

## **SPATIO-TEMPORAL PATTERNS OF SEX RATIO AND ITS DIFFERENTIALS IN WEST BENGAL**

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### **Abstract:-**

Sex ratio is one of the basic demographic characteristics which depicts the status of women and measures the extent of prevailing equity between males and females in a society at a given point of time. It is a ratio of females to thousand males in India. It is mainly the outcome of the interplay of sex differentials in mortality, sex selective migration, sex ratio at birth and at times the sex differential in population enumeration. In this paper an attempt is made to understand the spatial - temporal patterns and its differentials as well as its impact on society in the state of West Bengal in India. This study is primarily based on secondary sources of data i.e. Census of India, Statistical Hand Book of West Bengal, Vital Statistics of India etc. Analysis and interpretation of patterns, differentials and impact of Sex Ratio have been done with the help of statistical, cartographic and GIS techniques.

**Keywords:-Sex Ratio, Patterns, Differentials, Determinants, West Bengal.**

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## **1.Introduction:-**

Among the three major elements of population composition i.e. Sex composition, Age composition and Economic composition, Sex composition is one of the basic demographic characteristics which is most important for any meaningful demographic analysis of any region. So the study of sex composition is of a great interest to a population geographer. Actually sex composition is expressed as sex ratio. Sex ratio can reflect Biological, Social, Economic and Migration characteristics of population prevailing in an area and is a useful tool for regional analysis of other demographic elements like population growth, marriage rates, occupational structure, fertility rates etc. According to United Nations of all the demographic attributes of population, the sex structure is one of the most fundamentals and directly related to the reproductive potential of the humankind, deaths and marriages. Sex ratio is one of the social indicators which depicts the status of women and measures the extent of prevailing equity between males and females in a society at a given point of time. A change of sex composition largely reflects the underlying socio-economic and cultural patterns of a society in different ways. Sex ratio is mainly the outcome of the interplay of sex differentials in mortality, sex selective migration, sex ratio at birth and at times the sex differential in population enumeration. In this paper an attempt is made to understand the spatial -temporal patterns and its differentials as well as its impact on society in the state of West Bengal in India.

### **1.1. The concept of Sex ratio:-**

In demography the human sex ratio is the ratio of male to females in a population. In Indian census sex ratio is defined as the number of females per 1000 males in the population. It is expressed in the following formula:-

**Sex ratio**= (Number of females / Number of males) X 1000

There are three types of sex ratio in population geography –

**Primary sex ratio**- It is the sex ratio at the time of conception.

**Secondary sex ratio**- It is the sex ratio at the time of birth.

**Tertiary sex ratio** - It is the sex ratio at the time of enumeration.

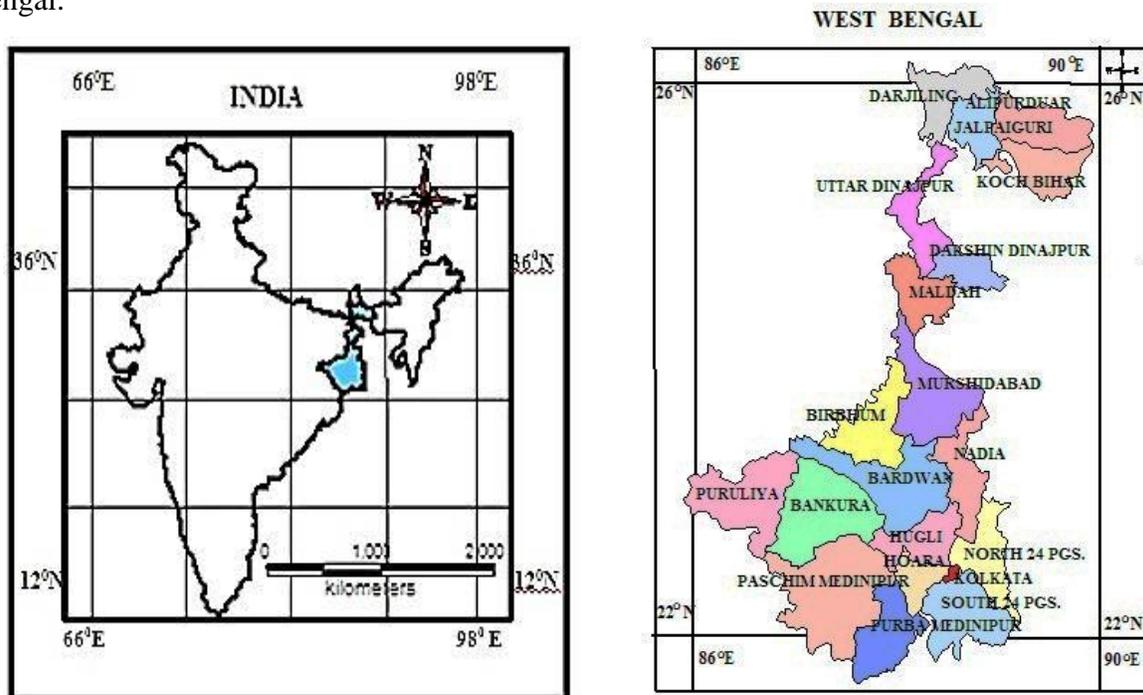
## 1.2. Objectives:-

The main objectives of the study are-

- 1.To highlight the temporal pattern of sex ratio of West Bengal and India comparatively.
- 2.To interpret the spatial pattern of sex ratio in West Bengal.
- 3.To know the caste-wise distribution of sex ratio in West Bengal.
- 4.To describe the religion-wise distribution of sex ratio in West Bengal.
- 5.To find out the rural-urban distribution of sex ratio in West Bengal.
- 6.To examine the differentials and impact of sex ratio in West Bengal.

