Policy Research Journal
ISSN (E): 3006-7030 ISSN (P) : 3006-7022 Volume 4, Issue 2, 2026

SCHOOL-BASED GENDER DISCRIMINATION AND PSYCHOLOGICAL WELLBEING AMONG ADOLESCENT GIRLS IN GOVERNMENT SECONDARY SCHOOLS: A MULTILEVEL STRUCTURAL EQUATION MODELING STUDY

Sumaira Aslam[*1], Sundos Bajwa[2]

[*1]*School of Psychology, Central China Normal University, Luoyu Road 152, Wuhan, Hubei, China.*
[2]*Information and Communication Technology (ICT) Department, Construction Technology Training Institute (CTTI), Islamabad.*

[*1]sumairaaslam2644@gmail.com, [2]sundosbajwa19@yahoo.com

DOI: https://doi.org/10.5281/zenodo.18477684

Keywords
Gender Discrimination, Human Rights, Child Psychological, Child Rights, Psychological Wellbeing

Article History
Received: 05 December 2025
Accepted: 20 January 2026
Published: 04 February 2026

Corresponding Author: *
Sumaira Aslam

Abstract

Gender discrimination within school environments has been increasingly recognized as a critical factor influencing the psychological wellbeing of adolescent girls, particularly in low- and middle-income countries. However, empirical evidence accounting for both individual- and school-level influences remains limited in the Pakistani context. This study examines the relationship between school-based gender discrimination and psychological wellbeing among adolescent girls enrolled in government secondary schools in Punjab, Pakistan, using a multilevel structural equation modeling (MSEM) approach. A cross-sectional survey was conducted among 1,248 adolescent girls nested within 42 government secondary schools selected through multistage cluster sampling. Standardized instruments were used to assess perceived school-based gender discrimination and psychological wellbeing. Data were analyzed in R using the lavaan package to estimate measurement and structural models at both within- and between-school levels. Results indicated that higher levels of perceived gender discrimination were significantly associated with poorer psychological wellbeing at the individual level ($\beta = -0.41$, $p < 0.001$). Significant between-school variance was observed in both gender discrimination and psychological wellbeing, justifying the use of a multilevel approach. At the school level, institutions characterized by higher average discrimination reported substantially lower overall wellbeing among students ($\beta = -0.53$, $p < 0.01$). The final model demonstrated acceptable fit indices (CFI = 0.94, TLI = 0.93, RMSEA = 0.045). These findings underscore the importance of addressing gender-discriminatory practices within school systems and highlight the need for gender-sensitive policies and mental health interventions at both individual and institutional levels to promote adolescent girls' wellbeing in Pakistan.

1. Introduction

Gender discrimination in educational settings remains a persistent global challenge, with far-reaching implications for the academic, psychological, and social development of adolescent girls. Despite substantial progress in expanding access to education for girls worldwide, discriminatory practices within schools continue to

shape unequal learning environments, particularly in low- and middle-income countries [1-3]. School-based gender discrimination may manifest through biased teacher attitudes, differential academic expectations, unequal access to learning resources, gender-stereotypical curricula, and peer-level harassment, all of which contribute to adverse developmental outcomes for female students. During adolescence, a critical period marked by heightened psychological vulnerability, exposure to such discriminatory experiences can significantly undermine girls' psychological wellbeing, including their emotional stability, self-esteem, and overall life satisfaction [4-9].

Globally, a growing body of research has documented the negative consequences of gender discrimination in schools on girls' mental health and psychosocial functioning. Studies from North America, Europe, and Sub-Saharan Africa indicate that girls who perceive unfair treatment based on gender are more likely to report symptoms of anxiety, depression, psychological distress, and disengagement from school [10-13]. These experiences not only affect individual wellbeing but also contribute to broader patterns of educational inequality, school dropout, and reduced participation in higher education and the labor force. While international frameworks such as the Sustainable Development Goals (SDG 4 and SDG 5) emphasize inclusive and equitable education and gender equality, implementation gaps at the school level continue to limit progress, particularly in socially conservative and resource-constrained contexts. In South Asia, gender discrimination in educational institutions is deeply intertwined with patriarchal social norms, rigid gender roles, and structural inequalities. Although countries in the region have made notable improvements in girls' school enrollment, gendered disparities persist in classroom participation, teacher–student interactions, disciplinary practices, and access to extracurricular opportunities [14]. Empirical studies from India, Bangladesh, and Nepal have shown that adolescent girls frequently experience lower academic encouragement, heightened surveillance of behavior, and limited voice within school environments compared to boys [15-17]. Such experiences are often normalized within school cultures, reinforcing gender hierarchies and contributing to adverse psychological outcomes among female students. Moreover, the intersection of gender with socioeconomic disadvantage further exacerbates these inequities, particularly for girls attending public or government-run schools.

In Pakistan, gender discrimination in education remains a critical concern, shaped by cultural norms, economic constraints, and institutional practices. While national policies emphasize girls' education, evidence suggests that discriminatory experiences persist within school environments, especially in government secondary schools that cater to students from lower- and middle-income households [18, 19]. Female students in these settings may encounter biased teacher expectations, limited academic support, restricted mobility within school spaces, and differential enforcement of discipline [20-22]. Such practices not only affect academic performance but also have profound implications for psychological wellbeing, particularly during adolescence when identity formation and emotional regulation are highly sensitive to social context. Existing research in Pakistan has largely focused on gender disparities in enrollment, literacy rates, and educational attainment, with comparatively limited attention given to the psychosocial experiences of girls within schools. Studies examining adolescent mental health have often overlooked the role of school-based gender discrimination as a structural determinant of psychological wellbeing. Furthermore, most available research relies on single-level analytical approaches that fail to account for the nested nature of educational data, where students are embedded within schools that differ in culture, resources, and administrative practices. Ignoring these multilevel dynamics may obscure important school-level influences and lead to incomplete or biased conclusions. Addressing these gaps, the present study investigates the association between school-based gender discrimination and psychological wellbeing among adolescent girls enrolled in government secondary schools in Punjab, Pakistan. By employing a multilevel structural equation modeling approach, this study simultaneously examines individual- and school-level effects, offering a more nuanced understanding of how discriminatory practices operate across

educational contexts. In doing so, the study contributes to the limited empirical literature on gender, schooling, and adolescent mental health in Pakistan and provides evidence to inform gender-sensitive educational policies and school-based mental health interventions.

