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Machine Learning Classification of Suicidal Ideation in Adolescents with Attention-Deficit/Hyperactivity Disorder: A Random Forest Approach Incorporating Impulsivity, Emotional Dysregulation, and Family Cohesion

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1. Round 1

1.1. Reviewer 1

Reviewer:

In the paragraph stating “ADHD constitutes an independent risk factor for suicidal thoughts and behaviors across developmental stages”, the authors should further elaborate on the theoretical pathways through which ADHD contributes to suicidality. Specifically, a conceptual model linking executive dysfunction, emotional dysregulation, impulsivity, and suicidal ideation would help readers understand the hypothesized mechanisms underlying the machine learning framework.

The paragraph beginning with “Impulsivity has consistently emerged as one of the most important psychological characteristics linking ADHD and suicidality” discusses impulsivity as a multidimensional construct, yet the analyses only use a total BIS-11 score. The authors should justify the decision to exclude attentional, motor, and non-planning impulsivity subscales, or alternatively explore whether specific impulsivity dimensions contribute differently to model performance.

In the Data Analysis section, the sentence “Continuous predictor variables were standardized to facilitate model stability and interpretation” requires further justification. Random Forest algorithms are generally insensitive to variable scaling. The authors should explain the purpose of standardization in this context and discuss whether model performance differed before and after preprocessing.

The manuscript states that “Hyperparameter optimization was performed using grid search techniques.” However, no information is provided regarding the search space, selected hyperparameters, or optimal parameter values. Reporting these details is essential for reproducibility and would allow readers to assess the robustness of the final model configuration.

In Table 1, the correlation between emotional dysregulation and suicidal ideation is reported as r = .67. Given the strength of this association, the authors should evaluate potential multicollinearity among predictors and report variance inflation factors or alternative diagnostics. Although Random Forest models can tolerate correlated predictors, high intercorrelations may affect feature importance rankings.

Authors revised the manuscript and uploaded the document.

1.2. Reviewer 2

Reviewer:

In the section discussing emotional dysregulation, the statement “emotional dysregulation may therefore serve as a key mechanism linking neurodevelopmental vulnerabilities to suicidal outcomes” is theoretically important. However, the manuscript does not test this proposition directly. The authors should consider discussing whether mediation or interaction analyses were explored prior to model construction, particularly given the strong correlation between emotional dysregulation and impulsivity.

The paragraph beginning with “Family functioning represents another important domain influencing adolescent mental health and suicide risk” appropriately emphasizes family cohesion; however, family cohesion is only one dimension of family functioning. The authors should explain why cohesion was selected over related constructs such as adaptability, parental monitoring, family communication, or family conflict, all of which have established associations with suicidality.

In the final paragraph of the Introduction, the authors identify a research gap by stating “there remains a notable gap concerning the combined predictive contribution of impulsivity, emotional dysregulation, and family cohesion within a robust machine learning classification model.” This claim should be supported by a more systematic review of prior machine learning studies in suicidality. A summary table comparing previous models, predictors, algorithms, and predictive accuracies would strengthen the novelty argument.

In the Methods section, the sentence “A total of 482 adolescents were recruited using a stratified cluster sampling approach” requires additional detail. The manuscript should specify the clustering units, stratification criteria, recruitment locations within each province, and whether sampling weights were considered. These details are necessary for evaluating representativeness and potential sampling bias.

The eligibility criteria paragraph states that participants with “incomplete questionnaire responses exceeding 10% of total items were excluded from the study.” The rationale for selecting the 10% threshold should be justified. Additionally, the authors should report the number of excluded participants for each exclusion criterion and provide a participant flow diagram consistent with reporting standards.

In the Measures section, the description of the SIQ-JR notes that “participants scoring above the recommended cutoff point were classified as exhibiting significant suicidal ideation.” The manuscript should explicitly report the cutoff score used, cite the corresponding validation study, and explain whether the threshold has been validated specifically in Canadian adolescents with ADHD.

The paragraph describing the FACES-IV instrument states that “Participants responded to 21 items.” The authors should clarify whether only the cohesion subscale was administered or whether the full instrument was completed and subsequently reduced. This distinction is important because psychometric properties may differ depending on administration procedures.

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2. Revised

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