

REGIONAL ANALYSIS OF MALE LITERACY AND LEVELS OF DEVELOPMENT IN GAYA DISTRICT OF BIHAR

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The present paper is an attempt to analyse the spatial patterns of male literacy rate, variations in the levels of development and causal relationship between male literacy rate (dependent variable) and selected variables of development (independent variables) among the twenty four blocks of Gaya district of Bihar. The entire research work is based on secondary sources of data collected from Census of India Publications (2001), New Delhi. The block boundary has been considered as the smallest unit of study. The spatial patterns of male literacy rate show a steady increase from south to north and east to west, while the high level of socio-economic development is in eastern and north-central parts and it is low in the blocks lying in the south-western part of the district.

Introduction

Literacy is on the world's agenda. It is part of international educational targets and it figures, explicitly or implicitly, in other development goals. At national level, literacy is a matter of concern both in industrialized and developing countries, in terms of levels of acquisition, access to literacy learning, the social practices of literacy or its changing nature in the digital age (Robinson 2005). However, there are dramatic differences in literacy levels observed around the world, such as between developed and developing countries (Ramdas 1989 & 1990). The developing countries of the world are characterized not only by low literacy rates but also by a great disparity in the literacy rates between urban and rural populations, between males and females, and between the young and the aged, a disparity in consonance with differences in necessity, propensity, and opportunity to become literate (Krishan and Shyam 1978). As a result, Literacy policy and programming in developing countries continues to be influenced by the assumption that without literacy, an adult is unable to function on an equal basis in society and that an individual can be easily categorized as either literate or illiterate (Robinson-Pant 2010).

The population commission of United Nations considers a person to be literate who has ability to read and write with understanding a simple statement. The Census of India, 2001 defines literacy as a ratio between literate population and total population excluding seven years of children. In other words, a person aged 7 years and above who can both read and write with understanding in any language has been taken as literate. The concept of literacy varies from country to country; generally, it refers to

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the minimum level of literacy skills. This minimum level of skill varies from ability to communicate orally, to make a check of a variety of difficult arithmetical computations. However, the length of schooling has often considered as a basis of distinction between a literate and illiterate (Chandna 2005). Thus, it is not simply just the dichotomy (termed basic literacy) separating those who can read (called literates) from those who cannot (called illiterates). More theoretically robust is the conceptualization of literacy as a continuous, multidimensional indicator of proficiency in using written language, with its higher levels reflecting an ability to draw logical inferences and think critically (Wallendorf 2001).

Literacy is valued in its own right, not only freeing people from ignorance and prejudice, but also enhancing their ability to find work, and attain occupational and social advancement (Nicholas and Nicholas 1992). Moreover, it is a crucial life skill, which enables individuals to participate more fully in the practices of their community (Abadzi 1995), and thus, the literacy levels are assumed to reflect the quality of the human capital in a society-thus having implications for economic growth (Fuller *et al* 1986; Wagner 1986). In fact, literacy is the foundation of all other developmental processes and viewed as both a means and an end of development (Azim 2005). Sen (1995) observed that literacy has instrumental as well as intrinsic significance in the dynamic process of development.

Development is a dynamic concept. In fact, there is no clear agreed definition of development, but still economic development along with qualitative change in the social, economic and institutional realness of a society is generally considered as the key element of development (Rao 1984). It is a value positive concept because development is not only a change, but a change for betterment (NCERT, 1995), it means change along with growth (Colm and Geiger 1962). Drewnowski (1966) defines development as a process of qualitative change and quantitative growth of the social and economic reality which we call either society or economy because of the close interrelation of economic and social elements. No purely social or purely economic development is possible; consequently, it is better not to speak of social development separately. It is a single process which is best called simply development.

Objectives of the Study

The present study has been undertaken with the following objectives:

- (i) to inspect the spatial patterns of male literacy rate in Gaya district,
- (ii) to analyse the regional variations of level of development in the study area,
- (iii) to find out the relationship between male literacy rate (dependent variable) and selected indicators of development (independent variables) in twenty four blocks of Gaya district, Bihar.

