International Journal of Advanced Education and Research
www.alleducationjournal.com
ISSN: 2455-5746
Received: 28-06-2026, Accepted: 28-07-2026, Published: 12-08-2026
Volume 11, Issue 3, 2026, Page No. 52-55

Maternal education, gender dynamics and students' academic achievement: A critical review of intergenerational pathways

Prity Sagar*, Siddheswar Mishra
Department of Education, ISBM University, Chhattisgarh, India
Corresponding Author: Prity Sagar
DOI: https://doi.org/10.66856/ijaer.2026.11.3.11040

Abstract
Maternal education is a major dimension of family socioeconomic position and an important pathway for transmitting human capital across generations. This critical narrative review synthesizes conceptual, longitudinal, quasi-experimental, and large-scale survey evidence on the relationship between maternal education, student gender, and academic achievement, with particular attention to India. Literature published mainly between 2010 and 2025 was identified through targeted searches of education, psychology, economics, and public policy sources, complemented by foundational theoretical works and national reports. The evidence indicates a consistent positive association between maternal education and children's language, literacy, numeracy, school participation, and educational progression. However, the magnitude and interpretation of this association vary by outcome, age, household resources, school quality, and research design. Home learning resources, parental expectations, health and nutrition investments, maternal agency, and protection of study time emerge as plausible mediating pathways. Gender is not a uniform moderator: maternal education can reduce the disadvantage faced by girls in settings marked by unequal resource allocation, while gender gaps may persist at secondary, tertiary, and STEM transitions. Causal claims should therefore be reserved for designs that adequately address selection and unobserved family characteristics. The review recommends linking adult women's literacy and digital capability with foundational learning programs, strengthening school support for first-generation learners, and developing longitudinal Indian datasets capable of testing mediation and intersectional heterogeneity.

Keywords: Maternal education, academic achievement, gender parity, home learning environment, intergenerational transmission, India

Introduction

Educational achievement develops within a layered ecology of family, school and community influences. Family socioeconomic status is among the most reliable correlates of achievement, but it is multidimensional and cannot be represented adequately by income alone [1]. Maternal education is especially important because it may shape the language used with children, familiarity with school expectations, health-related decisions, aspirations, time allocation and the capacity to obtain learning resources. These mechanisms are consistent with cultural-capital theory [2] and the bioecological account of development [3].

The association should not, however, be interpreted mechanically. Mothers who obtain more education may differ from other mothers in prior ability, family background, and place of residence, aspirations and access to institutions. Children's outcomes also reflect paternal education, household wealth, school quality and wider gender norms. Quasi-experimental evidence from changes in schooling opportunities strengthens the case that maternal schooling can improve children's cognitive outcomes, but estimated effects depend on the population and identification strategy [4]. Longitudinal evidence likewise suggests that increases in maternal education among low-income families can be associated with improved cognitive scores, while effects across behavioural domains are more complex [5].

In India, the question has particular significance because rapid educational expansion coexists with social stratification, rural–urban inequality and gendered transitions in secondary and higher education. Recent cohort evidence indicates that gender gaps have narrowed at lower levels of schooling but remain at secondary completion and college transitions [6]. This review therefore asks: (i) through which pathways is maternal education associated with academic achievement; (ii) how does student gender condition these pathways; (iii) how strong is the evidence for causal interpretation; and (iv) what implications follow for education policy and future research?

Review approach

This paper uses a critical narrative review design. Targeted searches were undertaken for literature published primarily during 2010–2025 using combinations of the terms maternal education, mother's schooling, academic achievement, cognitive outcomes, home learning environment, gender gap, girls' education, India, IHDS, ASER, PISA, mediation and causal effect. Peer-reviewed empirical studies, meta-analyses, major longitudinal or household-survey analyses, and authoritative policy or assessment reports were prioritized. Foundational works were included where necessary to establish theory. Health studies were used only when they clarified a pathway relevant to learning, rather than being treated as direct evidence of academic achievement. Because a complete database export, duplicate log and independent screening record were not available, this paper does not claim to be a systematic review or present fabricated PRISMA counts. The synthesis is organized by mechanisms, methods, international evidence, Indian evidence and policy implications.

Conceptual framework and transmission pathways

Cultural and cognitive resources

Cultural-capital theory proposes that families transmit language practices, dispositions and forms of knowledge that are valued by educational institutions [2]. More-educated mothers may be better positioned to engage in shared reading, explain school tasks, and communicate with teachers and model academic routines. These practices do not operate identically across cultures. A recent meta-analysis covering low- and middle-income countries found a small but statistically meaningful overall association between the home language-literacy environment and children's language and literacy skills, with stronger associations for adult literacy practices and books in the home than for home tutoring [7]. This cautions against equating effective parental involvement solely with direct teaching.

