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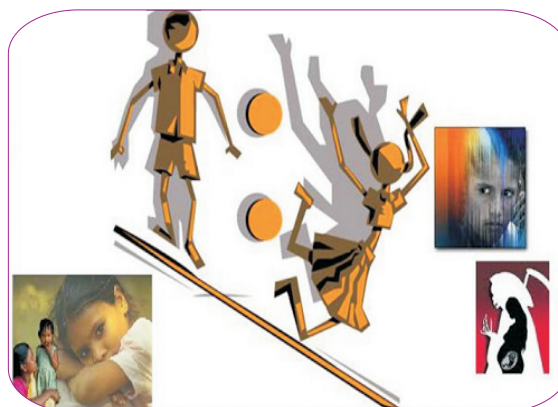
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SKEWED CHILD SEX RATIOS IN ODISHA: A REGIONAL ANALYSIS

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ABSTRACT:

One of the disturbing demographic features of recent time is the skewed child sex ratios (CSR) and Odisha is no longer an exception to this. The remarkable steady decline of CSR observed in the state following national trends in some of the demographic features with wide regional variation due to specific socio-economic and cultural practices. This study found that geographical spread of low CSR has been expanding over the years. This is primarily caused by rising trends of sex differential in infant and child mortality and differential rate of sex selective abortion.

KEYWORDS: Sex ratio, child sex ratio, sex ratio at birth, gender differential mortality

1. INTRODUCTION

The last part of twentieth century gave an alarm towards unbalanced sex ratio (SR)¹ and more specifically child sex ratio (CSR)². Skewed sex ratio is a critical social problem in India and is more severe in case of 0-6 years aged child population. The CSR steadily declined from 976 in 1961, 964 in 1981, 953 in 1991, 927 in 2001 and 914 in 2011 (Nandi and Deolalikar 2013; Nanzy and Shylaja 2014). Geographically, the sex ratio is more skewed in the north and the west representing more masculinity than the less adverse sex ratio in the south and the eastern region of India (Nanzy and Shylaja 2014). According to Agnihotri (2003) such established regional dichotomy between north-south or east-west and (or) north-west and south-east is no longer valid in present time (Srinivasan and Bedi 2008:961-962). In this context it is important to understand that biologically in all stages of life (except pre-birth), females have lower mortality rate than males, mortality rate for both sexes has been declining over the years due to improvement in health facilities and males generally engaged in more life risk oriented work such as violence, war etc. than female. Despite these advantages, the number of females is lower than males and even steadily decline make a grave concern. In other words, the skewed sex ratio has not only been falling down temporally but also expanding spatially over the years. This is primarily because 'India has been traditionally and culturally plagued with the problem of gender discrimination of worst form: the avoidance of female births' (Patel et al. 2013: 1129) and high level of female mortality after or even before birth (Nanzy and Shylaja 2014). So, they (females) are subject to higher level of mortality as compared to their male counterpart within or outside the mother womb. This event is aggravated due to widespread discriminatory approaches towards girls and sex determination technology which 'diffused from core regions towards culturally homogeneous, adjacent regions over the years' (Guilmoto and Oliveau 2007 as cited in Kuzhiparambil and Rajani 2012:265). Thus, low sex ratio is attributed because of rampant sex selective abortion, more infant mortality (IMR)³ and child mortality (CMR)⁴ of girls compared to boys of 0-6 years aged. Both these factors are the product

of strong son preferences (Nandi and Deolalikar 2013:216). Beside, differential under enumeration of in the census, changing pattern of contraceptive use, increasing desire for diagnostic technique for sex selection was also found to be important for variation in CSR (Despande 2008). Several studies corroborate this, despite; the Prenatal Diagnostic Test (PNDT) Act 1996 sex selective abortion in India is quite rampant. Varied statistical figures show the extent of female deficits due to excessive female feticides. As direct data is not available for measuring extent of sex selective abortions, indirect estimation is done from SRB. According to Sen's estimates (2003) there are 37 million 'missing females' (i.e. unborn girls) in India. Another estimates by Jayaraman (1994) and Arnold et al. (2002) around 50, 000 to 100000 girl fetuses are aborted every year in India. Jha et al. estimates around 4.5 lakh to 5.4 lakh fetuses are aborted in each year in India (as cited in Nandi and Deolalikar 2013:217). By looking at the magnitude of the statistics often scholars argued that PNDT Act has not fully catered its objective but according to Nandi and Deolalikar (2013) that gender imbalance in CSR would have been worsened even more in the absence of the PNDT ACT 1996.

