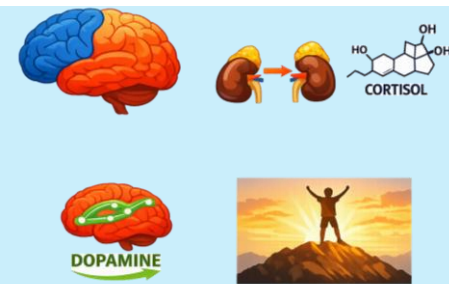


From Vulnerability to Resilience: Understanding Adolescent Brain, Behavior, and Risk Pathways in NCD Prevention

Background

Adolescence is a sensitive neurodevelopmental stage characterized by immaturity of the prefrontal cortex, heightened limbic reactivity, and ongoing identity formation. These biological and psychosocial transitions increase susceptibility to behavioural risk factors for non-communicable diseases (NCDs), including unhealthy diet, physical inactivity, and substance use. Stress responses mediated by the hypothalamic–pituitary–adrenal (HPA) axis and altered reward processing in the mesolimbic dopamine system further amplify vulnerability. Yet adolescence also offers a window for resilience, where protective factors can redirect trajectories toward healthier outcomes.



Aim

To design, implement, and evaluate a school-based Social Cognitive Theory (SCT)-driven behavioural change intervention that reduces NCD risk factors among adolescents, while examining neurobiological and psychosocial mechanisms of vulnerability and resilience.

Conclusions

This study demonstrates that adolescence is a second window of prevention where neurodevelopmental vulnerabilities can be counterbalanced by resilience-building interventions. Embedding SCT-based SBCC within schools cultivates self-regulation, emotional resilience, and health-promoting behaviours. Integrating vulnerability–resilience frameworks into adolescent health programming offers scalable strategies to reduce NCD burden and aligns with global priorities for prevention and resilience.

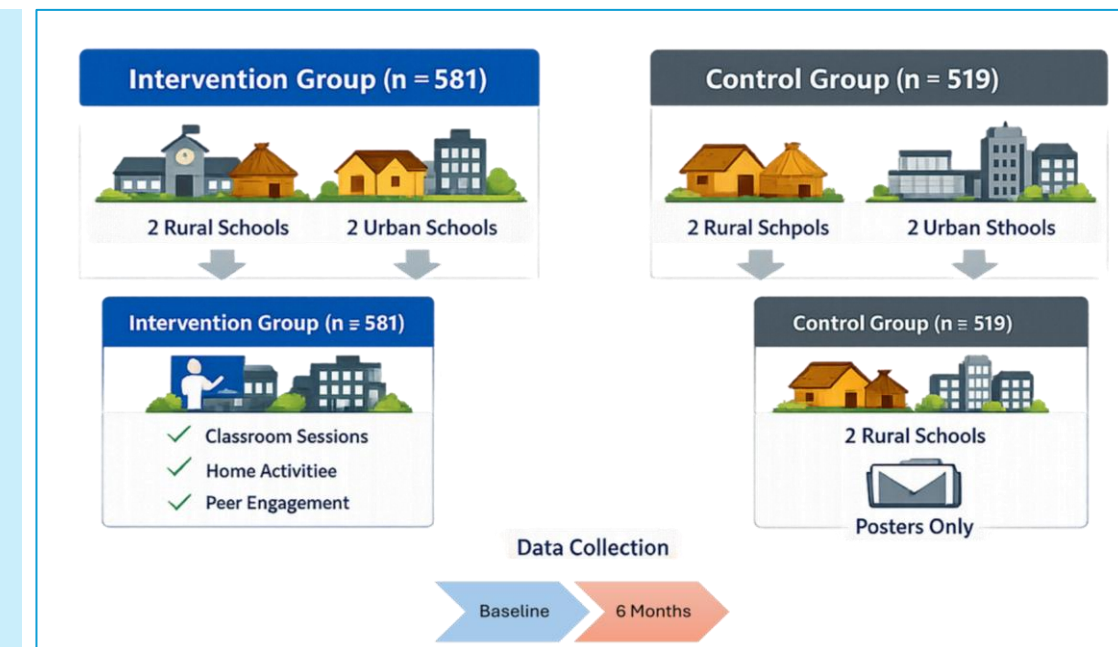
Methods

Design: Mixed-methods

Participants: 1,100 adolescents (13–16 years)