Home numeracy and domain-specific support

Home learning environments are domain specific. A meta-analysis of the home mathematics environment found that parent–child mathematical activities, expectations and attitudes are related to mathematics achievement, although effect sizes vary with measurement and design [8]. Maternal education may facilitate access to such activities, but parental anxiety, cultural beliefs and the child's prior performance can also influence what parents do. Consequently, reciprocal effects are possible: parents may increase support when a child struggles or when achievement signals high potential.

Maternal agency and household allocation

Education can expand mothers' access to information, paid work, social networks and participation in household decisions. In turn, greater agency may shift investments toward nutrition, health, books, tutoring, transport and continued schooling. Indian evidence using the India Human Development Survey shows that maternal education is associated with multiple dimensions of child well-being, while also demonstrating that the strength of association varies across outcomes [9]. These links are relevant to achievement because health, attendance and cognitive development are mutually reinforcing. Nevertheless, maternal education should not be treated as an isolated individual attribute; its returns are shaped by household income, public services and local gender regimes.

Gendered pathways

In contexts where sons and daughters face different expectations, maternal education may alter resource allocation and aspirations. It may help mothers resist early withdrawal of girls from school, negotiate domestic workloads and support mobility or digital access. Indian household evidence indicates that gaps in educational expenditure vary by age and state and become more pronounced for some older adolescents [10]. Research on preschool choice also reports that male–female differences in private preschool enrolment decline as maternal education and living standards rise [11]. Yet maternal education is not guaranteed to eliminate bias: it operates within constraints created by safety concerns, labour markets, caste, early marriage and institutional opportunity.

Methodological considerations

The literature uses cross-sectional regression, longitudinal models, multilevel models, structural equation models, propensity-score approaches and instrumental-variable designs. Each answers a different question. Cross-sectional studies estimate adjusted associations but remain vulnerable to omitted-variable and reverse-causality bias. Multilevel models are useful when children are clustered within schools or regions, while structural equation models can test indirect pathways such as the home learning environment. Longitudinal fixed-effects or change models reduce some time-invariant confounding. Instrumental-variable and policy-reform designs can support causal inference when the instrument affects maternal schooling but has no independent pathway to child outcomes [4].

Methodological precision is particularly important when reporting effect sizes. The original manuscript's uncited universal claims—such as fixed test-score gains per additional year of maternal schooling, a specific odds ratio for girls' completion, or a constant percentage of the effect attributable to nurture were removed because those values cannot be generalized without a named dataset, model and source. The defensible conclusion is that associations are generally positive but heterogeneous, and that causal estimates are design- and context-dependent.

Table 1: Main analytical approaches and interpretive limits

Approach	Primary contribution	Main limitation
Cross-sectional regression	Estimates adjusted associations in large surveys.	Cannot rule out unobserved selection or reverse causality.
Longitudinal/ change models	Tests temporal ordering and within-family or within-person change.	Attrition and time-varying confounding may remain.
Multilevel modelling	Separates child, household, school and regional variation.	Hierarchy alone does not establish causality.
SEM/mediation analysis	Tests indirect pathways through home environment or expectations.	Results depend on model specification and temporal assumptions.
IV/policy reform designs	Can estimate causal effects for populations affected by an exogenous schooling change.	Validity depends on strong exclusion and relevance assumptions.

Synthesis of international evidence

Evidence from the United States National Longitudinal Survey of Youth indicates that maternal education has a positive causal influence on children's cognitive and behavioural outcomes when schooling reforms are used as instruments, although not every outcome responds equally [4]. Longitudinal work with economically disadvantaged families similarly finds that maternal educational gains are associated with better standardized cognitive performance [5]. These studies improve on simple correlations, but their local estimates should not be transported automatically to India or other institutional settings.

International assessment research also shows that socioeconomic inequalities in achievement persist across education systems. PISA evidence emphasizes that disadvantaged students face multiple barriers, while resilience varies with school and system conditions [12]. Maternal education can therefore be understood as one component of a broader opportunity structure. It may enhance the productivity of school inputs, but it cannot compensate fully for weak instruction, segregation, inadequate digital access or economic insecurity.

Gender patterns are likewise multidimensional. Across countries, boys often show lower achievement in reading and lower rates of tertiary completion, whereas girls and women remain underrepresented in several STEM fields [13]. A single 'gender gap' measure can therefore conceal opposite patterns by subject and transition. Reviews of maternal education must distinguish achievement, enrolment, persistence, field choice and completion.

