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The Impact of Adverse Childhood Experiences on Type 2 Diabetes Mellitus and the Role of

Early Intervention

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TITLE

The title for this project is: The Impact of Adverse Childhood Experiences on Adult-onset Type II Diabetes Mellitus and the Role of Early Intervention.

ABSTRACT

Purpose: The purpose of this article is to provide an understanding of negative health effects of adverse childhood experiences (ACEs) on Type II Diabetes Mellitus and the role of primary healthcare providers in decreasing morbidity and mortality through screening and intervention.

Method: A literature search was conducted through PubMed, EBSCO, ProQuest Education and PLOS ONE using keywords such as: adverse childhood experiences (ACEs), type 2 diabetes mellitus, primary care intervention. The most relevant articles were selected with additional selectivity based on the publication year as the basis for this piece.

Results: Currently, minimal information exists on the role of primary care providers in screening ACEs and early intervention in relation to type 2 diabetes.

Conclusion: Ultimately, more research needs to be conducted in assessing the benefits and risks of early intervention of children with ACEs to analyze the change in trajectory of type 2 diabetes mellitus in their adult life.

Keywords: adverse childhood experiences (ACEs), type 2 diabetes mellitus, primary care intervention.

INTRODUCTION

The most formative years of development begin in childhood. Many studies indicate the importance of safety and stability in the home for healthy development. In many poverty-stricken homes, however, these essentials do not exist. Adverse childhood experiences (ACEs) describe potentially traumatic events that may undermine children's sense of stability, safety, and healthy

relationships.¹ These traumatic events can include experiencing violence, abuse, neglect, family member suicide, substance misuse, mental health problems, parental separation or parental incarceration.¹ The timeline for these events is further defined as occurring in the home for children between age 0-17 years.¹ Research shows that the detriment of witnessing these events may persist for years and progress into unresolved emotional or distressing effects, altering brain development, and shaping a child's response to trauma.¹ The extent goes beyond mental and emotional effects, however, since research also demonstrates that undergoing ACEs has lasting effects on overall health and predisposes these children to develop conditions such as: obesity, diabetes, depression, heart disease, cancer, STDs, stroke, COPD and suicide attempts.^{1,3}

The primary healthcare provider role is an integral part of screening and prevention of diseases and conditions. Assessments may be utilized to identify risks in the home for both children and adults. Timely access to assessment, intervention, effective care, support and treatment for children and families in which ACEs have occurred can help mitigate health problems, strengthen children's resilience, and break the cycle of adversity.

ACES CONTRIBUTE TO THE DEVELOPMENT OF T2DM

The stress response is a well-known mechanism demonstrating the link between stress and upregulation of the hypothalamic-pituitary-adrenal (HPA) axis.^{2,3} When a stressful stimulant ensues, a series of reactions occur between the hypothalamus, the anterior pituitary and the adrenal glands -- ultimately releasing cortisol from the adrenal cortex. Cortisol promotes mobilization of energy stores and releases glucose and lipid into the circulation. Additionally, cortisol suppresses the immune response and activates the sympathetic nervous system resulting in an increase of blood pressure, increased heart rate and the release of pro-inflammatory cytokines.^{2,3} In a form of adaptation to a stressful environment, the human body compensates by

preparing for action through allostasis. Allostasis is maintenance of homeostasis through production of adrenaline and cortisol in response to stress. This is a helpful tool in the short-term context as it provides energy. Repeated or sustained stress exposure, however, leads to chronic allostatic load, disruption in glucose metabolism, dysregulation of neuroendocrine function and chronic low-grade inflammation.² The cascade additionally affects cognition, social and emotional function.¹

In a recent study² conducted on rodents, chronic administration of corticosterone in drinking water led to hyperglycemia, insulin resistance and dyslipidemia. Meanwhile, removal of the adrenal gland in rodents sensitized the brain to insulin.² This suggests a strong link between the absence of circulating glucocorticoids and improvement in insulin sensitivity. Primate studies also showed that mothers exposed to early scenarios of food insecurity over a period of 16 weeks resulted in their babies having higher insulin resistance, body weight and waist circumference.²

