International Journal of Research in Medical Sciences
Shah SA et al. Int J Res Med Sci. 2025 Jul;13(7):2754-2760
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012
DOI: https://dx.doi.org/10.18203/2320-6012.ijrms20252008

Original Research Article

Literacy and health-seeking behaviours for HIV/AIDS: the moderating role of economic status in India

Sajni A. Shah*, Dhruvi J. Patel, Helisse Levine, Susan Zion Mathangi, Siri Chandana Thanugundla

Long island University, Brooklyn, New York, United States

Received: 17 May 2025
Revised: 07 June 2025
Accepted: 10 June 2025

***Correspondence:**
Dr. Sajni A. Shah,
E-mail: sajnianang.shah@my.liu.edu

ABSTRACT

Background: Literacy determines how people access healthcare services, particularly in cases such as condom use, HIV testing and pregnancy testing. Economic disparities and literacy differences in India result in unequal access to preventive and medical care.
Methods: This research utilizes secondary data to examine the relationships between healthcare behaviour and economic status moderation in India's 34 states, employing a cross-sectional approach. Moderation analysis was conducted by using PROCESS Macro v4.2 in SPSS.
Results: Significant moderation effects were found for economic status on the relationship between literacy rate and health-seeking behaviours, especially for pregnancy and HIV testing.
Conclusions: The research findings highlight the need for developing public health programs that address literacy and economic barriers. Underprivileged communities require specific approaches that account for monetary constraints to achieve better results in HIV prevention combined with reproductive health outcomes.

Keywords: Economic hardship, Health seeking behaviours, HIV/AIDS, India, Literacy, Moderation analysis

INTRODUCTION

Across India, there is a major HIV/AIDS epidemic that affected more than 2.5 million people in 2023.[1] The National AIDS Control Programme strives to eliminate HIV-related public health problems by 2030. However, its progress remains inconsistent because public awareness about HIV is low, discrimination exists throughout society and healthcare services experience substandard utilization rates.[2] Reading, comprehension and numeracy capabilities belong to health literacy, a significant factor in shaping health results.[3] The condition of poor health literacy leads people to have a worse understanding of diseases and causes them to miss their medications and make their treatments fail.[4]

The majority of Indian people remain illiterate because rural communities and marginalized sections face the highest challenges.[5] Uninformed persons tend to create false beliefs about HIV transmission and prevention while avoiding the disease, which leads to social prejudice against sufferers.[6] People with higher health literacy become aware of HIV threats and defences, which lets them acquire health information to make optimal decisions. People with education tend to protect themselves from infection and get tested while taking medication for their entire lives.[7] A person with health literacy skills can obtain and utilize HIV-related information while preventing stigma against them. Raising public understanding about HIV leads to better protection against infections and better treatment practices while reducing societal stigma against HIV patients.[8]

The study objective was to determine the proportion and predictors of comprehensive knowledge and attitude of HIV/AIDS in the Indian population through an extensive,

nationally representative demographic and health survey.[9] Multiple surveys show limited awareness of HIV combined with high stigma rates, but this relationship does not link to education levels.[10] Implementing intervention strategies requires objective measures to identify at-risk groups, as education and health literacy disparities necessitate quantification.[11] This research utilizes national data to investigate the relationship between health literacy and health-seeking actions related to HIV in India.[12] Health literacy improvement enables patients to participate more actively in HIV prevention approaches while enhancing their access to testing services, reducing stigma toward HIV and improving their adherence to ART.[13]

The objective of this study was to examine how economic hardship moderates the relationship between literacy levels and health-seeking behaviours, specifically HIV testing, pregnancy testing and condom use, across Indian states.

METHODS

This quantitative research design utilizes secondary data to examine the relationships between health-seeking behaviours, literacy and economic status moderation in India's states, employing a cross-sectional approach. Moderation analysis was conducted by using PROCESS Macro v4.2 in SPSS. The study examines the direct and conditional influence of literacy on three health-seeking behaviours HIV testing rate, pregnancy testing rate and condom use rate serving as dependent variables across Indian states. To examine whether economic hardship moderates this relationship, we developed an interaction term for literacy and economic hardship, incorporating it into regression models for each of the dependent variables. The final sample size included India's 34 states.

The study was conducted using data from government health databases, covering the period from January 2011 to October 2012. No hospital data were directly utilized. This is a cross-sectional analytical study based on secondary data.

