



Depression in Adolescents with Type 2 Diabetes (T2D) and Obesity Attending a Multidisciplinary Tertiary Care (MTC) Clinic



Sahitya Talachutla, MSIV, Samantha Bothwell, MS, Lauren D. Gulley, Ph.D., Megan M. Kelsey, MD, MS, Lauren B. Shomaker, Ph.D., and Elizabeth B. Ruzicka, Ph.D. *University of Colorado School of Medicine, Aurora, CO 80045*

Objective

T2D incidence has risen ~5% per year in adolescents over the past decade. Comorbidities are common, requiring MTC that addresses medication, health behaviors, and mental health. Clinical guidelines recommend depression monitoring, but depression in relation to health indices (e.g., HbA1c, lipids) in adolescents with T2D attending MTC is not well characterized. Furthermore COVID-19 especially affected the population, leading to many adolescents presenting in DKA. **We aimed to characterize depression and in-clinic psychology contact in relation to health indices in youth with T2D and obesity presenting to MTC clinic.** We further attempted to characterize how youth attending the MTC clinic were affected during COVID-19 by differentiating health indices and depression prior-to and during/after the COVID-19 pandemic.

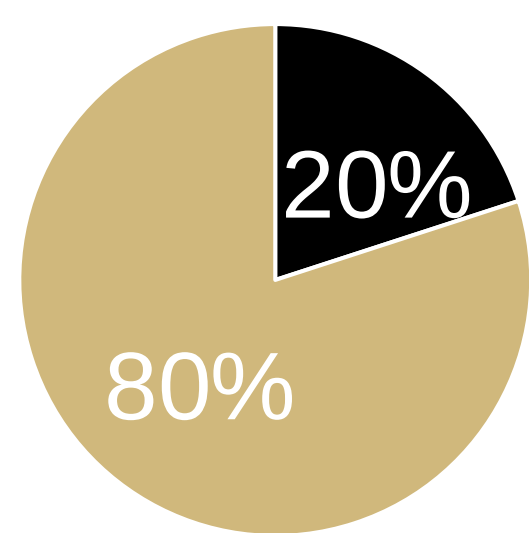
Background

Statistics on T2D, Obesity, and Depression in Adolescents

- 95% Relative Increase in T2DM in adolescents from 2001 to 2017
- Obesity rates dramatically increased over the past 50 years, and severe obesity (BMI > 99%) increasing more recently (1/5 meet class I criteria)

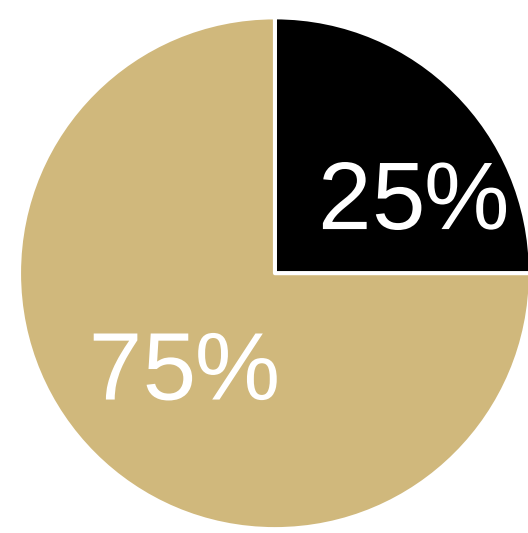
Depression in Adolescent T2D and Obesity

Adolescents with T2D



■ Depression
■ No Depression

Adolescents with Obesity



■ Depression
■ No Depression

Figure 1. Rates of depression in adolescents with T2D and obesity. NHANES III data demonstrate 20% depression rate for boys with obesity and 30% for girls. Rates of depression vary in T2D with one estimate at 19% in MTC academic centers, with 19% endorsing self harm.

Depression and T2D-related Health Indices (e.g. HbA1c, Lipids)

- Depression related to worse T2D-related health in adults
- ADA clinical guidelines recommend screening for depression and addressing depression as indicated
- Depression is related to worsening A1c levels, but other associated health outcomes have not been explored in adolescent patients presenting for MTC
- COVID-19 was predicted to have worsening health outcomes on patients including depression and possibly worse glycemic control.

