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# Spatial-Temporal Transformation in Female Population, Literacy and Gender Disparity in Adampur Block

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**ABSTRACT**

The present study attempts to analyse the spatial-temporal transformation of female population distribution and literacy, along with gender disparities in the Adampur block. The question arises that if women represent half of the total population, then what has been the trend of its distribution, literacy and gender disparity in the study area, and what is its current pattern. This study used both primary (2026) and secondary (1991, 2001 & 2011 - Census of India) data. Literacy rates were measured using standards recommended by the Census of India, while the 'Sopher's Disparity Index', developed by Kundu and Rao (1985), was used to measure gender inequality in literacy. Patterns of spatio-temporal transformation of female population distribution, literacy rate along with gender inequality were mapped using geographic information system (GIS). The map clearly shows that the female population increases from villages located north of the study area towards the south. Conversely, villages located east and north of Adampur Town have lower literacy rates; however, villages closer to Adampur Town have higher gender disparities in literacy. Factors contributing to low literacy and higher gender disparities include poor transport connectivity between villages and cities, prevailing societal attitudes toward girls, pressure of household chores, distance to schools,

family educational levels, and the patriarchal system.

**Introduction:** Spatial social progress can be gauged through the study of female population, literacy, and gender inequality. Regional development cannot be achieved solely by relying on men; women's participation is also crucial. Despite women representing an equal share of the total population, their status, especially in rural areas, is still affected by numerous social and cultural barriers. Spatial and temporal patterns of change quantify how and to what extent female population, literacy, and gender inequality levels have changed over time and space; this concept also analyses how this rate of change is not uniform across rural areas. Among demographic factors, literacy is a paramount indicator that measures human progress. Her research uncovered cultural, socio-economic, and infrastructural barriers that hinder girls' educational attainment **(Bano S. & Sakshi 2023)**. They studied that in social environments where the level of gender inequality is high, in some cases the condition of women is worse than that of men **(Urvashi et al 2022)**. She analysed the interrelationships between gender, poverty and the environment in the context of spatial and temporal changes, and explored why and how factors such as environmental degradation, limited access to natural resources, and poverty adversely affect rural women **(Agarwal B. 1997)**. They investigated the relationship between female labour force and female educational attainment, observing the surprising result that where female labour force is high, female literacy levels are low **(Vanneman R. & Sundaram A. 2008)**. The present paper highlights the social reality of the study area by studying the spatio-temporal changes in female population, literacy and gender inequality, which will be helpful in reducing regional disparities in gender inequality and making effective plans for the future, so that the actual situation of rural development and women empowerment can be understood in the context of spatio-temporal patterns.

**Objectives:**

- to investigate the spatial-temporal transformation of female population distribution.
- to examine the spatial-temporal pattern of literacy and gender disparity in the study area.

**Study Area:** Adampur Block covers a geographical area of 32,189.00 hectares, located between latitudes 29°7'38" North and 29°23'21" North and longitudes 75°19'39" East and 75°37'20" East, forty kilometres northwest of Hisar, the district headquarters. Adampur Block experiences a semi-arid climate, with a flat surface characterized by predominantly sandy and loamy soils. These climatic conditions, combined with the Rajasthani culture, have given Adampur Block a distinct identity within Haryana. All villages in the block are interconnected and connected to Adampur Town through an efficient transportation network,

ensuring daily and other necessities. A significant portion of Adampur Block's population is engaged in agriculture, although there has been an increase in engagement in non-agricultural pursuits. As per 2011 stats, Adampur block has a total population of 111542, of which 59015 are males and 52527 are females.

