ISSN: 0976-3031

Available Online at http://www.recentscientific.com

CODEN: IJRSFP (USA)

International Journal of Recent Scientific Research
Vol. 9, Issue, 7(G), pp. 28176-28180, July, 2018

International Journal of Recent Scientific Research

DOI: 10.24327/IJRSR

Research Article

A COMPARATIVE ANALYSIS OF INFANT SEX RATIO IN TAMIL NADU AND INDIA FOR TWO CENSUS YEARS

Magesh Rajan H., Gayathri K and Vasna Joshua*

ICMR-National Institute of Epidemiology, Chennai

DOI: http://dx.doi.org/10.24327/ijrsr.2018.0907.2411

ARTICLE INFO

Article History:

Received 4th April, 2018
Received in revised form 25th May, 2018
Accepted 18th June, 2018
Published online 28th July, 2018

Key Words:

Infant sex ratio, determinants, Tamil Nadu, India

ABSTRACT

The objective of the study was to identify the determinants for regional variations of the ISR for districts of Tamil Nadu at local level and for Indian states at the global level. This exercise was also to compare for the period 2001 and 2011.Census of India data and published health reports on various determinants of ISR were used. Ordinary least square regression analysis was applied to understand which among the determinants are related to the ISR. Among the determinants of Tamil Nadu, the wasted pregnancy and infant mortality rate for the year 2001; and the percent persons below poverty line for 2011 were statistically significant. For India, the coefficient of the percentage of persons below poverty line (BPL) and infant mortality rate for the year 2001; female literacy, wasted pregnancy and percent of persons below poverty line for the year 2011 were statistically significant.

INTRODUCTION

Infant Sex Ratio (ISR) represents the number of females per thousand males whose age is 0-1 years in a human population. Sexratio has been considered as an important social indicator to measure the extent of the prevailing equity between males and females, in a society, and at a given point of time (MOFHW, 2005). Determinants of change in sex ratio vary from sex differentials in mortality, sex migration, sex morbidity, sex ratio at birth, child sex ratio and sex differentials in population enumeration (Census of India, 2001). It has been reported by the Registrar General and Census of India (RGI) that some big countries like China whose country sex ratio in 2001 was 944 has drastically fallen to 926 in 2011. While Nigeria's sex ratio stood at 987 in 2011 as against 1016 in 2001; across the globe the sex ratio has reported a sharp decline in the number of women (Barakade, 2012). In India the sex ratio among children 0-6 years (child sex ratio) was 914 girls per 1000 boys during 2011. It had declined from 927 (census 2001) and it was 945 in 1991(Karande and Khadke, c2013).India has been considered to be in better position among all countries in terms of sex ratio. In many developing countries, more girls die between age group (0-4 and 0-6). It has also shown a wide contrast with the developed countries, where deaths of boys are higher than those of girls (Sharma and Anant, c2015).There are several studies in literature about sex ratio at birth, children sex ratio and sex differentials in mortality and morbidity but study on infant sex ratio is sparse. Hence an attempt was made with the available data. In India the ISR among children 0-1years was 915 girls per thousand boys and 910 girls per thousand boys in 2001 and 2011 respectively. Similarly in Tamil Nadu state the ISR was 955 girls per thousand boys and 939 girls per thousand boys in 2001 and 2011 respectively.

Some of the factors affecting sex ratio are traditional bias associated with son preference, low status of women, social and financial security associated with sons, socio- cultural practices like dowry and violence (MOFHW,2005). Variations in the sex ratio reflect the diverse levels of social obstacles that girls and women face in different regions. The above factors have affected the natural balance of the male and female population. The greater the obstacles, the lower are the sex ratio. The objective of the study aims to identify the determinants of the ISR(i) for districts of Tamil Nadu (at local level) for the period 2001 and 2011 and (ii) for Indian states (at global level) for the period 2001 and 2011.

Corresponding author:* **Vasna Joshua
ICMR-National Institute of Epidemiology, Chennai

MATERIALS AND METHODS

Census of India data alone was not complete especially for district level information hence other sources from National Family Health Survey (NFHS-2)reports, Sample Registration System, District level household and facility surveys (DLHS II and DLHS IV; closer to census years) and published reports on various covariates of ISR was used (FWS, 2011; CRS,2014; NHDR,2001; Christophe and Irudaya,2013; MHFWG, 2011; Johnston, 2014; PNPE, 2011-12; HDI,2011; Handbook, 2012;) the information was gathered for districts of Tamil Nadu and for Indian states for the year 2001 and 2011 respectively.

