Original Research Paper

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Geography

LITERACY AND POPULATION GROWTH OF MALDA DISTRICT: CORRELATION AND REGRESSION ANALYSIS

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ABSTRACT Rapid population growth continues to be a matter of concern for the study area as well as the country. Literacy plays an important role in controlling rapid population growth. This paper attempts to study the correlation between literacy and population growth of Malda District, based on secondary data which has been collected from Census of India 2011 and District Census Hand Book (1961-2011). Pearson's Product Moment Correlation Coefficient method has been applied to determine the results. This study finds out the strong negative correlation between literacy and population growth of Malda District.

KEYWORDS : Literacy, Population growth, Negative correlation, Malda District.

1. 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 between two given points of time. As per Census of India 2011, the total population of Malda District is 3988845 of which 2051541 are male and 1937304 are female while 3447185 are rural and 541660 are urban population. The decadal growth rate of population of Malda District is 21.22 percent during 2001-2011 which is second highest in the state (13.84 percent) and also more than the national average (17.70 percent). As per 2011 Census, literacy rate of Malda District is 61.73 percent which is much lower than the state average (77.08 percent) and the national average (74.04 percent). In this paper, an attempt has been made to examine the correlation between literacy rate and population growth of Malda District.

2. Objectives

1. To examine the correlation between literacy rate and population growth of Malda District.
2. To explore the correlation between male-female literacy rate and population growth of the district.
3. To find out the correlation between rural-urban literacy rate and population growth of Malda District.

2. Materials and Methods

The present study focuses on the correlation between literacy rate and population growth of Malda District which is entirely based on secondary data. The required data is collected from Census of India 2011 and District Census Hand Book (1961-2011) of Malda District. Two variables i.e. literacy rate and population growth of Malda District has been taken for the study. The collected data tabulated systematically and calculated correlation between literacy rate and population growth by using Pearson's Product Moment Correlation Coefficient method by using the following formula:

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

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

4. RESULTS AND DISCUSSIONS

4.1.Relationship Between Literacy Rate and Population Growth:

This section describes the relationship between literacy rate and population growth of Malda District.

Table 1. Literacy Rate and Population Growth of Malda District (1961-2011)

Census Year	Percentage of Literacy Rate (X)	Percentage of Population Growth (Y)	XY	X^2	Y^2
1961	13.79	30.33	418.25	190.16	919.91
1971	17.61	31.98	563.17	310.11	1022.72
1981	23.06	26.00	599.56	531.76	676.00
1991	35.62	29.78	1060.76	1268.78	886.85
2001	50.28	24.78	1245.94	2528.08	614.05
2011	61.73	21.22	1309.91	3810.59	450.29
∑	202.09	164.09	5197.59	8639.48	4569.82

Source: Calculated by Author from District Census Hand Book, Malda (1961-2011).

Pearson's Product Moment Correlation Coefficient:

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

$$= \frac{6 \times 5197.59 - 202.09 \times 164.09}{\sqrt{[6 \times 8639.48 - (202.09)^2][6 \times 4569.82 - (164.09)^2]}}$$

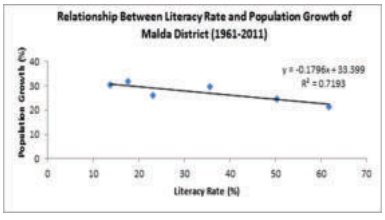
$$= \frac{31185.54 - 33160.95}{\sqrt{[51836.88 - 40840.37][27418.92 - 26925.53]}}$$

$$= \frac{-1975.41}{\sqrt{[10996.51 \times 493.39]}}$$

$$= \frac{-1975.41}{\sqrt{5425568.07}}$$

$$= \frac{-1975.41}{2329.28}$$

$$= -0.85 \text{ (Negative Correlation)}$$



It has been observed from table 1 that the literacy rate of malda district has increased from 13.79 percent in 1961 to 61.73 percent in 2011 while population growth decreased from 30.33 percent in 1961 to 21.22 percent in 2011. The correlation coefficient value between literacy rate and population growth (r) is -0.85 which indicates there is strong negative correlation between literacy rate and population growth in the case of the district.

4.2.Relationship Between Male Literacy Rate and Population Growth:

This section expresses the relationship between male literacy rate and population growth of Malda District.

