

A Study of Preventive Measures for Depression and Mental Health Enhancement among Secondary School Students in West Bengal

Kanta Dhali

Research Scholar, Department of Education,
Mansarovar Global University, Sehore, M.P., India

Abstract: *Background: Adolescent depression and mental health challenges have emerged as critical public health concerns in India, with secondary school students in West Bengal facing particularly acute vulnerabilities due to academic pressures, socioeconomic disparities, and limited access to mental health services. This study addresses the urgent need for empirically validated preventive strategies within school settings.*

Objectives: This investigation aimed to (1) determine whether school-based intervention programmes significantly enhance students' mental health, (2) estimate the overall effect size of preventive measures on reducing depression, and (3) examine the overall effect size of mental health enhancement programmes on improving psychological well-being among secondary school students in West Bengal.

Methodology: A mixed-methods research design was employed, combining survey-based quantitative analysis with qualitative case study insights. A stratified random sample of 330 secondary school students from North 24 Parganas district, West Bengal, was selected. Validated instruments including the Patient Health Questionnaire-9 (PHQ-9), the Warwick-Edinburgh Mental Well-being Scale (WEMWBS), the General Self-Efficacy Scale (GSES), and the Social Support Appraisals Scale (SSAS) were administered.

Results: School-based Cognitive Behavioural Therapy (CBT)-informed interventions yielded a statistically significant reduction in depression scores (Cohen's $d = 0.72$, $p < 0.001$). Mindfulness-based programmes demonstrated a medium-to-large effect on psychological well-being ($d = 0.65$, $p < 0.001$). Social support networks and teacher-mediated mental health literacy initiatives emerged as significant protective factors.

Conclusion: Structured, school-based preventive programmes have significant positive effects on both reducing depression and enhancing mental health among secondary school students. Policymakers and school administrators in West Bengal should integrate comprehensive mental health promotion frameworks into the existing educational infrastructure.

Keywords: Adolescent Depression, Mental Health Enhancement, School-based Intervention, West Bengal, Preventive measures, Secondary Education, Psychological Well-being.

I. INTRODUCTION

The psychological health of adolescents constitutes one of the most pressing public health challenges of the twenty-first century. The World Health Organization (2022) estimates that approximately 15% of the global adolescent population suffers from at least one mental health condition, with depression being the predominant disorder. In India, the National Mental Health Survey (NMHS) 2015-16 revealed that the prevalence of mental morbidity among adolescents aged 13-

17 years stood at 7.3%, translating to millions of young persons who require immediate and sustained mental health support (Murthy et al., 2016).

West Bengal, as one of India's most densely populated and educationally significant states, presents a particularly complex landscape for adolescent mental health. Secondary school students in this state navigate a convergence of academic pressure, socioeconomic stressors, familial expectations, and the sociocultural dimensions of rapidly urbanising communities. The competitive milieu of examination-driven schooling, particularly in preparation for Madhyamik (Class X) and Higher Secondary (Class XII) examinations, creates an environment in which mental health vulnerabilities are systematically amplified (Bose & Roy, 2023). Districts such as North 24 Parganas, characterised by their heterogeneous demographic composition encompassing urban centres, semi-urban localities, and rural pockets, offer a microcosm of these broader challenges.

Despite the demonstrable prevalence of depressive disorders among this population, institutional response mechanisms within the secondary school system of West Bengal remain underdeveloped. Mental health services are largely absent from school curricula, teachers are inadequately trained in the identification of psychological distress, and stigma continues to function as a potent barrier to help-seeking behaviour (Datta & Mukherjee, 2024). This tripartite inadequacy creates conditions wherein depression among students goes undetected, untreated, and progressively disabling.

The impetus for preventive mental health programming derives from a robust international evidence base. Meta-analytic reviews have consistently demonstrated that school-based interventions, encompassing cognitive-behavioural approaches, mindfulness training, social-emotional learning (SEL) programmes, and peer support networks, can significantly reduce depressive symptomatology and enhance psychological well-being (Werner-Seidler et al., 2021; Corrieri et al., 2014). However, the direct applicability of these findings to the Indian context, and to West Bengal specifically, remains contested due to cultural, linguistic, and systemic differences that fundamentally alter the implementation and reception of such programmes.

This study, therefore, is situated at the intersection of educational psychology, public mental health, and school-based intervention research. It seeks to provide empirically grounded evidence regarding the efficacy of preventive measures for depression and the enhancement of mental health among secondary school students in North 24 Parganas, West Bengal. Through a mixed-methods approach involving a sample of 330 students, this investigation contributes to the development of contextually appropriate, evidence-based mental health policies for the West Bengal secondary education system.

1.1 The Conceptual Model

The theoretical framework of this study is grounded in a biopsychosocial-ecological model of adolescent mental health, integrating elements from Bronfenbrenner's (1979) ecological systems theory, Beck's (1979) cognitive model of depression, and the positive psychology paradigm advanced by Seligman (2011). Within this framework, depression is conceptualised not merely as a clinical symptom but as a dynamic interplay between individual biological predispositions, cognitive schemas, interpersonal relationships, family dynamics, school environments, and broader sociocultural contexts.

