Skewed Sex Ratio of Jammu & Kashmir State (Census 2001 & 2011)

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ABSTRACT

The study on the sex ratio of overall population and of children in 0-6 age group for different districts of Jammu & Kashmir concentrates on the following:

The data collected is evaluated for any pattern of sex ratio's in terms of urban, rural segregation and to find whether the indices are different from district to district of Jammu & Kashmir state so that precautionary measures can be taken care of to tackle this alarming situation in the state.

For comparing sex ratios between pair of districts, it is tempting to arrange these (districts) in an increasing or decreasing order of sex ratio. But the reported sex ratios are not directly comparable since their "reliability" depends on the size of the population of the districts. Hence, a more reasonable index of dissimilarity between districts is the Chi-square measure computed under the hypothesis that the districts have the same sex ratio.

The sex ratios/Chi-square values cannot be arranged on a linear interval scale and hence one has to think of an alternative more complex partial ordering among the districts to reflect a more meaningful structure that may be present in the data.

Any ordering based on the results to be meaningful should be such that in the sequence, the difference between neighboring districts possible and the "effective difference" may be defined as the largest of these differences between successive pairs along the ordered set. Hence, ordering between every pair of districts must be such that this largest "gap" between consecutive pairs along the ordering should be as small as possible, that is among all possible sequences one can introduce between any specified district pairs.

Hence, Minmaxion, an operation which enables one to find such "optimal approach distance" between every district pair, based on the Chi-square as an index or dissimilarity with respect to the sex ratios.

Introduction

As per the Census 2011, the overall sex ratio at the national level has increased by 7 points since the 2001 census to reach 940 females per 1000 males¸ this is lower than 1961 when the figure stood at 941 females per 1000 males.

Despite introducing several laws on female foeticide and schemes to encourage the families to have a girl child, the sex ratio in India has gone down. The child sex ratio has gone to 914 females per 1000 males which is the lowest record since independence. These numbers clearly state that the Indian society still prefer boys over girls such that they could have a security for their future. The child sex ratio has gone down to 914 from 927 when the last census was taken. The monotonic decline in the sex ratio over the last decade, despite the improving socio economic characteristics reinforces the existence of gender discriminatory practices which starts even before birth; which requires the urgent attention of public policy, as improving literacy and economic value of women is necessary but not sufficient for enhancing the relative life chances of girl child.

However, this figure conceals the wide variation across the states in India and a distinct geographical pattern. The state of Mizoram has the highest child sex ratio with 971 females per 1000 males, while Meghalaya has 970 per 1000 males.

Normally, the states like Punjab and Haryana have lower sex ratio, but in the recent years, an increasing trend has been seen in these states as compared with 2001 census. Haryana has 830 females while Punjab has 846 females per 1000 males.

The 2001 & 2011 census highlighted this issue by devoting a full section on child sex ratio. This distressing state of affairs raised voice of grave concern across all sections of society. It set into motion serious debates and resulted in a series of action on several fronts to curb the menace of female foeticide in certain parts of the country. In this direction, (Haragopal and Pandit, 2006) (Haragopal and Lakshman Rao, 2014) analysed the data

for Andhra Pradesh, Delhi, Punjab and Haryana states and found that there is a substantial drop of 0-6 female sex ratio. This was noticed by analyzing the data on village wise/district wise. With this experience we have analysed the data on Jammu & Kashmir state for the 2011 census and present the results in the next sections.

The analysis of results in Jammu & Kashmir district wise data revealed a significant insight into the problem at levels below the state at the national level particularly in certain parts of the country. The rural-urban differentials in the sex ratio in the age group 0-6 further sheds light on the spatial analysis of possible adverse impact on the female child due to the spread of the modernization and technological advancement in the villages and urban centers. The Jammu & Kashmir state has 22 districts (Census 2011) and as per the data provided by the census.

Child sex ratio district level analysis
Table 1. Distribution of districts by range of 0-6 child sex ratio of Jammu & Kashmir state: 2001, 2011

Child sex ratio (0-6)	Number of Districts	
	2001	2011
880 & below	2	12
881-915	1	4
916-950	2	5
951-985	5	1
986 &above	4	-

* Data source: Data C. D's from Census India- 2001 and 2011

From Table 1, it is observed that less number of districts that is six districts out of 22 districts in the Jammu & Kashmir state has the 0-6 child sex ratio is above 916. From these figures it is alarming that the state should recover comprehensively as per this index is concerned. The district level data on child sex ratio provides further insight into the pattern that exists at this level within a state. Keeping this point in view we have analysed the district level data with urban and rural segregation and found that an alarming situation exists in the districts of Jammu & Kashmir where a highest fall in the sex ratio is observed.