Odisha being a state located eastern part of India is no longer exception to this macro pattern of CSR and has witness a steady decline of child sex ratio. This CSR has fallen from 1035 in 1961 to 941 in 2011 and some of the districts with the most unequal 0-6 sex ratio lie within the state. Though the CSR is higher in Odisha as compared to national average but temporal patterns in the ratio indicate that the state is following a similar trend of the country. Within this larger macro framework the following objectives have been made.

2. OBJECTIVES

- 1) To explore the levels and trends of child sex ratio in Odisha.
- 2) To examine spatial patterns of child sex ration at regional and district level of Odisha.
- 3) To analyses the causative factors for such trends and spatial patterns.

3. PROBLEMS

Geographical scale is an important yardstick to understand a problem in more general or particular point of view. Geography also influences the nature and extent of the problem. There is almost absent or very little work has been done to address the issues of SR in general and CSR in particular in Odisha. Besides, few scholar(s) often do state level analysis for SR or and CSR which led to hides lot of intra-regional and inter-districts variation. In this context, a regional and district level analysis is done to understand the spatial variation and causative factors of CSR

4. SCOPE AND LIMITATIONS

This paper is unique in its own way because it is probably the first one to understand the CSR issue in regional context within the state of Odisha. It is not only trying to find out deficit of girls at birth, gender differential IMR and CMR in spatial dimensions but infer their contribution towards lowering of CSR over times. In addition, it also link CSR with other socio-economic development at district level. The major limitation of this paper is that it is an aggregate analysis at districts or regional level. Hence, much information which corroborates our arguments is not available or included in the analysis. Thus it gives a partial picture of the whole issues and associated causative factors.

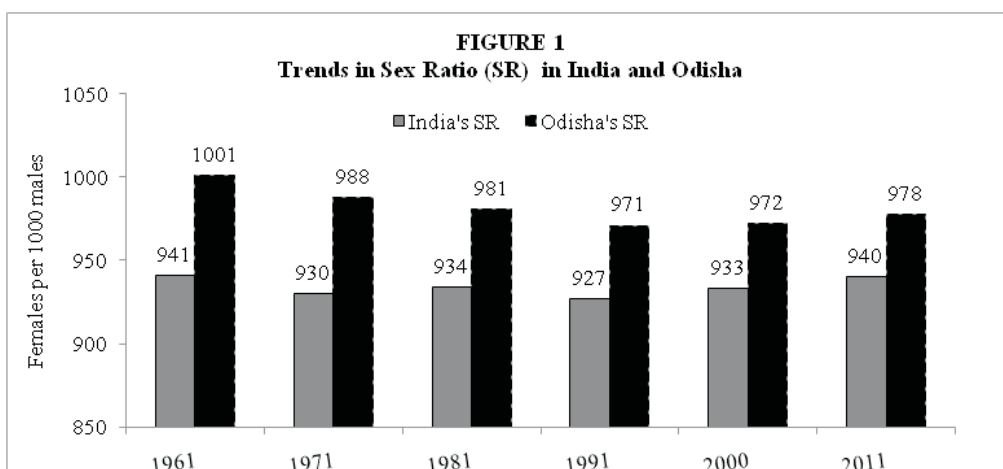
5. DATA AND METHODOLOGY

In this analysis data has been taken from various sources such as Census of India 2001 and 2011, Sample Registration System (SRS-2013) and Annual Health Survey (AHS). Sex ratio and other socio-economic indicators are taken from Census of India while IMR, CMR and SRB data has been taken from SRS 2013 at state level and for districts level SRB, IMR and CMR has been taken from AHS 2011-12. Descriptive statistics, Coefficient of Variation, Pearson's correlation and Choropleth mapping technique by using ARC-GIS 10.3 have been used extensively.