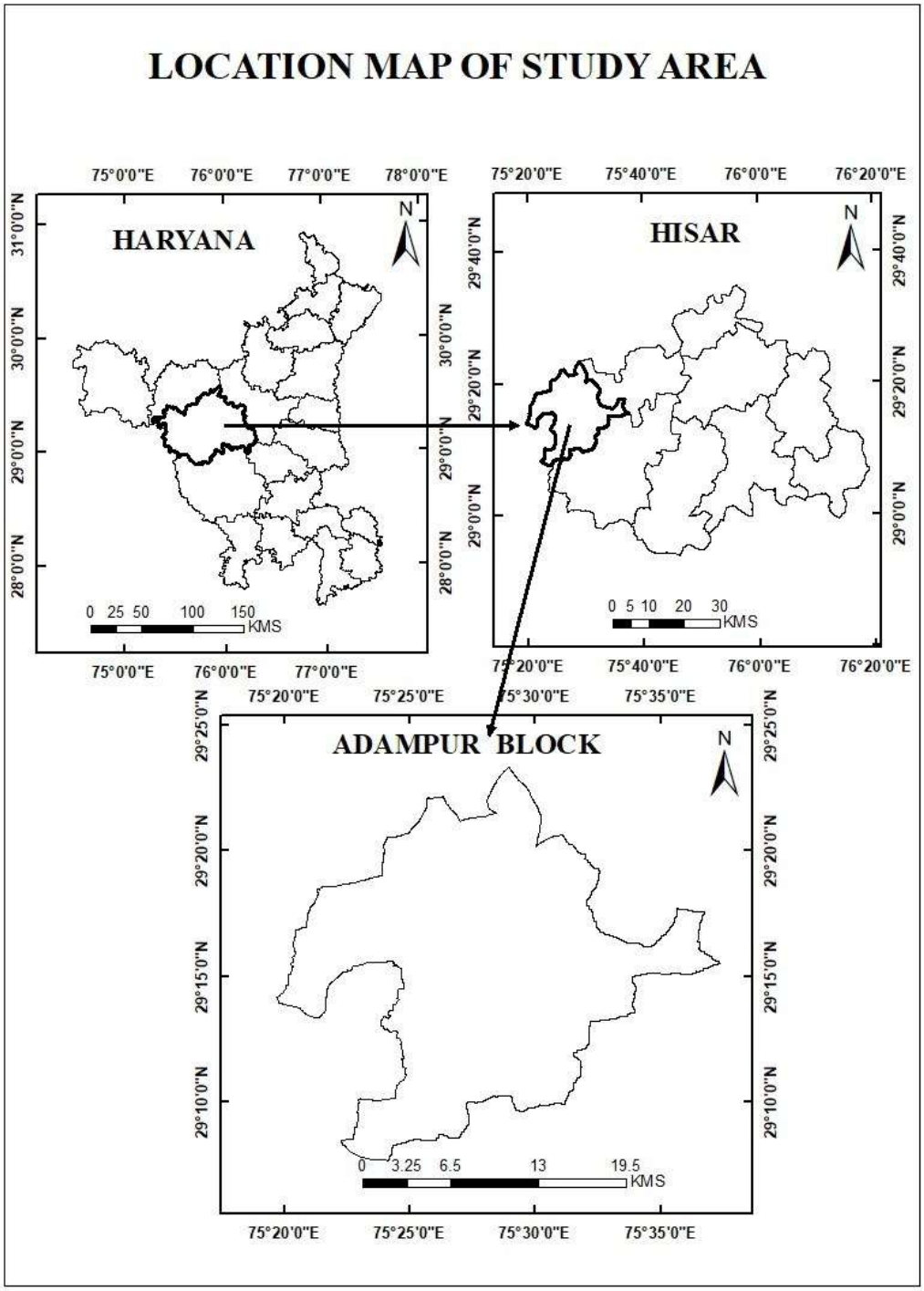


**Figure 1**

**Methodology:** The objectives of the current study were examined using both primary and secondary data. Primary data were collected through interviews, questionnaires, and observation methods in March-April 2026. Three villages in the study area: Sadalpur, Kutia Kheri, and Chuli Khurd, were selected for primary data collection, which was based on analysis of secondary data indicators such as the number of women in the village, sex ratio levels, literate female population, and gender inequality. Primary data was collected from a total of ninety-seven households, using stratified random sampling method, while selecting the sample, different age groups, social categories (SC/OBC/General) and economic status were taken into consideration. Secondary data from the Census of India for the years 1971, 1991, 2001 and 2011, as well as government reports, research papers, articles, books, journals and internet sources are used. Literacy rates were measured using standards recommended by the Census of India, while the 'Sopher's Disparity Index', developed by Kundu and Rao (1985), was used to measure gender inequality in literacy. Patterns of spatio-temporal transformation of female population distribution, literacy rate along with gender inequality were mapped using geographic information system (GIS).

**Result & Discussion:** The distribution of the female population is a dynamic phenomenon that involves not only measuring population growth or decline, but also studying the geographical and non-geographical factors responsible for its spatio-temporal distribution. Higher educational attainment and technical education, government schemes, digitalization, expanded transportation networks, and improved healthcare facilities contribute to equal sex ratios or a higher female population. On the other hand, a lack of education and healthcare facilities, a male-dominated society, and gender inequality, among other factors, contribute to a lower female population. Furthermore, migration, changes in agriculture and employment opportunities also play an important role in influencing the spatio-temporal pattern of the female population.

**Spatial-temporal transformation of female population (1971-2011):** The table clearly indicates that the female population in the study area has shifted from the very low category to the very high category. In 1971, there was only one village in the very high category, which increased to four in 2011, while the number in the high category increased from two to six. Positive growth was also noted in the moderate level; in 1971, only four villages were listed in this category, which increased to nine in 2011. The greatest change was observed in the low-level female population distribution category; in 1971, thirteen villages were listed, which