## 1.3. Study Area:-

West Bengal is a state in eastern India stretching from the Himalayas in the North to the Bay of Bengal in the south. It lies between  $85^{\circ}50'$  East to  $89^{\circ}50'$  East longitude and  $21^{\circ}38'$  North to  $27^{\circ}10'$  North latitude. The state has a total area of  $88.752 \text{ km}^2$ . There are 20 districts in West Bengal.



**Figure 1:-** Location Map of the Study Area.

According to 2011 census it is the fourth most populated state in India with a population of 91347736. The state contributes 7.8% of India's Population. In this State number of Hindu population is 64385546(70.54%) and number of Muslim population is 24654825(27.01%).The

state's 2001-2011 decennial growth rates was 13.93%. It has a population density of 1029 inhabitants per square kilometers, making the second most populated state in India. In West Bengal the sex ratio is 947 females per 1000 males. The literacy rate is 77.08%. In West Bengal about 72% of people live in rural areas.

#### **1.4. Data Base:-**

This study is primarily based on secondary source of data. Some important sources of data are Census of India published by Government of India, Statistical Hand Book of West Bengal published by the Bureau of Applied Economics and Statistics, Primary Census Abstracts published by the Registrar General of India and Census Commissioner, Sample Registration System Statistical Report published by Registrar General of India, Vital Statistics of India Based on the Civil Registration System published by Registrar General of India etc.

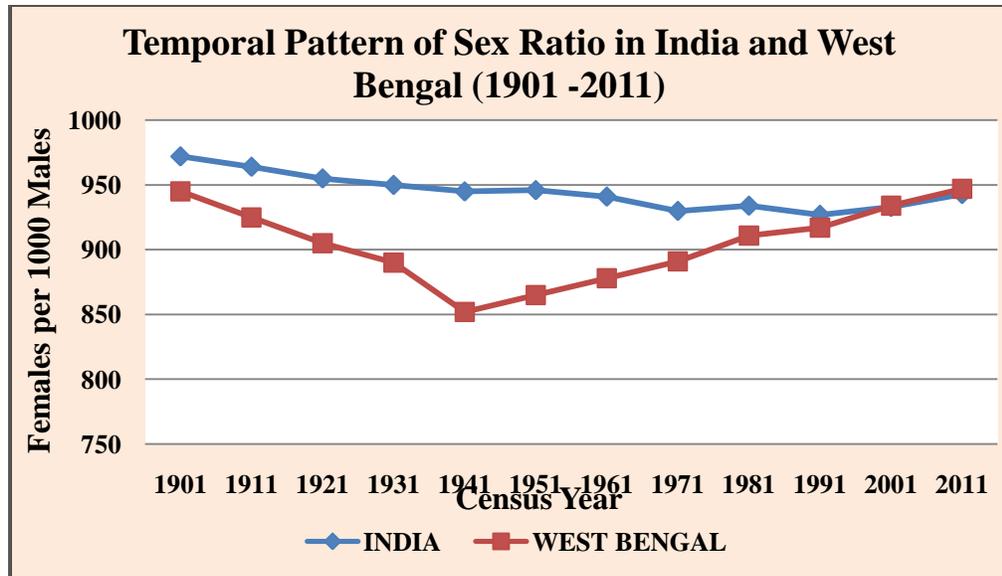
#### **2. Methodology:-**

The methodology of any study is based on both Ideographic and Nomothetic approach. In this study both qualitative and quantitative methods have been used. At first secondary data sources have been studied in greater depth and detail. Elaborate Information about the study area has been collected. Then the data were arranged, processed and presented in tables. Maps have been used for the spatial pattern of sex ratio. Analysis and interpretation have been done with the help of statistical and cartographic techniques. The spatial data base have been prepared with the help of map info professional 10.5 GIS software.

#### **3. Results and Discussion:-**

##### **3.1. Temporal patterns of sex ratio in India and West Bengal:-**

In 1901 West Bengal has 945 females per 1000 males. Highest sex ratio of 947 is shown in 2011 and lowest sex ratio of 852 is shown in 1941. There are two distinctive trends - one is decreasing from 1901 to 1941 and another is increasing from 1941 to 2011.



**Figure 2:-**Temporal Pattern of Sex Ratio in India and West Bengal (1901-2011)

**Source:-** Census of India (1901 to 2011).

From this figure the decadal variation of sex ratio for India and West Bengal from 1901 to 2011 is also to be shown. In this period most of the census year India's average sex ratio is more than West Bengal's average sex ratio. There is the only two decades i.e. 1991 – 2001 and 2001 – 2011 which show the negative variation of sex ratio. Apart from that, during other decades National average sex ratio is higher than State average sex ratio. National and State variation of sex ratio is maximum in 1941(+93). During 1901 to 1941 this variation shows upward trends. But from 1941 to 2011 it shows downward trends. From the recent past both National and State sex ratio are going to upward this trend of sex ratio is due to economic development, Urbanization and female literacy rate.