6. RESULTS AND DISCUSSION

6.1 Trends in Sex Ratio in India and Odisha

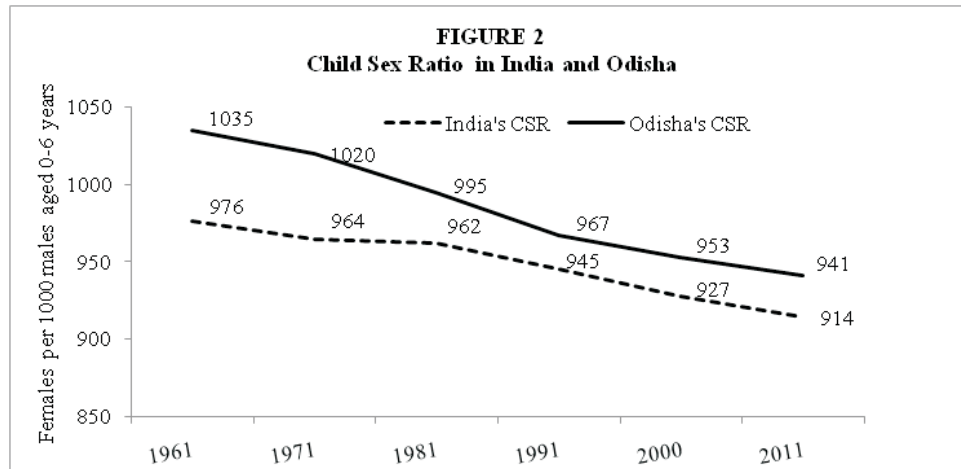
The overall SR was 941 in 1961 then it further declined by 11 points to 930 in 1971. After that a slight increase of 4 points in 1981 the SR became 934 in 1981. The overall SR had touched the lowest point of 927 in 1991. The Census 2001 has marked by increase of 6 points to 933 and which is followed by 7 points upswing in the last decade to 940 females per 1000 males. The improvements in post 1991 is because of women are outlive men (Nanzy and Shylaja 2014). However, there is a wide regional variation of SR is observed at state level. In the context of Odisha, the female per 1000 males is relative higher than the national average at all the decades. There was a monotonous falling of SR from 1001 in 1961 to 971 in 1991 almost 30 points decline. However, following the national trend pattern it also stated rising since 1991. Only 1 point and 6 points increased of SR between 1991 and 2001 and 2001 to 2011 made 971 and 978 female per 1000 males respectively. Though the overall sex ratio in Odisha started falling since 1961 but it slightly shows upward trends after 1991. The sex ratio has increased by only 6 percent during 2001 and 2011.



Source: Register General of India, 2013

6.2 Trends in Child Sex Ratio in Odisha

The entire nation reported a sharp decline of CSR during the past decades. It has declined from 976 in 1961 to 914 in 2011 almost a decline of 62 points within five decades. Almost all the states in recent decade, except Kerala, have reported declined trends in past four decade (as cited in Nanzy and Shylaja 2014:62). Odisha is being reported tha decline of 94 points from 1035 to 941 between 1961 and 2011. At the national level, the latest decade (2001-2011) reported the third highestt downfall of CSR by 13 points after 1991-2001 decade (decline by 18 points) and 1981-1991 decade (declined by 17 points). The decadal changes shows, the highest decrease of CSR in Odisha has been reported during 1981-1991 decade (declined by 28 points) followed by 1971-1981 decade (25 points declined). During 2001-2011, Odisha is marked by 12 points falling of CSR. During 1981 and 1991 it experienced the sharpest decline of 28 points within decade in Odisha. Thus, it evident that though, the CSR of Odisha is relatively higher than national average but it has been reported sharper falling than country as a whole. Many factors are responsible increasing of masculinity of sex ratio at younger age (0-6 years) both at state and national level. Scholars argue that such increase in masculinity or decline number of girls per 1000 boys is caused by strong patriarchal and patrilineal culture in the society, strong preference of sons which varies across states. This son preference further aggravated in a situation of decline fertility which both India and Odisha has been passing through. Nanzy and Shylaja (2014) argued that if the second order birth is also male, couple will rarely go for third child and contribute to unfavorable sex ratio. Besides, unfavorable treatment against girls leads to more exposure to high infant and child mortality.



