Elevated Anxiety Levels Associated with Higher A1cs

Margaret Gillis, BS[1]; Emma Ospelt, MPH[1]; Saketh Rompicherla, MS[1]; Ann Mungmode, MPH[1]; Nicole Rioles, MA[1]; Alissa Roberts, MD[2]; Caleb Schmid, MD[3]; Tamara Hannon, MD[4]; G. Todd Alonso, MD[5]; Osagie Ebekozien, MD, MPH[1,6]

1) T1D Exchange, Boston, MA , 2) Seattle Children's Hospital, Seattle, WA, 3) Oregon Health and Sciences University, Portland, OR, 4) University of Indiana School of Medicine, Indianapolis, IN, 5)University of Colorado, Barbara Davis Center, Aurora, CO, 6) University of Mississippi School of Population Health, Jackson, MS

Background

- Multi-center study aims to investigate association between anxiety and glycemic outcomes for people with type 1 diabetes
- The generalized anxiety disorder scale (GAD-7) is a 7-question anxiety screener with scores 0-21. Anxiety scores were categorized thus: 0-4 minimal; 5-9 mild; 10-14 moderate; 15-21 severe[1]

Methods

- Electronic medical record (EMR) data from April 2017-June 2023 was analyzed
- 738 distinct people with type 1 diabetes (PwT1D) from 9 clinics with ages ranging between 12-75 years
- Anxiety was classified as minimal vs elevated (Mild, moderate, and severe)
- Most recent GAD-7 score was used along with a corresponding A1c
- Chi-square test and Fisher's Exact test were used to see significant differences between the two groups.
- Logistic regression was used with A1c < 7% and > 9% as the binary outcome and anxiety level as the predictor variable for an unadjusted model and an adjusted model with variables for race/ethnicity, insurance type, gender, and device use

References

1. Sapra A, Bhandari P, Sharma S, Chanpura T, Lopp L. Using Generalized Anxiety Disorder-2 (GAD-2) and GAD-7 in a Primary Care Setting. Cureus. 2020 May 21;12(5):e8224. doi: 10.7759/cureus.8224. PMID: 32582485; PMCID: PMC7306644.
2. Herzer M, Hood KK. Anxiety symptoms in adolescents with type 1 diabetes: association with blood glucose monitoring and glycemic control. J Pediatr Psychol. 2010 May;35(4):415-25. doi: 10.1093/jpepsy/jsp063. Epub 2009 Aug 14. PMID: 19684117; PMCID: PMC2858435
3. Rechenberg K, Whittemore R, Grey M. Anxiety in Youth With Type 1 Diabetes. J Pediatr Nurs. 2017 Jan-Feb;32:64-71. doi: 10.1016/j.pedn.2016.08.007. Epub 2016 Sep 20. PMID: 27663096; PMCID: PMC5743322.

Results

Table 1. Comparison of elevated and minimal anxiety groups

	Minimal Anxiety (N=379)	Elevated Anxiety (N=359)	p-value
Mean Age (SD)	21 (9.6)	21 (8.5)	
Age Category (Years) – n (%)			
12-17 years	110 (29)	126 (35)	0.09
18-24 years	234 (62)	200 (56)	0.11
25-75 years	35 (9)	33(9)	1
Gender – n (%)			
Male	206 (54)	120 (33)	< 0.01
Female	173(46)	239 (67)	< 0.01
Race/Ethnicity- n (%)			
NH White	263 (69)	242 (67)	0.62
NH Black	60(16)	81(23)	0.03
Hispanic	29 (8)	20 (6)	0.32
Other	21 (6)	12 (3)	0.20
Insurance Type- n (%)			
Public	133 (35)	120 (33)	0.69
Private	190(50)	181(50)	1
Other	23 (6)	23 (6)	0.97
Mean A1c (SD)	8.6 (2.1)	9 (2.3)	
Median A1c (IQR)	8 (2.7)	8.6 (3)	
A1c <7%- n (%)	76 (20)	69 (19)	0.85
A1c >9%- n (%)	115 (30)	148 (41)	< 0.01
CGM- n (%)	252 (67)	215 (60)	0.08
Insulin Pump – n (%)	185(49)	165(46)	1
DKA- n (%)	30 (8)	34(10)	0.53
SH- n (%)	0 (0)	3 (.84)	0.12

- Individuals with A1c >9% made up a significantly greater portion (p < 0.01) of the elevated anxiety group (41%) vs. minimal anxiety (30%) (Table 1).
- Anxiety level was not significantly associated with odds of A1c < 7% in the unadjusted and adjusted models (Table 2).

Table 2: Factors Associated with Glycemic Outcomes (A1c<7%) in PwT1D

Model A*	OR (95%CI)	p-value	Model B*	OR (95%CI)	p-value
minimal anxiety (ref)	-		minimal anxiety (ref)	-	
elevated anxiety	0.94 (0.65,1.35)	0.74	elevated anxiety	0.89 (.56,1.43)	0.63

*Model A is the unadjusted model and Model B is the adjusted model for race/ethnicity, insurance type, gender, device use.

- Odds ratio (OR) is >1 for both the unadjusted and adjusted model, showing that PwT1D in the elevated group have increased odds of having an A1c >9% compared to the minimal anxiety group (Table 3).

Table 3: Factors Associated with Glycemic Outcomes (A1c>9%) in PwT1D

Model A*	OR (95%CI)	p-value	Model B*	OR (95%CI)	p-value
minimal anxiety (ref)	-		minimal anxiety (ref)	-	
elevated anxiety	1.60 (1.18,2.17)	0.02	elevated anxiety	1.86 (1.19,2.85)	< 0.01

*Model A is the unadjusted model and Model B is the adjusted model for race/ethnicity, insurance type, gender, device use.

Conclusions

- PwT1D and elevated anxiety levels showed higher A1c levels compared to those with minimal anxiety, supported findings are in existing literature.[2,3]
- Further analysis should be done to determine a causal relationship between anxiety and glycemic outcomes, as stated in existing literature.[3]
- Prospective research should be done to find effective post screening interventions in people with T1D.

Acknowledgements