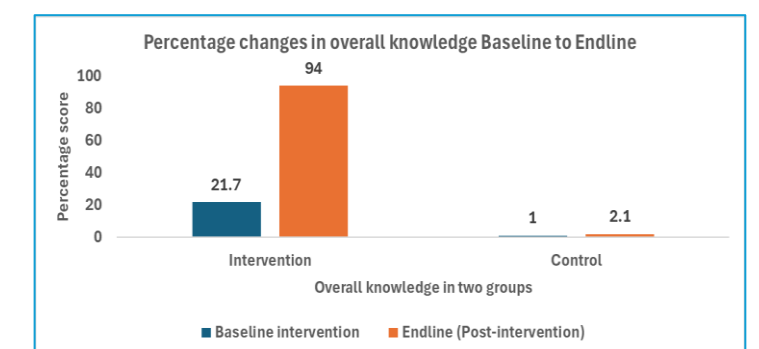
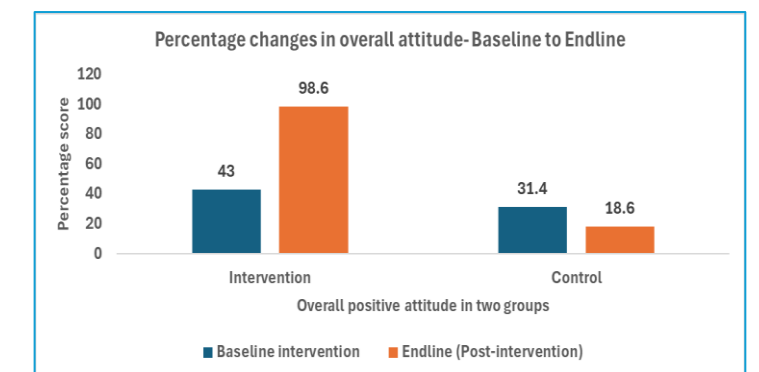
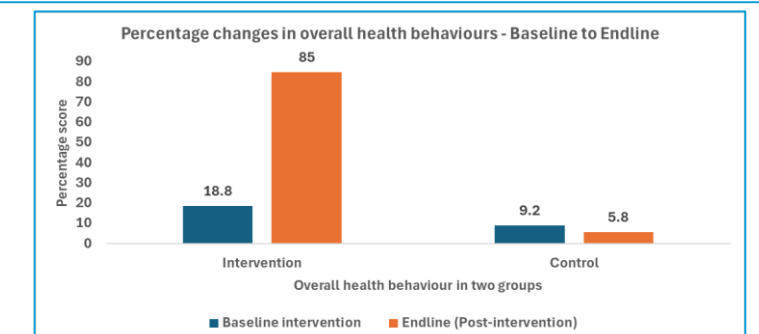
Quantitative data collected at baseline and six months - analysed using RMANOVA.

Qualitative data from focus group discussions were thematically analysed to contextualise behavioural outcomes.



Results

The intervention group showed significant improvements in knowledge (21.7% to 94.0%), attitudes (43.0% to 98.6%), and healthy behaviours (18.8% to 85.0%) compared to controls ($p = 0.001$). RMANOVA confirmed gains in mean scores for knowledge ($F = 643.7$), attitudes/self efficacy ($F = 741.0$), and behaviour practice ($F = 523.5$). Qualitative findings revealed that self efficacy, personal health goals, and family involvement acted as resilience drivers, while peer pressure shifted from a barrier to a facilitator through group reinforcement.



Conflict of Interest: The authors report no conflicts of interest.

Funding: This project was self-funded.

Author: Dr. Tejaswini B Darukaradhy, M.S Ramaiah University of Applied Sciences, Bengaluru, Karnataka, India