### 3.2. Spatial pattern of sex ratio in India and West Bengal:-

According to 2011 census, the sex ratio of India is 943. Spatial variation of sex ratio in India is also prevalent. From the Table-1 it is shown that the highest sex ratio is 1084 in Kerala followed by Tamilnadu with 996, Andhra Pradesh with 993 and so on. In India lowest sex ratio is found in Haryana with 879. Again among the Union Territories Puducherry has the highest sex ratio and Daman & Diu has the lowest sex ratio which are 1037 and 618 respectively.

**Table 1: -State-Wise Sex Ratio in India.**

Sl.No.	State/Union Territory	Sex Ratio	Sl.No.	State/Union Territory	Sex Ratio
1	Kerala	1084	20	Maharashtra	929
2	Tamilnadu	996	21	Rajasthan	928
3	Andhra Pradesh	993	22	Gujarat	919
4	Chhattisgarh	991	23	Bihar	918
5	Meghalaya	989	24	Uttar Pradesh	912
6	Manipur	985	25	Punjab	895
7	Orissa	979	26	Sikkim	890
8	Mizoram	976	27	Jammu & Kashmir	889
9	Goa	973	28	Haryana	879
10	Karnataka	973	<b>Union Territory</b>		
11	Himachal Pradesh	972	1	Puducherry	1037
12	Uttaranchal	963	2	Lakshadweep	946
13	Tripura	960	3	Andaman & Nicobar Islands	876
14	Assam	958	4	Delhi	868
15	<b>West Bengal</b>	<b>950</b>	5	Chandigarh	818
16	Jharkhand	948	6	Dadra & Nagar Haveli	774
17	Arunachal Pradesh	938	7	Daman & Diu	618
18	Madhya Pradesh	931			
19	Nagaland	931	<b>India</b>		<b>943</b>

**Source:** - Census of India, 2011.

If we consider district wise variation of sex ratio, we find the highest sex ratio in Mahe in Poducherry with 1176 followed by Almora in Uttaranchal with a sex ratio of 1141, Kannur in Kerala with a sex ratio of 1133. Again Daman in Daman & Diu has the lowest sex ratio of only 533. From the Table-1 it is clearly shown that West Bengal is at the 15<sup>th</sup> position which has 950 females per 1000 males population.

### 3.3. Changing Patterns of District-wise Sex Ratio in West Bengal:-

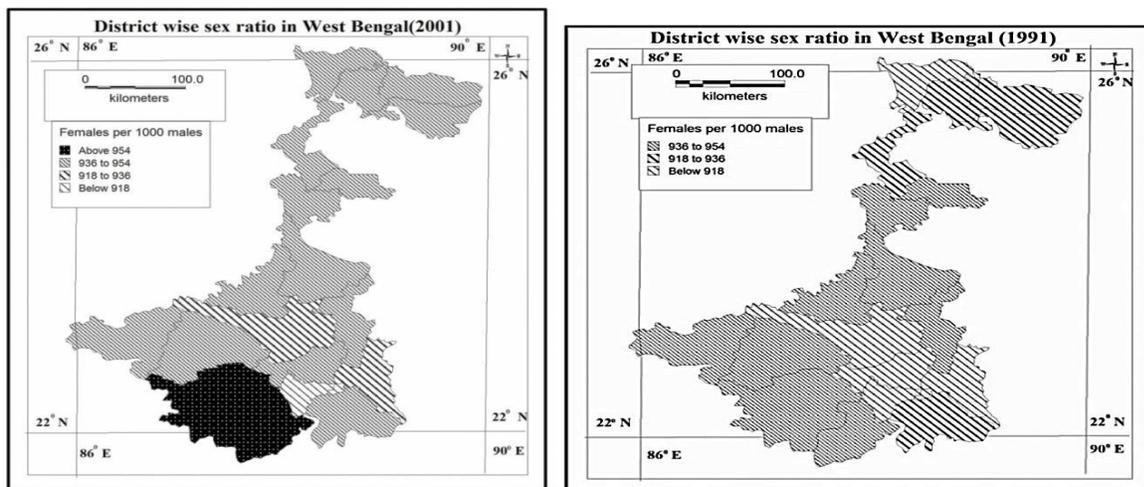
To better understanding about the trends of spatial pattern of sex ratio in West Bengal, three choropleth maps have been given for the three census years. The sex ratios of the entire districts have been classified into four categories and in every map these categories have been remained the same. These four categories are:-

#### 1) Less than 918 females per 1000 males:-

In 1991 there were six districts i.e. Darjiling, Burdwan, Hugli, Haora, North 24 Pgs. and Kolkata were included in this category of sex ratio. But in 2001, as compared to the previous decade Darjiling, Burdwan, Hugli and North 24 Pgs. have increased their sex ratio and jumped up to the above category and only two districts i.e. Kolkata and Haora were still in the same category. In 2011 only Kolkata was dominated in this category. In Kolkata sex ratio is low because of male dominated in immigration for better employment opportunities.

#### 2) 918 to 936 females per 1000 males:

In 1991 there were four districts i.e. Jalpaiguri, Uttar Dinajpur, South 24 Pgs. and Koch Bihar were included in this category. During 1991 to 2001 these all districts increased their sex ratio and jumped up to the next category. But Burdwan and North 24 Pgs. were newly added in this category. Only Haora was included in this category in 2011.