On the whole the sex ratio at the district level is below the ideal of 1000. However, as will be seen later in many districts the variations in sex ratio is considerably being quite low in some districts and relatively very high in some other districts.

Analysis for the present situation is as follows: in each district for each of the sub-districts the sex ratio of all children, rural children and urban children as well as entire population including the children and rural and urban separately evaluated for the data.

Analysis of Jammu & Kashmir districts
Table 2. Totals of 22 districts for each of six groups data

	Population	Male	Female	Pop 0-6	Male 0-6	Female 0-6
Rural	9108060	4774477	4333583	1593008	854141	738867
Urban	3433242	1866185	1567057	425897	230214	195683
Total	12541302	6640662	5900640	2018905	1084355	934550

* Data source: Data C. D's from Census India-2011

As a first step we have listed out the 6 characteristics in the table 2, which gives totals of 22 districts of Jammu & Kashmir.

Table 2(a). Observed frequencies of overall population data

	Male	Female
Rural	4774477	4333583
Urban	1866185	1567057

Table 2(c). Expected frequencies of overall population data

	Male	Female
Rural	4822749	4285311
Urban	1817913	1615329

Table 2 (a), (c) gives the observed and expected frequencies of overall male population and overall female population with respect to rural and urban areas of the state.

Table 2(d). Computation of Chi-square value for overall population (for 2011 data)

Observed frequency (Oi)	Expected frequency (Ei)	Chisquare formula
4774477	4822749	483.1596
4333583	4285311	543.7545
1866185	1817913	1281.776
1567057	1615329	1442.528
		$\text{(Chi-square) } \chi^2 = \sum_{i=1}^{4} \frac{(Oi - Ei)^2}{Ei} = 3751.2$

*Observed and Expected frequencies from Tables 2 (a), 2 (b)

For these the association of these characteristics are analysed by Chi-square statistic for overall population for the data and the statistic value is 3751.2 with 1 d.f (from Table 2 (d)). From this statistic it can be concluded that there is a significant difference between overall male population and overall female population with respect to rural and urban areas of the state.

Table 2(e). Observed frequencies of overall 0-6 population data

	Male	Female
Rural	854141	738867
Urban	230214	195683

Table 2(f). Expected frequencies of overall 0-6 population data

	Male	Female
Rural	855605	737403
Urban	228750	197147

Similarly, Table 2 (e), (f) gives the observed and expected frequencies of overall male 0-6 population and overall female 0-6 population with respect to rural and urban areas of the state and the Chi-square statistic for overall 0-6 population for the data is 25.7 with 1 d.f which indicate that there is a significant difference between overall male 0-6 population and overall female 0-6 population with respect to rural and urban areas of the state.

Table 2(g). Proportion of female, female 0-6 of 22 districts data

	Male	Female	Male 0-6	Female 0-6
Rural	0.5371	0.4629	0.5436	0.4564
Urban	0.5242	0.4758	0.5405	0.4595
Total	0.5295	0.4705	0.5362	0.4638

Also, we have calculated the proportion of female and female 0-6 population for all the 22 districts and are given in Table 2(g). From this we can understand that there is no improvement in terms of female 0-6 population for the data and found that the difference between rural and urban areas and are misleading.

With the above observations in sight we want to see that whether there is any difference within the 22 districts of the state and found that there is a difference within the districts for the six characteristics considered and these results are given in table 3 and found that most of the districts are different. (Srinivasan, 1994).

Table 3. Chi-square values for the proportion of overall female population, female 0-6 population of 22 districts with respect to rural, urban areas data

Districts	Proportion of females pop in the pop.	Proportion of female 0-6 in the pop.	proportion of females in the rural region	proportion of female 0-6 in the rural region	proportion of females in the urban region	proportion of female 0-6 in the urban region
Kupwara	820.0*	19.0*	599.0*	11.4*	1050.7*	5.3*
Baramula	3.8	0.1	0.6	0.0	216.9*	0.0
Srinagar	46.4*	0.4	5.9*	2.7	1413.0*	9.9*
Badgam	6.1*	48.0*	1.0	53.0*	84.7*	1.7
Pulwama	97.6*	36.1*	102.9*	48.5*	76.0*	0.5
Anantnag	483.9*	31.2*	190.7*	32.8*	357.9*	1.1
Leh(Ladakh)	2066.1*	26.2*	258.1*	12.8*	2902.6*	16.9*
Kargil	297.4*	78.9*	194.7*	67.2*	356.0*	9.3*
Doda	114.6*	110.8*	57.4*	113.3*	24.1*	0.5
Udhampur	61.6*	16.7*	13.5*	21.9*	928.3*	1.8
Punch	2.9	26.4*	0.0	20.8*	132.6*	1.7
Rajouri	168.3*	0.4	13.6*	0.1	2930.2*	0.6
Jammu	36.0*	269.9*	2.0	289.5*	68.9*	18.7*

