Original Research Paper

Volume - 15 | Issue - 05 | May - 2025 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

Geography

LITERACY AND POPULATION GROWTH OF WEST BENGAL: CORRELATION AND REGRESSION ANALYSIS

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ABSTRACT Rapid population growth is a serious problem of the study area as well as the country. Rapid population growth is severely hampering the socio-economic development of the study area. Literacy plays a very important role in controlling rapid population growth. This research work attempts to study the correlation between literacy and population growth of West Bengal, based on secondary data which has been obtained from Census of India (1961-2011) and Statistical Abstract of West Bengal. Karl Pearson's Product Moment Correlation Coefficient method is used to determine the results. This research paper finds a strong negative correlation between literacy and population growth of West Bengal.

KEYWORDS : Literacy, Population growth, Negative 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. UNESCO defines literacy 'as the ability to identity, understands, interpret, create, communicate and compute using printed and written materials'. Population growth is the rate in the number of inhabitants living in a particular area during a specific period of time. As per Census of India 2011, the total population of West Bengal is 91276115 of which 46809027 are males and 44467088 are females while 62183113 are rural and 29093002 are urban population. According to Census of India 2011, West Bengal's literacy rate is 76.26 percent, while Kerala has the highest literacy rate (93.91 percent) in the country. As per Census of India 2011, West Bengal's decadal population growth rate is 13.84 percent, while Kerala has the second lowest decadal population growth rate (4.86 percent) in the country. In this research paper, an attempt has been made to analyze the correlation between literacy and population growth of West Bengal.

OBJECTIVES

1.To examine the correlation between literacy rate and population growth of West Bengal.
2.To examine the correlation between male-female literacy rate and population growth of the West Bengal.
3.To examine the correlation between rural-urban literacy rate and population growth of West Bengal.

MATERIALS AND METHODS

The study focuses on the correlation between literacy and population growth of West Bengal which is based on secondary data. The required data is obtained from the Census of India (1961-2011) and the Statistical Abstract of West Bengal. Two variables i.e. literacy and population growth of West Bengal has been taken for the study. Karl Pearson's Product Moment Correlation Coefficient method is used to examine the correlation between literacy and population growth of West Bengal. The formula is:

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

Where, X = Explanatory Variable (Literacy Rate)
Y = Explained Variable (Population Growth).

RESULTS AND DISCUSSIONS

Correlation Between Literacy Rate And Population Growth:

This section describes the correlation between literacy rate and population growth of West Bengal.

Table 1. Literacy Rate And Population Growth Of West Bengal (1961-2011).

Census Year	Percentage of Literacy Rate (X)	Percentage of Population Growth (Y)	X^2	Y^2	XY
1961	29.28	32.80	857.32	1075.84	960.38
1971	33.20	26.87	1102.24	722.00	892.08
1981	40.94	23.17	1676.08	536.85	948.58
1991	57.70	24.73	3329.29	611.57	1426.92
2001	68.64	17.77	4711.45	315.77	1219.73
2011	76.26	13.84	5815.59	191.55	1055.44
∑	306.02	139.18	17491.97	3453.58	6503.13

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

$$r = \frac{n\sum XY - \sum X.\sum Y}{\sqrt{[n\sum X^2 - (\sum X)^2][n\sum Y^2 - (\sum Y)^2]}}$$

$$= \frac{6 \times 6503.13 - 306.02 \times 139.18}{\sqrt{[6 \times 17491.97 - (306.02)^2][6 \times 3453.58 - (139.18)^2]}}$$

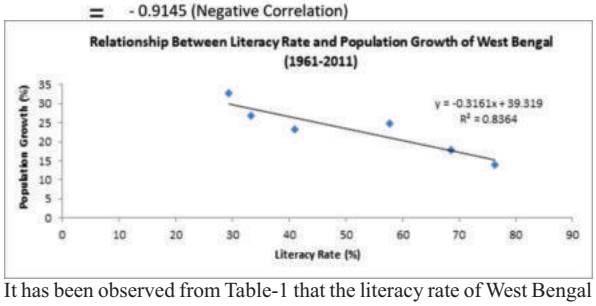
$$= \frac{39018.78 - 42591.86}{\sqrt{[104951.82 - 93648.24][20721.48 - 19371.07]}}$$

$$= \frac{-3573.08}{\sqrt{[11303.58 \times 1350.41]}}$$

$$= \frac{-3573.08}{\sqrt{15264467.47}}$$

$$= \frac{-3573.08}{3906.98}$$

$$= -0.9145 \text{ (Negative Correlation)}$$



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 population growth decreased from 32.80 percent in 1961 to 13.84 percent in 2011. The correlation coefficient value (r) between literacy rate and population growth is - 0.9145 which indicates that there is strong negative correlation between literacy and population growth of West Bengal.

Correlation Between Male Literacy Rate And Population Growth:

This section describes the correlation between male literacy rate and population growth of West Bengal.

Table 2. Male Literacy Rate And Population Growth Of West Bengal (1961-2011).