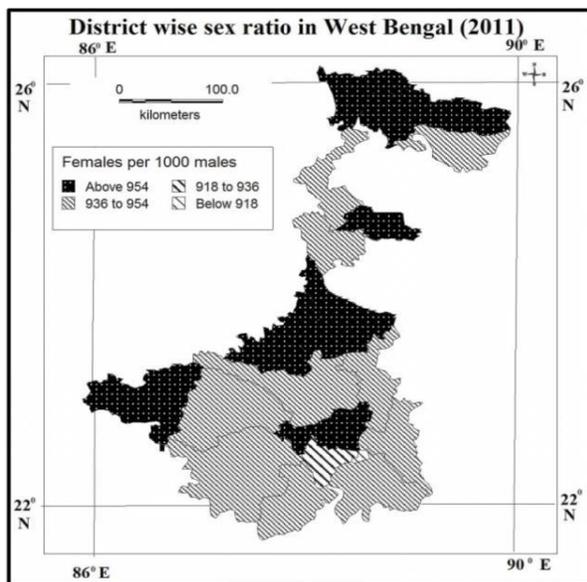


**Figure 3:- Sex Ratio in West Bengal(1991)Figure 4:- Sex Ratio in West Bengal (2001)**

**Source : - Census of India, 2001.Source:- Census of India, 1991.**

### 3) 936 to 954 females per 1000 males:-

In 1991 nine districts i.e. DakshinDinajpur, Maldah, Nadia, Murshidabad, Birbhum, Puruliya, Bankura, Purba and PaschimMedinipur were included in this category. In the next decade from these districts only Purba and PaschimMedinipur were gone into the above category by increasing their sex ratio. Again six districts i.e. Darjiling, Jalpaiguri, KochBihar, DakshinDinajpur, Hugli and South 24 Pgs. were newly added to this category. At that time total fourteen districts were included in this category. In 2011 six districts i.e. Jalpaiguri, Darjiling, DakshinDinajpur, Murshidabad, Birbhum, Puruliya and Hugli jumped up to the next category. Apart from that Purba and PaschimMedinipur districts decreased their ratio and included in this category. North 24 Pgs. was also included in this category.



**Figure 5:-** Sex Ratio in West Bengal (2011)

**Source:** - Census of India, 2011.

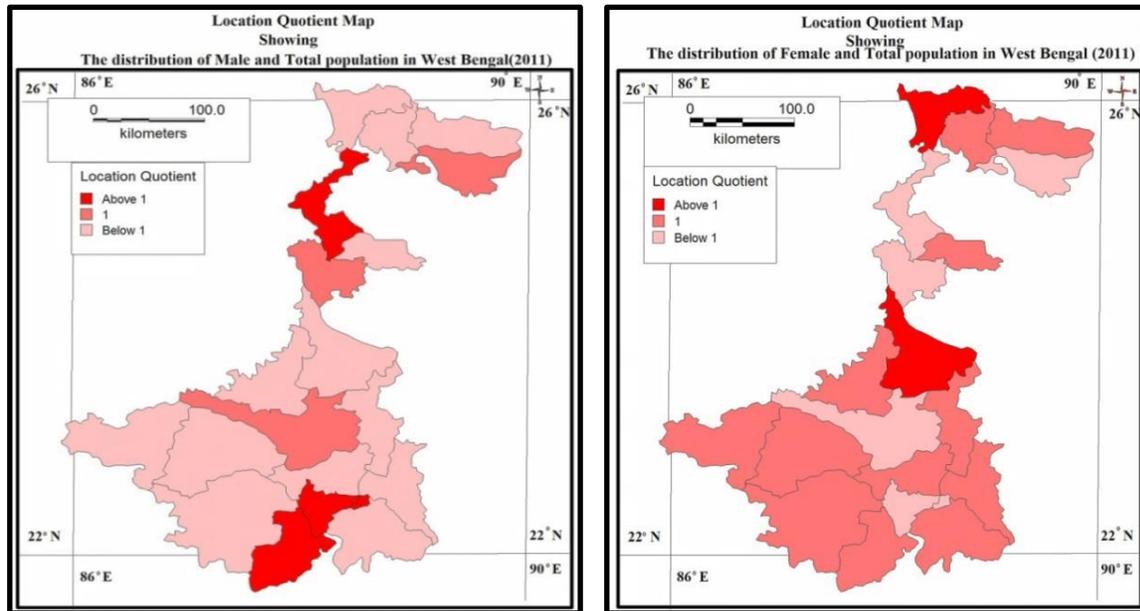
### 4) Above 954 females per 1000 males:-

In 1991 no district was included in this category. In the next decade two districts i.e. Purba and PaschimMedinipur have been included and in 2011 eight districts have been included in this category. So it may be concluded that most of the districts have been experiencing an increasing pattern of sex ratio. This is the only impression of advancement of society.

### 3.4. District-Wise Concentration of Male and Female population in West Bengal:-

Fig.6 and Fig.7 are shown the male and female concentration with the help of two Location Quotient maps. The values of Location Quotient have been classified into three categories. These are:-

- 1) Above 1 :- More concentration than state average.
- 2) 1 :- Equally concentration as state average.
- 3) Below 1 :- Less concentration than state average.