Hypothesis

In adolescents ages 12-18 yrs, depression, as measured by the 20-item Center for Epidemiologic Studies-Depression Scale (CES-D), will be associated with worse health indices including hyperlipidemia and worsening HbA1c.

Methodology

Retrospective Chart Review: Youths ages 12-18 yrs with T2D at MTCs visits at a pediatric hospital from January 1st, 2016 – December 31st, 2021. Depression was assessed in all patients via CES-D score. Presence/absence of contacts with an MTC psychologist were determined for all patients. A1c and lipid panel information was recorded when obtained for each MTC visit during this time.

Methodology

Statistical Analysis: Health indices, including HbA1c, total cholesterol, LDL cholesterol, and HDL cholesterol, were extracted from initial clinic visit. Fisher's exact (for categorical variables) t, t-tests, or Wilcoxon Rank Sum tests (for continuous variables) were used to describe associations of depression with PC and health indices.

Inclusion Criteria: Patients ages 12-18 attending the MTC clinic were included. Diagnosis of T2D was made based on ADA criteria (HbA1c $\geq$ 6.5%, fasting plasma glucose $\geq$ 126 mg/dl or random/2-hour glucose $\geq$ 200 mg/dl). If unequivocal hyperglycemia was not present, diagnosis is made with confirmatory testing. Type 1 diabetes was excluded based on the absence of 4 pancreatic autoantibodies.

Definitions

- CES-D < 16:** No to Low Depression Symptoms
- CES-D 16 -19:** Mild Depression Symptoms
- CES-D $\geq$ 20:** Moderate to Severe Depression Symptoms

Results

Demographics: $N=126$ adolescents ($M_{age} \pm SD$ 15 $\pm$ 2 yrs) with T2D (onset age 13 $\pm$ 3 yrs). Majority (**73%**) were screened for depression in first or second MTC visit. Of those, **21%** reported mildly elevated symptoms (CES-D16-19); **27%** had moderately elevated symptoms (CES-D $\geq$ 20). The vast majority (**93%**; $n=117$) of patients saw a clinic psychologist at the first or second MTC visit.

