

Spatial Dynamics of Female Literacy in the Western Himalayan Region: A Comparative Study of Chakrata and Shillai Blocks

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Abstract

Female literacy is a crucial indicator of social development and gender equality, particularly in mountainous rural regions where accessibility and socio-cultural constraints strongly influence educational attainment. This study examines the spatio-temporal pattern of female literacy in Chakrata Block (Uttarakhand) and Shillai Block (Himachal Pradesh) during 2001-2011. The analysis is based on village-level data from the Census of India. Villages were classified into five literacy categories very high to very low based on the literacy rate. A comparative spatial analysis was applied to identify regional disparities and literacy transition. Results show overall improvement in female literacy in both blocks, but the pattern differed. Shillai experienced a balanced upward shift and eliminated very low literacy villages by 2011, while Chakrata showed gradual yet uneven progress, retaining pockets of deficiency in remote settlements. The expansion of moderate and high literacy categories indicates growing acceptance of girls' education, however, advancement to very high literacy remained limited. The study highlights the importance of accessibility, awareness and targeted interventions for improving female literacy in mountainous rural regions.

Keywords: Female literacy, Gender disparity, Rural education, Mountain regions, Educational accessibility

Introduction

Female literacy is a key indicator of social development because it influences health behaviour, family welfare and economic participation. Higher literacy among women is associated with improved decision-making and better educational outcomes for the next generation (Rao & Gupta, 2006). Despite overall progress in India, gender disparity in education continues to persist in rural areas due to economic limitations and traditional attitudes toward girls' schooling (Kaur, 2023).

The problem becomes more pronounced in mountainous regions where difficult terrain, scattered settlements and long travel distances reduce access to educational facilities (Singh, 2015). Girls are more affected than boys because household responsibilities and safety concerns often restrict their mobility (Biswas & Das, 2021). Although government programmes

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have improved enrolment, retention and advancement to higher levels of education remain uneven (ASER Centre, 2021). Studies also show that parental awareness, infrastructure and community support strongly influence girls' educational attainment in rural areas (UNESCO, 2020; NITI Aayog, 2021). Various government initiatives have expanded school facilities and encouraged girls' enrolment in rural areas (Jha et al., 2015). However, improvement differs from place to place because local accessibility and settlement pattern affect educational opportunities (Indira & Chaitra, 2024). Therefore, a micro-level study is necessary to understand the actual distribution of literacy within rural regions.

Literature Review

Female literacy is widely accepted as an important indicator of social and economic development. Educated women are more aware of health, nutrition and family welfare, and they also contribute more actively to household decision-making (Dreze & Sen, 2013; Rao & Gupta, 2006). Research shows that improvement in women's education leads to better child education and overall human development. Gender inequality in education still exists in rural India. Families often prefer to educate boys because they are seen as future earners, while girls are expected to perform domestic work (Kingdon, 2002; Agarwal, 2014). Early marriage and household responsibilities further reduce girls' chances of continuing education (Kaur, 2023). Physical environment also plays a major role. In hill regions, schools are located far from settlements and children have to travel long distances, which discourages girls' attendance due to safety concerns and mobility restrictions (Singh, 2015).

Studies have shown that girls in rural households spend more time in caregiving and fuel or water collection, leading to irregular attendance and dropouts (Biswas & Das, 2021). Although enrolment has increased in recent years, regular attendance and completion rates remain uneven (ASER Centre, 2021). Government programmes such as universal elementary education and residential schools for girls have improved access and reduced dropout rates (Jha et al., 2015). Yet, progress varies across regions because parental awareness, economic status and accessibility influence educational continuation (Indira & Chaitra, 2024). Recent research also notes that lack of digital access in rural areas affects learning continuity, especially among girls (Panda, 2024). Overall, existing studies show that female literacy improvement depends not only on school availability but also on social acceptance and local conditions. Therefore, village-level comparative studies are necessary to understand regional differences in educational development (Das, 2023).

Chakrata block in Uttarakhand and Shillai block in Himachal Pradesh provide an important setting to examine such variation. Both areas share similar physical conditions but differ in settlement pattern and accessibility. Therefore, a comparative village-level analysis helps to understand how local factors influence female literacy transition. The present study analyses spatial and temporal changes in female literacy between 2001 and 2011 to identify regional disparities and the nature of educational development.