Source: Register General of India, 2013

6.3 Regional patterns of CSR in Odisha

Because of excessive female child mortality in India, child sex ratio 935 is considered to be reasonable (Nanzy and Shylaja 2014: 62) but beyond that it is a matter of serious concern. Odisha's CSR has been approaching towards the critical threshold level of 935. During 2001 and 2011 CSR has declined by 12 points. Table 1 shows urban areas of Odisha reported 24 points decline of CSR from 933 to 909 while rural areas fall from 955 to 939 almost 16 points decline. Among the three NSS regions of Odisha, the lowest level of sex ratio is being reported in Coastal region (920) followed by Northern region (937). Thus, Coastal region crosses the critical limit of 935. The Northern and the Coastal regions are also being reported with highest and second highest falling of 18 points and 12 points making CSR 937 from 955 and 920 from 932 in during 2001-2011 respectively. The least fall of CSR is being reported in Southern region which is also one among three regions where falling rate is below the state average. The intra regional variation in CSR is not prominent among the regions (as C.V. ranges from 2.5-3.5 in 2011 and 1.4 – 1.7 in 2001) but it increases in all three regions. This indicates intra-regional distribution of CSR became more skewed i.e. some districts fall more rapidly than other districts in all the three regions. The high unequal distribution is absorbed in the Northern region followed by Coastal and Southern region in 2011.

Table 1 Regional variation of child sex ratio(0-6 age group) in Odisha

Regions	2011	2001	Decadal Change (2001-2011)
Northern Region*	937	955	18
C.V	(3.5)	(1.7)	
Coastal Region*	920	932	12
C.V	(2.8)	(1.4)	
Southern Region*	964	971	7
C.V	(2.5)	(1.5)	
Odisha	941	953	12
C.V	(3.5)	(2.8)	

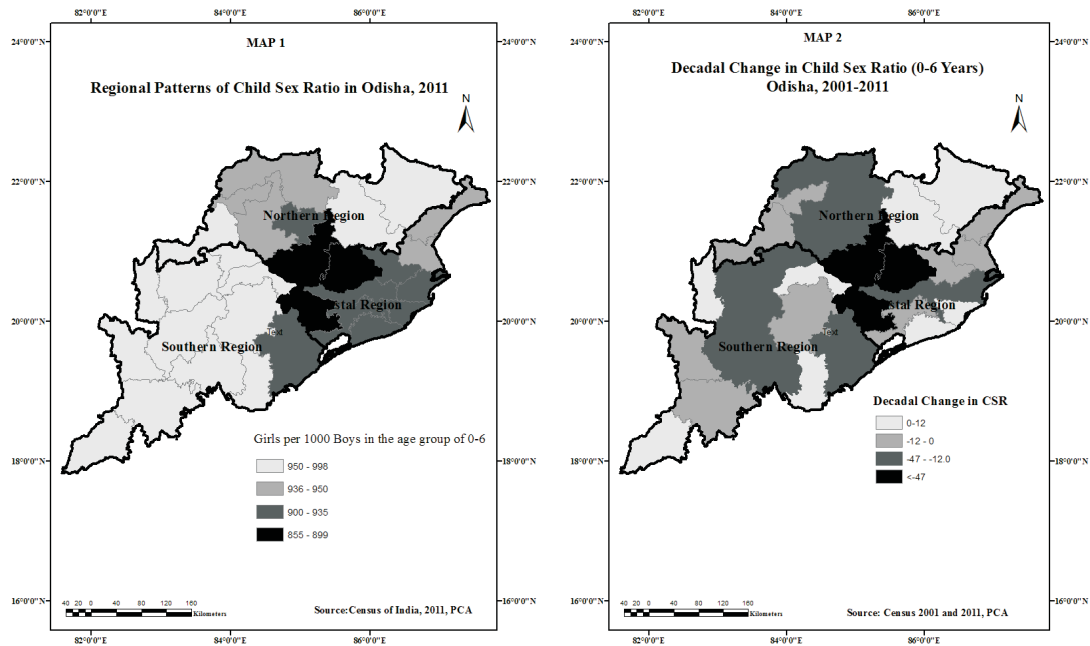
Notes: Northern Region Comprises of nine districts namely Bargarh, Jharsuguda, Sambalpur, Debagarh, Sundargarh, Keonjhar, Mayurbhan, Dhenkanal, and Anugul; Coastal Region Comprise Baleswar, Bhadrak, Kendrapora, Jagatsingpur, Cuttack, Jajpur, Nayagarh, Khorda, and Puri; Southern States Consists of Twelve Districts Namely Ganjam, Gajapati, Kandhamal, Baudh, Sonapur, Balangir, Nuapada, Kalahandi, Rayagada, Nabarangpur, Koraput, and Malkangir.