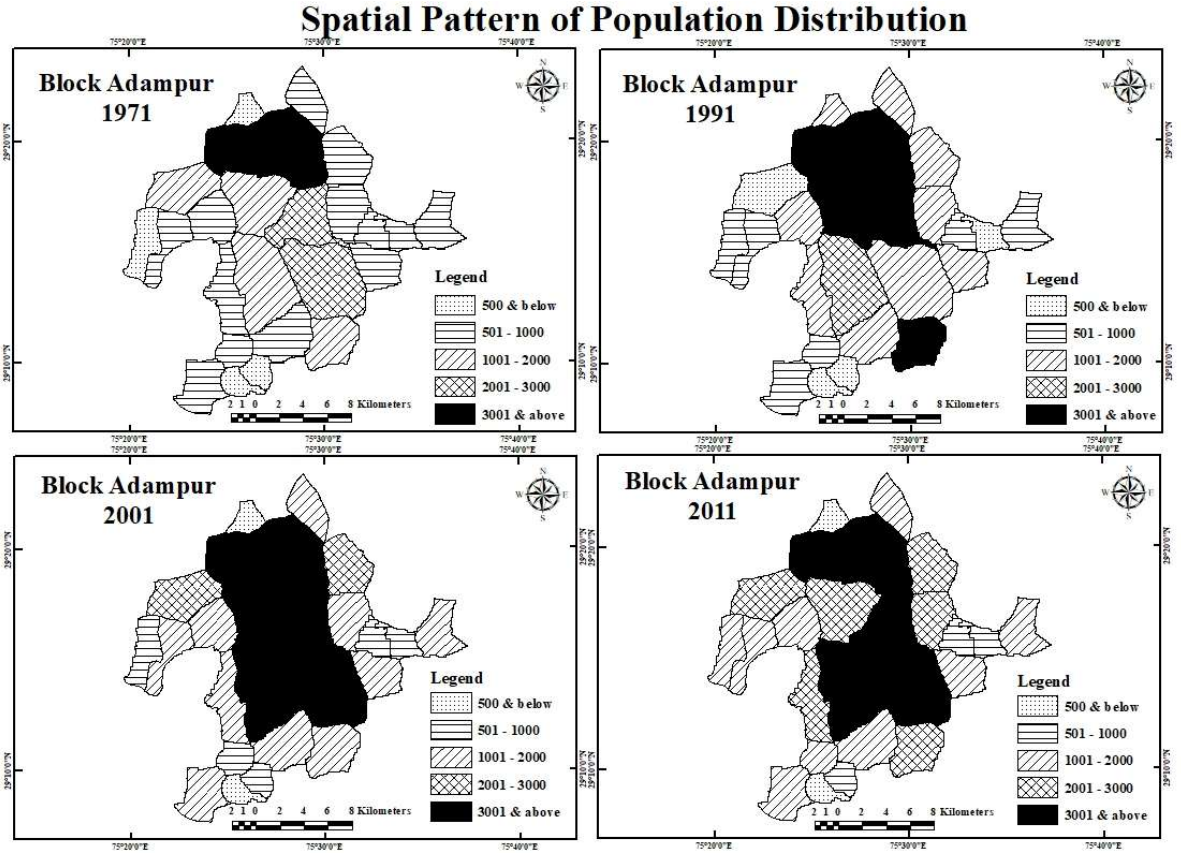


**Figure 2**

**Table 1**

**Distribution of Female Population**

| Category & Level of Population | No. of Villages & Percentages | | | |
|---|---|---|---|---|
| | 1971 | 1991 | 2001 | 2011 |
| **Very High (3001 & above)** | 1 (4.17) | 4 (16.67) | 5 (20.83) | 4 (16.67) |
| **High (2001 - 3000)** | 2 (8.33) | 1 (4.17) | 2 (8.33) | 6 (25) |
| **Moderate (1001 - 2000)** | 4 (16.67) | 9 (37.5) | 10 (41.67) | 9 (37.5) |
| **Low (501 - 1000)** | 13 (54.67) | 6 (25) | 5 (20.83) | 3 (12.5) |
| **Very Low (500 & below)** | 4 (16.67) | 4 (16.67) | 2 (8.33) | 2 (8.33) |

decreased to only three in 2011. Similarly, a decrease was observed in the very low-level female population distribution category.

**Spatial-temporal transformation of female literacy (1971-2011):** The map clearly illustrates the spatio-temporal transformation of female literacy in the study area. No significant change is evident in the very high category of female literacy, as in 1971, this category included 12.5 percent of the villages in the study area, compared to 8.33 percent in 2011. The largest change in female literacy categories is observed in the high category; in 1971, only 4.17 percent of villages were listed in this category, which increased to 41.67 percent in 2011. A positive finding in terms of female literacy is that in 1971, 29.17 percent of villages were listed in the very low category, which decreased to only 4.17 percent in 2011. A significant change is also evident in low-level female literacy. In 1971, 37.5 percent of villages fell into this category, while this figure declined to just 12.5 percent in 2011. Therefore, the data in the table clearly shows that between 1971 to 2011, villages in the study area have shifted from very low and low female literacy to moderate and high levels of female literacy, indicating positive results.

