

## Relationship between Glycated Hemoglobin in Adolescents with Type 1 Diabetes Mellitus and Parental Anxiety and Depression

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**Abstract :** Background: Type 1 diabetes mellitus (T1D) is the most common chronic endocrine pathology in children. The management of type 1 diabetes requires a strong diet, physical activity, lifelong insulin therapy, and proper self-monitoring of blood glucose and is usually complicated and, therefore, may result in a variety of psychosocial problems for children, adolescents, and their families. Metabolic control of the disease is determined by glycated haemoglobin (HbA1c), the main criterion for diabetes compensation. A correlation was observed between anxiety and depression levels and glycaemic control in many previous studies. It is assumed that anxiety and depression symptoms negatively affect glycaemic control. Parental psychological distress was associated with higher child self-report of stress and depressive symptoms, and it had negative effects on diabetes management. Objective: The main objective of this paper is to evaluate the relationship between parental mental health conditions (depression and anxiety) and metabolic control of their adolescents with T1DM. Methods: This cross-sectional study recruited adolescents with T1D (N=251) and their parents (N=251). The respondents completed questionnaires. The 7-item Generalized Anxiety Disorder (GAD-7) scale measured anxiety level; The Patient Health Questionnaire - 9 (PHQ-9) measured depressive symptoms. Glycaemic control of patients was assessed using the last glycated haemoglobin (HbA1c) values. GLM mediation analysis was performed to determine the potential mediating effect of the parent's mental health conditions (depression and anxiety) on the relationship between the mental health conditions (depression and anxiety) of a child on the level of glycated hemoglobin (HbA1c). To test the significance of the mediated effect (ME) for non-normally distributed data, bootstrapping procedures (10,000 bootstrapped samples) were used. Results: 502 respondents were eligible for screening to detect anxiety and depression symptoms. Mediation analysis was performed to assess the mediating role of parent GAD-7 on the linkage between a dependent variable (HbA1c) and independent variables (child GAD-7 un child PHQ-9). The results revealed that the total effect of child GAD-7 ( $B = 0.479, z = 4.30, p < 0.001$ ) on HbA1c was significant but the total effect of child PHQ-9 ( $B = 0.166, z = 1.49, p = 0.135$ ) was not significant. With the inclusion of the mediating variable (parent GAD-7), the impact of child GAD-7 on HbA1c was found insignificant ( $B = 0.113, z=0.98, p = 0.326$ ), the impact of child PHQ-9 on HbA1c was found also insignificant ( $B = 0.068, z=0.74, p = 0.458$ ). The indirect effect of child GAD-7 on HbA1c through parent GAD-7 was found significant ( $B = 0.366, z = 4.31, p < 0.001$ ) and the indirect effect of child PHQ-9 on HbA1c through parent GAD-7 was found also significant ( $B = 0.098, z = 2.56, p = 0.010$ ). This indicates that the relationship between a dependent variable (HbA1c) and independent variables (child GAD-7 un child PHQ-9) is fully mediated by parent GAD-7. Conclusion: The main result suggests that glycated haemoglobin in adolescents with Type 1 diabetes is related to adolescents' mental health via parents' anxiety. It means that parents' anxiety plays a more significant role in the level of glycated haemoglobin in adolescents than depression and anxiety in the adolescent.

**Keywords :** type 1 diabetes, adolescents, parental diabetes-specific mental health conditions, glycated haemoglobin, anxiety, depression

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