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Original Research Article

Missing daughters? A 6-year village-level study of sex ratio trends at birth and its correlation with MTP and abortion in central India

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ABSTRACT

Background: India has experienced persistent gender imbalances, with declining sex ratios at birth (SRB) largely attributed to son preference, sex-selective abortions, and the misuse of reproductive technologies. Despite legislative measures such as the PCPNDT Act, skewed SRBs remain prevalent, especially in rural regions. While national-level data highlight this trend, there is a dearth of village-level, time-bound analyses examining the role of Medical Termination of Pregnancy (MTP) in influencing SRB. This study aims to analyze village-wise SRB trends over six years in a Central Indian block and assess their correlation with MTP and abortion data, particularly among women with previous female children.

Methods: A retrospective observational study was conducted using secondary data from 2019 to 2025, sourced from sub-centres, PHCs, CHCs, and private facilities. Data included annual live births disaggregated by sex and MTP/abortion cases categorized by maternal parity. Villages were anonymized, and statistical analyses, including Spearman's correlation, were performed to explore associations between SRB and MTP/abortion trends.

Results: SRB varied significantly across villages, with values ranging from as low as 720 to over 1200 across years. Abortions and MTPs were consistently higher among women with one or more daughters, with a peak in 2024-25. However, Spearman's correlation revealed only a moderate, statistically insignificant relationship between SRB and MTP (r_s=0.4857, p=0.3287), and a negligible correlation with abortions (r_s=0.0857, p=0.8717).

Conclusions: The findings suggest that gender preference may subtly influence abortion patterns, even if not strongly reflected in statistical correlation. Persistent low SRBs in certain villages signal the need for targeted, grassroots-level interventions to combat sex-selective practices and promote gender equity.

Keywords: Medical termination of pregnancy, Rural India demographics, Sex ratio trends, Sex-selective practices

INTRODUCTION

India has long faced a significant imbalance in its sex ratio, with a notably lower number of females compared to males. This disparity is especially stark among children, as reflected in the declining child sex ratio (CSR) from 964 girls per 1000 boys in 1971 to just 914 in 2011, signaling a deepening demographic concern.[1] The roots of this imbalance lie in entrenched socio-cultural preferences for sons over daughters, which manifest through sex-selective abortions and higher rates of female infant mortality.[2]

Such gender-biased practices have persisted despite legislative interventions, notably the enactment of the Pre-Conception and Pre-Natal Diagnostic Techniques (PCPNDT) Act in 1994, aimed at curbing the misuse of diagnostic technologies for sex selection.[3] Nonetheless, the proliferation of new reproductive technologies (NRTs) since the mid-1980s has facilitated the

continuation of prenatal sex determination and selective elimination of female fetuses.[4]

Studies indicate that India alone accounts for nearly half of the global deficit of female births, highlighting the extent of discrimination against daughters from the earliest stages of life[5]. This phenomenon is further compounded by broader socioeconomic and systemic factors such as commercialization of the medical profession, consumer-driven development models, and deeply rooted patriarchal norms.[4-6]

The problem of "missing daughters" in India has shifted from overt practices like female infanticide to more covert yet widespread mechanisms like pre-birth sex selection.[6] Previous macro-level analyses have underscored national and regional disparities in CSR, but there remains a gap in micro-level, village-based research examining trends over time and the impact of medical termination of pregnancy (MTP) on sex ratios at birth. This study seeks to address that gap through a six-year empirical investigation in Central India, correlating sex ratio trends at birth with reported cases of MTP and abortions. By doing so, it aims to offer a localized understanding of how systemic son preference continues to influence reproductive choices and demographic patterns at the grassroots level.

The aim of this study was to analyze the trend and variation in the sex ratio at birth across villages in a block over a six-year period. It also examined trends in Medical Termination of Pregnancy (MTP) and abortion data during the same timeframe. Additionally, the study assessed the correlation between the sex ratio at birth and MTP/abortion cases, particularly among women with one or more previous female children, to understand possible links to sex-selective practices.

METHODS

This was a retrospective, observational, record-based study conducted to analyze trends in the sex ratio at birth (SRB) and its correlation with Medical Termination of Pregnancy (MTP) and abortion patterns across villages in the block of district, Central India, over a six-year period from 2019 to 2025.

The study utilized secondary data collected from multiple sources, including birth registers maintained at sub-centres and Primary Health Centres (PHCs), MTP and abortion registers from public health facilities such as PHCs and Community Health Centres (CHCs), as well as available data from private health centres. In addition, reports from ASHAs and ANMs were used to extract information related to maternal parity and the number of previous female children, wherever available.

