



## CHANGING TRENDS OF SEX RATIO AT BIRTH AT TERTIARY HOSPITALS OF RAJASTHAN

### Medical Science

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### ABSTRACT

**Objectives-** To study changing trends of sex ratio at birth at tertiary hospitals (medical college hospitals) of Rajasthan, India and the impact of Government initiatives for girl child post 2010.

Sample size-5,75,948 live births

**Method:** The present retrospective study included data of live females and males born at the Department of Obstetrics and Gynecology, of medical college hospitals of Rajasthan, like SMS Medical College, Jaipur (Mahila Chikitsalaya & Zanana Hospital), from 2000-15 and from medical colleges of Ajmer, Bikaner, Jhalawar and Kota from 2010-15. Sex ratio at birth (SRB) was calculated for different years. The mean and standard deviation were analyzed to understand the trends.

**Results-** SRB has consistently increased at tertiary hospitals of Rajasthan post 2010 while this was erratic before 2010. At SMS Medical College hospital, Jaipur, the average SRB has increased and the standard deviation around the mean has decreased. The range for 95% confidence interval has improved. Medical College hospitals at Ajmer and Bikaner have shown a nominal increase in SRB.

**Conclusion-** Strict PCPNDT Act and Government schemes for girl child appeared to be effective in improving SRB in Rajasthan post 2010 following their implementation.

### KEYWORDS

Abortion, Sex Distribution, Sex Ratio

#### Introduction

Sex ratio at birth (SRB) is a global issue, and has remained unfavourable to females with number of males always outnumbering females. A distorted SRB may be considered indirect evidence of prenatal sex determination followed by sex-selective abortion.<sup>1,2</sup> India is one of the several countries where such concerns are persistent and significant.<sup>3</sup> Besides being a demographic indicator it is also a focal point for policymakers. Internationally the biologically normal sex ratio at birth is around 105 male births per 100 female births<sup>4</sup> which translates to 952 female births per 1,000 male births in India under natural circumstances. In South East Asia including India, gender bias is common due to male patriarchy and cultural preferences. Similar picture is seen in some Latin American, Asian and African countries like China, Korea, Indonesia, Brazil etc. According to United Nations Population Fund (UNFPA) son preference in India, is due to reasons of inheritance, family lineage, economic security, old age support, and birth & death rituals. Daughters are considered as burden due to dowry practices. Comparison of observed SRB with normal SRB gives an idea of girls missing at birth. Prenatal sex selection has resulted in approximately 5.7 lakh girls missed annually in India (2001-08) & 4.5 million girls missed over (2001-08).<sup>5,6</sup> More recently, the number of "missing girls have reached almost 117 million in 2010, most of them being from China and India."<sup>7</sup>

Techniques for sex identification such as ultrasound or amniocentesis became commonly available in India in the 1990s. Today, techniques such as, chorionic villus sampling, blood tests and pre-conception methods, are further distorting SRB. Female feticide, infanticide, abandonment of girl child, lack of health care and nutrition are few examples of gender bias.<sup>8,9</sup> Masculine society causes marriage squeeze, prostitution, bride trafficking, polygamy, crimes and gender based violence.<sup>10</sup>

Data from Sample Registration System (SRS) Survey indicates SRB in India for 2001-03 was estimated at 883, which has increased to 906 in 2007-09 and 906 for 2009-11. The average SRB in Rajasthan was 855 Females for every 1000 males from 2001-03, improving to 875 in 2007-09 and to 893 in 2011-13.<sup>11</sup>

Prenatal Diagnosis was introduced in India as a method for detecting fetal abnormalities but was soon used for prenatal sex selection. In 1994 Government of India, brought Pre-natal Diagnostic Techniques Act (PNDT Act) for prohibition of sex selection which was amended in 2003 to Pre-Conception and Pre-Natal Diagnostic Techniques (PCPNDT) Act<sup>12</sup> to improve the regulation of technology used in sex selection. There has been a shift towards arresting the gender

imbalance in sex ratios in a few states. A quantitative evaluation of the PCPNDT Act using longitudinal data found a significantly positive impact of the Act on child sex ratio.<sup>13</sup>

'In addition to the expected effects of social and economic development, India has strong public policies to increase gender equity and to equalize the value of sons and daughters to their parents, through vigorous media campaigns and legislation, and more recently through financial incentives to parents with daughters'.<sup>14</sup> Our study aimed at analyzing the changing trends of SRB at medical college hospitals of Rajasthan. We postulated that, with increased initiatives of Government policies, there has been a slight rise in SRB trend in these hospitals. The purpose of these initiatives is to curb the falling sex ratio at birth in Rajasthan.