Objectives

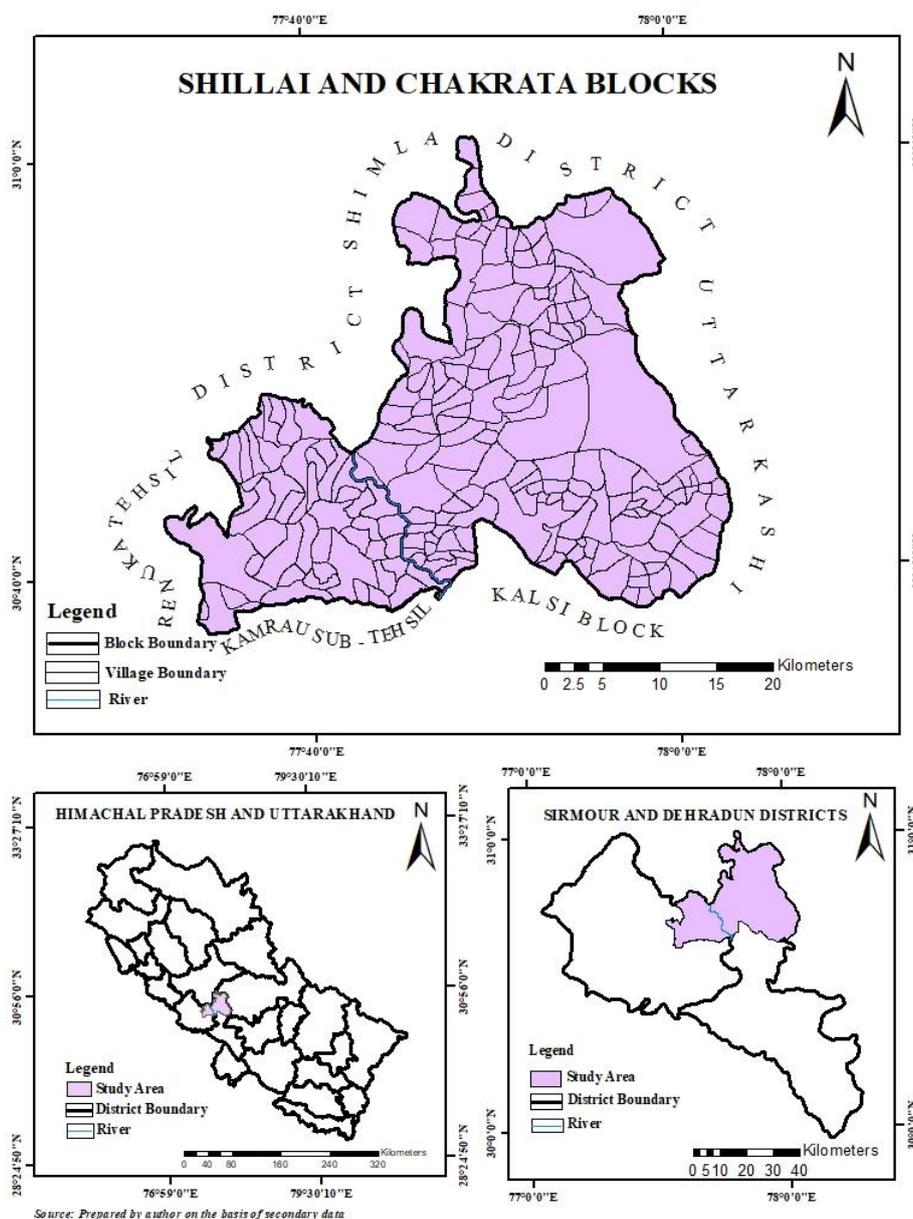
1. To analyse the spatial and temporal pattern of female literacy in Chakrata and Shillai blocks between 2001 and 2011 with a comparative perspective.

2. To examine regional disparities and identify the socio-economic factors influencing the transition of female literacy in both blocks.