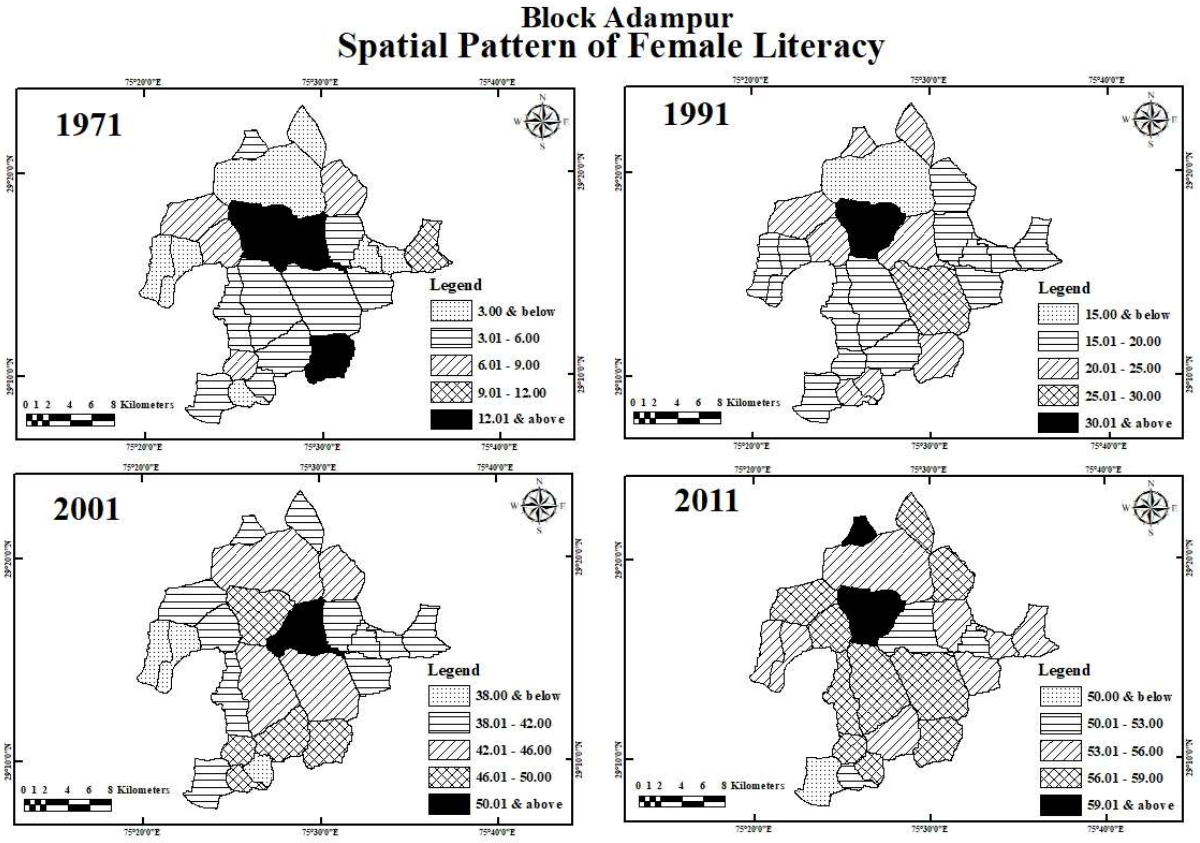


**Figure 3**

| Table 2<br>Spatial Pattern of Female Literacy | | | | |
|---|---|---|---|---|
| **Category** | **No. of Villages & Percentages** | | | |
| | **1971** | **1991** | **2001** | **2011** |
| **Very High** | 3 (12.5) | 1 (4.17) | 1 (4.17) | 2 (8.33) |
| **High** | 1 (4.17) | 1 (4.17) | 5 (20.83) | 10 (41.67) |
| **Moderate** | 4 (16.67) | 8 (33.33) | 4 (16.67) | 8 (33.33) |
| **Low** | 9 (37.5) | 13 (54.17) | 11 (45.83) | 3 (12.5) |
| **Very Low** | 7 (29.17) | 1 (4.17) | 3 (12.5) | 1 (4.17) |