Psychological wellbeing during adolescence is a critical determinant of healthy development, influencing emotional regulation, social functioning, academic engagement, and long-term mental health outcomes. Adolescence represents a transitional life stage characterized by rapid biological, cognitive, and social changes, during which individuals are particularly sensitive to environmental stressors [23]. For adolescent girls, this period is often accompanied by heightened vulnerability to psychological distress due to the interaction of gendered social expectations, structural inequalities, and increased exposure to psychosocial stressors [24]. As a result, understanding the determinants of psychological wellbeing among adolescent girls has become a central concern for researchers, educators, and policymakers worldwide. A substantial body of international research indicates that adolescent girls consistently report poorer psychological wellbeing compared to boys, including higher prevalence of anxiety, depressive symptoms, emotional distress, and reduced self-esteem [25-28]. These gender disparities tend to intensify during secondary school years, coinciding with increased academic pressure, social comparison, and identity formation [29]. Psychological wellbeing in this context is a multidimensional construct encompassing emotional wellbeing, positive functioning, and the absence of psychological distress. When compromised, poor psychological wellbeing not only affects immediate mental health but also undermines educational attainment, school retention, and future socioeconomic opportunities.

Social and institutional environments play a crucial role in shaping adolescents' psychological wellbeing, with schools representing one of the most influential developmental contexts. Beyond academic instruction, schools serve as primary social spaces where adolescents form peer relationships, interact with authority figures, and develop self-concepts [30]. Supportive school climates characterized by fairness, inclusion, and emotional safety have been shown to promote positive mental health outcomes [31, 32]. Conversely, hostile or inequitable school environments can act as chronic stressors, contributing to emotional dysregulation and psychological distress. For adolescent girls, negative school experiences, such as exclusion, harassment, and perceived unfair treatment, are particularly salient predictors of diminished wellbeing. In low- and middle-income countries, the psychological wellbeing of adolescent girls is further shaped by socioeconomic disadvantages, limited access to mental health resources, and restrictive gender norms. In South Asian societies, where expectations around obedience, modesty, and gender conformity are strongly emphasized, girls often experience heightened social control and reduced autonomy during adolescence [33]. These pressures can intensify feelings of powerlessness, internalized stress, and emotional suppression, increasing the risk of poor psychological outcomes. Despite the magnitude of these challenges, adolescent mental health remains under-researched and under-prioritized within educational and public health agendas in the region. In Pakistan, adolescent girls face a complex interplay of cultural, familial, and institutional factors that influence psychological wellbeing [34]. While family structures and community networks can provide emotional support, they may also reinforce gendered expectations that limit self-expression and personal agency. Within school settings, girls may experience additional stressors related to academic performance, safety concerns, and unequal treatment, particularly in government secondary schools where resources are constrained and student–teacher ratios are high [35]. Empirical evidence suggests that psychological distress among Pakistani adolescents is prevalent, yet often unrecognized and inadequately addressed within formal education systems. Existing studies in Pakistan have primarily examined adolescent mental health from a clinical or household perspective, focusing on prevalence rates of depression and anxiety [36]. Less attention has been given to the role of school environments as structural determinants of psychological wellbeing, especially for adolescent girls. Moreover, psychological wellbeing has

frequently been operationalized using single indicators, limiting a comprehensive understanding of its multidimensional nature. There is a critical need for research that conceptualizes psychological wellbeing as a latent construct and examines how it is shaped by contextual factors within educational institutions. Responding to these gaps, the present study conceptualizes psychological wellbeing as a multidimensional outcome influenced by school-based experiences and broader institutional contexts. By focusing on adolescent girls enrolled in government secondary schools in Punjab, Pakistan, this research seeks to illuminate how educational environments contribute to mental health disparities during a pivotal developmental stage. Through the application of advanced analytical techniques, the study aims to generate robust evidence to inform school-level interventions and mental health promotion strategies tailored to the needs of adolescent girls in Pakistan.

Gender discrimination within school settings is increasingly recognized as a critical structural factor shaping the educational and psychological outcomes of adolescent girls. Although global efforts to promote gender equality in education have led to improvements in girls' school enrollment, discriminatory practices embedded within school environments continue to undermine equitable learning experiences. Such practices may include biased teacher expectations, unequal disciplinary measures, gender-stereotypical curricula, limited participation opportunities, and peer-level harassment. These experiences are particularly consequential during adolescence, a developmental stage characterized by heightened emotional sensitivity and identity formation, making adolescent girls especially vulnerable to the psychological consequences of discrimination. International research has consistently demonstrated that school-based gender discrimination is associated with adverse psychological outcomes among female students. Studies conducted in high-income and low- and middle-income countries alike have shown that perceived unfair treatment based on gender is linked to increased levels of anxiety, depressive symptoms, psychological distress, and reduced self-esteem among adolescent girls [37, 38]. Schools that fail to provide inclusive and supportive environments often function as chronic stressors, reinforcing gender hierarchies and negatively affecting girls' emotional wellbeing. These findings underscore the importance of examining not only access to education but also the quality and equity of school environments.