Indian evidence and context

India's expansion of elementary schooling and narrowing of some gender gaps represent substantial progress. However, cohort analysis shows that gains are uneven: gaps have narrowed for school entry and primary completion but persist in secondary and college outcomes [6]. National statistics similarly indicate improved youth literacy while documenting continuing differences across levels and social groups [14].

These patterns make maternal education relevant not only to early achievement but also to later transitions that require information, financial planning and negotiation within the household.

Large household datasets offer a more nuanced picture than universal claims. The India Human Development Survey demonstrates how education, caste, residence, wealth and family characteristics intersect [9,15]. State-level analysis of household educational expenditure finds that gender disparities vary by age and location [10]. Evidence on preschool enrolment suggests that maternal education and household living standards can moderate gender differences in access to private provision [11]. Together, these studies support a conditional interpretation: maternal education can reduce some forms of disadvantage, but its influence is mediated by the availability, cost and perceived returns of education.

Annual Status of Education Report evidence continues to show that foundational reading and arithmetic remain major challenges in rural India and that learning levels differ substantially across children and contexts [16]. These reports do not by themselves identify a causal maternal-education effect. They do, however, underline why home support, access to print, regular attendance and responsive school instruction matter. Policy should avoid placing responsibility for system-level learning deficits on mothers, particularly those who were themselves denied educational opportunity.

Table 2: Comparative interpretation of evidence

Dimension	International evidence	Indian evidence
Frequently examined outcomes	Language, cognition, mathematics, behavioural adjustment, tertiary progression.	Foundational learning, enrolment, expenditure, grade progression and completion.
Important mediators	Home literacy/numeracy practices, expectations, school quality and socioeconomic resources.	Maternal agency, household allocation, study time, health, safety, affordability and school access.
Gender pattern	Girls often lead in reading; disadvantages persist in some STEM transitions; boys may lag in other outcomes.	Lower-level gaps have narrowed, but secondary and tertiary transitions remain socially differentiated.
Interpretive caution	Causal estimates are local to the reform and population studied.	Cross-sectional associations may reflect caste, wealth, location and school availability.

Research gaps and future directions

First, India needs longitudinal datasets linking repeated measures of maternal education, agency, home learning practices, school quality and children's achievement. Second, studies should test mediation with appropriate temporal ordering instead of inferring mechanisms from contemporaneous correlations. Third, heterogeneity should be examined across caste, tribe, disability, income, migration status, rurality and state policy. Fourth, the post-pandemic role of maternal digital capability warrants study, but research should distinguish device access, platform skills, language accessibility and meaningful learning support. Fifth, adolescent transitions require greater attention because gender disparities may reappear when schooling costs, safety concerns, domestic work and marriage expectations intensify. Finally, future reviews should use preregistered protocols, database exports, transparent screening and verified study-level extraction in accordance with established reporting guidance [17].

Policy implications

Policy should recognize maternal education as both a long-term public investment and a marker of accumulated opportunity. Adult women's literacy programmes can be linked with school-based foundational literacy initiatives and community learning centres envisioned in India's National Education Policy 2020 [18]. Such programmes should include functional literacy, numeracy, digital capability and knowledge of school processes, while respecting women's time and avoiding unpaid instructional burdens.

Schools should provide additional academic support to first-generation learners through tutoring, accessible communication and parent engagement in local languages. Community libraries, Anganwadi centres and self-help groups can widen access to books and guided learning activities. At the same time, direct investments in teacher quality, safe transport, sanitation, scholarships and prevention of early marriage remain essential. Maternal education is a valuable resource, not a substitute for equitable public provision.

Conclusion

Maternal education is consistently associated with children's academic development, but the relationship is neither singular nor context free. The strongest interpretation is that education expands mothers' cognitive, informational and decision-making resources, which can

improve home learning opportunities and educational continuity. Gender conditions these processes through household expectations and institutional transitions; in India, maternal education may help reduce some disadvantages faced by girls, although inequalities persist at later stages. Publication-quality scholarship should therefore avoid unsupported universal effect sizes and distinguish association, mediation and causation. Policies that combine women's learning opportunities with high-quality schools and targeted support for disadvantaged students offer the most credible route to intergenerational educational equity.

Declarations

Acknowledgement: The authors acknowledge the institutional support of the Department of Education, ISBM University.

Conflict of interest: The authors declare no conflict of interest.

Funding: No external funding was received for this review.

Author contributions: Both authors contributed to conceptualization, literature synthesis, critical revision and approval of the final manuscript.

Ethical approval: Not applicable; the study is based exclusively on published literature and secondary reports.

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