*Regional figures are the average of the above mentioned district.; C.V refers to Coefficient of Variation

Source: Census of India, Primary Census Abstract, 2001 and 2011.

6.4 District level patterns of CSR in Odisha

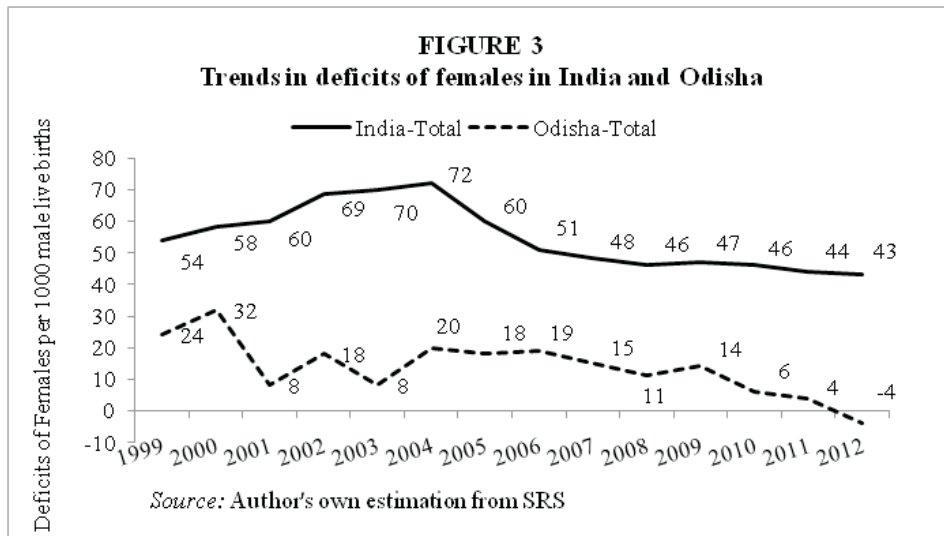
'In India due to excessive female child mortality, a lower level of child sex ratio of 935 is considered to be reasonable. Child sex ratio below this should be viewed with serious concerned' (Nanzy & Shylaja 2014: 62). The gravity of the problems varied over space and time. Out of 30 districts only five districts had below 935 CSR in 2001 but their number has increased to 11 in 2011. This shows that geographical spread of lowest level of CSR has been expanding. The districts which have lower than 935 CSR in 2011 are Nayagarh (855) which is also the lowest among thirty district followed by Dhenkanal, Anugul Ganjam, Cuttack, Khordha, Jajapur, Kendrapora, Deogarh, Jagatsingpur and Puri. Along with these districts, Sambalpur district has CSR below the state average (941). MAP 1 shows that low level of CSR districts are not unevenly distributed across the state or regions rather they formed a geographical zone of 'low' CSR within the states transcends the regional boundaries. This zone of low is formed mostly by Coastal region and south-eastern part of Northern Region (particularly Anugul, Dhenkanal and Sambalpur). Almost all districts, except Ganjam (908), almost all the district have higher than 935 girls per 1000 boys in the age group of 0-6). Nabarangpur district is reported highest CSR (998) in 2011. Apart from Nabaragpur, districts, Malkangiri, Baudh, Nuapada, Korapur, Gajapati, Kandhamal, Kendujhar, Rayagada, Mayurbhanj, and Balangir (arrange in descending order) have CSR above 950. There is not mush change in the geographical stability in the district-level pattern of CSR between 2001 and 2011 which revealed from coefficient analysis ($r=0.878$) (Das 2016:15).