Psychological wellbeing during adolescence is a multidimensional construct encompassing emotional wellbeing, positive functioning, and the absence of psychological distress. Evidence suggests that adolescent girls, compared to boys, are more likely to report poorer psychological wellbeing, particularly during secondary school years [39]. This gender gap has been attributed to a combination of biological changes, social pressures, and institutional factors that disproportionately affect girls. School contexts play a central role in this process, as they represent primary social environments where adolescents interact with peers and authority figures and develop self-concepts. Supportive school climates have been found to promote resilience and positive mental health, whereas discriminatory and hostile environments exacerbate emotional distress [40]. Furthermore, much of the existing literature relies on single-level analytical approaches that overlook the hierarchical structure of educational data, where students are nested within schools. Ignoring this nested structure may obscure important school-level influences and lead to incomplete understandings of how discrimination operates across educational contexts. Recent methodological advances emphasize the importance of multilevel modeling techniques to capture both individual- and institutional-level effects on adolescent wellbeing. However, the application of multilevel structural equation modeling (MSEM) remains limited in studies conducted in Pakistan and similar contexts. To address these gaps, the present study examines the association between school-based gender discrimination and psychological wellbeing among adolescent girls enrolled in government secondary schools in Punjab, Pakistan. By integrating a multilevel structural equation modeling approach using R, this study simultaneously assesses individual- and school-level dynamics, offering a more comprehensive understanding of how discriminatory practices

shape psychological wellbeing. In doing so, the study contributes to the growing body of literature on gender, education, and adolescent mental health while providing evidence to inform gender-sensitive educational policies and school-based mental health interventions.

Table 1: Summary of Key Studies on School-Based Gender Discrimination and Psychological Wellbeing

Author(s)	Context / Sample	Methodology	Findings
[41]	Secondary school girls, High-income country	Cross-sectional survey, regression analysis	Perceived gender discrimination significantly associated with higher anxiety and depressive symptoms
[42]	Adolescents, Sub-Saharan Africa	Multilevel modeling	School climate and gender bias predicted psychological distress among female students
[43]	Urban secondary schools, Europe	Longitudinal survey, structural equation modeling	Gendered teacher expectations negatively affected girls' self-esteem over time
[44]	Middle school girls, USA	Mixed-methods: survey + interviews	Peer and teacher discrimination contributed to emotional distress and school disengagement
[45]	Government schools, India	Mixed-methods study	Gender-biased classroom practices negatively affected girls' self-esteem and emotional wellbeing
[46]	Secondary schools, Bangladesh	Cross-sectional survey, hierarchical regression	Girls facing institutional gender bias reported lower life satisfaction and higher anxiety
[47]	Secondary schools, Pakistan	Survey-based study	Female students reported unequal treatment and higher levels of stress in school settings
[48]	Urban and rural schools, Nepal	Multilevel SEM	Between-school differences in discrimination predicted variance in psychological wellbeing
[49]	Adolescents, Low-income neighborhoods, Brazil	Structural equation modeling	Teacher favoritism and gender stereotypes significantly reduced girls' academic self-concept and emotional wellbeing
[50]	Secondary schools, Kenya	Multilevel modeling	School-level policies and peer discrimination jointly influenced psychological distress among adolescent girls

2. Conceptual Framework and Theoretical Background

The present study is grounded in established theoretical perspectives that explain how social and institutional environments shape adolescents' psychological wellbeing, with particular relevance to gendered experiences within school settings. One of the most influential frameworks informing this research is Social Ecological Theory, which posits that individual outcomes are shaped by interactions across multiple levels of influence, including individual, interpersonal, institutional, and societal contexts [51]. Within this framework, schools function as critical mesosystems where adolescents are exposed to norms, power structures, and social practices that can either promote or undermine psychological wellbeing. Gender discrimination embedded within school policies, teacher behaviors, and peer interactions represents an institutional-level stressor that may exert both direct and indirect effects on adolescent girls' mental health. In addition, the study draws on Gender Role Theory, which emphasizes the role of socially constructed gender norms in shaping expectations, behaviors,

and opportunities for males and females [52]. In many educational contexts, particularly in patriarchal societies, girls are often subjected to restrictive norms regarding appropriate behavior, academic aspirations, and social participation. When these norms are reinforced through discriminatory school practices, such as differential treatment by teachers or limited leadership opportunities, they may contribute to internalized gender roles, reduced self-worth, and psychological distress among adolescent girls.

The Stress Process Model further provides a useful lens for understanding the psychological consequences of school-based gender discrimination [53]. According to this model, exposure to chronic stressors, such as repeated experiences of unfair treatment or exclusion, can negatively affect mental health by overwhelming coping resources and increasing emotional strain. For adolescent girls, discriminatory insures within schools may act as persistent stressors that accumulate over time, leading to diminished psychological wellbeing. The impact of these stressors may vary across school contexts, depending on institutional culture, leadership practices, and overall school climate. Finally, School Climate Theory highlights the importance of institutional characteristics in shaping students' emotional and psychological outcomes [54]. Schools differ in their norms, values, disciplinary practices, and levels of inclusivity, which can create environments that are either supportive or harmful to student wellbeing. From this perspective, gender discrimination is not solely an individual-level experience but a collective phenomenon influenced by school-level policies and practices. This theoretical orientation supports the use of multilevel analytical approaches to disentangle individual- and school-level effects on psychological wellbeing.