Study Area

The study covers Chakrata Block of Dehradun district in Uttarakhand and Shillai Block of Sirmour district in Himachal Pradesh (Figure 1). Both blocks lie in the Western Himalayan region and are predominantly rural in character. The terrain is mountainous with steep slopes, narrow valleys and scattered settlements, which strongly influence settlement distribution and accessibility (Negi, 1995; Singh, 2015). Agriculture and animal husbandry are the main sources of livelihood in both areas, and economic opportunities outside farming remain limited (Census of India, 2011).

Figure 1



Source: Prepared by the authors based on Census of India

Chakrata block is located in the Jaunsar–Bawar tribal region of Uttarakhand. Settlements are highly dispersed and many villages remain remote with limited road connectivity. Due to long travel distances and difficult terrain, access to schools and other services is comparatively restricted (Singh, 2015). Traditional occupations and seasonal migration also influence the socio-economic structure of the area (Negi, 1995). Shillai block lies in the trans-Giri region of Sirmour district in Himachal Pradesh.

Compared to Chakrata, villages are relatively compact and road connectivity is better developed. Educational and basic services are therefore more accessible, although the area still retains rural characteristics and dependence on agriculture (Census of India, 2011; Government of Himachal Pradesh, 2020). Since both blocks share similar environmental conditions but differ in accessibility and settlement pattern, they provide a suitable setting to examine spatial variation in female literacy. The contrast helps in understanding how geographical and socio-economic factors influence educational development in mountain regions.

Database and Methodology

The study is based entirely on secondary data obtained from the Census of India for the years 2001 and 2011. Village-level data on female literacy for Chakrata Block (Dehradun district, Uttarakhand) and Shillai Block (Sirmour district, Himachal Pradesh) were collected from the Primary Census Abstract. A total of 154 inhabited villages in Chakrata and 50 inhabited villages in Shillai were considered for analysis. The data were compiled and tabulated to examine temporal change and spatial variation in female literacy (Census of India, 2001; Census of India, 2011). The study follows a comparative and descriptive analytical approach to understand spatial patterns of female literacy. For uniform interpretation, villages were grouped into five literacy categories based on percentage of female literates: Very High: Above 70%, High: 60.01 – 70.00%, Moderate: 50.01 – 60.00%, Low: 40.01 – 50.00%, Very Low: Below 40%. The number and percentage of villages in each category were calculated for both census years to identify temporal changes. A comparative analysis between the two blocks was then carried out to examine disparities in literacy transition.

To interpret spatial variation, category-wise distribution of villages was analysed to identify upward or downward movement of settlements across literacy levels. The method helps in understanding whether literacy improvement was uniform or uneven across the study area. The results were interpreted in relation to accessibility and settlement characteristics.

Results and Discussion

The analysis of village-level data shows a clear improvement in female literacy in both Chakrata and Shillai blocks between 2001 and 2011 (Figure 2 & 3; Table 1). The pattern of change differs considerably. The overall trend indicates a gradual shift of villages from lower literacy categories to middle and higher categories, though the transition remained uneven in Chakrata while relatively balanced in Shillai.

Very High Female Literacy (>70%)

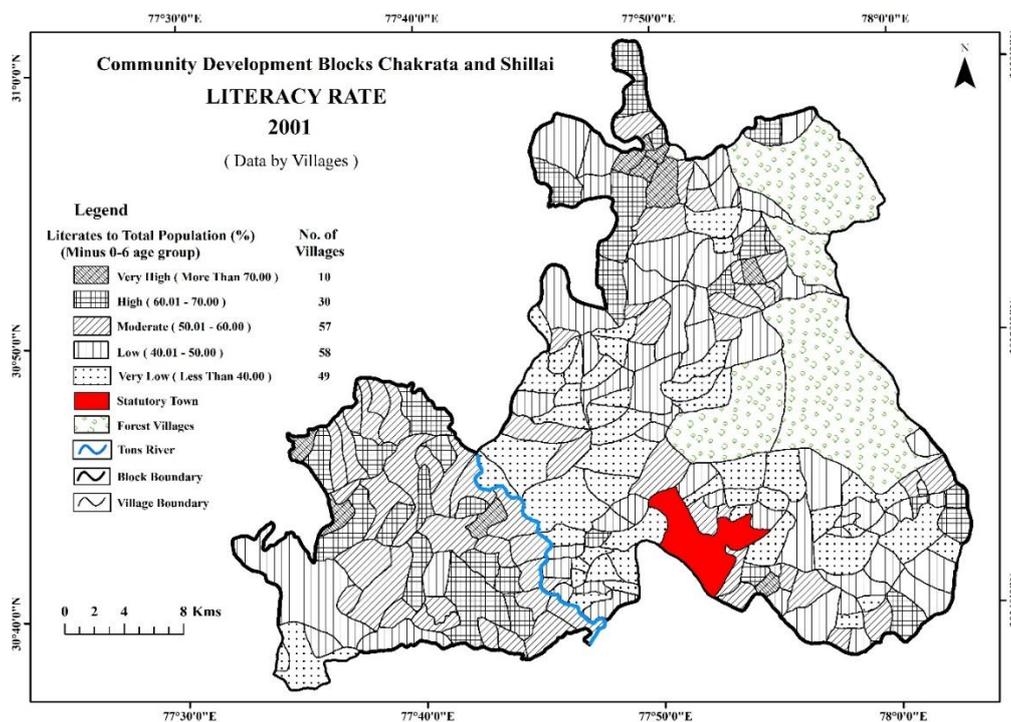
In 2001, villages with very high female literacy were almost absent in both blocks, reflecting widespread educational deprivation among women. By 2011, Chakrata showed noticeable