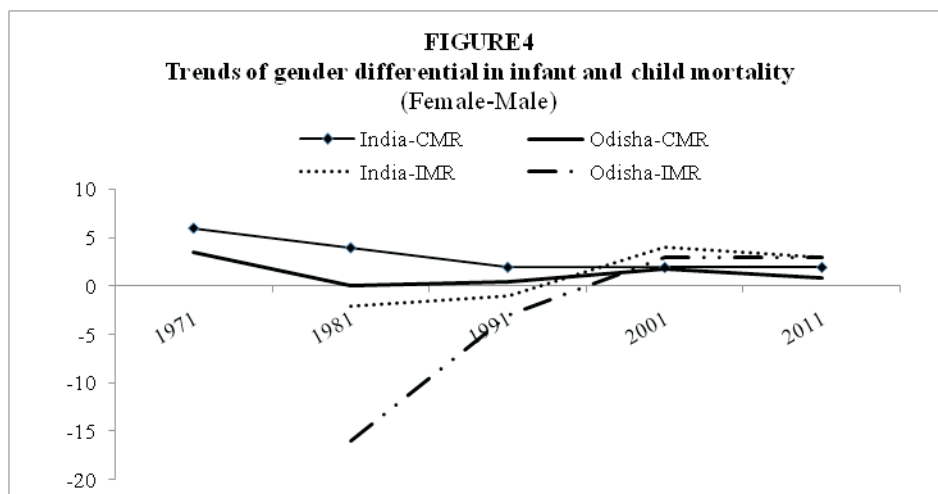
The census 2011 of India has registered eight districts out of thirty with positive change or increase in CSR as compared to 2001 (See Map 2). These districts are Baudh (13 points) followed by Nuapada, Malkangiri, Kendujhar, Mayurbhanj, Jagatsingpur, Gajapati and Puri. Nayagarh district is being reported as the sharpest fall of CSR by 48 point from 904 to 855 CSR followed by Dhenkanal and Anugul during 2001 and 2011. These three districts are also formed the core of lowest CSR within the state. There are another 10 districts where CSR falls above the states average (12 points) during the same period. These Districts are Ganjam, Deogarh, Kalahandi, Cuttack, Sundargarh, Sambalpur, Rayagada, Sonapur, Kendrapora, and Balangir. Rest of the districts declined between 0-11 points of CSR during 2001 and 2011.

7. Causative factors

7.1 Trends of female deficits in Odisha



‘In Indian context, in the absence of complete registration system, the Sex Ratio at Birth (SRB) is commonly assumed to be 952 female live births per 1000 male live births’ (Srinivasan and Bedi 2008:965). In other words, SRB of 952 is considered as SRB without any interventions and if SRB is statistically different and less than 952 indicates pre-birth deficit due to female feticide (Srinivasan and Bedi 2008). Based on SRS annual data a decline trend of female deficit (difference of observed sex ratio at birth from 952) at India and Odisha is observed since 2004 (see figure 3). This is really a good sign. In addition to that, in all the years, female deficit in Odisha is much lower than the female deficit at national average. The rate of falling deficit of female in Odisha is much faster than the national level creating more favorable space for female children. This is one of the major factors for having relatively better CSR in Odisha as compared to all India level. Despite such positive sign in case of female child survival, the state shows lower CSR in 2011. It is because declining CSR is a cumulative process and hence, short term improvement in number of girl child is enough to compensate the loss which has happened cumulatively.