Census Year	Percentage of Male Literacy Rate (X)	Percentage of Population Growth (Y)	X^2	Y^2	XY
1961	40.08	32.80	1606.41	1075.84	1314.62
1971	42.81	26.87	1832.70	722.00	1150.30
1981	50.67	23.17	2567.45	536.85	1174.02
1991	67.81	24.73	4598.20	611.57	1676.94
2001	77.02	17.77	5932.08	315.77	1368.65
2011	81.69	13.84	6673.26	191.55	1130.59
∑	360.08	139.18	23210.10	3453.58	7815.12

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

$$r = \frac{n\sum XY - \sum X.\sum Y}{\sqrt{[n\sum X^2 - (\sum X)^2][n\sum Y^2 - (\sum Y)^2]}}$$

$$= \frac{6 \times 7815.12 - 360.08 \times 139.18}{\sqrt{[6 \times 23210.10 - (360.08)^2][6 \times 3453.58 - (139.18)^2]}}$$

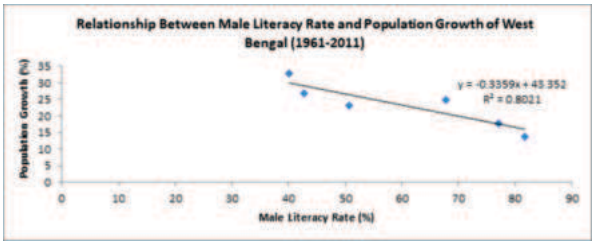
$$= \frac{46890.72 - 50115.93}{\sqrt{[139260.60 - 129657.61][20721.48 - 19371.07]}}$$

$$= \frac{-3225.21}{\sqrt{[9602.99 \times 1350.41]}}$$

$$= \frac{-3225.21}{\sqrt{12967973.73}}$$

$$= \frac{-3225.21}{3601.11}$$

$$= -0.8956 \text{ (Negative Correlation)}$$



It has been found 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 population growth decreased from 32.80 percent in 1961 to 13.84 percent in 2011. The correlation coefficient value (r) between male literacy rate and population growth is - 0.8956 which indicates that there is strong negative correlation between male literacy and population growth of West Bengal.

Correlation Between Female Literacy Rate And Population Growth:

This section expresses the correlation between female literacy rate and population growth of West Bengal.

Table 3. Female Literacy Rate And Population Growth Of West Bengal (1961-2011).

Census Year	Percentage of Female Literacy Rate (X)	Percentage of Population Growth (Y)	X^2	Y^2	XY
1961	16.98	32.80	288.32	1075.84	556.94
1971	22.42	26.87	502.66	722.00	602.43
1981	30.25	23.17	915.06	536.85	700.89
1991	46.56	24.73	2167.83	611.57	1151.43
2001	59.61	17.77	3553.35	315.77	1059.27
2011	70.54	13.84	4975.89	191.55	976.27
∑	246.36	139.18	12403.11	3453.58	5047.23

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

Pearson's Product Moment Correlation Coefficient:

$$r = \frac{n\sum XY - \sum X.\sum Y}{\sqrt{[n\sum X^2 - (\sum X)^2][n\sum Y^2 - (\sum Y)^2]}}$$

$$= \frac{6 \times 5047.23 - 246.36 \times 139.18}{\sqrt{[6 \times 12403.11 - (246.36)^2][6 \times 3453.58 - (139.18)^2]}}$$

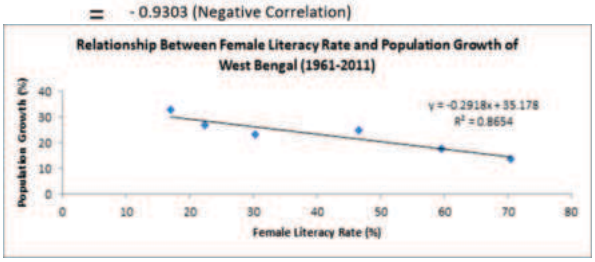
$$= \frac{30283.38 - 34288.38}{\sqrt{[74418.66 - 60693.25][20721.48 - 19371.07]}}$$

$$= \frac{-4005.00}{\sqrt{[13725.41 \times 1350.41]}}$$

$$= \frac{-4005.00}{\sqrt{18534930.92}}$$

$$= \frac{-4005.00}{4305.22}$$

$$= -0.9303 \text{ (Negative Correlation)}$$



It has been shown 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 population growth decreased from 32.80 percent in 1961 to 13.84 percent in 2011. The correlation coefficient value (r) between female literacy rate and population growth is - 0.9303 which indicates that there is strong negative correlation between female literacy and population growth of West Bengal.

Correlation Between Rural Literacy Rate And Population Growth:

This section describes the correlation between rural literacy rate and population growth of West Bengal.

Table 4. Rural Literacy Rate and Population Growth of West Bengal (1961-2011).