**Spatial-temporal transformation of female literacy in sample villages (1971-2026):**

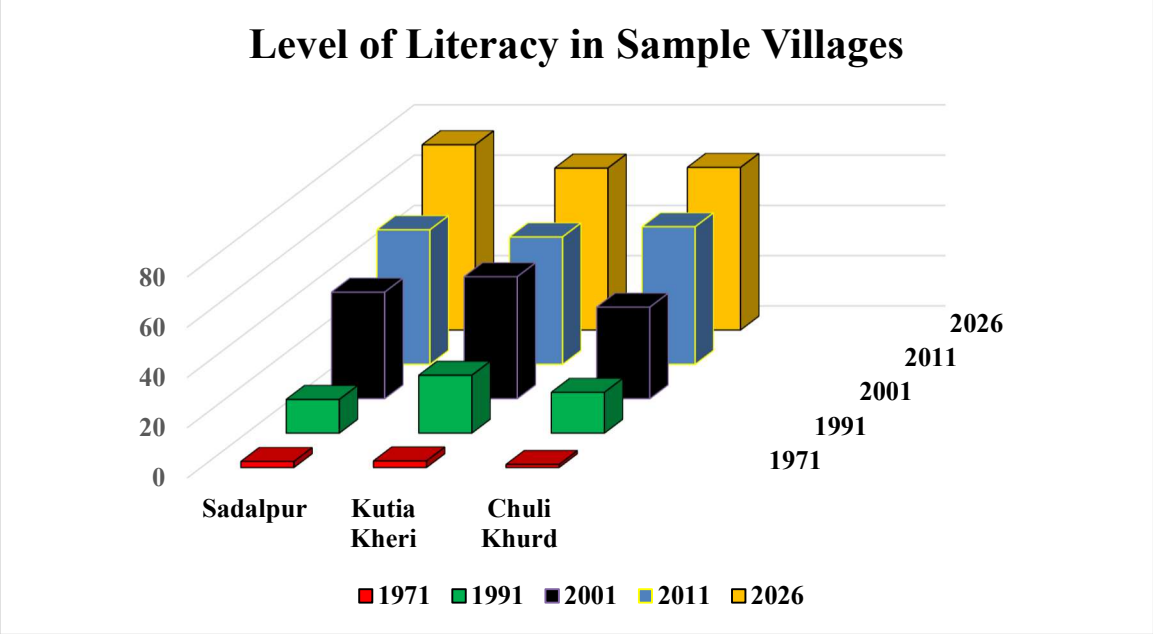


**Figure 4**

The diagram clearly shows the female literacy levels of the sample villages in the study area. Analysis of the data reveals a phenomenal increase in female literacy in the villages of the study area over the past half decade (55 years). In the village of Sadalpur, female literacy was only 2.38 percent in 1971, which increased to 73.74 percent in the 2026 survey data. Similarly, in the villages of Kutia Kheri and Chuli

Khurd, female literacy was only 2.59 and 1.19 percent in 1971, which increased to 64.44 percent and 64.7 percent, respectively, in 2011.

**Spatial-temporal transformation of gender disparity in literacy (1971-2011):** The map clearly shows the spatio-temporal transformation of gender disparity in literacy in the study area. It is noteworthy that, over the past 40 years (1971 to 2011), gender disparity in literacy in the study area has not changed significantly. In 1971, 8.33 percent of villages in the study area were listed in the very high category of gender disparity, which remained the same in 2011, although this increased to 16.67 percent in 2001. In 1971, 20.83 percent of villages in the study area were listed in the high category of gender disparity, which decreased to 8.33 percent in