Database and Methodology

The present research work is entirely based on secondary sources of data collected from Directorate of Statistics and Evaluation (Forecast Section) publications (2005) Patna,

and block wise indicators of socio-economic development from the Office of the Director of Census Operation, Govt. of Bihar, publications (2001) Patna. A set of twenty six socio-economic indicators of various sectors have been taken into account to determine the levels of development in the twenty four blocks of the Gaya district. These indicators fall into categories like population characteristics, land use, education, agriculture, economic activities, health, transport & and banking facilities, etc.

To find out the areal variations of socio-economic development, in the first step, the raw data for each variable has been computed into standard score. It is generally known as Z value or Z-score. The score quantify the departure of individual observations, expressed in a comparable form. This means it becomes a linear transformation of the original data (Smith, 1973). It may be expressed as:

$$Z_{ij} = \frac{X_{ij} - \bar{X}_i}{\sigma_i}$$

Where, Z_{ij} indicates Standardized value of the variable i in block j ; X_{ij} for Actual value of variable i in block j ; \bar{X}_i for Mean value of variable i in all blocks; and σ_i for Standard deviation of variable i in all blocks.

In the second step, the Z-scores of all variables have been added block wise and the average has been taken out for these variables which may be called as composite score (CS) for each block and may be algebraically expressed as:

$$CS = \frac{\sum Z_{ij}}{N}$$

Where, CS is composite score; N refers to the number of variables; $\sum Z_{ij}$ indicates z-scores of all variables i in block j .

The positive values relating to the block's z-score explain high level of socio-economic development and negative values the low level of socio-economic development in the study area. The correlation co-efficient is worked out between male literacy rate (dependent variable) and selected variables of socio-economic development (independent variables) and student t-test technique is applied to find out the determinants which are significant at 1 per cent and 5 per cent levels. The correlation co-efficient has been computed on the basis of the Karl Pearson's correlation co-efficient (r) method which is as follows:

$$r = \frac{\Sigma xy - \Sigma x \Sigma y / n}{\sqrt{\Sigma x^2 - \frac{(\Sigma x)^2}{n}} \sqrt{\Sigma y^2 - \frac{(\Sigma y)^2}{n}}}$$

Where, r is the co-efficient of correlation; x, y are the two given variables and n is the number of observation.

To find out the computed 't' value, student t-test technique is used which is given below:

$$t = r \sqrt{\frac{(n-2)}{1-r^2}}$$

Where, t is the calculated value of 't' in the test of significance; n is the number of observation and r is the computed value of co-efficient of correlation.

To compute the statistical data, the advanced statistical techniques, the SPSS Software (Version 16.0) and R Software (Version 2.12.2) have been used. Besides, advanced statistical techniques, GIS-Arc view programme (Version 3.2 a) has been applied to show the spatial patterns of male literacy rate and levels of socio-economic development among the blocks of the district through maps.

Study Area

Gaya district as a whole has been chosen as study area for the present research work and the administrative boundary of a block has been considered as the smallest unit of study. The district comprises of four sub-divisions namely, Gaya Sadar, Neem Chak Bathani, Sherghati, and Tikari. These sub-divisions are further divided into 24 blocks. It lies entirely in the Southern Bihar. The mainland extends between $24^{\circ} 5'$ and $25^{\circ} 10'$ North latitudes, and $84^{\circ} 4'$ to $85^{\circ} 5'$ East longitudes (Figure 1). It takes up a geographical

