



LITERACY AND SEX RATIO OF WEST BENGAL: CORRELATION AND REGRESSION ANALYSIS

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**ABSTRACT** Sex ratio is considered an essential indicator for understanding the demographic characteristics and status of human development of a nation. Literacy plays a very important role in increasing the sex ratio. This work attempts to analyze the correlation between literacy and sex ratio of West Bengal, based on secondary data which has been collected from Census of India (1961 to 2011) and statistical abstract of West Bengal. The Karl Pearson's Correlation Coefficient method has been used to determine the results. This research work finds a strong positive correlation between literacy and sex ratio of West Bengal.

**KEYWORDS :** Literacy, Sex ratio, Positive correlation, West Bengal.

**INTRODUCTION**

According to Census of India 2011, a person of seven years and above who can both read and write with understanding in any language is taken as literate. Sex ratio is the number of females per thousand males in a population. As per 2011 Census, the total population of West Bengal is 91276115 of which 46809027 are male population and 44467088 are female population while 62183113 are rural population and 29093002 are urban population. According to Census of India 2011, the Literacy rate of West Bengal is 76.26 percent, while the highest literacy rate is found in Kerala (93.91 percent) in the country. As per 2011 Census, the sex ratio of West Bengal is 950, while Kerala records the highest sex ratio of 1084 in the country. In this research paper, an attempt to analyze the correlation between literacy and sex ratio of West Bengal.

**OBJECTIVES**

- 1.To examine the correlation between literacy rate and sex ratio of West Bengal.
- 2.To explore the correlation between male-female literacy rate and sex ratio of West Bengal.
- 3.To find out the correlation between rural-urban literacy rate and sex ratio of West Bengal.

**MATERIALS AND METHODS**

The present study analyzes the correlation between literacy and sex ratio of West Bengal, which is entirely based on secondary data obtained from Census of India (1961 to 2011) and statistical abstract of West Bengal. Two variables i.e. Literacy rate and Sex ratio of West Bengal has been taken for this study. Karl Pearson's Product Moment Correlation Coefficient method is applied to examine the correlation between literacy and sex ratio of West Bengal. The formula is:

$$r_{xy} = \frac{n\sum XY - \sum X \cdot \sum Y}{\sqrt{[n\sum X^2 - (\sum X)^2][n\sum Y^2 - (\sum Y)^2]}}$$

Where, X = Explanatory Variable (Literacy Rate)  
Y = Explained Variable (Sex Ratio).

**RESULTS AND DISCUSSIONS**

This section describes the correlation between literacy rate and sex ratio of West Bengal.

**Table 1.** Literacy Rate and Sex Ratio of West Bengal (1961-2011).

Census Year	Percentage of Literacy Rate (X)	Sex Ratio (Y)	X <sup>2</sup>	Y <sup>2</sup>	XY
1961	29.28	878	857.32	770884	25707.84
1971	33.20	891	1102.24	793881	29581.20
1981	40.94	911	1676.08	829921	37296.34
1991	57.70	917	3329.29	840889	52910.90
2001	68.64	934	4711.45	872356	64109.76
2011	76.26	950	5815.59	902500	72447.00
∑	306.08	5481	17491.97	5010431	282053.04

Source: Calculated by author from Census of India (1961-2011).

It has been observed from table-1 that the literacy rate of West Bengal has increased from 29.28 percent in 1961 to 76.26 percent in 2011

while sex ratio also increased from 878 in 1961 to 950 in 2011. The Correlation coefficient value between literacy rate and sex ratio is 0.96987 which indicates there is strong positive correlation between literacy and sex ratio of West Bengal.

Karl Pearson's Product Moment Correlation Coefficient:

$$r_{xy} = \frac{n\sum XY - \sum X \cdot \sum Y}{\sqrt{[n\sum X^2 - (\sum X)^2][n\sum Y^2 - (\sum Y)^2]}}$$

$$= \frac{6 \times 282053.04 - 306.02 \times 5481}{\sqrt{[6 \times 17491.97 - (306.02)^2][6 \times 5010431 - (5481)^2]}}$$

$$= \frac{1692318.24 - 1677295.62}{\sqrt{[104951.82 - 93648.24][30062586 - 30041361]}}$$

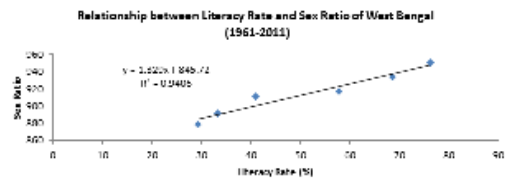
$$= \frac{15022.62}{\sqrt{[11303.58 \times 21225]}}$$

$$= \frac{15022.62}{15022.62}$$

$$= \frac{239918485.50}{15022.62}$$

$$= \frac{15022.62}{15489.30}$$

$$= 0.96987$$



**Correlation between Male Literacy Rate and Sex Ratio:**

This section expresses the correlation between male literacy rate and sex ratio of West Bengal.