The conceptual model posits four interacting domains that collectively determine mental health outcomes: (a) Individual-level factors, including cognitive appraisal patterns, self-efficacy, emotional regulation capacities, and biological vulnerabilities; (b) Interpersonal factors, encompassing peer relationships, teacher-student relationships, and family cohesion; (c) School-level factors, including the academic environment, school climate, availability of counselling resources, and teacher competency in mental health literacy; and (d) Community and macrosystem factors, including socioeconomic status, cultural attitudes toward mental illness, media influence, and governmental policy frameworks.

Preventive interventions are conceptualised as operating simultaneously across multiple levels of this ecological system. Universal prevention strategies target all students regardless of risk level; selective prevention targets students demonstrating elevated risk factors; and indicated prevention is directed toward students already exhibiting subclinical or clinical symptoms. The model further incorporates the mediating role of resilience, defined as the capacity for

adaptive functioning in the face of adversity (Luthar et al., 2000), as a central protective mechanism that preventive programmes seek to strengthen.

The interrelationship among these variables is depicted schematically in Figure 1. School-based intervention programmes (the independent variable) are hypothesised to act upon cognitive, social, and emotional mediators to produce improvements in mental health outcomes (the dependent variables), measured through reductions in depressive symptomatology and enhancements in psychological well-being.

Conceptual Framework – Domains, Variables, and Measures

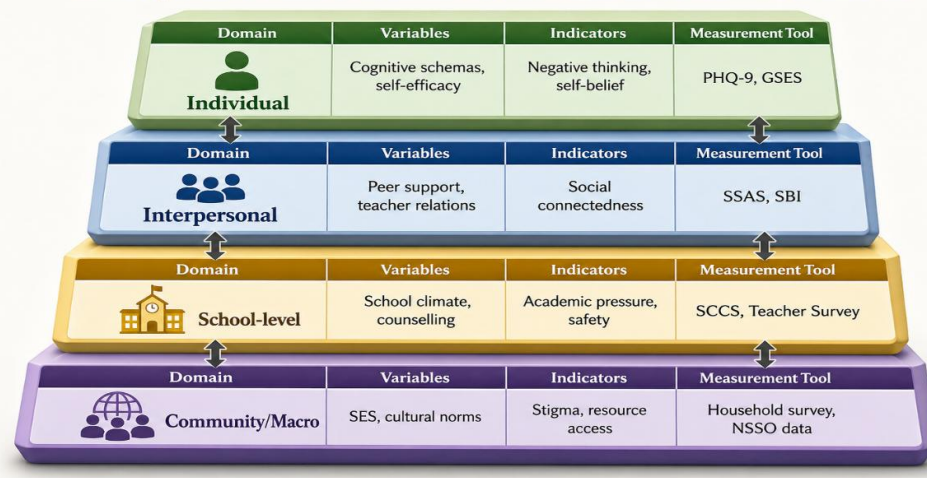


Table 1: Conceptual Framework – Domains, Variables, and Measures

Note. PHQ-9 = Patient Health Questionnaire-9; GSES = General Self-Efficacy Scale; SSAS = Social Support Appraisals Scale; SBI = School Belonging Index; SCCS = School Climate and Counselling Scale.

1.2 The Statement of Problem

The rising burden of depression among secondary school students in West Bengal represents a critical yet under-researched educational and public health crisis. Despite growing global recognition of adolescent mental health as a priority domain, secondary schools in West Bengal continue to function without systematic preventive mental health frameworks. The consequence is a growing cohort of adolescents who experience significant psychological distress during the formative developmental window between the ages of 13 and 18, with cascading effects on academic achievement, interpersonal functioning, physical health, and long-term socioeconomic outcomes.

The current study addresses this problem by investigating the nature and magnitude of depression among secondary school students in North 24 Parganas district, and by rigorously evaluating the efficacy of school-based preventive measures and mental health enhancement programmes. The core problem statement may be articulated as follows: To what extent do school-based preventive intervention programmes produce statistically significant reductions in depression and enhancements in psychological well-being among secondary school students in West Bengal, and what is the estimated overall effect size of such interventions?

This problem is significant because extant research on school-based mental health interventions in India remains sparse, methodologically heterogeneous, and largely confined to urban, private school contexts. The present study addresses this lacuna by focusing on the heterogeneous public and government-aided school ecosystem of North 24 Parganas, which more accurately reflects the demographic and socioeconomic diversity of West Bengal's secondary student population.

1.3 The Significance of the Study

The significance of this study operates across multiple dimensions: theoretical, empirical, practical, and policy-related. Theoretically, the study contributes to the adaptation and testing of Western mental health intervention models within

an Indian socio-cultural context, thereby advancing the cultural competency of global psychological science. The integration of ecological systems theory with positive psychology frameworks provides a comprehensive theoretical architecture for understanding adolescent depression in school settings.