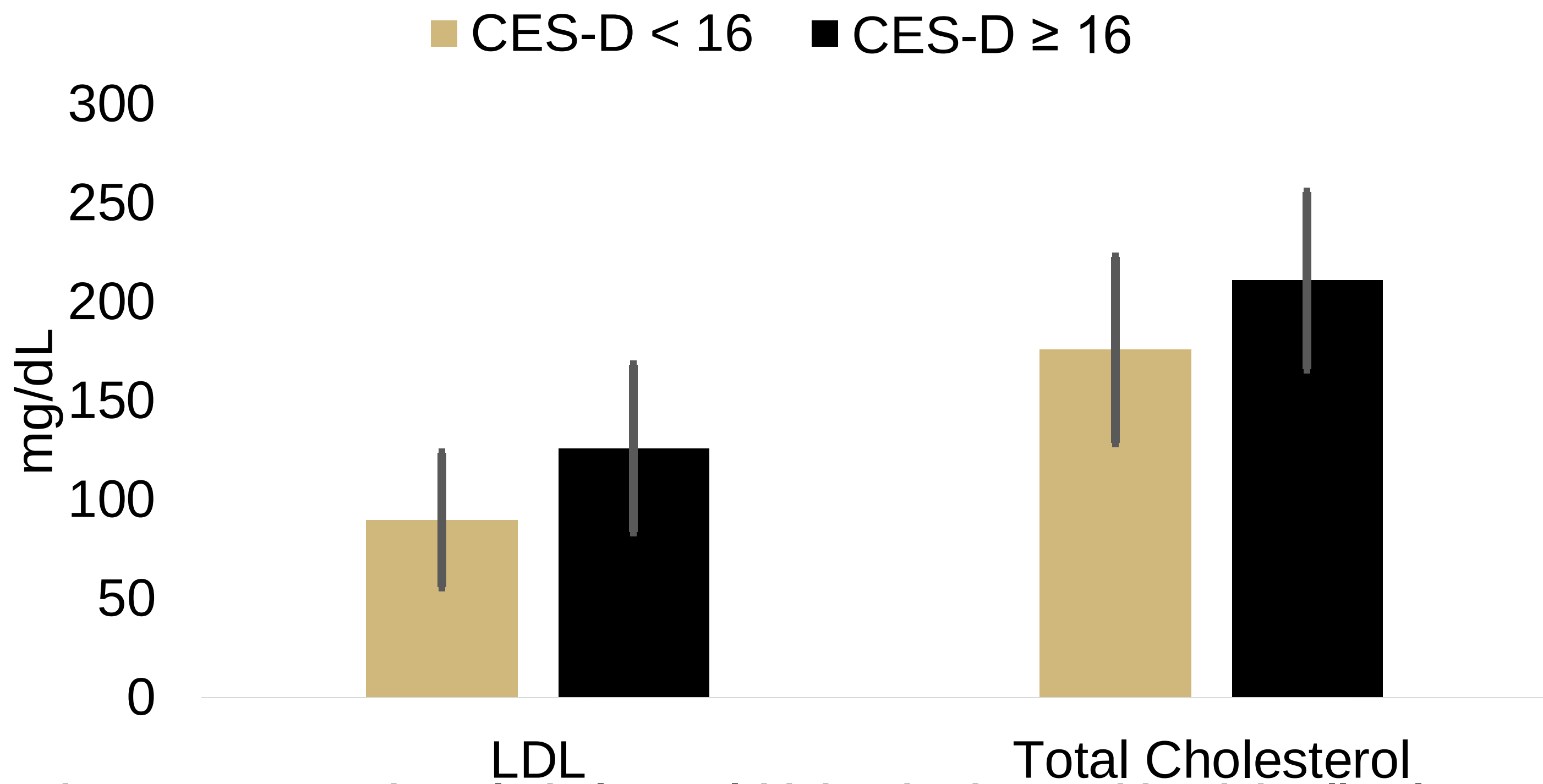


Figure 2. LDL and total cholesterol higher in those with minimally elevated depression or higher. Youths with CES-D $\geq$ 16 had higher LDL (126 $\pm$ 42 vs 90 $\pm$ 34 mg/dL and total cholesterol (211 $\pm$ 45 vs 176 $\pm$ 47mg/dL, $p<.01$) than those with no-to-mild symptoms. Gender, Psych contacts, race and language preference were similar across groups.

HbA1c and Triglycerides: HbA1c (9 $\pm$ 3%) and triglycerides (253 $\pm$ 191 mg/dL) were elevated in all patients, regardless of depression symptoms status.

Psychological Contacts and Depression: Psychology contact was more likely for those with CES-D $\geq$ 16 ($X^2=6.97$, $p<.01$). There were fewer total psychological contacts from before to during COVID-19 (2 [1, 3.75] vs. 1 [0, 2], $p = 0.01$).

COVID-19 impacts on the MTC clinic: There were no significant differences in HbA1c, BMI z-score, total cholesterol, triglycerides, LDL, or other health indicators. Likewise, CES-D scores were similar among adolescents seen before and during/after COVID-19 (16.8 $\pm$ 10.4 vs 17.6 $\pm$ 12.2, $p = 0.93$).

Depression and BMI: BMI z-score was also similar across adolescents by depression status (2.27 $\pm$ 0.465 vs 2.22 $\pm$ 0.406, $p = 0.55$).