**Table 2.** Male Literacy Rate and Sex Ratio of West Bengal (1961-2011).

Census Year	Percentage of Male Literacy Rate (X)	Sex Ratio (Y)	X <sup>2</sup>	Y <sup>2</sup>	XY
1961	40.08	878	1606.41	770884	35190.24
1971	42.81	891	1832.70	793881	38143.71
1981	50.67	911	2567.45	829921	46160.37
1991	67.81	917	4598.20	840889	62181.77
2001	77.02	934	5932.08	872356	71936.68
2011	81.69	950	6673.26	902500	77605.50
∑	360.08	5481	23210.10	5010431	331218.27

Source: Calculated by author from Census of India (1961-2011).

Karl Pearson's Product Moment Correlation Coefficient:

$$r_{xy} = \frac{n\sum XY - \sum X \cdot \sum Y}{\sqrt{[n\sum X^2 - (\sum X)^2][n\sum Y^2 - (\sum Y)^2]}}$$

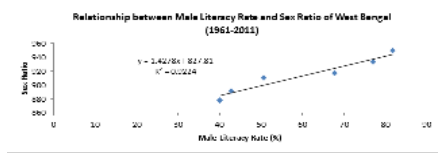
$$= \frac{6 \times 331218.27 - 360.08 \times 5481}{\sqrt{[6 \times 23210.10 - (360.08)^2][6 \times 5010431 - (5481)^2]}}$$

$$= \frac{1987309.62 - 1973598.48}{\sqrt{[139260.60 - 129657.61][30062586 - 30041361]}}$$

$$= \frac{13711.14}{\sqrt{[9602.99 \times 21225]}}$$

$$= \frac{13711.14}{14276.68}$$

$$= 0.96038$$



It has been shown from table-2 that the male literacy rate of West Bengal has increased from 40.08 percent in 1961 to 81.69 percent in 2011 while sex ratio also increased from 878 in 1961 to 950 in 2011. The correlation coefficient value between male literacy rate and sex ratio is 0.96038 which indicates there is strong positive correlation between male literacy and sex ratio of West Bengal.

**Correlation between Female Literacy Rate and Sex Ratio:**

This section describes the correlation between female literacy rate and sex ratio of West Bengal.

**Table 3.** Female Literacy Rate and Sex Ratio of West Bengal (1961-2011).

Census Year	Percentage of Female Literacy Rate (X)	Sex Ratio (Y)	X <sup>2</sup>	Y <sup>2</sup>	XY
1961	16.98	878	288.32	770884	14908.44
1971	22.42	891	502.66	793881	19976.22
1981	30.25	911	915.06	829921	27557.75
1991	46.56	917	2167.83	840889	42695.52
2001	59.61	934	3553.35	872356	55675.74
2011	70.54	950	4975.89	902500	67013.00
Σ	246.36	5481	12403.11	5010431	227826.67

Source: Calculated by author from Census of India (1961-2011). Karl Pearson's Product Moment Correlation Coefficient:

$$r_{xy} = \frac{n\sum XY - \sum X \cdot \sum Y}{\sqrt{[n\sum X^2 - (\sum X)^2][n\sum Y^2 - (\sum Y)^2]}}$$

$$= \frac{6 \times 227826.67 - 246.36 \times 5481}{\sqrt{[6 \times 12403.11 - (246.36)^2][6 \times 5010431 - (5481)^2]}}$$

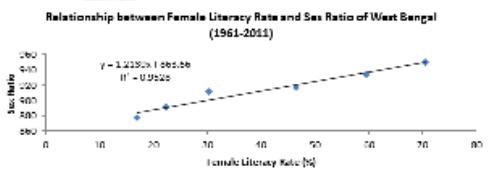
$$= \frac{1366960.02 - 1350299.16}{\sqrt{[74418.66 - 60693.25][30062586 - 30041361]}}$$

$$= \frac{16660.86}{\sqrt{[13725.41 \times 21225]}}$$

$$= \frac{16660.86}{\sqrt{291321827.25}}$$

$$= \frac{16660.86}{17068.15}$$

$$= 0.9761$$



It has been found from table- 3 that the female literacy rate of West Bengal has increased from 16.98 percent in 1961 to 70.54 percent in 2011 while sex ratio also increased from 878 in 1961 to 950 in 2011. The correlation coefficient value between female literacy rate and sex ratio is 0.9761 which indicates that there is strong positive correlation between female literacy and sex ratio of West Bengal.

**Correlation between Rural Literacy Rate and Sex Ratio:**

This section expresses the correlation between rural literacy rate and sex ratio of West Bengal.