The regional variation of ISR in districts of Tamil Nadu and Indian states are shown using the maps [Figure1, Figure2]. The maps were drawn using ArcGIS 10 (ESRI, Redlands, CA, USA) software.Thirty-six major Indian states including union territories and 32districts of Tamil Nadu and for 13 covariates for which the information was available were examined for the study. These states (districts) cover nearly 99% of the country's (Tamil Nadu state's) population.ISR was considered as a dependent variable and independent variables(determinants) examined were female literacy rate, still birth rate, percentage of wasted pregnancy, infant mortality rate, maternal mortality rate, percentage of persons below poverty line, human development index, percentage of births with birth order greater than four, percentage of women married before 18 yrs, percentage of birth complication, crude birth rate and total fertility rate. Wasted pregnancy includes both spontaneous abortions and induced abortions. Spontaneous abortions are miscarriages; whereas induced abortions include any medical termination of pregnancy or may be sometimes hidden sex selective abortions of the individual.

Ordinary Least square (OLS) regression being a simple and widely used statistical technique, when the dependent variable (ISR) was used. It was used to understand which among the independent variables are related to the ISR using SPSS 20 (IBM SPSS, Bangalore) software. The inclusion or exclusion criteria of the independent variables were assessed by looking at the individual regression coefficients, random patterns, and indicative of model biases, standardized residuals and distributional displays. The multicollinearity of the variables was assessed using the variance inflation factor (VIF) values, exceeding the value 10 are signs of serious multicollinearity requiring correction. Statistical goodness of fit for the multiple regression models was assessed by the correlation coefficient and the coefficient of determination (R^2).

The four determinants (independent variable) namely female literacy rate, percentage of wasted pregnancy, percentage of persons below poverty line and infant mortality rate were found suitable to be included in the regression model for Tamil Nadu and India. The summary statistics of the variables are shown in [Table 1aandTable 1b]

RESULTS

Districts of Tamil Nadu

The map clearly shows the increase in the imbalance of ISR among districts of Tamil Nadu. The northern districts namely Krishnagiri, Dharmapuri, Salem, Nammakal and Perambalur has an ISR of less than 922 girls for 1000 boys in 2001 whereas in 2011 districts Cuddalore, Thiruvanamalai and Ariyalur were also added.

The independent variables accounted for around 73 per cent of the variation in the ISR across districts during 2001, around 71 per cent in 2011. Among the determinants (independent variables), the coefficient of the pregnancy wasted and infant mortality rate were negative and statistically significant for the year 2001, keeping all other variables in the model constant. In the year 2011 the coefficient of the persons below poverty line was negative and statistically significant keeping all other variables in the model constant. All other OLS estimate was not statistically significant [Table 2].

These results thus show that wasted pregnancies and the infant mortality rate were associated with a lower ISR, suggesting strongly that sex-selective abortions and/or discrimination against female children in this age group are higher during 2001 whereas during the year2011 the percentage of population below Poverty Line (BPL) has (negative) significant influence on the level of infant sex ratio which means that the people of BPL in spite of their economical crisis, might have discrimination for male or female child. The coefficient of all other variable, however, was statistically insignificant keeping all other variables in the model constant.

States of India

The map clearly shows the imbalance of ISR among states of India. Majority of the state's ISR have less than 943 girls for 1000 boys. States namely Tamil Nadu, Andhra Pradesh, Orissa, Jharkhand and Manipur which had more no. of girls also have got shifted to the above category in the year 2011.

The independent variables account for around 62 per cent of the variation in the ISR across the states in 2001 and around 61 per cent in 2011. Among the independent variables, the coefficient of the percentage of persons below poverty line was positive and the infant mortality rate has a negative influence were statistically significant keeping all other variables in the model constant for the year 2001. Additionally in the year of 2011, female literacy and the coefficient of the pregnancy wasted (negative) were statistically significant keeping all other variables in the model constant. These results suggest that higher number of persons below poverty line affects or imbalances the ISR in both the years; wasted pregnancies was associated with a lower ISR, suggesting strongly that pregnancy wastage among female children in this age group are higher during 2011. The coefficient of all other variables, however, was not statistically significant.

DISCUSSION

The maps clearly depict the gender imbalance across the regions and progress to a category of decrease in female infants. It is an alarming sign for the country. The above exercise also shows that imbalance in ISR has been influenced by the wasted pregnancy at the district level of Tamil Nadu (2001) and also state level of India (2011). Every year in India 12 million girls are born and about one-third of these girls die in the first year of life and it is estimated that every sixth female death is directly due to gender discrimination (Parvesh, c2011).Policies are framed to correct sex ratio imbalances in India in recent years and mainly concentrated on preventing sex-selective abortions. Male children are preferred than girls

because female children are considered to have less strength; less paid for any tasks; more of a liability and eventually has to leave the family and any investment was seen as a waste of resources as she will not be able to contribute financially to the family; prevailing dowry system in India makes the thought of having a daughter even more of a burden and more inclined to abort a female baby.