**Figure 6:** - Location Quotient Map for Male and Total Population (2011) **Figure 7:** - Location Quotient Map for Female and Total Population (2011)

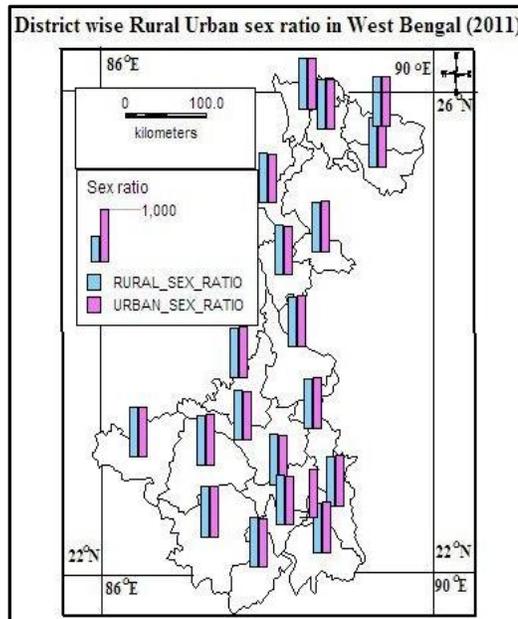
**Source:** - Census of India, 2011

**Source:-** Census of India, 2011.

In 2011 males are more concentrated in Uttar Dinajpur, Haroa, and Purba Medinipur district with respect to state average. In Koch Bihar, Maldah, Burdwan male are equally concentrated in respect of west Bengal state average. In other districts males are lessly concentrated. Again in 2011 Darjiling and Murdhidabad were a highly female concentrated area . But Koch Bihar, Uttar Dinajpur, Burdwan and Haroa were a less female concentrated area.

### 3.5.Rural-Urban Distribution of Sex Ratio in West Bengal:-

A map with bar graph is given to show the district wise rural-urban distribution of sex ratio in West Bengal. From the Fig.8 it is shown that maximum rural sex ratio is found in Darjiling (973) and Minimum rural sex ratio is found in Koch Bihar (939). Again urban sex ratio is maximum in Dakshin Dinajpur (979) and Kolkata (908) has minimum urban sex ratio. In general rural areas have higher proportion of sex ratio than in urban areas. Here in West Bengal there are nine districts i.e. Darjiling, Uttar Dinajpur, Maldah, Burdwan, Hugli, Puruliya, Purba Medinipur and Haora in which rural sex ratio is more than urban sex ratio. Apart from that there are also ten districts i.e. Koch Bihar, Dakshin Dinajpur, Murshidabad, Birbhum, Nadia, North 24 Pgs., Bankura, South 24 Pgs, Paschim Medinipur and Kolkata in which urban sex ratio is more than rural sex ratio. This is the reflection of positive effects of urbanisation. Rural-urban difference of sex ratio is maximum in Malda (+35) and minimum in Birbhum (+9).

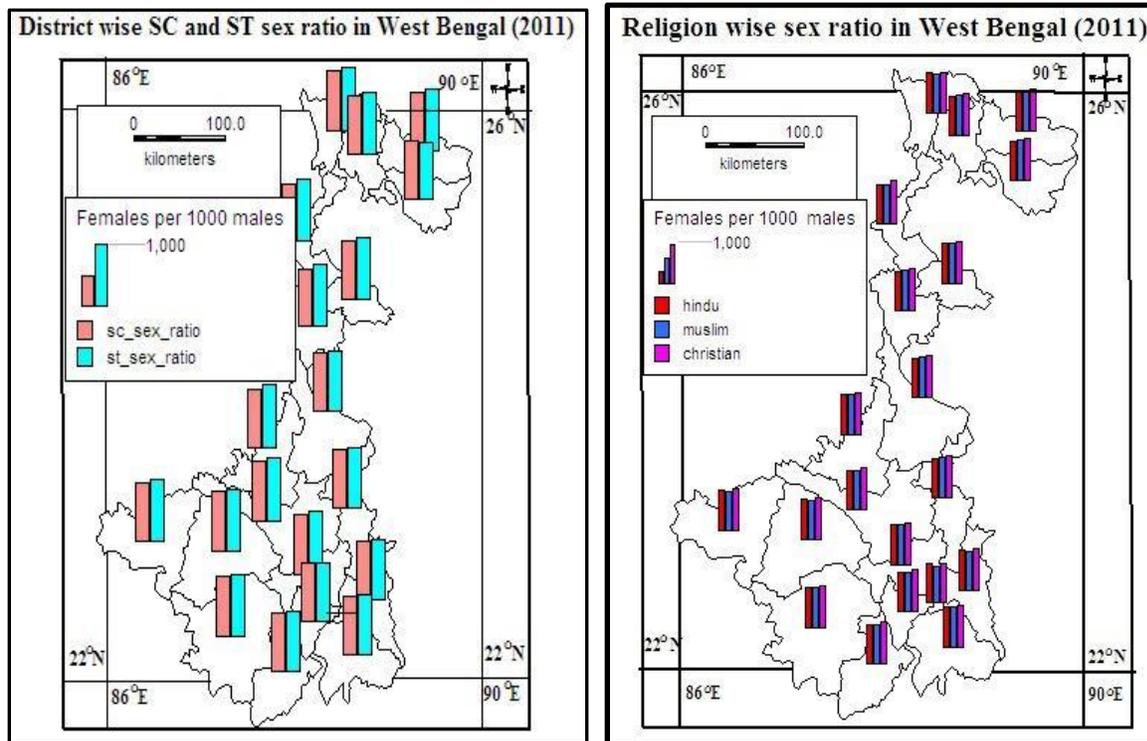


**Figure 8 :** - Rural-Urban Sex Ratio in West Bengal (2011)

**Source:** - Census of India, 2011

### 3.6. Caste-wise Distribution of Sex Ratio in West Bengal:

To show the caste-wise distribution of sex ratio, a map with bar graph is given. From the Fig.9 highest SC sex ratio is found in Bankura and PaschimMedinipur district(979) and lowest SC sex ratio is found in Maldah(931). Again in Birbhum and Hugli district maximum ST sex ratio is found (1024) and Koch Bihar has the lowest ST sex ratio (931). In West Bengal most of the districts have more ST sex ratio than SC sex ratio. Only in Koch Bihar and Haora district SC sex ratio is more than ST sex ratio.