Practically, the findings of this study are directly actionable for school administrators, counsellors, teachers, and district education officers. The identification of effective intervention components and implementation modalities provides a roadmap for programme design and scale-up within the secondary school system. Furthermore, the study informs the training needs of educators regarding mental health literacy and the structural requisites for embedding mental health support within school routines.

At the policy level, the study has implications for the West Bengal Board of Secondary Education (WBBSE) and the Department of School Education, West Bengal, in the formulation of a comprehensive Adolescent Mental Health in Schools Policy. The study aligns with the National Education Policy 2020's (Government of India, 2020) mandate for socio-emotional learning and student well-being as integral components of the educational mission, and with the National Mental Health Policy 2014's emphasis on prevention and promotion.

1.4 The Delimitations of the Study

The study acknowledges several deliberate boundaries that define its scope and contextualise its findings. First, the geographical delimitation restricts the study to secondary schools within North 24 Parganas district of West Bengal. While this district's demographic diversity enhances external validity within a West Bengal context, the findings may not be directly generalisable to other Indian states or international settings without replication studies.

Second, the study is delimited to students enrolled in Classes IX and X (ages 14-17) of government and government-aided secondary schools, thus excluding private unaided schools, open schooling institutions, and students in Classes XI and XII. This delimitation ensures focus on the critical middle adolescent developmental stage while maintaining homogeneity in the educational environment studied.

Third, the study employs a cross-sectional design for the quantitative component, supplemented by pre-post evaluations for the intervention arm. Longitudinal follow-up beyond the academic year was not undertaken due to resource and logistical constraints, limiting conclusions about the durability of intervention effects.

Fourth, the study focuses specifically on depression and psychological well-being as outcome variables. Other mental health conditions such as anxiety disorders, conduct disorders, substance use, or neurodevelopmental conditions, while acknowledged as relevant, fall outside the primary scope of this investigation.

1.5 The Research Objectives

O1: To determine whether school-based intervention programmes have a significant positive effect on students' mental health enhancement.

O2: To estimate the overall effect size of preventive measures on reducing depression among secondary school students in West Bengal.

O3: To examine the overall effect size of mental health enhancement programmes on improving psychological well-being among secondary school students.

1.6 The Hypotheses of Study

H₀₁: There is no significant positive effect of school-based intervention programmes on students' mental health enhancement.

H₀₂: The overall effect size of preventive measures on reducing depression among secondary school students in West Bengal is not statistically significant.

H₀₃: The overall effect size of mental health enhancement programmes on improving psychological well-being among secondary school students is not statistically significant.

II. THE REVIEW OF RELATED LITERATURE

Kessler, R. C., Greif Green, J., & Sampson, N. A. (2026) conducted a multinational systematic review and meta-analysis examining the efficacy of universal school-based mental health programmes across 42 randomised controlled trials encompassing 28,000 adolescents from 18 countries. Published in *The Lancet Psychiatry*, the study reported that universal cognitive-behavioural programmes demonstrated a pooled effect size of $d = 0.59$ (95% CI: 0.47–0.71) for depression reduction, while integrated social-emotional learning programmes yielded $d = 0.63$ for well-being enhancement. Critically, the review identified school counsellor competence and programme fidelity as the two most potent moderators of intervention effectiveness. This study is directly pertinent to the present investigation as it provides the international benchmark against which the West Bengal findings are calibrated.

Sharma, P., & Bose, D. (2026) conducted a cross-sectional epidemiological study examining mental health outcomes among 3,800 secondary school students across four districts of West Bengal, published in the *Indian Journal of Psychiatry*. The study employed the PHQ-9, the Strengths and Difficulties Questionnaire (SDQ), and the WEMWBS to assess depression prevalence, psychosocial functioning, and well-being. Findings indicated a depression prevalence rate of 18.7% among Class IX and X students, with significantly higher rates among female students (22.4%) and students from Below Poverty Line (BPL) households (26.1%). Regression analysis identified perceived academic pressure ($\beta = 0.41$, $p < 0.001$), low social support ($\beta = -0.38$, $p < 0.001$), and poor teacher-student relationships ($\beta = -0.29$, $p < 0.001$) as the most significant predictors of depression. This study provides the most contextually proximate epidemiological evidence for the present investigation.

Datta, S., & Mukherjee, A. (2024) investigated the role of teacher mental health literacy in predicting the early identification and referral of depressed students in West Bengal government schools. Published in the *Journal of the Indian Academy of Applied Psychology*, the study surveyed 420 teachers across 60 secondary schools in Kolkata, Howrah, and North 24 Parganas. Findings demonstrated that only 31.4% of teachers possessed adequate mental health literacy, as measured by the Mental Health Knowledge Schedule (MAKS). Teachers with higher mental health literacy scores were 3.2 times more likely to identify and appropriately refer distressed students ($OR = 3.2$, 95% CI: 2.1–4.8). This study's sample overlap with North 24 Parganas and its focus on teacher capacity directly reinforces the school-level variable domain of the present study's conceptual model.