Table 2. Male Literacy Rate and Population Growth of Malda District (1961-2011)

Census Year	Percentage of Male Literacy Rate (X)	Percentage of Population Growth (Y)	XY	X^2	Y^2
1961	21.47	30.33	651.19	460.96	919.91
1971	25.45	31.98	813.89	647.70	1022.72
1981	31.44	26.00	817.44	988.47	676.00
1991	45.61	29.78	1358.27	2080.27	886.85
2001	58.80	24.78	1457.06	3457.44	614.05
2011	66.24	21.22	1405.61	4387.74	450.29
∑	249.01	164.09	6503.46	12022.58	4569.82

Source: Calculated by Author from District Census Hand Book, Malda (1961-2011).

Pearson's Product Moment Correlation Coefficient:

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

$$= \frac{6 \text{ X } 6503.46 - 249.01 \text{ X } 164.09}{\sqrt{[6 \text{ X } 12022.58 - (249.01)^2][6 \text{ X } 4569.82 - (164.09)^2]}}$$

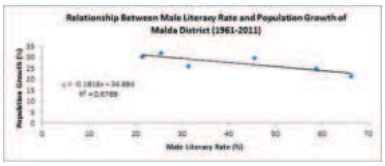
$$= \frac{39020.76 - 40860.05}{\sqrt{[72135.48 - 62005.98][27418.92 - 26925.53]}}$$

$$= \frac{-1839.29}{\sqrt{[10129.50 \text{ x } 493.39]}}$$

$$= \frac{-1839.29}{\sqrt{4997794.01}}$$

$$= \frac{-1839.29}{2235.57}$$

$$= -0.82 \text{ (Negative Correlation)}$$



It has been found from table 2 that the male literacy rate of malda district has increased from 21.47 percent in 1961 to 66.24 percent in 2011 while population growth decreased from 30.33 percent in 1961 to 21.22 percent in 2011. The correlation coefficient value between male literacy rate and population growth (r) is - 0.82 which indicates there is strong negative correlation between male literacy rate and population growth in the case of the district.

4.3.Relationship Between Female Literacy Rate and Population Growth:

This section describes the relationship between female literacy rate and population growth of Malda District.

Table 3. Female Literacy Rate and Population Growth of Malda District (1961-2011)

Census Year	Percentage of Female Literacy Rate (X)	Percentage of Population Growth (Y)	XY	X^2	Y^2
1961	5.84	30.33	177.13	34.11	919.91
1971	9.34	31.98	298.69	87.24	1022.72
1981	14.22	26.00	369.72	202.21	676.00
1991	24.92	29.78	742.12	621.01	886.85
2001	41.25	24.78	1022.18	1701.56	614.05
2011	56.96	21.22	1208.69	3244.44	450.29
∑	152.53	164.09	3818.53	5890.57	4569.82

Source: Calculated by Author from District Census Hand Book, Malda (1961-2011).

Pearson's Product Moment Correlation Coefficient:

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

$$= \frac{6 \text{ X } 3818.53 - 152.53 \text{ X } 164.09}{\sqrt{[6 \text{ X } 5890.57 - (152.53)^2][6 \text{ X } 4569.82 - (164.09)^2]}}$$

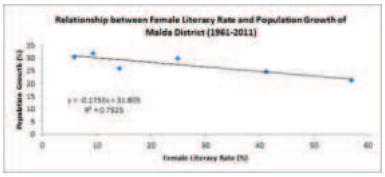
$$= \frac{22911.18 - 25028.65}{\sqrt{[35343.42 - 23265.40][27418.92 - 26925.53]}}$$

$$= \frac{-2117.47}{\sqrt{[12078.02 \text{ x } 493.39]}}$$

$$= \frac{-2117.47}{\sqrt{5959174.29}}$$

$$= \frac{-2117.47}{2441.14}$$

$$= -0.87 \text{ (Negative Correlation)}$$



It has been shown from table 3 that the female literacy rate of malda district has increased from 5.84 percent in 1961 to 56.96 percent in 2011 while population growth decreased from 30.33 percent in 1961 to 21.22 percent in 2011. The correlation coefficient value between female literacy rate and population growth (r) is -0.87 which indicates there is strong negative correlation between female literacy rate and population growth in the district.

4.4.Relationship Between Rural Literacy Rate and Population Growth:

This section shows the relationship between rural literacy rate and population growth of Malda District.