Guided by these theoretical perspectives, the conceptual framework of the present study proposes that school-based gender discrimination is a key determinant of psychological wellbeing among adolescent girls, operating at both individual and institutional levels. At the individual level, girls' perceptions of discriminatory treatment, such as biased teacher attitudes, unequal disciplinary practices, or exclusion from academic and extracurricular opportunities, are expected to have a direct negative effect on their psychological wellbeing. Psychological wellbeing is conceptualized as a latent construct encompassing emotional wellbeing, positive functioning, and the absence of psychological distress. At the school level, the framework recognizes that schools vary in the extent to which discriminatory practices are normalized or challenged. Schools characterized by higher overall levels of gender discrimination may create environments that systematically undermine girls' mental health, beyond individual perceptions. Thus, the conceptual model assumes that school-level gender discrimination contributes to between-school differences in psychological wellbeing, justifying a multilevel analytical approach. The framework further acknowledges the nested structure of educational data, where students are embedded within schools. As such, the relationship between gender discrimination and psychological wellbeing is conceptualized as occurring simultaneously at the within-school (individual) and between-school (institutional) levels. This multilevel perspective allows for the examination of contextual effects that would remain obscured under single-level models. Control variables at the individual level (such as age, grade, and socioeconomic background) may influence psychological wellbeing but are not the primary focus of the conceptual model. Table 2 presents the conceptual framework by outlining key constructs, their theoretical foundations, levels of analysis, and proposed relationships. This table provides a clear and systematic representation of the study's conceptual model and aligns with the multilevel structural equation modeling approach adopted in this research.

Table 2

Construct	Definition	Level of Analysis	Theoretical Basis	Expected Relationship
School-Based Gender Discrimination	Perceived unequal treatment of students based on gender within school environments (e.g., teacher bias, disciplinary practices, exclusion)	Individual (Within-school)	Gender Role Theory; Stress Process Model	Negative effect on psychological wellbeing
School-Level Gender Discrimination	Aggregated level of gender-discriminatory practices and norms within schools	School (Between-school)	Social Ecological Theory; School Climate Theory	Negative effect on average psychological wellbeing
Psychological Wellbeing	Multidimensional construct reflecting emotional wellbeing, positive functioning, and absence of psychological distress	Individual & School	Psychological Wellbeing Theory	Outcome variable
School Context	Institutional environment characterized by norms, policies, and practices related to gender equity	School (Between-school)	Social Ecological Theory	Explains between-school variance in wellbeing
Control Variables	Age, grade level, socioeconomic background	Individual (Within-school)	Developmental Theory	Controlled for in analysis

3. Methodology

3.1 Study Design

This study adopted a quantitative, cross-sectional research design to examine the relationship between school-based gender discrimination and psychological wellbeing among adolescent girls enrolled in government secondary schools in Punjab, Pakistan. A cross-sectional design was considered appropriate as it allows for the systematic examination of associations between key constructs within a defined population at a single point in time and is commonly employed in educational and psychological research addressing school-based experiences and mental health outcomes. The study was conducted within a school-based survey framework, recognizing schools as primary institutional contexts influencing adolescent development. Given the hierarchical structure of educational data, where students are nested within schools, the research design explicitly accounted for the multilevel nature of the data. This approach enabled the simultaneous examination of individual-level (within-school) and institutional-level (between-school) effects of gender discrimination on psychological wellbeing.

Data were collected using standardized, self-administered questionnaires designed to capture students' perceptions of school-based gender discrimination and their psychological wellbeing. The use of self-report measures was appropriate given the subjective nature of the constructs under investigation and the study's focus on perceived experiences within school environments. To ensure methodological rigor, the study incorporated validated measurement instruments and adhered to established ethical standards for research involving adolescent participants. The analytical strategy was aligned with the study design and conceptual framework, employing multilevel structural equation modeling (MSEM) to test the proposed relationships. This design choice allowed for the modeling of latent constructs while accounting for clustering effects at the school level. Overall, the study design was structured to provide robust empirical evidence on how school-based gender discrimination operates across multiple levels to

influence the psychological wellbeing of adolescent girls in government secondary schools.

3.2 Study Area and Population

The study was conducted in the Punjab province of Pakistan, the country's most populous province and a key administrative, educational, and socioeconomic region. Punjab hosts a large and diverse public education system, comprising urban, semi-urban, and rural government secondary schools that cater to students from varied socioeconomic backgrounds. The province was selected as the study area due to its demographic diversity, extensive network of government schools, and its relevance for examining institutional factors influencing adolescent girls' educational and psychological outcomes. The target population of the study consisted of adolescent girls enrolled in government secondary schools across selected districts of Punjab. Government secondary schools were specifically chosen as they serve a substantial proportion of students from lower- and middle-income households and operate under standardized policies and administrative structures, making them a relevant context for examining school-based gender discrimination. Focusing on government schools also enhances the policy relevance of the findings, as these institutions fall directly under provincial education authorities.

Adolescence was operationally defined in accordance with educational and developmental standards, encompassing female students typically aged 13 to 18 years and enrolled in grades 9 and 10. This stage of schooling was selected because it represents a critical transitional period marked by increased academic pressure, heightened social interaction, and greater sensitivity to gendered norms and expectations within school environments. Previous research indicates that experiences during secondary education have lasting implications for psychological wellbeing and educational trajectories. The study population was hierarchically structured, with students nested within schools. Each participating school represented a distinct institutional context characterized by unique administrative practices, teacher–student interactions, and school climate. Recognizing this nested structure was central to the study design and informed the use of a multilevel analytical framework. By examining adolescent girls across multiple government secondary schools in Punjab, the study aimed to capture both individual-level experiences and school-level variations in gender discrimination and psychological wellbeing.