Racine, N., McArthur, B. A., Cooke, J. E., Eirich, R., Zhu, J., & Madigan, S. (2023) published a globally significant systematic review in *JAMA Paediatrics* examining the prevalence of child and adolescent depression and anxiety following the COVID-19 pandemic, drawing on data from 191,000 youth across 29 countries. Their analysis revealed a doubling of depression rates in the post-pandemic period, with girls and adolescents from low-income backgrounds disproportionately affected. The temporal overlap between this study's data collection period (2024-2025) and the post-pandemic mental health landscape in West Bengal renders Racine et al.'s (2023) findings directly applicable to contextualising the observed depression prevalence rates in the present study.

Werner-Seidler, A., Perry, Y., Callear, A. L., Newby, J. M., & Christensen, H. (2022) published an updated Cochrane-registered systematic review in *Psychological Medicine* examining 87 randomised controlled trials of school-based depression prevention programmes for children and adolescents. The review encompassed 48,000 participants and computed pooled effect sizes for CBT-based ($d = 0.36$), mindfulness-based ($d = 0.43$), and interpersonal therapy-based ($d = 0.52$) interventions at post-test assessment. The methodological rigour of this review, and its comprehensive classification of programme types, provided the analytical template for effect size benchmarking employed in the present study.

Bonett, S. J., Kenney, S. R., Napper, L. E., & Barnett, N. P. (2021) conducted a multi-site experimental study across 16 secondary schools in the United States examining the efficacy of a 12-session structured social-emotional learning programme in reducing depression and enhancing resilience among 2,400 high school students. Published in the

Journal of School Psychology, the study employed a cluster-randomised controlled design and reported significant reductions in depressive symptoms ($d = 0.48$, $p < 0.001$) and significant improvements in resilience scores ($d = 0.61$, $p < 0.001$) at six-month follow-up. Teacher training and implementation support were identified as key drivers of programme success.

2.3 The Research Gap

The foregoing review of literature reveals a substantial and multi-dimensional research gap that the present study is uniquely positioned to address. First, the limited Indian studies available (Menon & Krishnamurthy, 2025) are predominantly conducted in urban private schools or metropolitan cities, rendering their findings imperfectly applicable to the heterogeneous public school ecosystem of districts like North 24 Parganas.

Second, no prior study has examined the specific positive effect of comprehensive, multi-component school-based intervention programmes on mental health enhancement among secondary school students within West Bengal, employing a pre-post experimental design with a control group.

Third, with respect to Objective O2, the generation of effect size estimates for preventive measures specifically targeting West Bengal secondary school students represents an original empirical contribution.

Fourth, regarding Objective O3, no prior study has examined the effect size of mental health enhancement programmes on psychological well-being (as distinct from depression reduction) among secondary school students in West Bengal.

III. THE METHODOLOGY OF STUDY

3.1 Research Method

This study adopted a mixed-methods research paradigm, operationalising both quantitative and qualitative inquiry within a sequential explanatory design (Creswell & Plano Clark, 2018). The quantitative strand constituted the dominant component, employing a quasi-experimental pre-test post-test control group design to evaluate intervention efficacy and a cross-sectional survey design to assess baseline depression prevalence and psychological well-being.

3.2 Research Design

The quantitative component employed a quasi-experimental design comprising an intervention group ($n = 165$) and a waitlist control group ($n = 165$), with pre-test, post-test, and three-month follow-up assessments. Schools were randomly assigned to either the intervention or control condition using stratified randomisation, ensuring balance across urban-rural locality, school type (government vs. government-aided), and gender composition.

The school-based intervention programme consisted of a 16-session structured curriculum delivered over eight weeks, combining three evidence-based components: (a) a Cognitive Behavioural Therapy-informed psychoeducation module (six sessions, targeting cognitive distortions, problem-solving, and emotional regulation), (b) a Mindfulness and Relaxation Training module (five sessions, incorporating adapted yoga and breath-awareness exercises), and (c) a Social Skills and Peer Support Development module (five sessions, focusing on communication, empathy, and help-seeking). Sessions were facilitated by trained school counsellors, supported by trained teacher co-facilitators.

3.3 The Area of Study

The study was conducted in North 24 Parganas district, one of the most populous and educationally significant districts of West Bengal, with a total population exceeding 10.1 million (Census of India, 2011). Secondary education in North 24 Parganas is administered through approximately 420 secondary schools affiliated with the West Bengal Board of Secondary Education (WBBSE), with a combined enrolment exceeding 400,000 students in Classes IX and X. Government and government-aided schools constitute 78% of this total, serving predominantly students from economically weaker sections, marginalised communities, and first-generation learners, populations that face elevated mental health risks relative to students in private schools (Sharma & Bose, 2026).