Sons in developing countries would carry on the family name; they are seen as essential for the survival of the family; economic support and for social security in old age; to perform death rites are part of a set of social norms and are thus valued more than daughters (Therese and Zhu, 2006; Roisin, c2011). Though there are possible hidden realities under the label of abortions but ultimately it ends with wasted lives. Predominantly prenatal sex determination results in an increase in the proportion of unwanted births which in turn reinforced to abortions.

This could be corroborated with the findings of an earlier study**,** that the number of sex selective abortion has increased vastly (Oomman and Ganatra; 2002). Also sex-selective abortion has been reported to be a family building strategy to achieve the conflicting goals of limiting family size and achieving the desired sex composition (Ganatra; 2000). In parts of China and India, it has been estimated that if the use of sex-selective abortions continues as its current rate, 12% to 15% of men of marrying age will be unable to find a wife in the country (Therese and Zhu, 2006).

The high positive significant association of female literacy on ISR in India in 2011 indicates that female literacy becomes an important explanatory factor for ISR. Similar findings were shown by a study that women's education was found to be the most significant factor in reducing son's preference. Also in another study there was an increased sex differential in mortality, not only with rise in socio-economic status, but also with better education for women (Basu, 1992).

Percentage of persons below poverty line has significant association on ISR in India in 2001 and 2011; which is suggestive of the impact of financial status of family on the sex composition of infant in the family. Poverty acts as a barrier of deprivation of basic amenities in families; and also negligence of birth complications and thereby gives rise to imbalances in the ISR.

Infant mortality also gives rise to imbalances in the ISR. It has been observed as the negative association with infant sex ratio in Tamil Nadu and India in 2001, suggesting that the female infant mortality rate was higher than the male infant mortality rate during that period.

The study also highlighted regional variations over years

The sex ratio at birth /infant /children is an important factor. A skewed sex ratio with less female may make women worse as pointed out by the author that robbery, rape and bride trafficking are associated with societies with large groups of young single men (LSN, 2011). As per census 2011, the study emphasizes that measures must be taken to increase female literacy globally to bring changes in social attitude towards women, preventive measures in pregnancy wastages like female sex selective abortions. The study also suggests poverty as a significant determinant locally as well as globally. It may lead to high mortality due to neglected birth complications and inability to access quality health care needs; which give rise to imbalances in the ISR. One of the limitations of the study is that the secondary data analysis pertains to data collected from various sources and with different objectives hence *needs* to be interpreted with little caution.

CONCLUSION

Strategies are needed to ensure that the health services and interventions are offered to persons below poverty line which may lead to gender balance in the forth coming census year. Public awareness campaigns must be planned and the dangers of gender imbalance must be propagated.