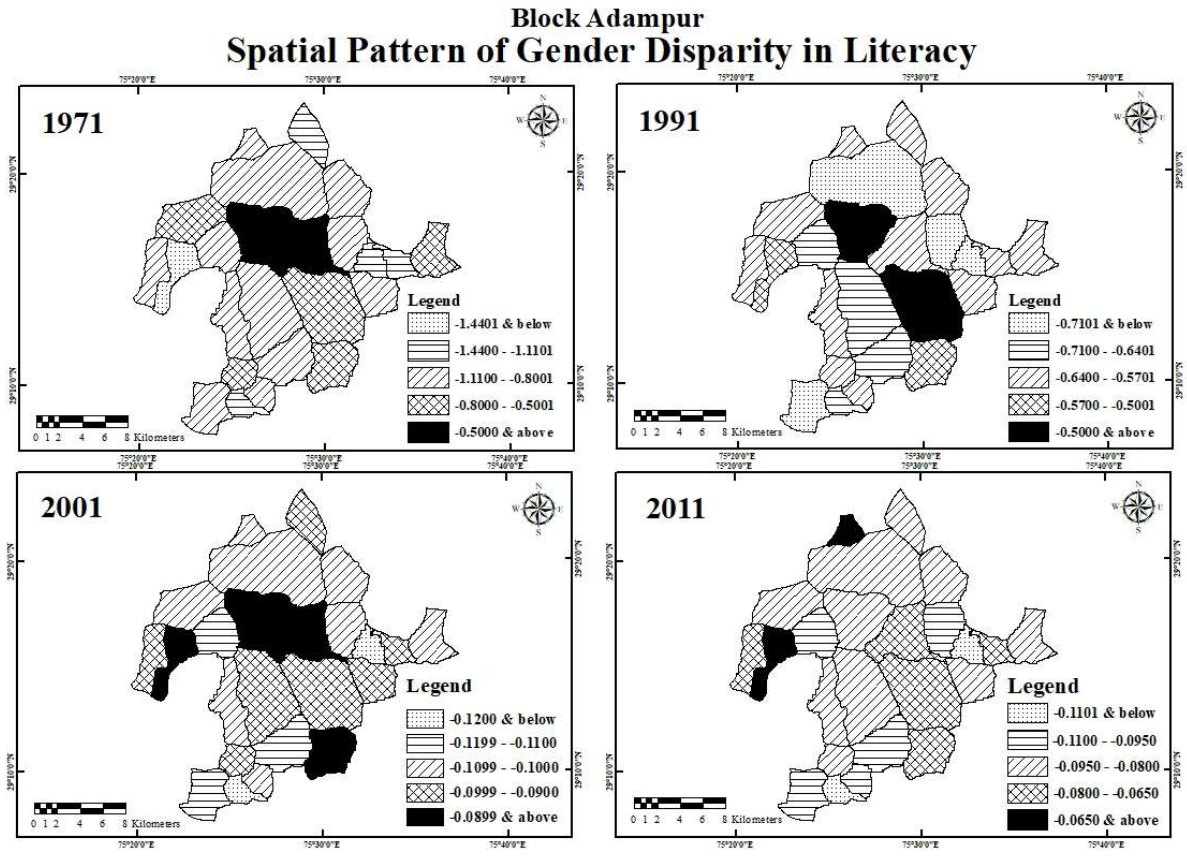


**Figure 5**

1991, while in 2001 and 2011, the figures were 29.17 percent and 20.83 percent, respectively. In 1971, half of the villages (50 percent) in the study area had moderate gender disparity in literacy, which declined slightly to 41.67 percent of the villages observed in 2011. The positive finding is that, albeit marginally, very low gender disparity in literacy has almost doubled in the study area. In 1971, the very

low gender disparity in literacy category covered 4.17 percent of villages, which increased to 8.33 percent in 2011.

**Table 3**

**Spatial Pattern of Gender Disparity in Literacy**

| Category | No. of Villages & Percentages | | | |
|---|---|---|---|---|
| | 1971 | 1991 | 2001 | 2011 |
| Very High | 2 (8.33) | 2 (8.33) | 4 (16.67) | 2 (8.33) |
| High | 5 (20.83) | 2 (8.33) | 7 (29.17) | 5 (20.83) |
| Moderate | 12 (50) | 12 (50) | 8 (33.33) | 10 (41.67) |
| Low | 4 (16.67) | 4 (16.67) | 3 (12.5) | 5 (20.83) |
| Very Low | 1 (4.17) | 4 (16.67) | 2 (8.33) | 2 (8.33) |

**Spatial-temporal transformation of gender disparity in literacy in sample villages:** The diagram clearly shows the gender disparity in literacy in the sample villages of the study area. Analysis of the data reveals that over the past half decade (55 years), there has been a significant change in the gender disparity in literacy in the villages of the study area. The data draws attention of spatial planners to the fact that while the census data from 1971 to 2011 recorded a decline in gender disparity in literacy, on the other hand, an increasing trend was observed in