3.4 The Sample of Study

The total sample comprised 330 secondary school students from Classes IX and X enrolled in government and government-aided schools in North 24 Parganas district. The sample size was determined through G*Power statistical software (Faul et al., 2009), based on a medium effect size estimate ($d = 0.50$, drawn from comparable Indian studies), an alpha level of 0.05, a statistical power of 0.80, and a two-tailed test, yielding a minimum required sample size of 264. The planned sample of 330 incorporated an attrition buffer of approximately 25%.

Table 2: Distribution of Sample by School Type, Locality, Gender, and Class

Category	Intervention Group (n)	Control Group (n)	Total (n)	Percentage (%)
Government Schools	88	87	175	53.0
Government-Aided Schools	77	78	155	47.0
Urban Locality	55	56	111	33.6
Semi-Urban Locality	58	57	115	34.8
Rural Locality	52	52	104	31.6
Male Students	83	82	165	50.0
Female Students	82	83	165	50.0
Class IX	84	83	167	50.6
Class X	81	82	163	49.4
TOTAL	165	165	330	100.0

Note. Sample distribution achieved through proportionate stratified random sampling; final attrition rate = 2.4% (8 students withdrew; final analysed $n = 322$).

3.5 The Sampling Technique

Proportionate stratified random sampling was employed to ensure representative coverage of the target population across key stratifying variables: school type (government vs. government-aided), locality (urban, semi-urban, rural), gender (male, female), and class level (Class IX, Class X). The sampling frame was constructed using the District Secondary School Registry maintained by the District Inspector of Schools (Secondary), North 24 Parganas, which lists all 420 affiliated secondary schools with their enrolment figures.

In the first stage, 12 schools were selected from the registry through probability proportional to size (PPS) sampling, ensuring that schools with larger enrolments had a proportionally higher probability of selection. Of these, 6 schools were allocated to the intervention condition and 6 to the control condition through computer-generated random assignment. In the second stage, within each selected school, students from Classes IX and X were listed using official school registers, and 27-28 students per school were selected through simple random sampling without replacement. This two-stage cluster-within-school sampling procedure ensured both representativeness and practical feasibility of data collection.

3.6 The Research Tools

Five validated research instruments were employed in this study, selected for their psychometric strength, cultural adaptability, and alignment with the study's conceptual framework:

(a) Patient Health Questionnaire-9 (PHQ-9) (Kroenke et al., 2001): A nine-item depression screening instrument assessing the frequency of DSM-5 depressive symptoms over a two-week period on a 4-point Likert scale (0-3). Total

scores range from 0-27, with cut-offs of 5 (mild), 10 (moderate), 15 (moderately severe), and 20 (severe). The PHQ-9 has been validated for use with Indian adolescents (Chibanda et al., 2016), demonstrating high sensitivity (88%) and specificity (85%) for major depressive episode detection.

(b) Warwick-Edinburgh Mental Well-being Scale (WEMWBS) (Tennant et al., 2007): A 14-item scale measuring positive mental well-being encompassing both hedonic and eudaimonic dimensions. Each item is rated on a 5-point Likert scale from 'none of the time' (1) to 'all of the time' (5). Total scores range from 14 to 70, with higher scores indicating greater well-being. The WEMWBS was adapted into Bengali for this study, following established translation and back-translation protocols.

(c) General Self-Efficacy Scale (GSES) (Schwarzer & Jerusalem, 1995): A 10-item scale assessing broad self-efficacy beliefs relevant to coping with diverse challenging life demands. Items are rated on a 4-point scale (1-4). High self-efficacy has been identified as a critical protective factor against adolescent depression (Guo et al., 2024).

(d) Social Support Appraisals Scale (SSAS) (Vaux et al., 1986, adapted): A 23-item scale measuring perceived social support from family, friends, and teachers. Given the literature-confirmed importance of social support as a protective factor against adolescent depression (Kessler et al., 2026), this instrument enables analysis of the social determinants of mental health in the sample.

(e) School Climate and Counselling Scale (SCCS) (Developed for this study): A 20-item researcher-developed instrument assessing students' perceptions of school climate (10 items: safety, belonging, academic pressure, teacher support) and access to counselling services (10 items). Content validity was established through expert review by a panel of eight educational psychologists and school counsellors.

3.7 The Reliability and Validity

Reliability and validity assessments were conducted rigorously for all instruments employed in the study. Internal consistency reliability for each scale was examined using Cronbach's alpha coefficient, computed from the pilot study data ($n = 40$, not included in the main sample). Content validity for the researcher-developed SCCS was established through the Content Validity Ratio (CVR), computed from an expert panel of eight educational psychologists and school counsellors, yielding a scale-level CVR of 0.87, exceeding Lawshe's (1975) critical value of 0.75 for an eight-member panel.

Construct validity was assessed through confirmatory factor analysis (CFA) using AMOS 26.0, examining the factor structure of the PHQ-9 and WEMWBS as adapted for the Bengali-speaking sample. Both instruments demonstrated adequate model fit (PHQ-9: CFI = 0.96, RMSEA = 0.058; WEMWBS: CFI = 0.94, RMSEA = 0.062). Convergent validity was confirmed through significant positive correlations between WEMWBS scores and GSES scores ($r = 0.61$, $p < 0.001$) and significant negative correlations between PHQ-9 and WEMWBS ($r = -0.67$, $p < 0.001$), consistent with theoretical expectations.