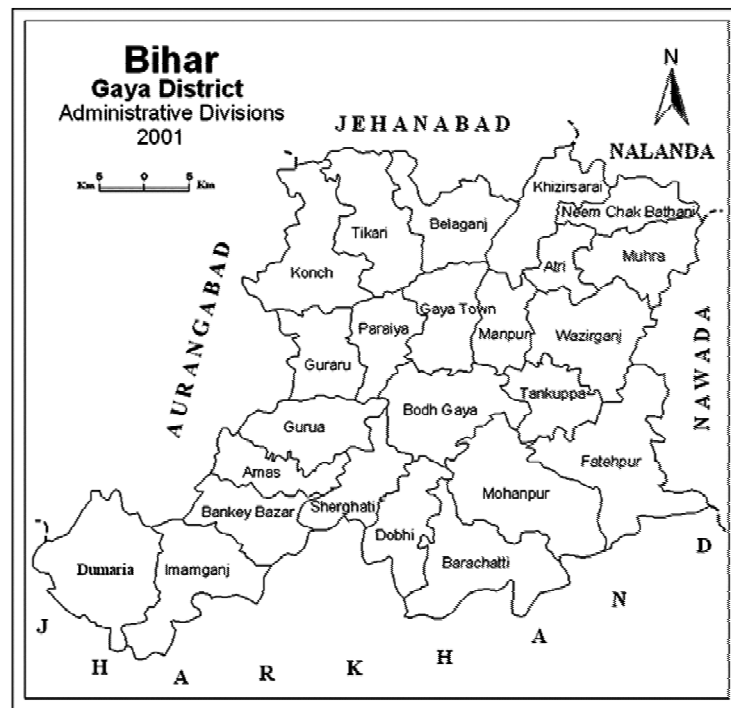


Figure 1

area of about 4,976 square kilometers bounded by Nawada district in the east, Aurangabad district in the west, Jehanabad district in the north and by the state of Jharkhand in the south.

According to the 2001 Indian Census, the total population of Gaya district was 3, 473,428 (4.18 per cent of the population of Bihar) of which 86.30 per cent was rural and remaining 13.70 per cent was classified as urban. The general density of population was 698 persons per square kilometer, while, in rural areas it was 613 and in urban areas 5631. The general sex ratio, that is the number of females per thousand males, was 938. The literacy rate was 51.07 per cent. The percentage of literacy in male and female population was 63.81 per cent and 37.40 per cent respectively.

Table 1
Block Wise Distribution of Male Literacy and Levels of Development in Gaya District of Bihar

Blocks	Z-Score of Male Literacy Rate	Composite mean Z-score of Levels of Development	Male Literacy vis-à-vis Levels of Development
Konch	0.96	0.00	ML ₁ D ₂
Tikari	1.35	0.15	ML ₁ D ₁
Belaganj	0.88	0.01	ML ₁ D ₂
Khizirsarai	0.60	0.00	ML ₁ D ₂
Neem Chak Bathani	0.02	0.01	ML ₂ D ₂
Muhra	-0.03	0.12	ML ₂ D ₁
Atri	-0.26	0.30	ML ₂ D ₁
Manpur	-0.20	0.07	ML ₂ D ₂
Gaya Town CD Block	2.87	-0.25	ML ₁ D ₃
Paraiya	0.69	0.17	ML ₁ D ₁
Guraru	0.78	-0.04	ML ₁ D ₂
Gurua	0.08	0.27	ML ₂ D ₁
Amas	0.06	0.07	ML ₂ D ₂
Bankey Bazar	- 0.74	-0.19	ML ₃ D ₃
Imamganj	-1.20	-0.18	ML ₃ D ₃
Dumaria	-1.62	-0.26	ML ₃ D ₃
Sherghati	-0.13	-0.25	ML ₂ D ₃
Dobhi	-1.44	0.07	ML ₃ D ₂
Bodh Gaya	0.14	0.00	ML ₂ D ₂
Tan Kuppa	- 0.74	-0.02	ML ₃ D ₂
Wazirganj	0.48	0.14	ML ₂ D ₁
Fatehpur	- 0.79	-0.07	ML ₃ D ₂
Mohanpur	- 0.95	0.03	ML ₃ D ₂
Barachatti	- 0.80	-0.08	ML ₃ D ₂

Source: Calculation is based on block level published data, Directorate of Statistics and Evaluation (Forecast Section), Patna, 2005 and Office of the Director of Census Operation, Govt. of Bihar, Patna, 2001.

Note: ML₁ = High Level of Male Literacy Rate, ML₂ = Medium Level of Male Literacy Rate, and ML₃ = Low Level of Male Literacy Rate; D₁ = High Level of Development, D₂ = Medium Level of Development and D₃ = Low level of development.

Regional Patterns of Male Literacy in Gaya District

Table 1 shows the block-wise Z-score values of male literacy in Gaya district, which varies from -1.62 score (Dumaria block) to 2.87 score (Gaya town C.D. block). The whole range of spatial variations of male literacy rate may be arranged into three categories such as, high (above 0.50 score), medium (0.50 to - 0.50 score) and low (below -0.50 score) (see Table 2).