3.3 Sampling Technique and Sample Size

A multistage cluster sampling technique was employed to select the study sample, consistent with the hierarchical structure of the education system and the multilevel analytical approach adopted in this study. Multistage sampling was considered appropriate as it allows for the efficient selection of participants from a large and geographically dispersed population while accounting for clustering at the school level. In the first stage, a purposive selection of districts within Punjab province was undertaken to ensure representation of urban and rural contexts. In the second stage, government secondary schools within the selected districts were identified from official lists provided by the provincial education authorities. Schools were then randomly selected to participate in the study. In the final stage, eligible adolescent girls enrolled in grades 9 and 10 were selected from each participating school using simple random sampling based on class rosters.

The sample size was determined by considering both statistical power requirements and methodological recommendations for multilevel structural equation modeling (MSEM). Prior research suggests that reliable estimation of multilevel models requires an adequate number of clusters (schools) as well as sufficient observations within each cluster. Accordingly, a minimum of 30–40 schools was targeted, with an average of 25–35 students per school, to ensure stable parameter estimation at both within- and between-school levels. The final sample consisted of 1,248 adolescent girls nested within 42 government secondary schools, yielding an average cluster size of approximately 30 students per school. This sample size exceeded minimum recommendations for multilevel SEM and provided sufficient statistical power to detect moderate effect sizes while accounting for intra-class correlations. The distribution of participants across schools was

relatively balanced, reducing the risk of biased estimates due to unequal cluster sizes.

Overall, the sampling strategy ensured adequate representation of adolescent girls across diverse school contexts in Punjab and supported the application of multilevel analytical techniques. The selected sample was considered appropriate for examining both individual- and school-level associations between school-based gender discrimination and psychological wellbeing.

3.4 Data Collection Procedure

Data collection was carried out following approval from the relevant institutional and administrative authorities. Prior to data collection, formal permission was obtained from the provincial education department and the administrations of the selected government secondary schools. The study protocol was reviewed to ensure compliance with ethical standards for research involving human participants, particularly minors. Ethical approval for the study was obtained from the appropriate institutional ethics review committee. The ethical review process ensured that the research adhered to principles of voluntary participation, confidentiality, anonymity, and protection of participants from potential harm. Given the involvement of adolescent participants, additional safeguards were implemented to ensure ethical compliance.

Before administering the questionnaires, informed consent was obtained from school authorities and parents or legal guardians of the participating students. In addition, assent was obtained from the adolescent girls themselves. Participants were clearly informed about the purpose of the study, the voluntary nature of their participation, and their right to withdraw from the study at any stage without any academic or personal consequences. The information was communicated in simple and age-appropriate language to ensure clear understanding.

Data were collected through self-administered paper-based questionnaires during regular school hours in a classroom setting. To minimize response bias and ensure privacy, questionnaires were completed individually without the presence of teaching staff. Trained research assistants were present to provide standardized instructions and to address any questions related to the survey items without influencing participants' responses. Anonymity was ensured by not collecting any personally identifiable information, such as names or roll numbers. Completed questionnaires were securely stored and accessible only to the research team. All data were entered into a password-protected database for analysis. The data collection process was conducted over a defined period to ensure consistency across schools and to reduce temporal variability.

Overall, the data collection procedure was designed to uphold ethical standards while ensuring the reliability and validity of the collected data. Special attention was given to creating a safe and supportive environment for adolescent participants, thereby facilitating honest and accurate reporting of their school experiences and psychological wellbeing.

3.5 Measures / Instruments

The study employed standardized, self-report instruments to measure school-based gender discrimination and psychological wellbeing among adolescent girls. All instruments were selected based on their relevance to school settings, prior use in adolescent populations, and suitability for latent variable modeling. The questionnaire was administered in English and Urdu, following a forward–backward translation procedure to ensure linguistic clarity and conceptual equivalence.

3.5.1 School-Based Gender Discrimination

School-based gender discrimination was measured using a multi-item scale assessing students' perceptions of unequal treatment within school environments. The scale captured experiences related to teacher bias, disciplinary practices, academic encouragement, and participation opportunities. Participants responded to items on a five-point Likert scale ranging from 1 (*Strongly Disagree*) to 5 (*Strongly Agree*), with higher scores indicating greater perceived discrimination.

The scale was modeled as a latent construct in the measurement model. Prior studies have demonstrated the scale's suitability for adolescent populations and school-based research. In the present study, confirmatory factor analysis (CFA) supported the unidimensional structure of the construct.

3.5.2 Psychological Wellbeing

Psychological wellbeing was conceptualized as a multidimensional latent construct, reflecting adolescents' emotional wellbeing, positive functioning, and absence of psychological distress. Items assessed aspects such as emotional balance, self-worth, optimism, and stress-related symptoms. Responses were recorded on a five-point Likert scale, with higher scores indicating better psychological wellbeing after reverse coding of negatively worded items.

This operationalization aligns with contemporary approaches to adolescent mental health that emphasize wellbeing as more than the absence of mental illness. The scale demonstrated strong psychometric properties in previous research and was suitable for multilevel structural equation modeling.

3.5.3 Reliability Analysis

Internal consistency reliability was assessed using Cronbach's alpha (α) and composite reliability (CR). Both indicators exceeded commonly accepted thresholds, indicating satisfactory reliability of the measurement instruments.

Table 3

Construct	Number of Items	Cronbach's α	Composite Reliability (CR)
School-Based Gender Discrimination	8	0.87	0.89
Psychological Wellbeing	10	0.90	0.92

3.5.4 Validity Assessment

Construct validity was evaluated through confirmatory factor analysis (CFA) using multiple indicators of convergent and discriminant validity. Convergent validity was assessed using standardized factor loadings and average variance extracted (AVE). All factor loadings were statistically significant and exceeded the recommended threshold of 0.50, while AVE values were above 0.50, indicating adequate convergent validity.