#### Materials and Methods

Sex ratio at birth is best measured by using birth records. The present retrospective study is a hospital based study and included data of live females and males born at the Department of Obstetrics and Gynecology of various medical college hospitals (tertiary hospitals) of different geographical locations in the state of Rajasthan, India, which were selected randomly by coin method. Available data from SMS Medical College, Jaipur (Mahila Chikitsalaya & Zanana Hospital), was from 2000-15 and for Medical Colleges of Ajmer, Bikaner, Jhalawar and Kota from 2010-15. Because anonymous summary statistics were used, no approval from an ethics committee was required. We assessed 5,75,948 live births from the database. The data collected from Record offices consisted of total number of live births by gender for each month. These totals were then summed for annual totals.

**Statistical Method:** The data given was in the raw format, therefore before calculating SRB, filtration of database files has been done. We divided the female live births with male live births and then multiplied it with 1000. In case of two or more hospitals of a medical college, we added the live births of the locations for female as well as male, before dividing the female data with male and then multiplied it by 1000. The sex ratio at birth was then calculated by using the following equation:

$SRB = (\text{Total number of female live births} / \text{Total number of male live births}) \times 1000$  SRB was analyzed for various medical college hospitals of Rajasthan and for different years. We ran regression and took mean and standard deviation of the data using Excel formula to understand the trend and consistency in the pattern. No other statistical software was used other than Excel since both the data (male and female) are independent of each other. In order to compare pre and post 2010 trend,

confidence intervals for the mean was derived from 2001-03 and 2010-15 by calculating mean  $\pm$  2SD from the mean. Thus 95% confidence interval (CI) was calculated for SRB. We took average 952 female births per 1000 male births to be the natural variation of sex ratio at birth.<sup>4</sup>

## Results

We found that the SRB at medical college hospitals of Rajasthan post 2010 shows increase while prior to 2010, there is no consistency in the pattern. It was observed that the number of live females born for every 1000 live males born since 2010 has been slowly increasing. The average SRB has increased while the deviation around the mean has decreased. The 95% confidence interval has also improved.

"Table 1" and "Table 2" show results of study conducted at SMS Medical College, Jaipur (Mahila Chikitsalaya and Zanana Hospital). "Table1" shows, increase in SRB post 2010, while prior to 2010, there is no consistency in the pattern. Comparative results between Mahila Chikitsalaya and Zanana Hospital have been plotted in "Figure 1".

Table 2 shows Mean and Standard Deviation.

At Mahila Chikitsalaya, the average SRB was 863.5 for 2001-03 (95% CI for mean was calculated as 825.1-901.9) which increased to 924.6 for 2013-15 (95% CI for mean was calculated as 903.8-945.4). Thus the 95% confidence interval has improved, from 2001-03 to 2013-15. In 2013-15, the average has increased by 7% from 2001-03 while the deviation around the mean has decreased from 19.2 to 10.4.

At Zanana Hospital, the average SRB was 902.75 for 2001-03 (95% CI for mean was calculated as 896.15-909.35) which increased to 927.6 for 2013-15 (95% CI for mean was calculated as 913.4-940.6). Thus the 95% confidence interval has improved, from 2001-03 to 2013-15. In 2013-15, the average has increased by 3% from 2001-03 while the deviation around the mean has increased from 3.3 to 6.8.

The above data of Jaipur indicates that the numbers of live female births are more, post 2010, than the live female births in previous years. Medical College hospitals at Ajmer and Bikaner have also shown a nominal increase in SRB post 2010 while at Jhalawar and Kota the SRB trend has been bit erratic as shown in "Table 3" and plotted in "Figure 2".

## Discussion

According to National Family Health Survey (NFHS)-4 of years 2015-16, India's sex ratio at birth has increased from 914 in 2004-05 to 919 in 2015-16. In Rajasthan, NFHS-4 shows increased SRB for children born in the last five years which is 845 (urban) 899 (rural) 887 (total) as compared to total SRB of 847 NFHS-3 (2005-06).

According to our study at SMS Medical College, Jaipur, in Mahila Chikitsalaya, the average SRB was 863.5 for 2001-03 which increased to 924.6 for 2013-15. In Zanana Hospital, the average SRB was 902.75 for 2001-03 which increased to 927.6 for 2013-15. The SRB post 2010 of medical college hospitals at Ajmer and Bikaner have also shown a nominal increase in SRB. Different trends of SRB in Rajasthan could be because of difference in geographical areas, communities, cultures, traditions and mindset. Various hypotheses have been elaborated to explain observed trends in SRB in our study. Preference for male child diminishes under the impact of new schemes supporting girls, gender equity laws and the marriage squeeze crisis. Various Government initiatives and stringent measures have helped in controlling declining SRB in India and in districts of Rajasthan.