The score of male literacy is marked with notable variation in its distribution among the blocks of Gaya district. The seven blocks (Gaya Town C.D., Konch, Tikari, Belaganj, Khizirsarai, Paraiya and Guraru) have high score (above 0.50 score) and formed a principal region over the north-western part of the district. However, nine blocks (Neem Chak Bathani, Muhra, Atri, Manpur, Gurua, Amas, Sherghati, Bodh Gaya and Wazirganj) of the district fall under the medium level (0.50 to - 0.50 scores) of male literacy, and all these blocks combinely constitute a long linear contiguous region, extending from the block of Amas in the south-west to the block of Neem Chak Bathani in the north-eastern part of the district. About one-third blocks come under the low level (below - 0.50 score) of male literacy and make out the two identifiable regions. First region lying in the south-western part of the district includes the blocks of Imamganj, Bankey Bazar and Dumaria, while, the second region formed by the blocks of Barachatti, Dobhi, Fatehpur and Tankuppa, is located in the south-eastern part of the district (see Figure 2).

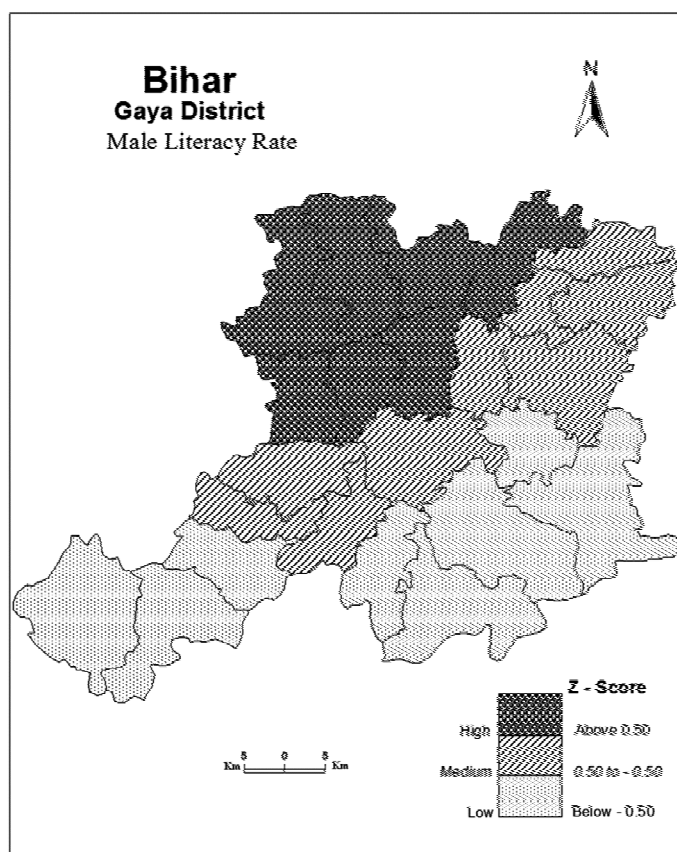
Table 2
Male Literacy Rate in Gaya District, Bihar

Category	Z-Score	No. of Blocks	Percentage of Total Blocks	Name of the Blocks
High	Above 0.50	07	29.17	Gaya Town C.D, Tikari, Konch, Belaganj, Khizirsarai, Paraiya and Guraru,
Medium	0.50 to - 0.50	09	37.50	Neem Chak Bathani, Muhra, Atri, Manpur, Gurua, Amas, Sherghati, Bodh Gaya and Wazirganj,
Low	Below - 0.50	08	33.33	Imamganj, Mohanpur, Barachatti, Dobhi, Fatehpur, Tankuppa, Bankey Bazar and Dumaria.
Total	24	100.00	-	

Source: Based on Table 1.

Levels of Socio-Economic Development in Gaya District

The analysis of Table 1 reveals that there is a wide range of variations in the level of development in the blocks of the Gaya district. It varies from the lowest - 0.26 score in the block of Dumaria to the highest 0.30 score in the block of Atri. This entire range of variations may be arranged into three categories i.e. high (above 0.08 score), medium (0.08 to - 0.08 score) and low (below - 0.08 score) as given in Table 3.