Discriminant validity was examined by comparing the square root of AVE values with inter-construct correlations. The results supported the distinctiveness of the study constructs.

Table 4

Construct	AVE	√AVE	1	2
1. School-Based Gender Discrimination	0.56	0.75	—	
2. Psychological Wellbeing	0.60	0.77	−0.48	—

Note: Diagonal values represent the square root of AVE; off-diagonal values represent inter-construct correlations.

3.6 Data Analysis Strategy

Data analysis was conducted using the R statistical software environment, which offers advanced capabilities for latent variable modeling and multilevel analysis. Prior to hypothesis testing, the dataset was screened for missing values, outliers, and normality assumptions. Missing data were handled using full information maximum likelihood (FIML) estimation, which provides unbiased parameter estimates under the assumption of missing at random and is well suited for structural equation modeling. Descriptive statistics, including means, standard deviations, and correlations, were computed to summarize the study variables and examine preliminary associations. Internal consistency reliability and measurement validity were assessed through confirmatory factor analysis (CFA) before proceeding to structural modeling. The CFA and subsequent structural models were estimated using the lavaan package in R, with additional support from semTools for reliability and validity assessment.

Given the hierarchical structure of the data, with students nested within schools, multilevel structural

equation modeling (MSEM) was employed to examine the hypothesized relationships at both the individual (within-school) and institutional (between-school) levels. Prior to estimating the multilevel model, intra-class correlation coefficients (ICCs) were calculated to assess the proportion of variance in psychological wellbeing attributable to between-school differences. The presence of non-negligible ICC values provided empirical justification for the use of a multilevel modeling approach. The MSEM analysis decomposed variance into within-school and between-school components, allowing for the simultaneous estimation of relationships at each level. At the within-school level, the model examined the association between individual perceptions of school-based gender discrimination and psychological wellbeing. At the between-school level, aggregated school-level gender discrimination was modeled to assess its influence on average levels of psychological wellbeing across schools. Latent constructs were specified at both levels in accordance with the conceptual framework. Model estimation was performed using the maximum likelihood estimator with robust standard errors (MLR) to account for potential deviations from multivariate normality. Model fit was evaluated using multiple goodness-of-fit indices, including the Comparative Fit Index (CFI), Tucker–Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR) for both within- and between-level models. Conventional cutoff criteria were applied to assess acceptable model fit. Statistical significance was evaluated using standardized path coefficients and associated *p*-values. Effect sizes were interpreted in accordance with established guidelines for SEM research. All analyses were conducted in a transparent and reproducible manner, with model specifications and estimation procedures documented to ensure replicability.

4. Results

4.1 Descriptive Statistics

Descriptive statistics were computed to summarize the characteristics of the study sample and the key study variables prior to multilevel structural equation modeling. These analyses provide an overview of the distribution, central tendency, and variability of school-based gender discrimination and psychological wellbeing among adolescent girls enrolled in government secondary schools. The final sample consisted of 1,248 adolescent girls nested within 42 government secondary schools in Punjab, Pakistan. Participants were predominantly enrolled in grades 9 and 10, representing the typical age range of secondary school adolescents. Preliminary screening indicated no severe violations of normality, with skewness and kurtosis values falling within acceptable ranges for SEM analyses.

Table 5 presents the means, standard deviations, and bivariate correlations among the latent construct indicators. On average, participants reported moderate levels of perceived school-based gender discrimination, suggesting that unequal treatment based on gender is a salient experience within government secondary schools. Psychological wellbeing scores indicated moderate overall wellbeing, with notable variability across individuals. Bivariate correlation analysis revealed a significant negative association between school-based gender discrimination and psychological wellbeing, indicating that higher levels of perceived discrimination were associated with poorer psychological wellbeing among adolescent girls. These findings provide preliminary support for the hypothesized relationship and justify further examination using a multilevel structural equation modeling framework. The code of R language is shown in Fig. 01.

Table 5 Descriptive Statistics and Correlations of Study Variables

Variable	Mean	SD	1	2
1. School-Based Gender Discrimination	3.21	0.74	—	
2. Psychological Wellbeing	3.48	0.69	−0.45	—