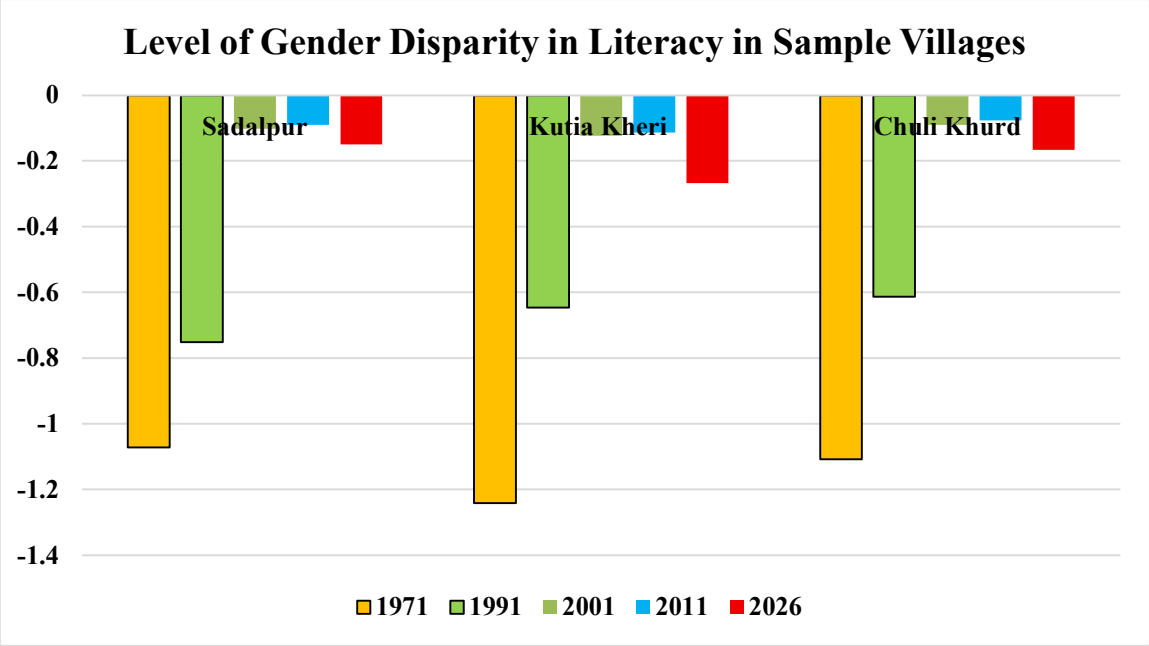

**Figure 6**

the survey data. Village Kutia Kheri ranks at the top in terms of gender disparity in literacy, both in the secondary and primary data from 1971 to 2026.

**Conclusion:** Rural women have a history of being marginalized in society. The current research reveals that the study area has experienced unprecedented changes in the rural female population, female literacy, and gender inequality over the past half decade. Sadalpur village, located north of Adampur town, holds a dominant position in the rural female population, but a trend of higher growth in the rural female population was observed towards the villages located to the south. Remarkable growth was also noted in the literacy levels of women in the study area, with Khara Barwala being the leading village in female literacy within the study area. Concerning female literacy, as of the 2011 Census, no village in the study area had a female literacy rate above 60 percent, but preliminary data have noted improvements in female literacy. Another important finding that should concern spatial planners is that villages in the study area with high literacy levels also have high gender disparities in literacy. Increasing trends in gender disparity in literacy were investigated in Kutia Kheri, a village dominated by a single caste. In some villages, rural women are overrepresented in education, health, and employment, while in others, low educational attainment, limited employment opportunities, and social evils hinder women's progress. While educational attainment has improved over time and space, the pace of improvement has been slow, leading to a slow improvement in gender disparities. Positive progress has been made in the study area regarding the spatio-temporal transformation of female population distribution, female literacy, and gender inequality. However, achieving the goals of inclusive and sustainable development for women requires rigorous policy initiatives to reduce regional disparities, increase opportunities for quality education, and reduce gender inequality.

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