Source: Based on Table 2.

Figure 2

Table 3
Levels of Socio-Economic Development in Gaya District, Bihar

Category	Z-Score	No. of Blocks	Percent of Total Blocks	Name of the Blocks
High	Above 0.08	06	25.00	Atri, Gurua, Wazirganj, Muhra, Paraiya and Tikari
Medium	0.08 to -0.08	13	54.17	Amas, Dobhi, Manpur, Khizirsarai, Konch, Neem Chak Bathani, Tankuppa, Bodh Gaya, Guraru, Mohanpur, Barachatti, Belaganj and Fatehpur
Low	Below -0.08	05	20.83	Imamganj, Bankey Bazar, Sherghati, Gaya Town C.D. and Dumaria.
Total	24	100.00	-	-

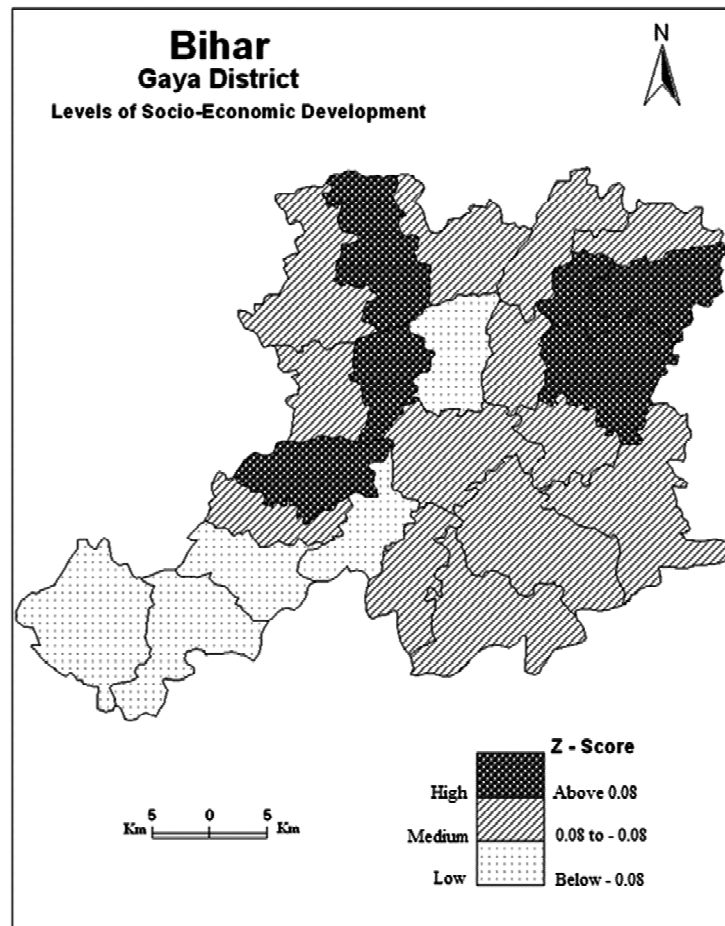
Source: Based on Table 1.

Table 3 exhibits that six blocks fall under the high level (above 0.08 score) of socio-economic development in the Gaya district, they are Gurua, Atri, Wazirganj,

Muhra, Paraiya and Tikari. Among them, three blocks (Gurua, Paraiya and Tikari) constitute a dominant linear region and make out a j-shaped figure in the north-central part, and other three blocks form a remarkable contiguous region in the eastern part of the district.

The thirteen blocks experience the medium level (0.08 to -0.08 score) of socio-economic development, in which ten blocks i.e. Khizirsarai, Neem Chak Bathani, Belaganj, Manpur, Dobhi, Tankuppa, Bodh Gaya, Mohanpur, Barachatti and Fatehpur make an extensive dominant region spreading over the northern, north-eastern, central and southern parts of the district.

The blocks of Konch and Guraru form an identifiable region in the north-western part of the district. However, Amas block, lying in the south-western part of the district, fails to form a contiguous region with any other block (Figure 3).