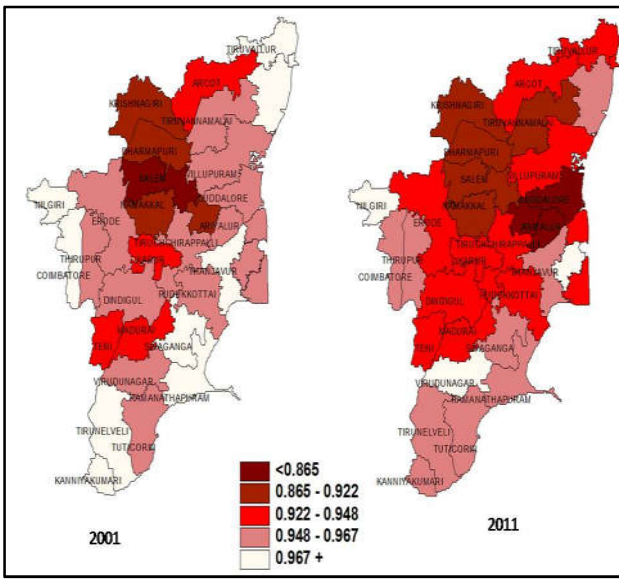

Fig 1 Distribution of Infant sex ratio in districts of Tamil Nadu

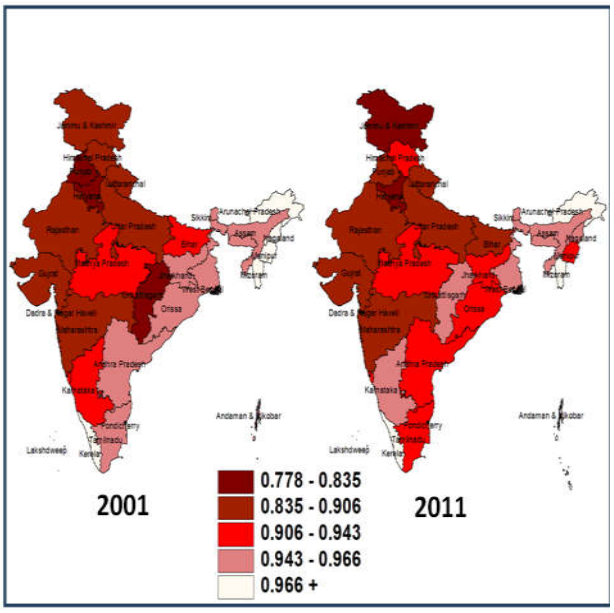

Fig 2 Distribution of Infant sex ratio in states of India

Table 1a Descriptive Statistics of the Determinants of Tamil Nadu

		TAMILNADU 2001 (N=34)				TAMILNADU 2011 (N=34)			
S No	**Variables**	**Minimum**	**Maximum**	**Mean**	**Std deviation**	**Minimum**	**Maximum**	**Mean**	**Std deviation**
1	Infant Sex ratio	860.9	1016.6	956.2	32.7	819.6	987.1	938.0	35.2
2	Female Literacy	50.6	84.8	63.8	50.6	52.4	90.5	71.9	52.4
3	Wasted pregnancy	2.2	11.7	6.1	2.2	0.0	6.8	1.4	0.0
4	Infant mortality rate	14.3	80.7	44.4	14.3	10.5	67.0	34.2	10.5
5	Percent of persons BPL	0.7	7.2	3.4	0.7	3.3	69.0	24.9	3.3

Table 1b Descriptive Statistics of the Determinants of India

		INDIA 2001 (N=35)				INDIA 2011 (N=35)			
S No	**Variables**	**Minimum**	**Maximum**	**Mean**	**Std deviation**	**Minimum**	**Maximum**	**Mean**	**Std deviation**
1	Infant Sex ratio	778.0	1006.5	925.8	56.3	778.9	988.8	922.7	46.9
2	Female Literacy	33.1	87.7	60.2	13.8	52.7	92.0	71.5	10.5
3	Wasted pregnancy	0.4	17.0	4.4	4.0	0.1	13.4	3.5	2.9
4	Infant mortality rate	11.0	91.0	45.6	22.0	11.0	67.0	39.1	15.1
5	Percent of persons BPL	3.5	47.2	22.2	12.6	1.0	39.9	18.5	11.6

Table 2 Result of OLS regression analysis for Tamil Nadu and India for the year 2001,2011.

S No	**Independent variables**	**Tamil Nadu districts 2001 Beta (Std error)**	**Tamil Nadu districts 2011 Beta (Std error)**	**Indian states 2001 Beta (Std error)**	**Indian states 2011 Beta (Std error)**
1	Constant	1065.5** (63.38)	855.5** (63.651)	947.3** (0.072)	693.6** (95.273)
2	Female Literacy rate	-.048 (0.695)	1.595 (0.941)	0.017 (0.849)	2.986**(1.008)
3	Wasted pregnancy	-5.071**(1.551)	-1.079 (0.438)	-1.28 (2.231)	-5.763*(2.612)
4	Persons below poverty line	-4.939(2.796)	-0.983* (0.406)	2.424**(0.704)	2.869**(0.729)
6	Infant mortality rate	-1.312**(0.389)	-0.250(0.590)	-1.549**(0.505)	-0.440 (0.656)
	R^2	0.73	0.71	0.62	0.61
	N	34	34	35	35