Results

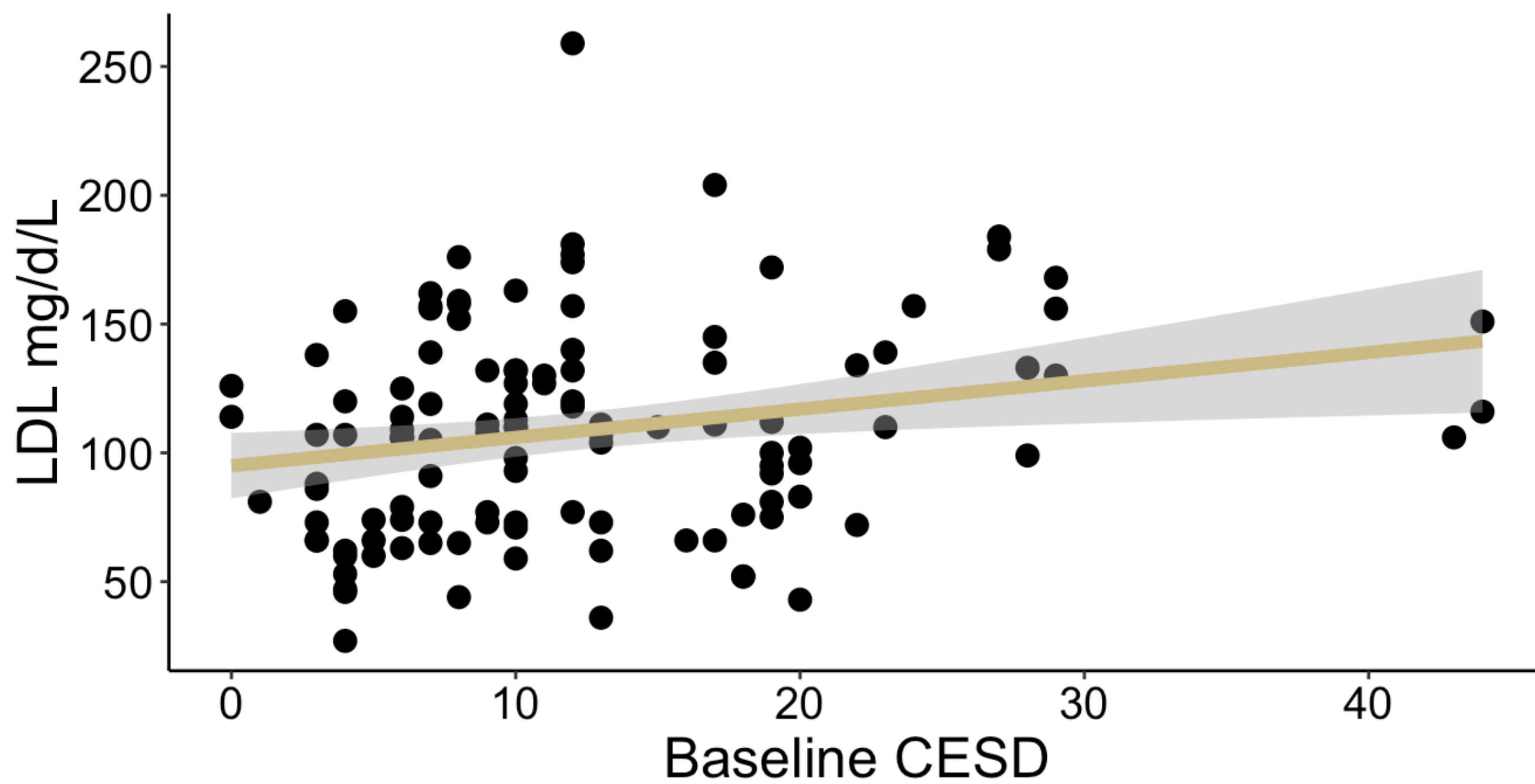


Figure 3. CES-D Score and LDL associated in adolescents with T2D, $p = 0.028$, $\beta = 1.1$ (95% CI : 0.12, 2.1), indicating that greater depression symptoms related to higher (worse) LDL cholesterol. Gender, Psych contacts, race and language preference were similar across groups.

Discussions/Conclusion

Conclusions

- Depression relates to elevations in LDL and total cholesterol among adolescents seeking MTC for T2D
- Depression screening with timely psychology contact is feasible in youth with T2D within an MTC clinic context

Limitations of Study

- Cannot determine directionality of associations among depression, T2D-related health indices, and psychology contact
- Association of Depression and HbA1c conclusions are limited given many patients presented with recent T2D diagnoses, which would not reflect barriers to effective treatment.
- Outcomes were not stratified based on different treatment modalities.

Future Directions

- Disentangle time-ordered effects of depression and T2D-related health comorbidities
- Experimentally test if depression treatment improves adolescent T2D health
- Re-evaluate HbA1c levels and depressive symptoms at minimum 6 months after diagnosis to determine relationship more clearly.
- Consider if data differs across different treatment modalities.

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