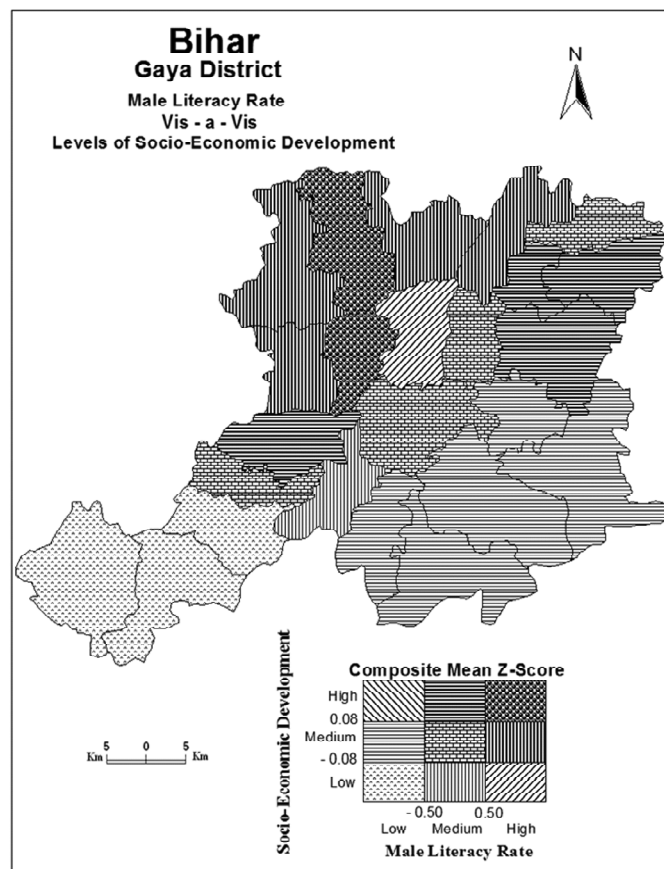
Source: Based on Table 3.

Figure 3

Remaining, five blocks i.e., Imamganj, Bankey Bazar, Dumaria, Sherghati and Gaya Town C.D. have the low level (below - 0.08 score) of socio-economic development, among them, the blocks of Imamganj, Bankey Bazar, Dumaria and Sherghati make a remarkable region in the south-western part of the district, while the block of Gaya Town C.D. situated in the north-central part of the district does not make any contiguous region with other blocks of the district.

Relationship between Male Literacy and Levels of Socio-Economic Development in Gaya District, Bihar

The relationship between male literacy rate and socio-economic development among the blocks of the district is dimensionally shown in Figure 4. The abscissa shows the male literacy and ordinate represents the level of socio-economic development. The blocks with reference to z-score of male literacy rate and composite z-score of level of socio-economic development may be arranged into three grades i.e. high, medium and low.



Source: Based on Table 1.

Figure 4

The entire range of variations of male literacy rate are grouped into three categories viz., high (above 0.50 score), medium (0.50 to - 0.50 score) and low (below - 0.50 score) and the level of socio-economic development is also divided as high (above 0.08 score), medium (0.08 to - 0.08 score) and low (below - 0.08 score) as given in Tables 2 and 3.

An analysis of Figure 4 depicts that only two blocks of the district fall under the categories of both the high levels of socio-economic development and male literacy rate and they form a longitudinal region in the mid of the north-western part of the district, while, the three blocks having low level of development and male literacy rate make a notable region in the south-western part of the district. On the other hand, two distinct regions of medium levels of development and male literacy have been made by the blocks of Manpur and Bodh Gaya in the central and Amas in the western part of the district. However, the five blocks namely Dobhi, Barachatti, Mohanpur, Fatehpur, Tankuppa situated in the south-eastern part of the district have experienced the low level of male literacy rate but medium level of socio-economic development, while, the blocks lying in the north-western (Konch and Guraru) and northern (Belaganj and Khizirsarai) parts of the district have recorded high level of male literacy rate but medium level of socio-economic development. Moreover, the blocks of Atri, Muhra, Wazirganj and Gurua spreading over the eastern and south-western parts of the Gaya district have witnessed the medium level of male literacy rate but high level of socio-economic development.