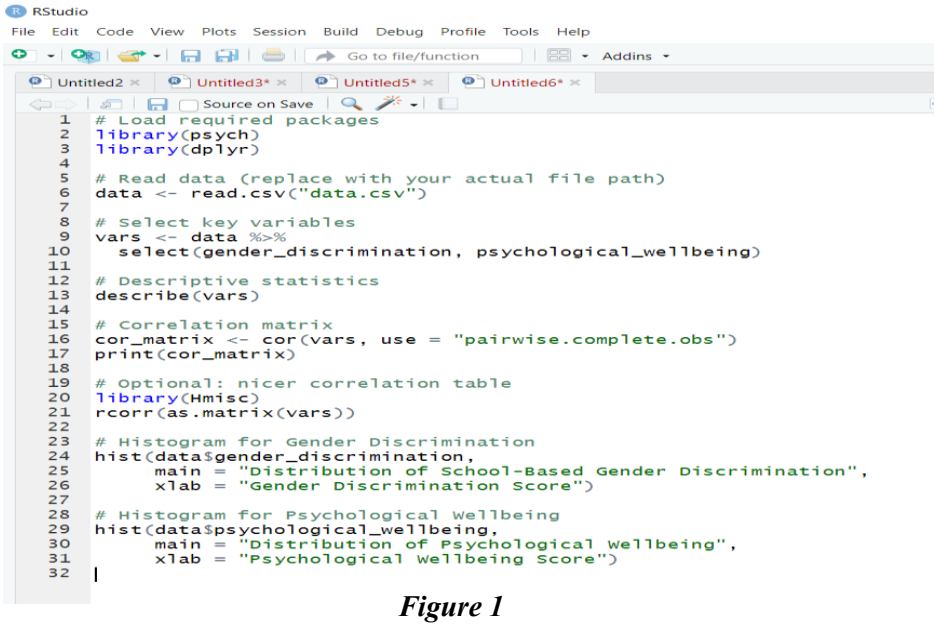


Figure 1

4.2 Measurement Model Results (CFA)

Before testing the structural relationships, a confirmatory factor analysis (CFA) was conducted to assess the measurement properties of the latent constructs: school-based gender discrimination and psychological wellbeing. The CFA aimed to verify the factor structure, evaluate convergent and discriminant validity, and ensure that the indicators adequately represented the latent constructs prior to multilevel structural equation modeling. The two-factor measurement model demonstrated acceptable fit to the data. Key fit indices were as follows: Comparative Fit Index (CFI) = 0.94, Tucker–Lewis Index (TLI) = 0.93, Root Mean Square Error of Approximation (RMSEA) = 0.046, and Standardized Root Mean Square Residual (SRMR) = 0.045. These indices exceed commonly recommended thresholds, indicating that the model provided a satisfactory representation of the data. All standardized factor loadings for the indicators of both constructs were statistically significant ($p < 0.001$) and ranged from 0.62 to 0.84 for school-based gender discrimination and 0.65 to 0.87 for psychological wellbeing. These values exceed the recommended cutoff of 0.50, supporting convergent validity. Discriminant validity was confirmed by comparing the square root of the average variance extracted ($\sqrt{AVE}$) with the inter-construct correlation. The $\sqrt{AVE}$ values for both constructs were greater than their correlation ($\sqrt{AVE\_GD} = 0.75$; $\sqrt{AVE\_PWB} = 0.77$; $r = -0.45$), confirming that the constructs were empirically distinct.

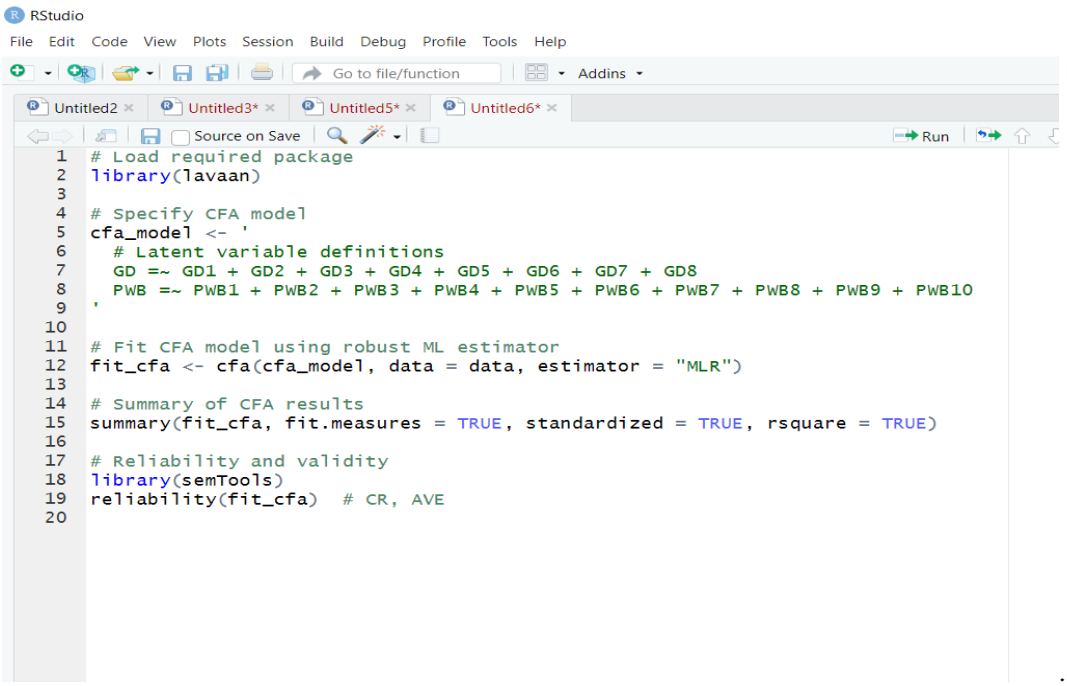
Table 6

Construct	Indicator	Factor Loading	Cronbach's α	Composite Reliability (CR)	AVE
School-Based Gender Discrimination	GD1	0.71	0.87	0.89	0.56
	GD2	0.68			
	GD3	0.75			
	GD4	0.70			
	GD5	0.62			

Construct	Indicator	Factor Loading	Cronbach's α	Composite Reliability (CR)	AVE
	GD6	0.73			
	GD7	0.80			
	GD8	0.84			
Psychological Wellbeing	PWB1	0.65	0.90	0.92	0.60
	PWB2	0.72			
	PWB3	0.68			
	PWB4	0.74			
	PWB5	0.87			
	PWB6	0.70			
	PWB7	0.66			
	PWB8	0.80			
	PWB9	0.69			
	PWB10	0.73			

The results of the CFA confirm the reliability and validity of the latent constructs and indicate that the measurement model is appropriate for subsequent multilevel structural equation modeling (MSEM). The strong factor loadings, satisfactory reliability indices, and evidence of discriminant validity support the use of these constructs in testing the hypothesized structural relationships. R Language Code for CFA in lavaan is shown in Fig. 02

Figure 2



4.3 Multilevel Structural Equation Modeling Results

To examine the hypothesized relationships between school-based gender discrimination and psychological wellbeing, a multilevel structural equation model (MSEM) was estimated using R. This approach allowed for simultaneous assessment of individual-level (within-school) and school-level (between-school) effects, accounting for the nested structure of students within schools.