| Kathua | 0.6 | 27.0* | 31.0* | 24.9* | 27.5* | 4.9* |
Bandipore	0.0	18.1*	10.3*	13.8*	0.8	2.8
Ganderbal	20.1*	0.0	96.2*	1.7	27.2*	8.3*
Shupiyan	302.9*	3.6	233.4*	3.9*	44.8*	1.9
Kulgam	482.8*	12.7*	255.8*	7.6*	157.0*	5.3*
Ramban	17.0*	68.0*	0.7	64.4*	53.2*	0.2
Kishtwar	68.9*	47.3*	24.7*	44.0*	2.7	0.2
Reasi	0.3	57.2*	6.5*	50.5*	14.0*	2.1
Samba	0.9	97.4*	1.4	90.8*	28.5*	9.4*

* indicates difference in the characteristics considered.

From this table 3, to be precise that there are 17 districts (Kupwara, Badgam, Pulwama, Anathanag, Leh (Ladakh), Kargil, Doda, Udhampur, Punch, Jammu, Kathua, Bandipore, Kulgam, Ramban, Kishtwar, Reasi and Samba) which differ with respect to proportion of female 0-6 population in overall population characteristics. And similarly the 18 districts (Kupwara, Badgam, Pulwama, Anathanag, Leh (Ladakh), Kargil, Doda, Udhampur, Punch, Jammu, Kathua, Bandipore, Shupiyan, Kulgam, Ramban, Kishtwar, Reasi and Samba) which are different with respect to proportion of female 0-6 population in rural region characteristics. While, there are 9 districts (Kupwara, Srinagar, Leh (Ladakh), Kargil, Jammu, Kathua, Ganderbal, Kulgam and Samba) which are different with respect to proportion of female 0-6 population in urban region characteristic.

Also there are 16 districts (Kupwara, Srinagar, Badgam, Pulwama, Anathanag, Leh (Ladakh), Kargil, Doda, Udhampur, Rajouri, Jammu, Ganderbal, Shupiyan, Kulgam, Ramban and Kishtwar) which differ with respect to proportion of female population in overall population characteristic. Similarly there are 16 districts (Kupwara, Srinagar, Pulwama, Anathanag, Leh (Ladakh), Kargil, Doda, Udhampur, Rajouri, Kathua, Bandipore, Ganderbal, Shupiyan, Kulgam, Kishtwar and Reasi) differ with respect to proportion of female population in rural region characteristic. While there are 20 districts (Kupwara, Baramula, Srinagar, Badgam, Pulwama, Anathanag, Leh (Ladakh), Kargil, Doda, Udhampur, Punch, Rajouri, Jammu, Kathua, Ganderbal, Shupiyan, Kulgam, Ramban, Reasi and Samba) which are differing with respect to proportion of female population in urban region characteristic.

The major characteristic of female 0-6 population with respect to all regions of rural, urban and overall areas of these districts shows a major decline. From this observation we understand that the 0-6 child sex ratio is quite different in almost all the districts of Jammu & Kashmir

This justification can be seen pictorially in the Figure 1, which depicts how the chi-square values are changing is shown.
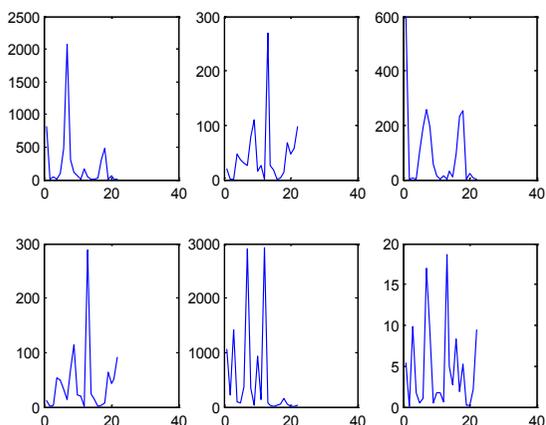
X – Axis: Districts
Y – Axis: Chi – square values
Figure 1 (for 2011)

After realizing the drastic changes in the data we want to study that whether these districts are similar or not with respect to 0-6 sex ratio etc is explored by the technique of clustering.

Cluster analysis is computed for finding the district similarities for data with respect to six characteristics of the population separately and found that there is a difference within the districts and among the districts with respect to the six characteristics.