** Significant at 1% level * Significant at 5% level

Reference

1. Ministry of Health and Family Welfare (MOFHW) (2005), Annual Report on Implementation of Pre-Conception and Pre-Natal Diagnostic Techniques Act. [Last cited 2017 Aug 2]. Available from: http://pndt.gov.in/writereaddata/mainlinkfile/File22.pdf
2. Census of India, (2001) (Series 1) Chapter-6, Sex Composition of the Population.
3. Barakade AJ. (2012). Declining Sex Ratio: An Analysis with Special Reference to Maharashtra State. Geoscience Research. ;3:92-5.
4. Karande SV, Khadke PA (c2013). Decline Trend of Child Sex Ratio 0-6 Years Age Group in Maharashtra. [Internet]. [Last cited 2017 Aug 2]. Available from http://www.researchfront.in/03%20JULY-SEPT%202013/3.pdf
5. Sharma, Anant (c2015). Declining Sex Ratio in Gujarat: A Socio-Demographic Analysis. [Internet].Maharaja Sayajirao University of Baroda: [Last cited 2017 Aug 2]. Available from: http://shodhganga.inflibnet.ac.in/handle/10603/56197.
6. Family Welfare Statistics (FWS) in India, 2011 Edition.[Last cited 2017 Aug 2] Available from: http://mohfw.nic.in/WriteReadData/l892s/3503492088FW%20Statistics%202011%20Revised%2031%2010%2011.pdf
7. Civil Registration System (CRS-1), (2014) of the Office of Registrar General, India (ORGI). Available from:https://data.gov.in/catalog/below-poverty-line-india
8. National Human Development Report, (NHDR) (2001). [Last cited 2017 Aug 2] Available from:http://planningcommission.nic.in/reports/genrep/nhdrep/nhdch2.pdf
9. Civil Registration System (CRS-2) (2014) of the Office of Registrar General, India (ORGI). Available from: https://data.gov.in/catalog/crude-birth-rate-india
10. Christophe Z G, S Irudaya R (c2013). Fertility at the District Level in India Lessons from the 2011 Census. EPW.XLVIII(23). [Last cited 2017 Aug 2]. Available from http://www.excellcareeronline.com/meterials/11931511691320.pdf
11. Ministry of Health and Family Welfare Government of India (MHFWG) (2011), Statistics Division. [Last cited 2017 Aug 2] Available from: https://nrhmmis.nic.in/PubFWStatistics%202011/Roman.pdf
12. Johnston WR (2014). India abortion percentages by state and territory, 1971-2013. [updated 2014 September 7; Last cited 2017 Aug 2] Available from: http://www.johnstonsarchive.net/policy/abortion/india/ab-indias2.html
13. Press Note on Poverty Estimates (PNPE), (2011–12), Planning Commission; Report of the Expert Group to Review the Methodology for Estimation of Poverty (2009) Planning Commission; PRS.[Last cited 2017 Aug 2] Available from: http://planningcommission.nic.in/news/press_pov1903.pdf
14. Human Development Index (HDI) (2011),[Last cited 2017 Aug 2] Available from: http://hdr.undp.org/es/content/table-2-human-development-index-trends-1980

15. Statistics on children in India, Hand book 2012, [Last cited 2017 Aug 2] Available from:http://nipccd.nic.in/reports/handbk12.pdf
16. Parvesh KS (c2011).Times of India.[Last cited 2017 Aug 2]. Available from: http://timesofindia.indiatimes.com/articleshow/7353590.cms
17. Therese H,Zhu WX (2006). Abnormal Sex Ratios in Human Populations: Causes and Consequences.PNAS;103:13271-75;[Last cited 2017 Aug 2]. Available from: https://doi.org/10.1073/pnas.0602203103
18. Roisin S (c2011). Child Reach international- Sex Selective Abortion in India.[Last cited 2017 Aug 2] Available from:http://India%20Sex%20Selective%20Abortion%20FINAL%20(1).pdf
19. Oomman N and Ganatra BR (2002). Sex Selection: The Systematic Elimination of Girls. Reproductive Health Matters.;10:184-8. [Last cited 2017 Aug 2]. Available from: https://www.tandfonline.com/doi/pdf/10.1016/S0968-8080(02)00029-0
20. Ganatra. B (2000). Abortion research in India: What we know, and what we need to know. In R. Ramasubban and S.J. Jejeebhoy, eds., Women's Reproductive Health in India:1st ed. Jaipur, India: Rawat Publications;186-235.
21. Basu. A. M (1992).Culture, the status of women and demographic behavior; illustrated with the case of India. Oxford: Clarendon Press.
22. Life Site News (LSN) (2011 April 15). India's Gender Imbalance - Worst in Recorded History, [Last cited 2017 Aug 2]. Available from: https://www.lifesitenews.com/news/indias-gender-imbalance-worst-in-recorded-history.

How to cite this article:

Magesh Rajan H., Gayathri K and Vasna Joshua. 2018, A Comparative Analysis of Infant Sex Ratio in Tamil Nadu and India for Two Census Years. *Int J Recent Sci Res.* 9(7), pp. 28176-28180. DOI: http://dx.doi.org/10.24327/ijrsr.2018.0907.2411

****