7.2 Trends in gender differential child mortality rate in Odisha

Various studies show infant mortality (mortality in the age group 0-365 days and expressed death per 1000 live births) is normally higher in case of males than females. It appears that normally 130 male infant deaths

occur per 100 female infant deaths (as cited in Srinivasan and Bedi 2007: 966). Figure 4 shows that before 1991 male infant mortality was higher than female mortality in India and Odisha as a whole but post 1991 period has witness a reverse trends i.e. female infants mortality exceeds the male infant mortality in both India and Odisha and have 3-4 points gender difference in infants death. This indicates girls who had advantageous situation of survival in past are now subject to neglect, under nourished and consequently lowered their numbers as compared to infant male. Some studies based on SRS data revealed that although female child mortality (0-4 years aged) is higher than male child mortality but shifting downward more rapidly than male mortality rate. This favors more to the girls than boys compared to earlier times. This positive sign may lead to reverse the CSR in long run (Nanzy and Shylaja 2014). Figure 4 shows that gender differential in child mortality has been decline over the years at the national level bur it has been raising at state level since 1991. Thus we can infer that rising gender differential in IMR and CMR are other important causes of decline CSR in post 1991 in Odisha.

7.3 Regional variation of female deficit and child mortality in Odisha

The high level of female child mortality is mainly caused by patriarchal and patrilineal culture of the society where desires for sons is predominant and consequent low position of women and Odisha is no exception from this. However, degree and forms of discrimination against girls varied over regions and time. Table 2 shows female infant and child mortality exceeds than male mortality in all the regions of Odisha. This reflects disadvantage position of female child in the society. The highest female infant and child mortality is observed in Southern region (67 and 92 respectively) but the gender differential in CMR is low and low female deficit at sex ratio at birth are prime factors of higher CSR as compared to Coastal and Northern region. The Coastal region is characterized by the highest gender differential in infant and child mortality (10.6, 11.9) with high level of female deficit (50 points) caused by low sex ratio at birth/ or high level of sex selective abortions. These demographic statistics reflects female child has disadvantage position in survival over male child in Coastal region. The excessive female child mortality as compared to male is caused due to poor access to nutrition, health and other resources. The average sex ratio at birth is the lowest in Northern region indicates excessive sex selective abortion and relatively high gender differential in mortality (IMR 5.6 AND CMR 7.0) brought this region as second lowest CSR zone within the state.

Table 2 Regional variation of sex ratio at birth, female deficits and gender differentials of infant and child mortality in Odisha.

Regions	SRB	Female Deficit=952-SRB	IMR-2011-12		CMR 2011-12		Gender Differential	
			Male	Female	Male	Female	IMR	CMR
Northern	891	61	53	58	66	73	5.6	7.0
Coastal	902	50	54	65	70	82	10.6	11.9
Southern	914	38	57	67	88	92	9.2	3.8
Odisha	903	49	56	63	76	81	7.0	5.0

Source: Author’s own estimation from AHS ODISHA Fact sheet 2011-12

7.4 CSR and Socio-Economic Developments

The Pearson correlation analysis at district level of Odisha shows that deficits of females has significantly positive ($r= 0.348$ $p < 0.01$) relation with gender differential (female -male) in CMR and gender differential in IMR ($r= 0.348$). This reflects that districts with higher rate of sex selective abortions or deficits of females are also the areas of higher female child mortality. In other words, the discrimination against girls goes hand in hand in pre and post birth phase. This is one or the prime cause of low CSR. The analysis also unfold an important fact that correlation between gender differential in IMR and CMR has significantly high positive correlation ($r=0.626$, $p < 0.01$) indicates both types of mortality co-vary across districts of Odisha. Besides, CSR has significantly high negative relation with gender differential in CMR ($r=-0.574$, $p < 0.01$) corroborates the argument of higher CMR is one of major factors of low CSR within the states. Similarly, significant high positive relation is also found