In Rajasthan, strict observance of PCPNDT Act such as inspections and decoy operations at ultrasound centres, and recent public attention has reduced the practice of sex selective abortions at places and has improved SRB in the NFHS. Data collected by Asian Centre for Human Rights, shows Rajasthan filed more than 600 cases by the end of 2015 for violation of PCPNDT act. Under Save the Girl Child Campaign, the "Informer Scheme" has been started in 2009 under which person informing about sex selection is awarded with cash. Since 2010, Rajasthan also has a provision for online registration of complaints for violation of this act (Department of Medical, Health and Family Welfare, Government of Rajasthan, n.d.). The UNFPA & UNICEF (United Nations Children's Fund) also address gender discrimination and work for well-being of women and girls.

The Government of India and the state governments including Rajasthan, have launched various incentive based schemes such as conditional cash transfer schemes (CCTs) and non-cash transfers for survival and welfare of girl child and mothers. These schemes aim at changing the attitude and mindset of parents towards their daughters, and to consider girl's existence as an asset for the family.

Following schemes are running in Rajasthan:

Mukhyamantri Balika Sambal Yojana, Pregnancy, Child Tracking & Health Services Management System since 2009 for online tracking of Antenatal, Postnatal Cases and to monitor regional and district-wise sex ratio.

Since 2011 onwards JSSY scheme (Janani Shishu Suraksha Yojana), Mukhya Mantri Nishulk Dawa Yojana, Janani Express scheme, Rajshree Yojana, Bhamashah Yojana, Sukanya Samridhi Khata & "Beti Bachao Beti Padhao" ("Save the girl child, educate the girl child") are running successfully in Rajasthan.

Such incentive based schemes have positive impact in reducing the gender imbalance, in enrollment and retention of girls in schools.<sup>15,16,17</sup> Experiences from various poor and low income countries like Brazil, Columbia, Mexico and Nicaragua show similar results for CCTs. A new study conducted by UNFPA with the International Institute of Populations Studies in Mumbai shows that there is gradual shift of cultural attitudes and girls are being considered as "less of a burden" and parents are willing to delay the girl's marriage and keep them enrolled in school, due to CCTs.

Above findings support our study, which aims at analyzing the changing trends of SRB in various medical college hospitals of Rajasthan.

**Conclusion-** The post 2010 rising SRB in various medical college hospitals of Rajasthan shows that government policies such as strict implementation of PCPNDT Act and incentive based schemes for girl child are working to increase the sex ratio at birth. But this is just the beginning and together we need to put in more efforts to sustain the increasing trend.

Girl child births should be valued. A key factor in reducing gender biased sex selection is by girl empowerment by providing her education, healthcare and jobs thus increasing her social and economic value. We recommend robust policy implementation, to address supply & demand side of prenatal sex selection services, to understand triggers & factors behind sex selection, influence key audiences such as youth, media, medical community, initiate debate and change community mindset to save the girl child.

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**Table 1 Change in Trends of Sex Ratio at Birth, SMS Medical College, Jaipur**

Year	SRB	
	Mahila Chikitsalaya (Jaipur)	Zanana (Jaipur)
2000	858.3	904.4
2001	841.3	906.1
2002	874.7	902.8
2003	874.4	899.4
2004	891.5	809.5
2005	905.4	870.7
2006	839.5	871.0
2007	894.1	883.4
2008	910.0	879.6
2009	870.5	870.5
2010	842.2	874.4
2011	877.5	871.8
2012	891.5	911.1
2013	912.8	924.7
2014	932.2	934.6
2015	928.9	921.6

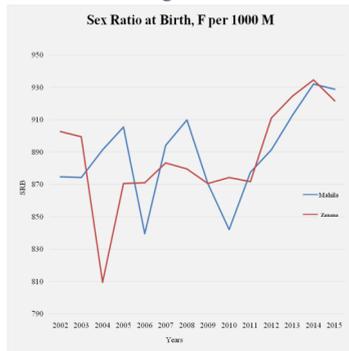
**Table 2 Mean and Standard Deviations of SRB at SMS Medical College, Jaipur**

Measures	Mahila Chikitsalya (Jaipur)		Zanana (Jaipur)	
	Year	2001-2003	2013-2015	2001-2003
Mean	863.5	924.6	902.75	927.0
Standard Deviation	19.2	10.4	3.3	6.8

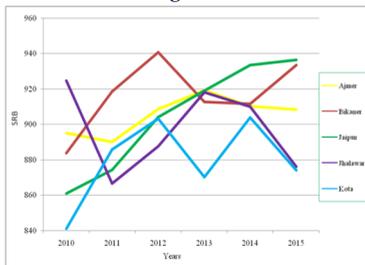
**Table 3 SRB of various Medical Colleges of Rajasthan, India**

Year	Ajmer	Bikaner	Jaipur	Jhalawar	Kota
2010	895.2	883.8	861	924.8	841.1
2011	890.2	918.7	874.3	866.6	885.9
2012	908.7	940.7	904.2	887.6	903.2
2013	919.3	912.7	919.1	918.2	870.3
2014	910.3	911.7	933.5	910.0	903.8
2015	908.5	933.6	936.4	876.0	874.0

**Figure 1**



**Figure 2**



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