improvement as several villages entered this category (Figure 3; Table 1). The increase suggests gradual social acceptance of girls' education and improvement in schooling access. Once basic schooling becomes common, literacy levels tend to rise faster due to awareness among families and generational continuity in education. Shillai recorded only a small number of villages in this category even in 2011. This indicates that although basic literacy improved, progression to higher educational attainment remained limited. Girls often discontinued schooling after primary or middle level due to domestic and agricultural responsibilities. Thus, reaching very high literacy requires not only enrolment but sustained participation in higher classes.

High Female Literacy (60.01–70%)

The high literacy category expanded significantly in both blocks during the decade. In Chakrata, the growth mainly occurred due to villages moving upward from moderate literacy levels rather than rapid advancement. This reflects gradual improvement where communities increasingly accepted girls' education but still faced accessibility constraints. Shillai experienced a stronger shift into this category. Better road connectivity and comparatively compact settlements allowed regular school attendance. This suggests that accessibility plays a crucial role not only in enrolment but also in continuation of education. Therefore, high literacy areas represent a stage where education becomes socially established within the community.

Figure 2



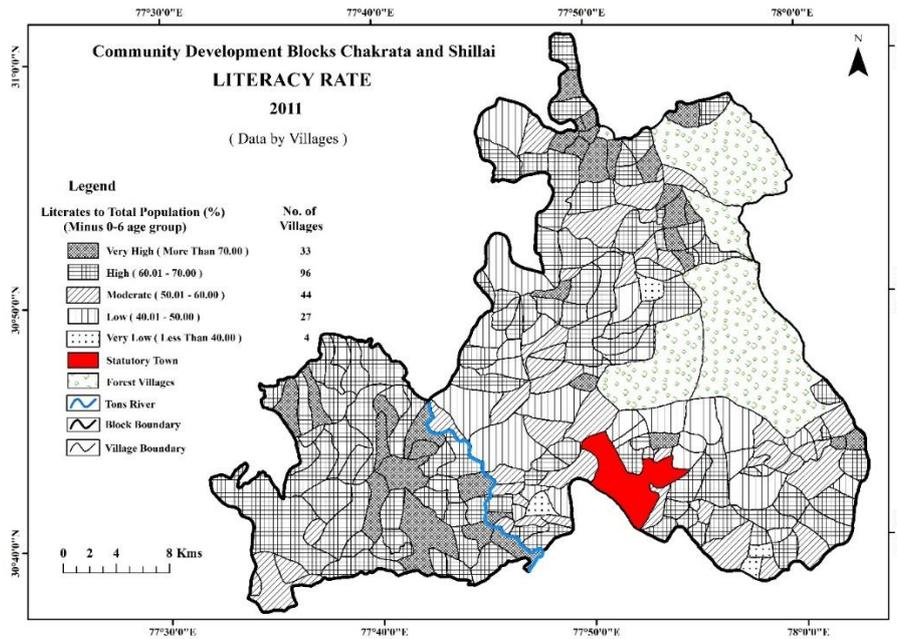
Source: Prepared by the authors based on Indian Census data

Moderate Female Literacy (50.01–60%)

The moderate literacy group showed the largest expansion in both blocks. Many villages previously under low literacy moved into this category, indicating steady improvement in basic

education. This stage reflects a transitional phase in literacy development where primary education becomes common but higher education participation remains limited. The persistence of many villages in this group also suggests slow educational progression. Economic responsibilities and opportunity cost of schooling often restrict girls from continuing beyond elementary level. Hence, the moderate category represents stabilization of basic literacy rather than advanced educational achievement.