**Figure 9** : - SC And ST Sex Ratio in West Bengal **Figure 10** : -Religion-wise Sex Ratio in West Bengal

**Source** : - Census of India, 2011. **Source** : - Census of India, 2011.

### 3.7. Religion-wise Sex Ratio in West Bengal:-

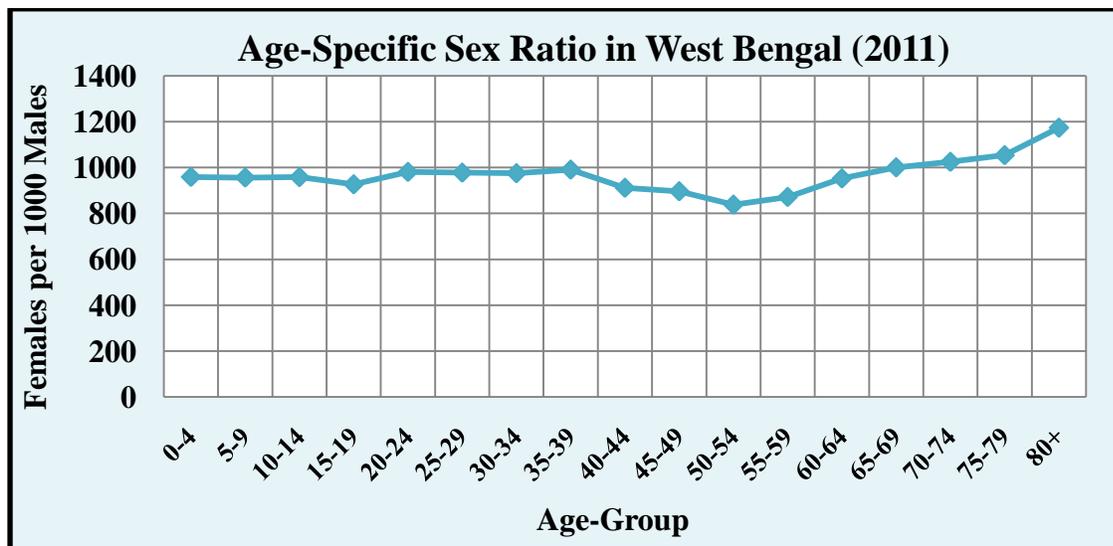
From the Fig.10 it is shown that sex ratio among Hindu community is maximum in Paschim Medinipur(967) and minimum in Kolkata(919). Sex ratio among Muslim community is maximum in Hugli (964) and minimum in Kolkata(860). Again sex ratio among Christian community is maximum in Uttar Dinajpur(1018) and minimum in Kolkata(936). Only in Darjiling Hindu sex ratio is more than other religious communities. In all the districts Muslim

sex ratio is in adverse condition. In Christian community sex ratio is more favourable condition. In all the districts except Darjiling Christian sex ratio is more than other religious communities.

### 3.8. Differentials of Sex Ratio in West Bengal:-

#### 3.8.1. Age-Specific Sex Ratio in West Bengal:-

From the Fig.11 it is seen that below 20 years of age sex ratio is more or less remain the same. But from 20 to 40 year of age sex ratio is going to upward direction. This type of trends may be explained with male out-migration and female in-migration after marriage. From 40 to 60 year of age sex ratio is in decreasing trend and after 65 years sex ratio is gradually increasing.