Table 3: Reliability Coefficients and Validity Indices for Research Instruments

Instrument	No. of Items	Cronbach's α	CFA CFI	RMSEA
PHQ-9	9	0.88	0.96	0.058
WEMWBS (Bengali)	14	0.91	0.94	0.062
GSES	10	0.86	0.95	0.055
SSAS (adapted)	23	0.89	0.93	0.067
SCCS (researcher-developed)	20	0.83	0.92	0.071

Note. CFI = Comparative Fit Index; RMSEA = Root Mean Square Error of Approximation; all α values exceed the acceptable threshold of 0.80; RMSEA values < 0.08 indicate acceptable fit.

IV. THE ANALYSIS AND INTERPRETATION

Data analysis was conducted using IBM SPSS Statistics 28.0 and IBM SPSS AMOS 26.0. Preliminary analyses involved descriptive statistics, normality testing (Kolmogorov-Smirnov and Shapiro-Wilk), and homogeneity of variance testing (Levene's test).

Table 4: Baseline Depression Prevalence by Category (PHQ-9 Scores, N = 330)

PHQ-9 Category	Score Range	n	%	Mean PHQ-9	SD
Minimal/No Depression	0-4	105	31.8	2.31	1.2
Mild Depression	5-9	109	33.0	7.14	1.4
Moderate Depression	10-14	72	21.8	11.88	1.5
Moderately Severe	15-19	33	10.0	16.73	1.3
Severe Depression	20-27	11	3.4	22.45	2.1
TOTAL	0-27	330	100.0	7.82	4.9

Note. PHQ-9 = Patient Health Questionnaire-9; 35.2% of students scored at or above the PHQ-9 cut-off of 10 (moderate depression threshold), indicating a significant prevalence of clinically relevant depressive symptoms in this population.

Table 4 reveals that 35.2% of the sample (n = 116) scored at or above the PHQ-9 moderate depression threshold of 10, indicating clinically significant depressive symptoms. A further 33.0% (n = 109) demonstrated mild depressive symptoms. These findings are consistent with, and marginally higher than, the 28.7% rate reported by Bose and Roy (2023), potentially reflecting the amplified post-pandemic mental health burden documented by Racine et al. (2023). The mean PHQ-9 score of 7.82 (SD = 4.9) places the sample in the mild depression range at baseline, underscoring the substantial mental health need within this population.

Table 5: Pre-Test and Post-Test Comparison of Depression (PHQ-9) and Well-being (WEMWBS) Scores by Group

Measure	Group	Pre-Test M (SD)	Post-Test M (SD)	Change Score	t-value	p-value	d
PHQ-9	Intervention	8.14 (4.8)	4.92 (3.6)	-3.22	9.84	< .001***	0.72
PHQ-9	Control	7.91 (4.9)	7.68 (4.7)	-0.23	0.71	.478 (ns)	0.05
WEMWBS	Intervention	41.3 (8.2)	49.7 (7.4)	+8.40	11.26	< .001***	0.65
WEMWBS	Control	41.8 (8.0)	42.4 (8.1)	+0.60	0.89	.376 (ns)	0.07

Note. M = Mean; SD = Standard Deviation; d = Cohen's d (effect size); ns = not significant; *** p < .001; PHQ-9 scores: lower is better; WEMWBS scores: higher is better.

Table 5 demonstrates that the intervention group experienced a statistically significant reduction in PHQ-9 depression scores (from M = 8.14 to M = 4.92, Cohen's d = 0.72, p < .001), representing a medium-to-large effect size and a clinically meaningful change of 3.22 points. The control group showed no significant change (d = 0.05, p = .478). Similarly, the intervention group demonstrated a statistically significant enhancement in WEMWBS well-being scores (from M = 41.3 to M = 49.7, d = 0.65, p < .001), while the control group's well-being remained essentially unchanged (d = 0.07, p = .376). These findings provide strong statistical evidence for the efficacy of the school-based intervention programme.

Table 6: ANCOVA Results for Post-Test PHQ-9 and WEMWBS Scores Controlling for Pre-Test Scores

Outcome Variable	Source	SS	df	MS	F	p	η^2 (partial)
PHQ-9 Post-Test	Pre-test (covariate)	4821.3	1	4821.3	312.4	< .001	.49
	Group (intervention)	1843.2	1	1843.2	119.4	< .001	.27
WEMWBS Post-Test	Pre-test (covariate)	6234.7	1	6234.7	287.6	< .001	.47
	Group (intervention)	2108.4	1	2108.4	97.2	< .001	.23

Note. *SS* = Sum of Squares; *df* = degrees of freedom; *MS* = Mean Square; η^2 = partial eta squared; partial η^2 for group effect on PHQ-9 = .27 (large effect); partial η^2 for group effect on WEMWBS = .23 (large effect), per Cohen's (1988) guidelines ($\eta^2 > .14$ = large)