Correlation (r) between Male Literacy Rate (Y_1) and Other Selected Variables of Development (X) in Gaya District

The simple associations between male literacy and each of the selected independent variables of socio-economic development have been computed and tested with the assumption that the linear relationship existed in all the cases. The analysis of correlation between male literacy rate (dependent variable) and selected variables of development (independent variables) has been listed in Table 4. Out of twenty six independent variables of development, the coefficient of correlation of fourteen variables ($X_1, X_2, X_3, X_4, X_5, X_7, X_{14}, X_{15}, X_{16}, X_{17}, X_{18}, X_{19}, X_{20}$ and X_{22}) has a higher level of significant relationship with the male literacy rate. Among these fourteen variables, ten variables are significant at the confidence level of 99 per cent in which five variables (X_1, X_5, X_7, X_{19} and X_{20}) are positively correlated, while, the rest five variables (X_2, X_4, X_{14}, X_{16} and X_{17}) are inversely correlated with the male literacy rate. Remaining four variables (X_3, X_{15}, X_{18} and X_{22}) are significant at the confidence level of 95 per cent, in which, two variables (X_3 and X_{22}) are positively and rest two variables (X_{15} and X_{18}) are negatively correlated with the male literacy rate.

Table 4
Results of Correlation (r) between Male Literacy Rate (Y) and Other Selected Variables
Socio-Economic Development (X), in Gaya District of Bihar

<i>Variables</i>	<i>Definition of Variables</i>	<i>Male Literacy (Y_i)</i>
X ₁	Population Density	0.711*
X ₂	Sex-Ratio	-0.717*
X ₃	Percentage of Land not Available for Cultivation to Total Geographical Area in Hectares	0.427**
X ₄	Percentage of S.C. and S.T. Population to Total Population	-0.880*
X ₅	Literacy Rate	0.977*
X ₆	Male Literacy Rate	1.000
X ₇	Female Literacy Rate	0.908*
X ₈	Number of Primary Schools per Lakh of Population	-0.373
X ₉	Number of Middle Schools per Lakh of population	0.203
X ₁₀	Number of High and High Secondary Schools per Lakh of population	-0.083
X ₁₁	Intensity of Cropping	0.030
X ₁₂	Percentage of Net Sown Area to Total Cropped area	-0.261
X ₁₃	Percentage of Irrigated Area to Total Cropped area	-0.165
X ₁₄	Employment Rate	-0.576*
X ₁₅	Male Employment Rate	-0.492**
X ₁₆	Female Employment Rate	-0.605*
X ₁₇	Percentage of Workers engaged in Cultivation	-0.528*
X ₁₈	Percentage of Workers engaged in Agricultural Labour	-0.510**
X ₁₉	Percentage of Workers engaged in Households Industry	0.573*
X ₂₀	Percentage of Workers engaged in Other Works	0.661*
X ₂₁	Number of Hospitals & Primary Health Centers per Lakh of Population	-0.101
X ₂₂	Percentage of Electrified Villages to Total Villages	0.445**
X ₂₃	Density of Surface Roads per sq. km. of Area	-0.081
X ₂₄	Number of Post & Telegraph Offices per Lakh of Population	0.331
X ₂₅	Number of Commercial Banks per Lakh of population	-0.216
X ₂₆	Number of Agricultural Credit Societies per Lakh of Population	-0.193

*Significant at 1 per cent level; **Significant at 5 per cent level.

Instead of one star and double star variables, other variables are also correlated with male literacy rate but not up to a significant level.

Conclusion

The present study reveals that the spatial patterns of male literacy rate show a steady increase from south to north, while, the level of development is high in the eastern and north-central parts and it is low in the blocks situated in the south-western part of the district. The t-test explains that the regional variations in the levels of male literacy in Gaya district of Bihar may have been mainly due to variations in the population

characteristics (population density and sex ratio), land use (land not available for cultivation), educational facilities (literacy rate and female literacy rate), economic activities (employment rate, male employment rate, percentage of workers engaged in cultivation, percentage of workers engaged in agricultural labour, percentage of workers engaged in households industry and percentage of workers engaged in other works) and infrastructural facilities (particularly percentage of electrified villages).

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