**Table 4.** Rural Literacy Rate and Sex Ratio of West Bengal (1961-2011).

Census Year	Percentage of Rural Literacy Rate (X)	Sex Ratio (Y)	X <sup>2</sup>	Y <sup>2</sup>	XY
1961	21.64	878	468.29	770884	18999.92
1971	25.72	891	661.52	793881	22916.52
1981	33.12	911	1096.93	829921	30172.32
1991	50.50	917	2550.25	840889	46308.50
2001	63.42	934	4022.10	872356	59234.28
2011	72.13	950	5202.74	902500	68523.50
Σ	266.53	5481	14001.83	5010431	246155.04

Source: Calculated by author from Census of India (1961-2011). Karl Pearson's Product Moment Correlation Coefficient:

$$r_{xy} = \frac{n\sum XY - \sum X \cdot \sum Y}{\sqrt{[n\sum X^2 - (\sum X)^2][n\sum Y^2 - (\sum Y)^2]}}$$

$$= \frac{6 \times 246155.04 - 266.53 \times 5481}{\sqrt{[6 \times 14001.83 - (266.53)^2][6 \times 5010431 - (5481)^2]}}$$

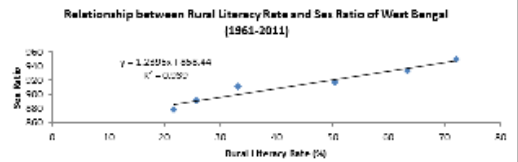
$$= \frac{1476930.24 - 1460850.93}{\sqrt{[84010.98 - 71038.24][30062586 - 30041361]}}$$

$$= \frac{16079.31}{\sqrt{[12972.74 \times 21225]}}$$

$$= \frac{16079.31}{\sqrt{275346406.50}}$$

$$= \frac{16079.31}{16593.57}$$

$$= 0.9690$$



It has been observed from table-4 that the rural literacy rate of West Bengal has increased from 21.64 percent in 1961 to 72.13 percent in 2011 while sex ratio also increased from 878 in 1961 to 950 in 2011. The correlation coefficient value between rural literacy rate and sex ratio is 0.9690 which indicates that there is strong positive correlation between rural literacy and sex ratio of West Bengal.

**Correlation between Urban Literacy Rate and Sex Ratio:**

This section describes the correlation between urban literacy rate and sex ratio of West Bengal.

**Table 5.** Urban Literacy Rate and Sex Ratio of West Bengal (1961-2011).

Census Year	Percentage of Urban Literacy Rate (X)	Sex Ratio (Y)	X <sup>2</sup>	Y <sup>2</sup>	XY
1961	52.89	878	2797.35	770884	46437.42
1971	55.93	891	3128.16	793881	49833.63
1981	62.66	911	3926.28	829921	57083.26
1991	75.27	917	5665.57	840889	69022.59
2001	81.25	934	6601.56	872356	75887.50
2011	84.78	950	7187.65	902500	80541.00
Σ	412.78	5481	29306.57	5010431	378805.40

Source: Calculated by author from Census of India (1961-2011). Karl Pearson's Product Moment Correlation Coefficient:

$$r_{xy} = \frac{n\sum XY - \sum X \cdot \sum Y}{\sqrt{[n\sum X^2 - (\sum X)^2][n\sum Y^2 - (\sum Y)^2]}}$$

$$= \frac{6 \times 378805.40 - 412.78 \times 5481}{\sqrt{[6 \times 29306.57 - (412.78)^2][6 \times 5010431 - (5481)^2]}}$$

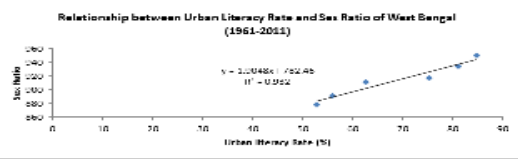
$$= \frac{2272832.40 - 2262447.18}{\sqrt{[175839.42 - 170387.33][30062586 - 30041361]}}$$

$$= \frac{10385.22}{\sqrt{[5452.09 \times 21225]}}$$

$$= \frac{10385.22}{\sqrt{115720610.25}}$$

$$= \frac{10385.22}{10757.35}$$

$$= 0.9654$$



It has been found from table-5 that the urban literacy rate of West Bengal has increased from 52.89 percent in 1961 to 84.78 percent in 2011 while sex ratio also increased from 878 in 1961 to 950 in 2011. The correlation coefficient value between urban literacy rate and sex ratio is 0.9654 which indicates that there is strong positive correlation between urban literacy and sex ratio of West Bengal.

**CONCLUSION**

The overall analysis of this study reveals that the correlation between literacy and sex ratio of West Bengal is strongly positive. Female literacy has been more effect than male literacy in increasing the sex

ratio in West Bengal. On the other hand, rural literacy has been more influence than urban literacy in increasing the sex ratio in West Bengal. Finally, increasing public awareness about the negative effects of low sex ratio and implementing strong education policies by the Government of India can improve the sex ratio in West Bengal.

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