Figure 3



Source: Prepared by the authors based on Indian Census data

Low Female Literacy (40.01–50%)

At the beginning of the study period, a considerable number of villages in both blocks were concentrated in the low literacy category (Figure 2; Table 1). By 2011, Shillai showed a clear decline in this category as villages moved upward, indicating balanced improvement across settlements. Chakrata, however, continued to retain a noticeable share of villages in this group. Remote location, scattered settlements and limited awareness slowed educational advancement in some areas. This reflects intra-regional disparity where accessible villages improved faster than remote ones.

Table 1- Female Literacy Rate: Distribution of Villages in Chakrata and Shillai Blocks

Blocks	Census Year	Female Literacy Rate to Total Female Population (%)				Total Villages	Average Literacy Rate (%)		
		More than 70.00	60.01 – 70.00	50.01 – 60.00	40.01 – 50.00		Less than 40.00	Block Average	District Average

Chakrata	2001	0 (00.00)	4 (2.60)	9 (5.84)	29 (18.83)	112 (72.73)	154 (100)	34.8	71.2	59.6
	2011	10 (6.50)	10 (6.50)	60 (38.96)	41 (26.62)	33 (21.43)		51.58	78.54	70.01
Shillai	2001	2 (4.00)	0 (00.00)	6 (12.00)	36 (72.00)	6 (12.00)	50 (100)	45.9	60.4	67.4
	2011	1 (2.00)	22 (44.00)	23 (46.00)	4 (8.00)	0 (00.00)		60.37	71.36	75.93

Figures in parentheses show percentage value to total inhabited villages

Source: Computed and complied by the authors based on Census of India data

Very Low Female Literacy (<40%)

Very low literacy villages represent severe educational deprivation. In 2001, Chakrata had a large number of such settlements. Although the number declined by 2011, some villages still remained in this category, showing persistent barriers such as distance from schools and domestic workload (Table 1). In contrast, Shillai eliminated this category completely by 2011. This indicates that minimum literacy spread across all villages and extreme educational backwardness was reduced. The improvement suggests better diffusion of schooling and awareness among households.

Comparative Interpretation

Gradual and uneven improvement with remaining pockets of low literacy in Chakrata block and more uniform improvement and removal of extreme deprivation in Shillai block. Thus, female literacy improvement depends not only on educational programmes but also on accessibility, settlement pattern and socio-economic conditions. Areas with better connectivity and compact settlements achieved faster and more balanced progress, while remote areas showed slower transition. Overall, the decade marks a shift from widespread educational deprivation toward increasing inclusion, though complete parity has not yet been achieved.

Conclusions

The study examined the pattern and change of female literacy in Chakrata and Shillai blocks between 2001 and 2011 using village-level Census data. The results show that female literacy improved in both blocks during the decade, but the nature of progress was different. Most villages shifted from very low and low literacy categories to moderate and high categories, indicating increasing acceptance of girls' education. The pace of improvement was uneven. Shillai block experienced a more balanced and consistent rise in literacy levels and successfully eliminated villages in the very low literacy category by 2011. This reflects better accessibility, relatively compact settlements and wider awareness about the importance of girls' education. Chakrata block, on the other hand, showed gradual but uneven progress. Several remote

villages continued to remain in low literacy groups, suggesting that geographical isolation and socio-economic constraints still limited educational advancement. The comparison indicates that improvement in female literacy depends not only on availability of schools but also on connectivity, settlement pattern and community awareness. Therefore, educational policies in mountainous regions should focus on improving accessibility, strengthening secondary-level schooling and promoting social awareness along with expansion of basic educational facilities. Such targeted efforts are necessary to achieve balanced and inclusive educational development in remote rural areas.

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