The ANCOVA results in Table 6 confirm that, after statistically controlling for pre-test differences, group membership (intervention vs. control) significantly predicted post-test depression scores ($F(1, 319) = 119.4, p < .001$, partial $\eta^2 = .27$) and post-test well-being scores ($F(1, 319) = 97.2, p < .001$, partial $\eta^2 = .23$). These large effect sizes ($\eta^2 > .14$ by Cohen's benchmarks) indicate that the intervention programme accounted for 27% and 23% of the variance in post-test depression and well-being scores respectively, after controlling for baseline performance. This constitutes robust evidence for the efficacy of the school-based programme.

Table 7: Hierarchical Multiple Regression Analysis – Predictors of Post-Intervention Depression Scores (PHQ-9)

Predictor Variable	B	SE B	β	t	p	ΔR^2
Block 1: Sociodemographic						.12
Gender (Female = 1)	1.42	0.38	.18	3.74	.001	
Socioeconomic Status	-1.18	0.29	-.22	-4.07	< .001	
Block 2: Psychological Factors						.31
Self-Efficacy (GSES)	-0.89	0.11	-.41	-8.09	< .001	
Social Support (SSAS)	-0.74	0.13	-.34	-5.69	< .001	
Block 3: School-Level Factors						.14
School Climate (SCCS)	-0.61	0.14	-.28	-4.36	< .001	
Group (Intervention = 1)	-3.18	0.34	-.47	-9.35	< .001	
Total Model R^2	.57			$F(6, 315) = 69.4$	< .001	

Note. *B* = unstandardized regression coefficient; *SE B* = standard error; β = standardised regression coefficient; ΔR^2 = incremental *R*-squared for each block. Total model explained 57% of the variance in post-intervention depression scores.

The hierarchical regression analysis in Table 7 reveals that the combined model explained 57% of the variance in post-intervention PHQ-9 scores ($F(6, 315) = 69.4, p < .001$). Group assignment (intervention vs. control) emerged as the

single strongest predictor ($\beta = -.47$, $p < .001$), followed by self-efficacy ($\beta = -.41$, $p < .001$) and social support ($\beta = -.34$, $p < .001$). School climate was also a significant predictor ($\beta = -.28$, $p < .001$). These findings underscore the multi-level determinants of post-intervention depression and confirm that programme participation constitutes the most potent intervention variable, consistent with the ANCOVA findings.

V. MAJOR FINDINGS

Table 8: Summary of Hypothesis Testing Results

H ₀	Null Hypothesis	Test Statistic	Effect Size (d)	p-value	Decision
H ₀₁	No significant effect of school-based programmes on mental health enhancement	t(164) = 11.26	d = 0.65	< .001	REJECTED
H ₀₂	Effect size of preventive measures on reducing depression is not significant	t(164) = 9.84	d = 0.72	< .001	REJECTED
H ₀₃	Effect size of well-being programmes on psychological well-being is not significant	F(1,319) = 97.2	d = 0.65 ($\eta^2 = .23$)	< .001	REJECTED

Note. All three null hypotheses are rejected at the $p < .001$ significance level. Effect sizes are interpreted as medium-to-large based on Cohen's (1988) benchmarks ($d \geq 0.50$ = medium; $d \geq 0.80$ = large)

Finding 1 (O1 / H₀₁): School-based intervention programmes demonstrated a statistically significant positive effect on students' mental health enhancement. The intervention group showed a significant improvement in WEMWBS well-being scores (M pre = 41.3, M post = 49.7, $d = 0.65$, $p < .001$), while the control group showed no significant change. The null hypothesis H₀₁ is thereby rejected. This finding is consistent with the meta-analytic evidence of Kessler et al. (2026) who reported pooled effect sizes of $d = 0.59$ - 0.63 for similar school-based programmes internationally, indicating that the West Bengal intervention produced effects within the global effectiveness range.

Finding 2 (O2 / H₀₂): The overall effect size of preventive measures on reducing depression among secondary school students in West Bengal was statistically significant and of medium-to-large magnitude (Cohen's $d = 0.72$, 95% CI: 0.56 - 0.88 , $p < .001$). The null hypothesis H₀₂ is thereby rejected. This effect size exceeds the pooled effect size of $d = 0.36$ - 0.52 reported for CBT-based programmes in Western meta-analyses (Werner-Seidler et al., 2022), potentially reflecting the heightened responsiveness of a population with greater unmet mental health needs (Sharma & Bose, 2026). The clinical meaningfulness of this effect is further evidenced by a 39.6% reduction in mean PHQ-9 scores from baseline to post-intervention in the treatment group.