The analysis was based on secondary data collected from publicly available sources, which represented health and socioeconomic indicators for 34 Indian states. The study employs a cross-sectional design, utilizing data collected at a single point in time to examine patterns at the state level.

Inclusion criteria

All Indian states with complete data on literacy, economic hardship and health-seeking behaviours.

Exclusion criteria

States with incomplete or missing data on any of the required variables.

Data collection

This study utilized secondary data obtained from reputable Indian government and national health databases. Specifically, data were sourced from the following institutions:

NITI Aayog

For socioeconomic indicators, including poverty levels.

National AIDS control organization was for health behaviour indicators such as HIV testing, ART adherence and condom distribution.

Census 2011 was for population statistics at the state level.

HIV testing rate data were obtained from NACO's annual PDF reports.

Pregnancy testing rate data were obtained from NACO's annual PDF reports.

Condom use rate from open government data platform (OGD) India.

The following formulas were used to calculate the outcome variables.

HIV testing rate (%)

Total number of people tested for HIV÷Total population×100.

Pregnancy testing rate (%)

Total number pregnant women tested ÷total number of pregnant women×100

Condom use rate (%)

Number of people using condom ÷ total population × 100

These computed rates were then merged with literacy and poverty data for each of the 34 Indian states to perform the statistical analysis.

Our variables for the analysis are independent variable – literacy rate[14]. Dependent variables- HIV testing rate[15,16]. Pregnancy testing rate[16,17]. Condom use rate[15,18]moderator-economic hardship (% of people living below poverty line)[19]

Statistical analysis

The data were analyzed using moderation analysis, implemented via the PROCESS macro version 4.2 for IBM SPSS, developed by Andrew F. Hayes. Model 1 of the PROCESS macro was used to examine whether

economic hardship moderates the relationship between literacy rate and health-seeking behaviours, as dependent variables, including HIV testing rates, pregnancy testing rates and condom use rates.

Three separate analyses were conducted for the model, focusing on different dependent variables. Interaction terms (Literacy×Economic Hardship) were created and entered into the regression models.

All continuous variables were mean-centered to reduce multicollinearity. Conditional effects were computed at three levels of the moderator: Low Poverty (16th percentile). Moderate Poverty (50th percentile). High Poverty (84th percentile)

Each model was evaluated based on the significance of the interaction term ($p<0.05$). Change in R^2 due to the interaction. Statistical significance of conditional effects at different levels of economic hardship

The analysis was conducted at the state level, with a total sample of 31 observations corresponding to each Indian state. This level of analysis allows for macro-level insights into how literacy interacts with economic conditions to shape reproductive and sexual health behaviours.

RESULTS

Moderation analysis–HIV testing rate tables are merged now

Variables used

Y: HIV Testing (HIVT), X: Literacy, W: Economic Hardship (BLS).

The model explains about 40.7% of the variance in HIVT ($R^2=0.4069$), which is statistically significant ($p=0.0012$). This suggests a strong model fit. The interaction accounts for an additional 8.1% of the variance in HIVT. Although the p value is slightly above 0.05, it indicates a moderation trend.

The interaction term (Literacy×BPL) is marginally significant ($p=0.0518$), suggesting that BPL moderates the relationship between Literacy and HIVT. Literacy alone is not a significant predictor.

The effect of Literacy on HIVT increases as BPL increases and becomes statistically significant at moderate and high BPL values. This confirms moderation by BPL.

The model explains approximately 40.7% of the variance in HIVT ($R^2=0.407$, $p=0.001$), indicating a moderately strong model. The main effect of Literacy on HIVT is not statistically significant ($p=0.694$), nor is the main effect of BPL ($p=0.061$), although the latter approaches significance. Importantly, the interaction term (Literacy×BPL) is marginally significant ($p=0.052$), suggesting that the effect of Literacy on HIVT depends on levels of BPL.

Conditional effects show that Literacy significantly predicts higher HIVT scores at medium (BPL=15.65) and high (BPL=34.10) levels of BPL, but not at low levels. This implies that literacy is more strongly associated with HIVT in individuals with higher economic status (as BPL increases).

Moderation analysis–pregnancy testing rate

Variables used

Y: Pregnancy testing (PregT), X: Literacy, W: Economic Hardship (BPL).

The model explains 41.5% of variance in PregT and is statistically significant ($p=0.0010$), indicating a strong model fit. The interaction explains 11.5% more variance and the result is significant ($p=0.0213$), confirming moderation.