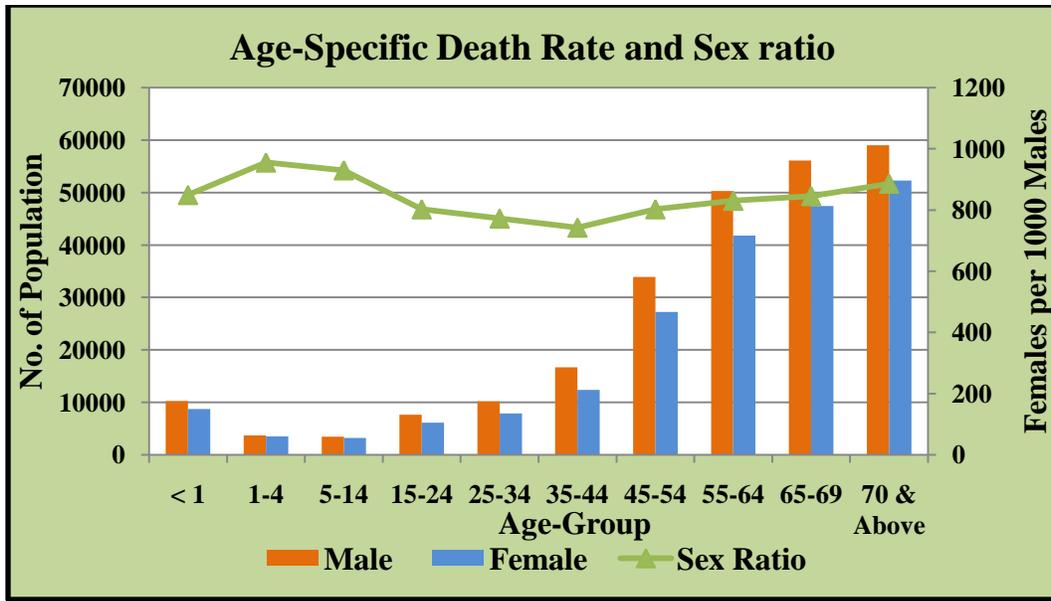


**Figure 11:** - Age-Specific Sex Ratio in West Bengal (2011)

**Source:** - Census of India, 2011.

#### 3.8.2. Age-Specific Death Rate and Sex Ratio in West Bengal:-

In the Fig.12 sex ratio is shown with a simple line graph and bar graph shows the actual death of population in different age group in 2013.



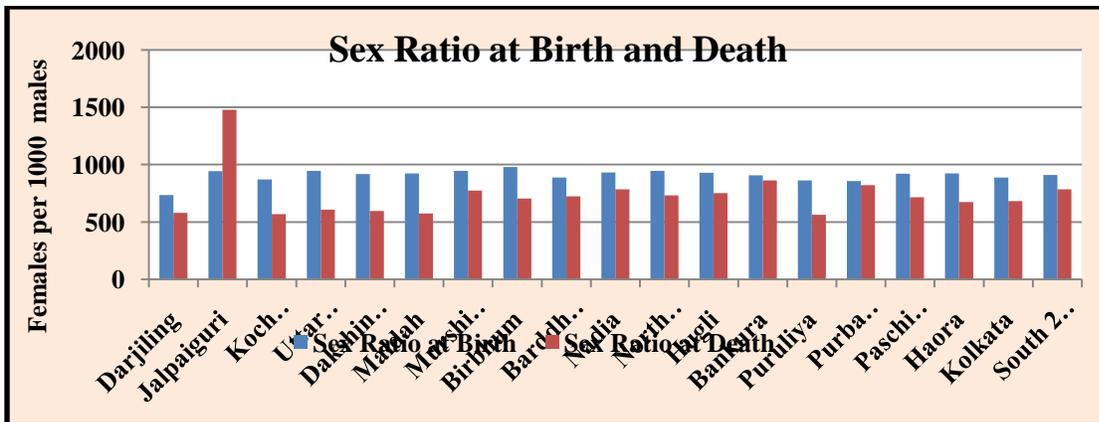
**Figure 12:-** Age-Specific Sex Ratio in West Bengal

**Source: -** Civil Registration System of India (2013)

Here it is seen that in all age groups male death rate is more than female death rate. It is also shown that male female difference of death rate is relatively more in higher age group. In infant age group it is also high and in this age group male mortality rate is higher than female mortality rate. So, sex ratio is also increased and for this reason above 45 year of age group sex ratio is gradually increasing.

**3.8.3. Sex Ratio at Birth and Death in West Bengal:-**

From the Fig.13 it is shown that sex ratio of birth is maximum in Birbhum(978) and minimum in Darjiling (736).

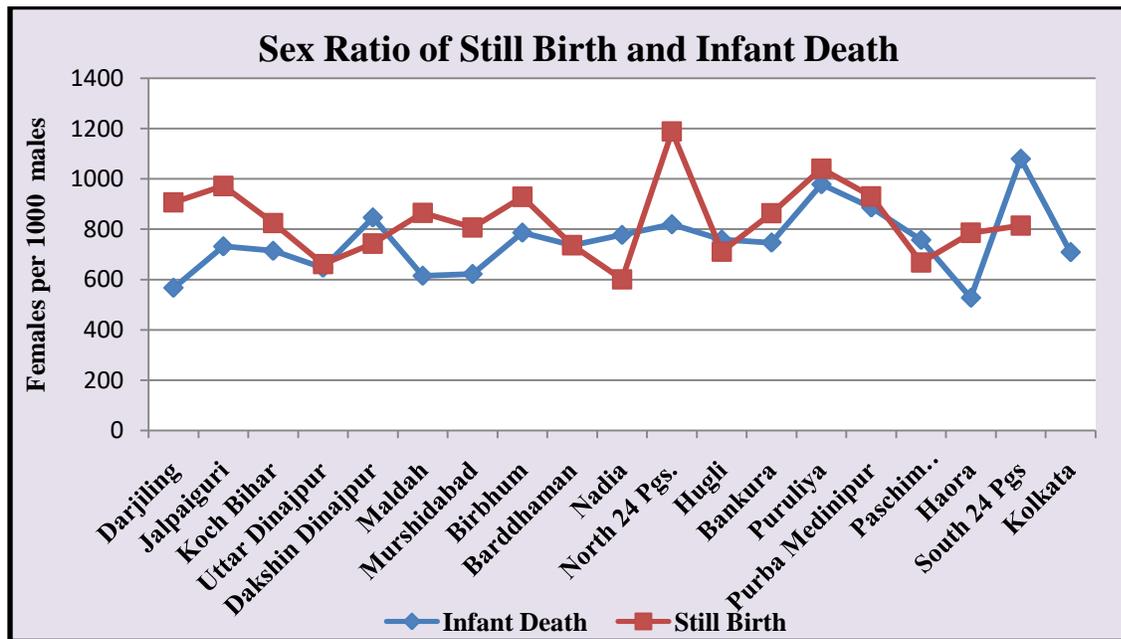


**Figure 13:-** District-wise Sex Ratio at Birth and Death

**Source:** - Civil Registration System of India (2013)

Again sex ratio of death is maximum in Jalpaiguri and minimum in Puruliya. Difference in sex ratio of birth and death is maximum in Jalpaiguri(-535) and minimum difference is found in PurbaMedinipur(+35). In most of the districts in West Bengal sex ratio of birth is more than sex ratio of death. Only in Jalpaiguri sex ratio of death is more than sex ratio of birth. It is clearly concluded that where this difference is less, sex ratio is remained constant and vice versa.