Data collected included village-wise live births disaggregated by sex for each year from 2019 to 2025, along with annual records of MTPs and abortions. The abortion data included information on maternal parity and the number of prior female children. To ensure confidentiality, villages were anonymized and assigned alphabetical labels (e.g., Village A, Village B, Village C, etc.) in all data presentation and analysis.

Sex Ratio at Birth (SRB) was calculated as,

SRB= (Female live births/Male live births)×1000

Annually, for each village and PHC area.

Descriptive statistics were applied to analyze trends in SRB across the six-year period, with special attention to variations across villages and PHC areas. Villages were categorized based on persistently low (<900) or high (>950) SRB values to identify patterns that may indicate gender-based practices. A correlation analysis was performed to explore the relationship between SRB and MTP/abortion rates, particularly examining whether abortions were more frequent among women who had one or more prior female children. Statistical significance of the observed relationships was tested using Pearson or Spearman correlation coefficients, depending on the nature of the data.

As the study was based solely on secondary data, individual patient consent was not required. However, all necessary permissions were obtained from district and block-level health authorities to access anonymized records, ensuring confidentiality and adherence to ethical research standards.

RESULTS

Table 1 presents the year-wise distribution of live births and corresponding sex ratios at the block level from 2019 to 2025. The sex ratio, indicating number of female births per 1,000 male births, showed an overall fluctuating trend. It improved from 894 in 2019-20 to a peak of 977 in 2021-22, followed by a gradual decline, reaching 924 in 2024-25. These variations reflect demographic changes, social factors, or the impact of health interventions targeting gender equity during this period.

Table 1: Year-wise total live births and sex ratios at block level.

Year	Male birth	Female birth	Total birth	Sex ratio/1000
2019-20	802	717	1519	894
2020-21	760	713	1473	938
20201-22	750	733	1483	977
2022-23	712	648	1360	910
2023-24	647	605	1252	935
2024-25	617	570	1187	924

The analysis of sex ratio trends across PHCs in block from 2019 to 2025 reveals notable fluctuations. Village A

showed a gradual increase from 727 in 2019-20 to 1050 in 2024-25, despite a dip in 2023-24. Village B experienced significant variability, peaking at 1207 in 2023-24 but sharply declining to 720 in 2024-25. Village C maintained a relatively stable sex ratio, with minor fluctuations ranging from 841 to 1005. Village D consistently reported higher sex ratios compared to other PHCs, reaching a maximum of 1098 in 2021-22 and slightly declining thereafter. The overall block sex ratio followed a moderate upward trend from 894 in 2019-20 to 977 in 2021-22, followed by fluctuations, ending at 924 in 2024-25. These trends indicate regional differences and possible influencing factors requiring further investigation (Figure 1).

Table 2 presents year-wise trends in MTP and abortion cases among women with one or more previous female children from 2019 to 2025. Abortions were consistently highest among women with one female child, rising from 18 cases in 2019-20 to a peak of 61 in 2024-25. MTP cases also increased over time, particularly among women with two daughters, reaching 13 cases in 2023-24. Although lower in number, MTPs and abortions were still reported among women with three or more daughters each year. The data indicates a potential link between the number of previous female children and the likelihood of seeking MTP or abortion, with a notable rise in cases in the final year of the study.

Table 3 presents the year-wise sex ratio at birth alongside total MTP and abortion cases from 2019 to 2025, along with the results of Spearman's rank correlation analysis. The correlation coefficient between sex ratio and MTP cases was rs=0.48571 with a p value of 0.32872, indicating a moderate positive correlation, though not statistically significant. For abortions, the correlation was weaker, with rs=0.08571 and a p value of 0.87174, suggesting virtually no relationship between sex ratio at birth and total abortion numbers. These findings imply that while there may be some association between MTP patterns and fluctuations in the sex ratio, the evidence is not strong enough to establish a statistically significant correlation in this dataset.

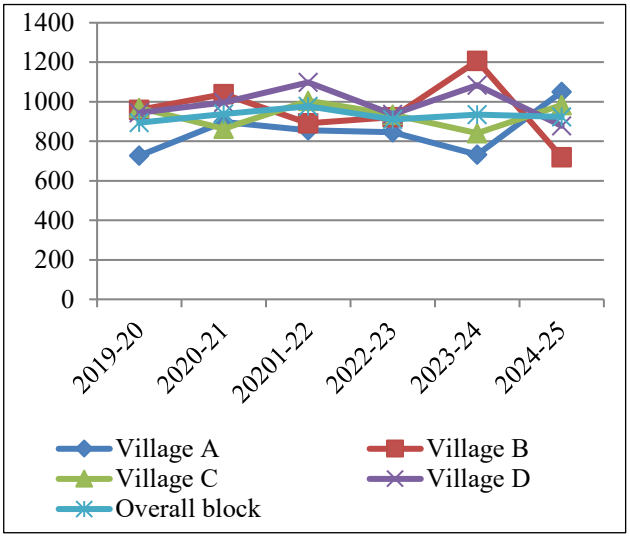

Figure 1: PHC-wise trend of sex ratio at birth in block in central India (2019-2025).