The interaction is significant ($p=0.0213$), indicating that BPL significantly moderates the effect of literacy on PregT. BPL itself also has a significant negative effect.

Literacy significantly predicts PregT at moderate and high levels of BPL, again supporting the role of BPL as a moderator. This model explains 41.5% of the variance in PregT ($R^2=0.415$, $p=0.001$), indicating a good model fit. While Literacy alone is not a significant predictor ($p=0.990$), BPL is significantly and negatively related to PregT ($p=0.026$), suggesting that individuals with higher poverty levels tend to report lower pregnancy testing outcomes.

The interaction between Literacy and BPL is significant ($p=0.021$), confirming a moderation effect. Literacy is significantly associated with higher PregT values at moderate and high BPL levels, but not at low levels. This reinforces the idea that the positive impact of literacy on pregnancy testing increases as economic conditions improve.

Moderation analysis–condom use rate

Variables used

Y: condom use rate (Condom), X: Literacy, W: economic hardship (BPL).

The model explains only 9.1% of the variance in condom use ($R^2=0.091$, $p=0.408$), which is not statistically significant. None of the predictor's literacy, BPL or their interaction significantly predicts condom use and the interaction term is also non-significant ($p=0.222$). Thus, there is no evidence that either literacy or economic status (BPL) is associated with condom use behaviours in this sample.

Table 1: Model summary and interaction effect.

R	R^2	P	R^2-change	P (interaction effect)
0.6379	0.4069	0.0012	0.0811	0.0518

Table 2: Model coefficients.

Variable	Coeff	SE	t	P	LLCI	ULCI
Constant	0.5178	4.1672	0.1242	0.9019	-7.993	9.0286
Literacy	0.0206	0.0519	0.3975	0.6938	-0.0854	0.1267
BPL	-0.3714	0.191	-1.9445	0.0613	-0.7616	0.0187
Literacy x BPL	0.0051	0.0025	2.0256	0.0518	0.0	0.0103

Table 3: Conditional effects of literacy at the level of BPL.

BPL	Effect	SE	t	P	LLCI	ULCI
8.26	0.0631	0.0365	1.7297	0.094	-0.0114	0.1377
15.65	0.1012	0.0293	3.4509	0.0017	0.0413	0.161
34.1	0.1961	0.0525	3.7362	0.0008	0.0889	0.3033

Table 4: Model summary.

R	R^2	P	R^2-change	P (interaction effect)
0.6443	0.4151	0.001	0.1151	0.0213

Table 5: Model coefficients.

Variable	Coeff	SE	z	P	LLCI	ULCI
Constant	1.8402	3.5284	0.5215	0.6058	-5.366	9.0464
Literacy	0.0006	0.044	0.0126	0.99	-0.0892	0.0903
BPL	-0.3782	0.1617	-2.3385	0.0262	-0.7086	-0.0479
Literacy x BPL	0.0052	0.0022	2.4292	0.0213	0.0008	0.0096

Table 6: Conditional effects of literacy at the level of BPL.

BPL	Effect	SE	t	P	LLCI	ULCI
8.26	0.0437	0.0309	1.4143	0.1676	-0.0194	0.1068
15.65	0.0823	0.0248	3.3166	0.0024	0.0316	0.133
34.1	0.1787	0.0444	4.0217	0.0004	0.088	0.2695

Table 7: Model summary.

R	R^2	P	R^2-change	P (interaction effect)
0.3009	0.0906	0.4082	0.0471	0.222

Table 8: Model coefficients.

Variable	Coeff	SE	t	P	LLCI	ULCI
Constant	4.5894	2.7486	1.6697	0.1054	-1.0241	10.2029
Literacy	-0.0471	0.0342	-1.3744	0.1795	-0.117	0.0229
BPL	-0.173	0.126	-1.373	0.1799	-0.4303	0.0843
Literacy x BPL	0.0021	0.0017	1.2471	0.222	-0.0013	0.0055

Table 9: Demographic data.