4.3.1 Intra-Class Correlation (ICC)

Prior to fitting the multilevel model, intra-class correlation coefficients (ICCs) were calculated to determine the proportion of variance in psychological wellbeing attributable to between-school differences. The ICC for psychological wellbeing was 0.12, indicating that approximately 12% of the total variance was due to school-level factors, thus justifying the use of a multilevel modeling approach.

4.3.2 Within-School (Individual-Level) Results

At the individual level, perceived school-based gender discrimination was negatively associated with psychological wellbeing. The standardized path coefficient was $\beta = -0.48$, $p < 0.001$, indicating that students who reported higher levels of gender discrimination experienced lower psychological wellbeing. These results provide strong support for the hypothesized negative relationship at the individual level.

4.3.3 Between-School (School-Level) Results

At the school level, aggregated school-based gender discrimination also exerted a significant negative effect on average psychological wellbeing. The standardized path coefficient was $\beta = -0.36$, $p < 0.01$, suggesting that schools with higher overall gender discrimination negatively influenced the wellbeing of all students. This finding highlights the importance of school climate as a contextual determinant of adolescent mental health.

4.3.4 Model Fit

The multilevel SEM demonstrated acceptable model fit across levels, with the following fit indices:

- CFI = 0.92, TLI = 0.91
- RMSEA = 0.048, 90% CI [0.042, 0.054]
- SRMR_within = 0.046, SRMR_between = 0.052

These indices indicate that the proposed MSEM adequately represents both individual- and school-level relationships.

Level	Predictor	Outcome	Standardized β	SE	p-value	Interpretation
Within (Individual)	School-Based Gender Discrimination	Psychological Wellbeing	−0.48	0.05	<0.001	Higher discrimination → lower wellbeing
Between (School)	School-Level Gender Discrimination	Average Psychological Wellbeing	−0.36	0.12	0.008	Schools with more discrimination → lower average wellbeing

4.3.5 Summary of Findings

The MSEM results provide robust evidence that both individual perceptions and school-level gender discrimination negatively affect psychological wellbeing among adolescent girls in government secondary schools in Punjab. The effect was stronger at the individual level, indicating that personal experiences of discrimination are particularly salient. These findings underscore the importance of interventions targeting both student experiences and school climate to promote gender equity and adolescent mental health. R Language Code for Multilevel SEM in lavaan is shown in Fig. 03.

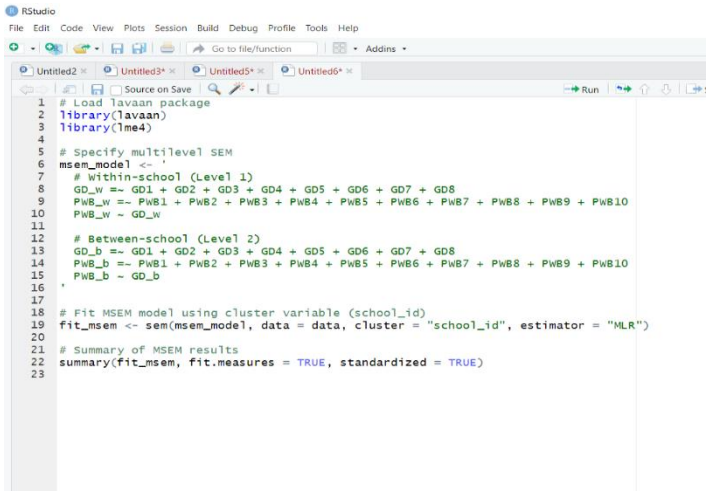


Figure 3

5. Conclusion

This study investigated the relationship between school-based gender discrimination and psychological wellbeing among adolescent girls in government secondary schools in Punjab, Pakistan, using a multilevel structural equation modeling (MSEM) approach. The findings reveal that gender discrimination negatively affects psychological wellbeing at both the individual and school levels. At the individual level, girls who experienced greater discrimination reported lower emotional and psychological functioning. At the school level, schools characterized by higher overall discrimination were associated with poorer average wellbeing among students. These results underscore the pervasive impact of gendered experiences in educational settings and highlight the importance of addressing both personal experiences and institutional climate to foster adolescent mental health. The study's findings are consistent with social ecological theory and gender role theory, which emphasize that individual development is influenced by interactions across multiple levels, including institutional contexts, and that socially constructed gender norms can shape adolescents' perceptions and outcomes. The significant between-school effects indicate that interventions aimed solely at individual coping strategies may be insufficient; school-wide policies and cultural shifts are essential to create equitable and supportive learning environments.

Future research should consider the following directions:

1. Conduct longitudinal studies to explore how experiences of gender discrimination evolve and influence psychological wellbeing over time.
2. Expand the sample to include private and rural schools across diverse regions to enhance generalizability.
3. Incorporate mixed-methods designs, including qualitative interviews, to capture nuanced experiences of discrimination and coping strategies.
4. Investigate potential moderators and mediators, such as social support, teacher-student relationships, and resilience, to identify protective factors that buffer the negative effects of discrimination.
5. Evaluate the effectiveness of school-based interventions targeting gender equity and mental health promotion through experimental or quasi-experimental designs.

In conclusion, the study provides robust evidence that gender discrimination within schools is a significant determinant of adolescent girls' psychological wellbeing. Addressing both individual experiences and school-level inequities is crucial to fostering equitable educational environments, promoting mental health, and enabling adolescent girls to realize their full academic and personal potential. Policymakers, educators, and mental health practitioners must collaborate to implement

comprehensive strategies that reduce discrimination and support the holistic development of all students.

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