Table 4. Rural Literacy Rate and Population Growth of Malda District (1961-2011)

Census Year	Percentage of Rural Literacy Rate (X)	Percentage of Population Growth (Y)	XY	X^2	Y^2
1961	12.23	30.33	370.94	149.57	919.91
1971	15.81	31.98	505.60	249.96	1022.72
1981	21.07	26.00	547.82	443.94	676.00
1991	32.57	29.78	969.93	1060.80	886.85
2001	47.80	24.78	1184.48	2284.84	614.05
2011	59.37	21.22	1259.83	3524.80	450.29
∑	188.85	164.09	4838.60	7713.91	4569.82

Source: Calculated by Author from District Census Hand Book, Malda (1961-2011).

Pearson's Product Moment Correlation Coefficient:

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

$$= \frac{6 \text{ X } 4838.60 - 188.85 \text{ X } 164.09}{\sqrt{[6 \text{ X } 7713.91 - (188.85)^2][6 \text{ X } 4569.82 - (164.09)^2]}}$$

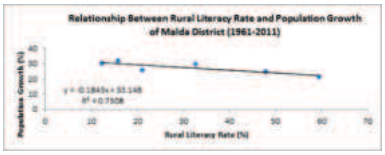
$$= \frac{29031.60 - 30988.40}{\sqrt{[46283.46 - 35664.32][27418.92 - 26925.53]}}$$

$$= \frac{-1956.80}{\sqrt{[10619.14 \text{ x } 493.39]}}$$

$$= \frac{-1956.80}{\sqrt{5239377.48}}$$

$$= \frac{-1956.80}{2288.97}$$

$$= -0.85 \text{ (Negative Correlation)}$$



It has been observed from table 4 that the rural literacy rate of malda district has increased from 12.23 percent in 1961 to 59.37 percent in 2011 while population growth decreased from 30.33 percent in 1961 to 21.22 percent in 2011. The correlation coefficient value between rural literacy rate and population growth (r) is - 0.85 which indicates there is strong negative correlation between rural literacy rate and population growth in the district.

4.5.Relationship Between Urban Literacy Rate and Population Growth:

This section shows the relationship between urban literacy rate and population growth of Malda District.

Table 5. Urban Literacy Rate and Population Growth of Malda District (1961-2011)

Census Year	Percentage of Urban Literacy Rate (X)	Percentage of Population Growth (Y)	XY	X^2	Y^2
1961	46.75	30.33	1417.93	2185.56	919.91
1971	58.54	31.98	1872.11	3426.93	1022.72
1981	62.69	26.00	1629.94	3930.04	676.00
1991	73.11	29.78	2177.22	5345.07	886.85
2001	79.30	24.78	1965.05	6288.49	614.05
2011	76.58	21.22	1625.03	5864.50	450.29
∑	396.97	164.09	10687.28	27040.59	4569.82

Source: Calculated by Author from District Census Hand Book, Malda (1961-2011).

Pearson's Product Moment Correlation Coefficient:

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

$$= \frac{6 \text{ X } 10687.28 - 396.97 \text{ X } 164.09}{\sqrt{[6 \text{ X } 27040.59 - (396.97)^2][6 \text{ X } 4569.82 - (164.09)^2]}}$$

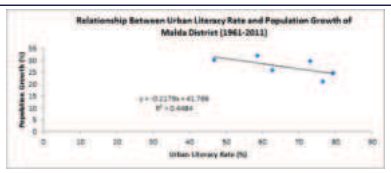
$$= \frac{64123.68 - 65138.81}{\sqrt{[162243.58 - 157585.18][27418.92 - 26925.53]}}$$

$$= \frac{-1015.13}{\sqrt{[4658.40 \text{ x } 493.39]}}$$

$$= \frac{-1015.13}{\sqrt{2298407.98}}$$

$$= \frac{-1015.13}{1516.05}$$

$$= -0.67 \text{ (Negative Correlation)}$$



It has been found from table 5 that the urban literacy rate of malda district has increased from 46.75 percent in 1961 to 76.58 percent in 2011 while population growth decreased from 30.33 percent in 1961 to 21.22 percent in 2011. The correlation coefficient value between urban literacy rate and population growth (r) is -0.67 which indicates there is moderate negative correlation between urban literacy rate and population growth in the district.

5. CONCLUSION

The overall analysis of this study reveals that the relationship between literacy rate and population growth in malda district is negative. Female literacy rate is more effective than male literacy rate in reducing population growth in the study area. On the other hand, rural literacy rate is more influential than urban literacy rate in reducing population growth in Malda District. Finally it can be said that implementation of a strong education policy by the Government especially development of women's education and rural education can control the rapid population growth of Malda district.

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