Census Year	Percentage of Rural Literacy Rate (X)	Percentage of Population Growth (Y)	X^2	Y^2	XY
1961	21.64	32.80	468.29	1075.84	709.79
1971	25.72	26.87	661.52	722.00	691.10
1981	33.12	23.17	1096.93	536.85	767.39
1991	50.50	24.73	2550.25	611.57	1248.87
2001	63.42	17.77	4022.10	315.77	1126.97
2011	72.13	13.84	5202.74	191.55	998.28
∑	266.53	139.18	14001.83	3453.58	5542.40

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

Pearson's Product Moment Correlation Coefficient:

$$r = \frac{n\sum XY - \sum X.\sum Y}{\sqrt{[n\sum X^2 - (\sum X)^2][n\sum Y^2 - (\sum Y)^2]}}$$

$$= \frac{6 \times 5542.40 - 266.53 \times 139.18}{\sqrt{[6 \times 14001.83 - (266.53)^2][6 \times 3453.58 - (139.18)^2]}}$$

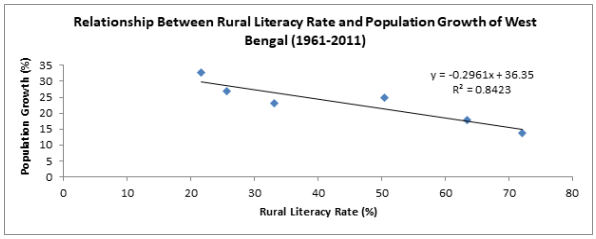
$$= \frac{33254.40 - 37095.65}{\sqrt{[84010.98 - 71038.24][20721.48 - 19371.07]}}$$

$$= \frac{-3841.25}{\sqrt{[12972.74 \times 1350.41]}}$$

$$= \frac{-3841.25}{\sqrt{17518517.82}}$$

$$= \frac{-3841.25}{4185.51}$$

$$= -0.9177 \text{ (Negative Correlation)}$$



It has been found 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 population growth decreased from 32.80 percent in 1961 to 13.84 percent in 2011. The correlation coefficient value (r) between rural literacy rate and population growth is - 0.9177 which indicates that there is strong negative correlation between rural literacy and population growth of West Bengal.

Correlation Between Urban Literacy Rate And Population Growth:

This section expresses the correlation between urban literacy rate and population growth of West Bengal.

Table 5. Urban Literacy Rate and Population Growth of West Bengal (1961-2011).

Census Year	Percentage of Urban Literacy Rate (X)	Percentage of Population Growth (Y)	X^2	Y^2	XY
1961	52.89	32.80	2797.35	1075.84	1734.79
1971	55.93	26.87	3128.16	722.00	1502.84
1981	62.66	23.17	3926.28	536.85	1451.83
1991	75.27	24.73	5665.57	611.57	1861.43
2001	81.25	17.77	6601.56	315.77	1443.81
2011	84.78	13.84	7187.65	191.55	1173.36
∑	412.78	139.18	29306.57	3453.58	9168.06

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

Pearson's Product Moment Correlation Coefficient:

$$r = \frac{n\sum XY - \sum X.\sum Y}{\sqrt{[n\sum X^2 - (\sum X)^2][n\sum Y^2 - (\sum Y)^2]}}$$

$$= \frac{6 \times 9168.06 - 412.78 \times 139.18}{\sqrt{[6 \times 29306.57 - (412.78)^2][6 \times 3453.58 - (139.18)^2]}}$$

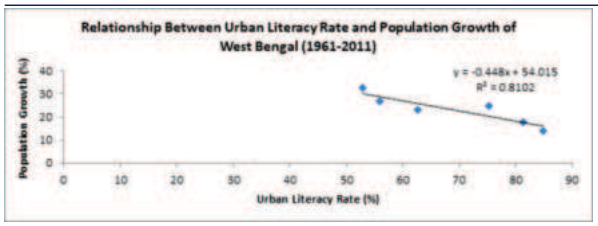
$$= \frac{55008.36 - 57450.72}{\sqrt{[175839.42 - 170387.33][20721.48 - 19371.07]}}$$

$$= \frac{-2442.36}{\sqrt{[5452.09 \times 1350.41]}}$$

$$= \frac{-2442.36}{\sqrt{7362556.86}}$$

$$= \frac{-2442.36}{2713.40}$$

$$= -0.9001 \text{ (Negative Correlation)}$$



It has been observed 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 population growth decreased from 32.80 percent in 1961 to 13.84 percent in 2011. The correlation coefficient value (r) between urban literacy rate and population growth is - 0.9001 which indicates that there is strong negative correlation between urban literacy and population growth of West Bengal.

CONCLUSION

The overall analysis of the present study reveals that the correlation between literacy and population growth of West Bengal is strongly negative. Female literacy rate has been more influence than male literacy rate in reducing population growth of West Bengal. On the other hand, rural literacy rate has been more effective than urban literacy rate in reducing population growth of West Bengal. Finally, it can be said that increasing public awareness about the negative effects of population growth and implementing a strong education policy by the Government of India can check rapid population growth in West Bengal.

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