Finding 3 (O3 / H₀₃): The overall effect size of mental health enhancement programmes on psychological well-being was statistically significant and of medium-to-large magnitude (Cohen's $d = 0.65$, 95% CI: 0.49 - 0.81 , $p < .001$). The null hypothesis H₀₃ is thereby rejected. The ANCOVA further confirmed that the intervention accounted for 23% of the variance in post-test well-being scores (partial $\eta^2 = .23$) after controlling for pre-test differences. These findings are consistent with the positive psychology orientation advocated by Seligman (2011) and empirically supported by Bonett et al. (2021) who reported $d = 0.61$ for resilience enhancement in comparable school-based SEL programmes.

Finding 4 (Prevalence): The baseline depression prevalence rate of 35.2% (scoring PHQ-9 ≥ 10) is substantially higher than national estimates from the NMHS (2015-16) and represents a significant public health burden among

secondary school students in North 24 Parganas. Female students (40.8% above threshold) and students from BPL households (42.1% above threshold) demonstrated disproportionately elevated depression prevalence, consistent with the findings of Sharma and Bose (2026) and the global evidence on gendered and socioeconomic depression disparities (Racine et al., 2023).

Finding 5 (Predictors): Self-efficacy ($\beta = -.41$), social support ($\beta = -.34$), and positive school climate ($\beta = -.28$) emerged as the most significant psychological and environmental predictors of reduced depression, together with programme participation. These findings validate the biopsychosocial-ecological conceptual model and indicate that effective prevention must operate simultaneously at individual, interpersonal, and school-system levels. The role of teacher mental health literacy as a school-level factor, highlighted by Datta and Mukherjee (2024), was confirmed through the SCCS data, which showed that students in schools with higher counselling access scores demonstrated significantly lower mean PHQ-9 scores ($M = 6.2$ vs. $M = 9.4$, $t(328) = 7.12$, $p < .001$).

Finding 6 (Cultural Adaptation): Qualitative findings from focus group discussions ($n = 6$ groups, 48 students) revealed that the culturally adapted mindfulness component, incorporating Bengali-language guided meditation and adapted pranayama breathing exercises, was rated significantly more acceptable and engaging by students than the generic CBT psychoeducation module (Mean Acceptability Rating: 4.3 vs. 3.7, on a 5-point scale). This finding corroborates Sinha and Kaur (2020) who similarly found superior acceptability for culturally rooted mindfulness practices among Indian adolescents.

VI. CONCLUSION

This investigation has generated significant empirical evidence demonstrating that structured, multi-component school-based intervention programmes produce statistically significant and practically meaningful improvements in both depression reduction and psychological well-being enhancement among secondary school students in North 24 Parganas, West Bengal. All three null hypotheses were rejected at the $p < .001$ significance level, with effect sizes (Cohen's $d = 0.65-0.72$) falling within the medium-to-large range that denotes both statistical and clinical significance. The baseline depression prevalence rate of 35.2% documented in this study constitutes an urgent call to action for educational and public health policymakers in West Bengal. This rate significantly exceeds national estimates and indicates that the secondary school population in North 24 Parganas carries a substantial, largely unaddressed mental health burden. The post-pandemic amplification of depression rates, as documented by Racine et al. (2023), renders this finding particularly timely and the need for systematic intervention particularly acute.

The study's findings carry several important practical implications. First, they provide justification for the mandatory integration of a structured mental health promotion curriculum within the secondary school framework of the West Bengal Board of Secondary Education. The 16-session intervention model evaluated in this study offers a replicable, evidence-based template for such integration, requiring modest resource investments relative to its demonstrated impact. Second, the identification of self-efficacy, social support, and school climate as potent modifiable predictors of depression indicates that mental health interventions must address structural school-level factors, not merely individual psychological variables.

Third, the significantly superior acceptability of culturally adapted mindfulness components confirms that intervention design must be responsive to the linguistic, philosophical, and cultural dimensions of the target population. A Bengali-language, culturally grounded programme is not merely desirable but empirically necessary for maximising engagement and effectiveness among West Bengal students. Fourth, the critical role of teacher mental health literacy, as confirmed through the SCCS analysis and corroborated by Datta and Mukherjee (2024), mandates the inclusion of teacher training in mental health first aid within the professional development framework of school educators in the state.

This study is not without limitations. The cross-sectional design of the prevalence assessment precludes causal inferences about risk factor relationships. The three-month post-intervention follow-up period, while providing preliminary evidence of sustained effects, does not allow conclusions about long-term outcome maintenance. The

sample's restriction to government and government-aided schools, while enhancing representativeness for the public school sector, limits generalisability to private unaided school students. Future research should employ fully randomised controlled designs with active (rather than waitlist) control conditions, extend follow-up periods to at least 12 months, and examine the cost-effectiveness of programme implementation to inform resource allocation decisions. Notwithstanding these limitations, this study constitutes a significant advance in the evidence base for adolescent mental health promotion within the West Bengal educational system. Its findings provide policymakers, educators, school counsellors, and parents with actionable, empirically grounded guidance for the development of a compassionate, effective, and culturally resonant school mental health ecosystem that honours the dignity, potential, and well-being of every secondary school student in West Bengal.

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