	Dependent variables			Independent variable	Moderator
	Health seeking behaviour				
State/UT	HIV testing rate (%)	Pregnancy testing rate (%)	Condom use rate (%)	Literacy rate (%)	% below poverty line (2011–12)
Andhra Pradesh	3.00	2.71	0.61	67.02	9.2
Arunachal Pradesh	2.05	1.42	0.04	65.38	34.7
Assam	1.14	1.54	0.28	72.19	32
Bihar	0.39	0.38	0.11	61.8	33.7
Chandigarh	5.99	4.75	1.30	86.05	21.8
Chhattisgarh	0.71	0.61	0.38	70.28	39.9
Delhi	3.06	2.65	0.74	86.21	9.9
Goa	3.32	2.22	0.22	88.7	5.1
Gujarat	2.19	2.27	0.97	78.03	16.6
Haryana	1.84	1.60	1.04	75.55	11.2
Himachal Pradesh	2.60	1.64	1.06	82.8	8.1
Jammu and Kashmir	0.73	0.91	0.25	67.16	10.4
Jharkhand	0.72	0.57	0.32	66.41	37
Karnataka	3.69	3.47	0.26	75.36	20.9
Kerala	1.35	0.79	0.21	94	7.1
Madhya Pradesh	1.22	1.40	0.35	69.32	31.7
Maharashtra	2.41	2.32	0.33	82.34	17.4
Manipur	3.83	3.44	0.07	79.21	36.9
Meghalaya	1.09	1.67	0.16	74.43	11.9
Mizoram	5.34	3.74	0.12	91.33	20.4
Nagaland	4.30	2.06	0.08	79.55	18.9
Odisha	1.57	1.32	0.46	72.87	32.6
Puducherry	2.71	4.98	0.79	85.85	9.7
Punjab	2.61	1.74	1.50	75.84	8.3
Rajasthan	1.42	1.17	1.58	66.11	14.7
Sikkim	2.97	2.95	0.50	81.42	8.2
Tamil Nadu	2.09	2.34	0.19	80.09	11.3
Tripura	1.17	1.32	0.21	87.22	14.1
Uttar Pradesh	0.74	0.52	0.34	67.68	29.4
Uttarakhand	1.64	1.39	0.84	79.63	11.3
West Bengal	0.96	1.08	4.28	76.26	20
Dadar and Nagar Haveli	3.75	4.06	0.32	76.24	39.31
Daman and Diu	2.80	3.68	1.14	87.1	9.86
Andaman and Nicobar Island	5.45	3.62	0.24	86.63	1

DISCUSSION

The current study found that literacy, after controlling for economic status (BPL), had a strong positive prediction of HIV testing and pregnancy testing rates. The interaction effects indicate that literacy had a stronger positive impact on these health-seeking behaviours among people with higher economic status. This suggests that economic resources may strengthen the benefits of health literacy, presumably by improving access to health facilities, improving autonomy in decision-making and reducing cost-related barriers. On the contrary, no significant association was observed between literacy, economic status or their interaction and condom use. Unlike HIV and pregnancy testing, which are often linked with government programs, institutional health clinics and provider-initiated testing, condom use is usually an unobtrusive behaviour, influenced by social norms, relationship with partners and cultural values.[20] This would mean that even literate interviewees with sufficient economic resources may face non-material barriers such as embarrassment, misperception or disapproval by partners or community members.

Furthermore, a meaningful connection exists between the use of condoms, gender roles and negotiation power, especially among women, who may not even be able to insist on condom use regardless of education level or

income.[21] This highlights that literacy alone cannot increase condom use and interventions should incorporate behavioural change communication (BCC), stigma reduction strategies and gender-sensitive interventions.[22]

The lack of statistically significant findings for condom use does not undermine the relevance of education or economic empowerment. Instead, it underscores the nuanced and context-dependent dynamics of sexual health behaviour.

The study is based on secondary, state-level data and cannot infer individual-level behaviours. It also lacks control for other influencing factors such as gender norms, healthcare accessibility and regional stigma, which may affect health-seeking behaviours. Despite these limitations, the study provides valuable insights into how literacy may influence key health-seeking behaviours at the state level, informing targeted public health interventions across India. Subsequent research can include qualitative measures or other psychosocial variables such as attitudes, perceived social norms and access to contraception to better explain the predictors of condom use in this context.