### 3.8.4. Sex Ratio of Still Birth and Infant Death in West Bengal:-



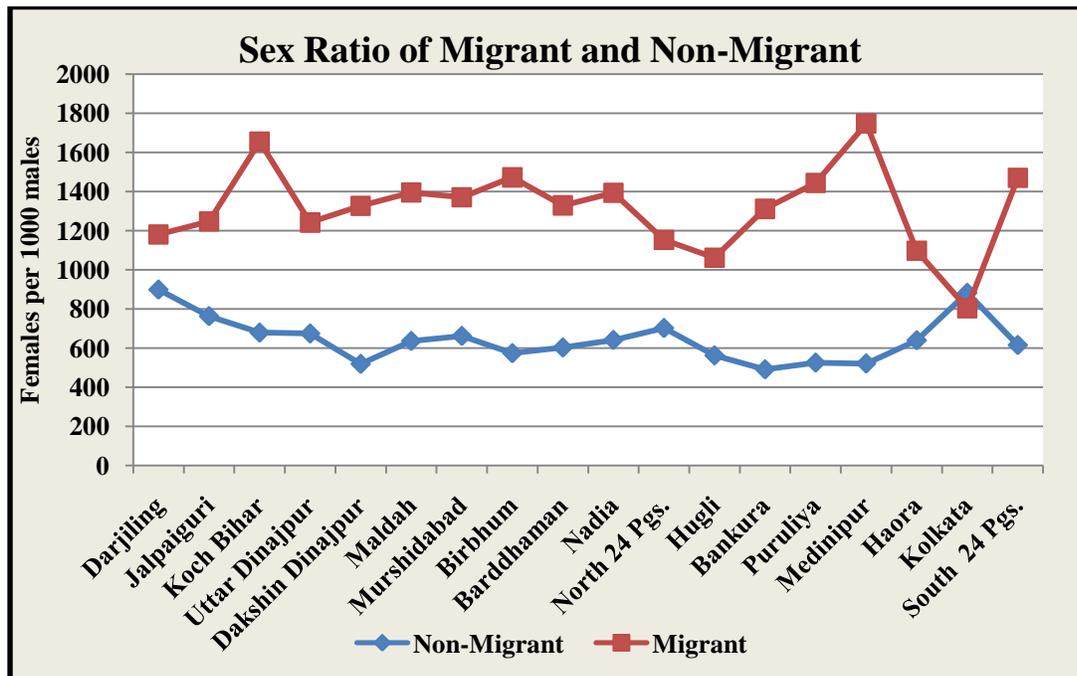
**Figure 14:-** District-Wise Sex Ratio of Still Birth and Infant Death.

**Source:** - Civil Registration System of India (2013)

From the Fig.14 it is shown that sex ratio of still birth is highest in North 24 Pgs.(1189) followed by Puruliya(1042), Koch Bihar(972), PaschimMedinipur(931) and so on. Lowest sex ratio of still birth is found in Nadia(601). It is also shown that highest sex ratio of infant death is in South 24 Pgs. and lowest in Haroa. In North 24 Pgs. more female still birth is happening and as a result sex ratio is automatically declined.

### 3.8.5. Sex Ratio of Migrants and Non-Migrant in West Bengal:-

From the Fig.15 it is shown that highest sex ratio among migrant and non-migrant is found in Medinipur(1749) and Darjiling (898) respectively. Again lowest sex ratio among migrant and non-migrant is found in Kolkata (804) and Bankura (491). In Kolkata, Haora and Hugli are industrial area and here male dominated in migration is occurred and as a result sex ratio also comes down. In Medinipur and Koch Bihar female dominated migration is occurred and sex ratio is also increasing. Except Kolkata all other districts have more sex ratio among migrant than sex ratio among non-migrant.



**Figure 15:-** District-Wise Sex Ratio of Migrants and Non-Migrants

**Source:** - Census of India, 2011

#### Conclusion:-

From the above discussion it is clearly concluded that the sex ratio of West Bengal is gradually increasing. But gender equality is remained in an unbalanced position. Despite the legal prohibition of both Union and State Government, in our society Foeticide, Infanticide, Sex Selective Abortion, Dowry System etc. are still practised. There are so many steps have been taken by both Union and State Government such as – “BetiBachao, BetiPadao”, “Save and Educate Girl Child”, Female Reservation in Education, Service and Political area,

“KannyashreePrakalpa” by Smt.MamataBannerjee, Chief Minister of West Bengal, etc. Some valuable suggestions which can help in improving sex ratio in West Bengal are such as- Pre-Natal and Pre-Conception Diagnostic Techniques Prohibition Act and Dowry Prohibition Act should be implemented effectively. Free and Compulsory Education for female should be provided. And the most important is the change in the mindset of the society towards female. Then gender equality within the society could be achieved.

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