between CSR and proportion of schedule tribes (ST) and SCST or (ST+SC) of the districts ($r=0.646, p < 0.001$; $r=0.702, p < 0.01$). This indicates the regions and districts with higher proportion of ST and SCST population are having better CSR within the states (similar findings documented by Das 2016:16). As it is well established facts that the scheduled tribes' society are more gender egalitarian in nature and that is why the Southern region of Odisha and two districts of Northern region where proportion ST is higher have good CSR. Literacy rate of both male and female are significantly high negative correlation with CSR. This confirms that area with higher level of education and literacy having low CSR. The probable reason could be educated or literate women and men are more conscious about family planning and more likely to have sex identification followed by sex selective abortion if fetus is not of desire sex (Retheford and Ray 2003; Das 2016). This also helps us to understand, why there is a regional difference of CSR within a particular geographical territory? Coastal regions have better literacy and better standard of living, low proportion ST population is also responsible for wider practices of such technology along with higher gender discrimination against girl child in terms of health, nutrition and amenities etc. Among all the regions Coastal region is more urbanized as compared to other two regions and hence it has lower fertility than other. The CSR has also positive relation with female workforce participation ($r=0.537^{**}$). The relationship between family below poverty line and CSR ($r=0.293$) positive but it is not statistically significant. Gender discrimination in relation to nutrition and health care are universal but it seems to be stronger in case land owning class or rich people than the poor family (Krishnaji 1987). Ganjam and all most all districts of Coastal regions are prosperous such as Cuttack, Khurda, Jajpur, Jagatsingpur, Kendrapara, Bhadrak, Baleswar and Puri and appear to also have lower CSR (Das 2016). According to AHS-2010-11 Odisha factsheet, the total fertility rate (TFR) is lower in urban area (1.9) than in rural areas (2.4). Studies also confirms that CSR is low in urban area due to increase availability and proximity to ultrasound machine helps in predicting sex before birth and rises sex selective abortion (Inchani and Lai 2008) and low TFR forced for strengthening desire for utilizing diagnostic technique.

8.CONCLUSION

Odisha is one of the poorest states of India but had surplus sex ratios in earlier decades. Even as per Census 2011 statistics, it has relative higher overall sex ratio and child sex ratio than national average. Both the national level and state level, over all sex ratio has been rising since 1991. But, the basic and more alarming issue lies in steady decline of child sex ratio (CSR) since 1961. In last six decades, states has experienced a 94 points decline from 1035 in 1961 to 941 in 2011 which is higher than the national level decline in CSR (i.e. 62 points from 976 in 1961 to 914 in 2011). However, the inter-regional and intra-regional distribution and change of CSR shows more gloomy pictures with wide variations. Among the three NSS regions i.e. Northern, Southern and Coastal, Coastal region is the worst affected CSR regions of the states followed by Northern region and Southern region. During 2001 and 2011, all the regions falling trends of sex ratios. The highest fall of CSR occurred in Northern regions followed by Coastal and Southern region. Out of thirty districts 11 districts (40 % of total districts) have lower than 935 CSR or they are in the zone of critical CSR. Among these eleven districts 7 districts are from Coastal regions. Besides, three districts (namely Nayagarh, Dhenkanal and Anugul) from north and one district from south (i.e. Ganjam) form contiguous zone of the lowest CSR which core is formed by Nayagarh, Dhenkanal and Anugul. Though, the inter-regional disparity in the distribution is not remarkable but such inequality increases in all the regions as compared to 2001. Looking at the causative factors of such low CSR over time and space, gender differential of mortality was favored girls than boys prior to 1991 but after this, trends has reversed. Now more girls (0-6 years) are subject to die due to gender discriminatory practices as compared to earlier periods. Thus, we can infer that rising gender differential IMR and CMR are other important causes of decline CSR in post 1991 in Odisha. The Coastal region is characterized by the highest gender differential in infant and child mortality (10.6, 11.9) with high level of female deficit (50 points) and better literacy and better standard of living, low proportion ST population are other factors made Coastal region as the lowest CSR zone within the states. The average sex ratio at birth is the lowest in Northern region indicates excessive sex selective abortion and relatively high gender differential in mortality (IMR 5.6 and CMR 7.0) brought this region as the second lowest CSR zone within the state. Deficits of females co-vary with the gender differential in mortality in

positive manner. Thus, govt. and other stakeholders should adopt the appropriate region and district specific policies to ameliorate the issues and make more gender friendly survival environment.

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1. Sex ratio measures in both ways i.e. number of females per 1000 males or number of males per 100 females. However, the Register General of India, Census Commissioner uses the first definition.
 2. Child sex ratio is defined as number girls per 1000 boys aged 0-6 age groups to
 3. IMR defined as infant death per 1000 live births in the age group of 0-365 days.
 4. Child mortality Number of children per 1,000 live births who die before reaching the age of 5. Here we have use 0-4 age group population.

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