Min Maxion Method:
As there is no meaningful similarity obtained through the clustering approach, the data is analysed by a technique called Min-Maxion method to evaluate the data for a possible path with respect to the six characteristics of the population of the 22 districts by taking chi-square values as distance matrix, this matrix which is non-metric and this technique is evaluated for finding a path with respect to the districts for all 6 characteristics. (Pandit, 1961). The path obtained is the optimal one in arranging them as changes of sex ratio. This path can help in trying to link the possible causes of difference in sex ratio with those factors which change in similar way among the districts. For example Education, Transportation facilities, Industrialization etc., thus, it is an exploratory tool which arranges districts according to gradual changes in sex ratios and suggesting to explore whether any other characteristics (like Education, Welfare groups etc) about the districts show a similar ordering. Also, by comparing all these paths for all the characteristics it is observed that all the paths differ drastically with each other. Thus, the causes operating on the sex ratios may not be the same but differ from path to path for the data. For instance the overall male, female population path indicates that the indices for the district Kulgam to Shupiyan is not much different while, when we compare Kulgam to Leh (Ladakh) the indices is very different and the distance between these districts is large. Similar path evaluations by this method are explored and are tabulated below for the other characteristics. Which indicate that the distance between the districts are clearly observed. If we observe these paths in some characteristics some districts does not seen, indicates that they have the same distance are dropped from the list.

Path for overall male population and overall female population

Kulgam	→	Shupiyan	→	Anantnag	→	Pulwama	→
Kishtwar	→	Doda	→	Badgam	→	Srinagar	→
Samba	→	Kathua	→	Ramban	→	Punch	→
Jammu	→	Baramula	→	Bandipore	→	Reasi	→
Ganderbal	→	Udhampur	→	Rajouri	→	Kupwara	→
Kargil	→	Leh (Ladakh)					

Path for rural male population and rural female population

Leh (Ladakh)	→	Kargil	→	Kupwara	→	Ganderbal	→
Reasi	→	Bandipore	→	Kathua	→	Rajouri	→
Ramban	→	Punch	→	Baramula	→	Samba	→

Jammu	→	Kishtwar	→	Doda	→	Badgam	→
Srinagar	→	Pulwama	→	Anantnag			

Path for urban male population and urban female population

Kulgam	→	Anantnag	→	Ganderbal	→	Kathua	→
Jammu	→	Bandipore	→	Kishtwar	→	Samba	→
Reasi	→	Badgam	→	Pulwama	→	Shupiyan	→
Punch	→	Ramban	→	Kupwara	→	Kargil	→
Rajouri	→	Leh (Ladakh)					

Path for overall 0-6 child male population and overall 0-6 child female population

Jammu	→	Samba	→	Pulwama	→	Kathua	→
Anantnag	→	Ganderbal	→	Baramula	→	Srinagar	→
Rajouri	→	Shupiyan	→	Kulgam	→	Udhampur	→
Bandipore	→	Reasi	→	Kishtwar	→	Ramban	→
Doda	→	Leh (Ladakh)	→	Kargil			

Path for rural 0-6 child male population and 0-6 rural child female population

Pulwama	→	Badgam	→	Kathua	→	Anantnag	→
Srinagar	→	Udhampur	→	Bandipore	→	Kulgam	→
Shupiyan	→	Kupwara	→	Ganderbal	→	Samba	→
Baramula							

Path for urban 0-6 child male population and urban 0-6 child female population

Leh (Ladakh)	→	Kargil	→	Reasi	→	Kulgam	→
Punch	→	Kupwara	→	Kishtwar	→	Baramula	→
Ramban	→	Udhampur	→	Doda	→	Rajouri	→
Badgam							

Conclusions:

From this analysis we could find that there is a difference between the associations of the six characteristics while the cluster analysis we could not find any similarities among the districts with respect to the six characteristics. Thus we have explored for the first time by applying min-maxion technique the possible path for the district wise patterns with respect to the characteristics.

From the analysis we could find that drastic changes have taken place in Jammu & Kashmir and specifically we found that alarming changes has occurred with respect to the 0-6 child sex ratio during 2011 census. Since, in overall comparisons 0-6 child sex ratio is found to be lower in rural areas than in urban communities, reason for this anomaly needs looking in to. Does it imply that larger female infant mortality in rural areas or is there a selective migration of families from rural to urban setting over a period of time.

An investigation about possible different mortality ratio of girl – infants in the rural and urban areas is perhaps in order. Also, the distribution of 'last child's sex and of the birth sequence, by sex in the families, and socio economic status of families may throw some light on this matter.

Therefore, continued monitoring of Sex Ratio can be of help in formulating and implementing policies to overcome the adverseness in the Sex Ratio. Hence, a five year sample survey for this sort of data should also be undertaken to take the stock of the situation for corrective action.

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