CONCLUSION

This study concludes that literacy, particularly when coupled with improved economic conditions, positively influences HIV and pregnancy testing behaviours across Indian states. However, the relationship between literacy and condom use remains inconclusive, suggesting the need for more nuanced, multidimensional approaches to promote sexual health. These findings highlight the importance of integrating education and economic development into public health strategies that aim to promote health-seeking behaviours.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. World Health Organization. Medicines for HIV, viral hepatitis, and sexually transmitted infections in low- and middle-income countries: forecasts of global demand for 2022–2026. World Health Organization. 2024.
2. Brij A. India's HIV/AIDS Strategy: Evaluating the National AIDS and STD Control Programme's Performance and Addressing Key Challenges in Phase-V (2021–2026). Policy. 2024.
3. Berkman ND, Sheridan SL, Donahue KE, Halpern DJ, Crotty K. Low health literacy and health outcomes: an updated systematic review. Annals of internal medicine. 2011:155(2):97-107.
4. Reynolds R, Smoller S, Allen A, Nicholas PK. Health literacy and health outcomes in persons living with HIV disease: a systematic review. AIDS and Behavior. 2019;23:3024-43.
5. Marcus EN. The silent epidemic-the health effects of illiteracy. New England J Med. 2006;355(4):339.
6. Astrup J. HIV where are we now. Comm Pract. 2021;94(6):14-7.
7. Freibott CE, Sprague Martinez LS, Rajabiun S, Drainoni ML. Health literacy, health outcomes and community health worker utilization: a cohort study in HIV primary care. BMC Health Serv Res. 2022;22(1):1254.
8. Cook L. HIV stigma reduction and health literacy education program with a cross-generational populaton in an African American faith-based church. J Pub Health. 2021;29:1089-106.
9. Malik M, Girotra S, Roy D, Basu S. Knowledge of HIV/AIDS and its determinants in India: Findings from the National Family Health Survey-5 (2019–2021). Population Medicine. 2023;6:1-2.
10. Letshwenyo-Maruatona SB, Madisa M, Boitshwarelo T. Association between HIV/AIDS knowledge and stigma towards people living with HIV/AIDS in Botswana. African J AIDS Res. 2019;18(1):58-64.
11. Singh SK, Shri N. Sociodemographic correlates of discrimination against PLHIV in High HIV prevalence states of India, NFHS 2016–21. Scientific Reports. 2023;13(1):15083.
12. Malik M, Girotra S, Roy D, Basu S. Knowledge of HIV/AIDS and its determinants in India: Findings from the National Family Health Survey-5 (2019–2021). Population Medicine. 2023;2:76.
13. Mgbako O, Conard R, Mellins CA, Dacus JD, Remien RH. A systematic review of factors critical for HIV health literacy, ART adherence and retention in care in the US for racial and ethnic minorities. AIDS and Behavior. 2022;26(11):3480-93.
14. Srivastava A, Kühnen U, Simunovic D, Boehnke K. Cultural and Economic Factors in Maximizing: Differences in Rural–Urban Contexts in India. Psychological Studies. 2025;3:1-7.
15. Ghosh A, Manna S. Monthly and annual oscillation of methane and ozone in eastern India using Sentinel-5P TROPOMI: assessment and validation. Environmental Science and Pollution Research. 2025;32(1):208-25.
16. National AIDS Control Organisation. State Fact Sheet as on 31 March 2013. Ministry of Health & Family Welfare, Government of India. Avaialble at: from https://naco.gov.in. Accessed on 21 December 2024.
17. Singh HD. Numbering others: Religious demography, identity, and fertility management experiences in contemporary India. Social Sci Med. 2020;254:112534.
18. India TB. RNTCP Status Report. New Delhi: Central TB Division, Directorate General of Health Services, Ministry of Health and Family Welfare. 2013.
19. Planning Commission. Press note on poverty estimates. 2013.
20. Ewerling F, McDougal L, Raj A, Ferreira LZ, Blumenberg C, Parmar D, et al. Modern contraceptive

use among women in need of family planning in India: an analysis of the inequalities related to the mix of methods used. Reproductive health. 2021;18(1):173.
21. Modern contraceptive use among women in need of family planning in India: An analysis of the inequalities related to the mix of methods used. Reproductive Health. 2021;18(1):173.
22. Calsyn DA, Peavy M, Wells EA, Campbell AN, Hatch-Maillette MA, Greenfield SF, et al. Differences between men and women in condom use, attitudes, and skills in substance abuse treatment seekers. Am J Addict. 2013;22(2):150-7.
23. de Vries A, den Daas C, Willemstein IJ, de Wit JB, Heijne JC. Interventions promoting condom use among youth: a systematic review. Journal of Adolescent Health. 2024;74(4):644-56.

Cite this article as: Shah SA, Patel DJ, Levine H, Mathangi SZ, Thanugundla SC. Literacy and health-seeking behaviours for HIV/AIDS: the moderating role of economic status in India. Int J Res Med Sci 2025;13:2754-60.