Table 2: Trends in MTP and abortion among women with one or more previous female children (2019–2025).

Year	MTP			Abortion		
	1 FCh	2 FCh	3 or More FCh	1 FCh	2 FCh	3 or More FCh
2019-20	8	3	2	18	7	1
2020-21	5	5	1	32	9	2
20201-22	5	1	0	44	3	2
2022-23	11	7	2	38	7	6
2023-24	12	13	0	34	8	3
2024-25	18	9	1	61	20	1

Table 3: Correlation between sex ratio at birth and MTP/abortion cases.

Year	Sex ratio/1000	Total MTPs	Total abortions	Spearman's rank correlation coefficient	
2019-20	894	13	26		
2020-21	938	11	43	For MTP r_s =0.48571, p (2-tailed) = 0.32872.	For Abortion r_s =0.08571, p (2-tailed) = 0.87174.
2021-22	977	6	49		
2022-23	910	20	51		
2023-24	935	25	45		
2024-25	924	28	82		

DISCUSSION

Based on the data presented in Tables 1 and 3, as well as broader national trends, a concerning pattern emerges with respect to sex ratios at birth and their relationship with medical termination of pregnancies (MTPs) and abortions. From 2019 to 2025, the block-level sex ratio fluctuated, peaking at 977 in 2021-22 but declining

thereafter to 924 in 2024-25. This trend aligns with national concerns about worsening conditional sex ratios and the rise in missing female births across India.

The moderate, though statistically insignificant, positive correlation between the sex ratio and MTP cases (rs=0.48571, p=0.32872) suggests some association, whereas the virtually null correlation with total abortion numbers (rs=0.08571, p=0.87174) points to the complexity of factors influencing these patterns. These findings, while not definitive, echo national evidence indicating that selective abortion rather than spontaneous abortion or general termination practices might be contributing to skewed sex ratios.

Nationally, research shows that the most plausible explanation for increasing numbers of missing female births is prenatal sex determination followed by selective abortion. These practices are especially prevalent in second- and third-order births, particularly when the previous children are girls.[7] While biological and environmental factors like infections, hormonal imbalances, or smoking may influence overall sex ratios, they are unlikely to explain the stark differences observed specifically at higher birth orders and over time.[7]

It is also critical to note that female infanticide, once a major concern, now plays a minimal role in the gap in female births for children aged 0-6 years, according to previous analyses.[7,11] The troubling increase in missing female births has been documented in nearly all Indian states, and sex-selective abortion is more common among wealthier and more educated families counterintuitive to patterns observed in child survival and access to healthcare.[7] This indicates deep-seated cultural preferences that persist even in contexts of greater access to education and health services.

Furthermore, the main driver behind missing female births, especially in second- and third-order births, is having one or more earlier daughters, suggesting that the desire for a male child remains a dominant social pressure. This is consistent with earlier findings showing that the sex ratio for a second child drops significantly when the first child is a girl as low as 716 girls per 1,000 boys (CI: 672-762, p<0.001) but conversely rises when the first child is a boy, suggesting strategic reproductive behavior based on the sex of existing children.[13]

These demographic distortions are especially striking when viewed against the backdrop of improved female child mortality rates in India over the last two decades.[12] While postnatal survival for girls has improved significantly, the same cannot be said for their chances of being born, underscoring a paradox where medical progress is outpaced by persistent gender bias.

In conclusion, while block-level data does not reveal a statistically significant correlation between sex ratio and abortion/MTP numbers, the patterns are consistent with national evidence of selective reproductive behavior and cultural biases. Addressing these challenges requires not only enforcement of laws against sex-selective practices but also deep societal shifts in gender norms and values.

This study has few limitations. MTP and abortion cases from unregistered or private providers may be underreported or missing, which can lead to underestimation of actual figures. With only six years of data and a small number of cases per year, statistical power is limited, which may reduce the strength and significance of correlation findings. Findings are based on a single block and may not be generalizable to other regions or districts with different demographic or cultural profiles.

CONCLUSION

This six-year village-level analysis revealed significant temporal and spatial variation in the sex ratio at birth across the block, with several villages showing persistently lower ratios. Trends in MTP and abortion data highlighted a noticeable number of cases among women with one or more previous female children, suggesting a potential influence of gender preference on reproductive decisions. While statistical correlation between sex ratio and MTP/abortion was not found to be significant, the pattern of higher abortion rates in women with daughters indicates possible underlying sociocultural bias. These findings underscore the need for continued monitoring and targeted interventions to address gender-biased practices and promote gender equity at birth.

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