CLINICAL SIGNIFICANCE: HIGH OCCURRENCES OF T2DM AND ACEs

A meta-analysis⁷ was performed comprising four cohort studies and three cross-section studies with a total number of participants at 87,251. Researchers found that ACEs were positively associated with the risk of T2DM with a combined odds ratio of 1.32 with 95% confidence interval from 1.16 to 1.51; indicating a clinically significant association.⁷

It has also been found that 62% of adults across 23 states experienced one ACE during childhood and nearly 25% had experienced three or more ACEs.² Some sources report this percentage to be higher—90% of children of all races, economic status and geographic regions will experience one ACE in their lifetime.^{4,5} Additionally, the number of ACEs experienced have been found to correlate with higher risks of negative health outcomes and overall well-being.^{1,4,5} Understanding the prevalence of patients who have encountered ACEs in their lifetime is crucial

when it comes to the basis of intervention. This is especially important to identify in fields like family medicine where screening and prevention are keystones in patient care.

The link between the prevalence of ACEs and chronic health conditions is explored by another study.³ They found that the intensity of ACEs correlate with risky behaviors and subsequently, poorer health. Lower economic status (LES) is also a known contributing factor to poorer adult health outcomes.^{2,3,4} The more ACEs individuals report, the greater their risks of health-harming behaviors and contracting infectious and non-communicable diseases.¹ A great obstacle preventing screening and intervention in these populations is that T2DM is less likely to be screened in LES individuals due to inability to access healthcare.⁴ This encourages the need for further exploration on T2DM screening protocols and the use of modalities that can increase access to care in underserved populations.

CURRENT SCREENING OPPORTUNITIES FOR ACEs AND PRIMARY CARE

PROVIDER INTERVENTION

Despite the overt link between ACEs and chronic diseases in adulthood, there continues to be a lack of ACE screening in primary care medicine. Primary care is an important field that focuses on combining patient-centered care and preventative medicine; both of which are crucial to the healthcare system. Implementation of ACE screening can be an important tool in reducing the healthcare burden. ACE screening can also be utilized to provide a gateway in discussion about the adversity patients have faced and the link between their chronic diseases. This may enable patients to feel understood, allow for them to receive resources and create an opportunity for intervention in patients.

Barriers to ACE screening in primary care facilities certainly exist and may include time restraints, inability to identify which patients to screen, and lack of knowledge with further

actions that can be taken following screening.⁶ This leaves room to acknowledge the importance of understanding risk factors that may help providers categorize higher-risk patients to ACEs. Additionally, identifying these gaps to screening bring to light the importance of provider education on the next steps and resources available to ensure that patients are appropriately supported.

REMAINING BARRIERS:

Barriers continue to exist in implementing screening of ACEs in the primary healthcare setting. Although further study needs to be conducted, some explored barriers to ACE screening may include time constraints.⁶ This is evident in the heavy burden already imbedded in the role of primary care through balancing complex patients and minimal time slots. Other barriers may include providers' knowledge about ACEs, confidence in screening for ACEs and confidence in actions to be taken following the results.⁶ This emphasizes an additional barrier—it is important for providers to know what local resources exist. Appropriate referrals can provide support for high-risk patients and help facilitate quality patient care, thereby decreasing chronic disease burden. Working to resolve these obstacles may decrease ACE screening time and possibly decrease the burden of screening.

FUTURE RESEARCH PROPOSAL

A proposed research study would include implementing a screening protocol for ACEs in the primary care setting and selecting research participants with varying degrees of ACE scores. These participants would take part in a cohort study. The cohort would receive education on management of stress, healthy lifestyle habits and given appropriate referrals. BMI, fasting glucose levels and hemoglobin A1c would be monitored over time.⁸ Ideally, this research would go on for several years to identify potential benefits of early intervention.

CONCLUSION

Undergoing ACEs has lasting effects on overall health and predisposes children to conditions such as obesity, diabetes, depression, heart disease, cancer, sexually transmitted diseases, stroke, and mental health struggles. Some of these conditions further contribute to the development of T2DM, perpetuating the cycle of insulin resistance. Understanding the mechanism behind chronic stress and T2DM allows us to understand how these traumatic events may change the physiology of glucose storage and usage. Studies have only recently been evaluating the role of primary care providers in screening, intervening and the lifelong benefits of intervention. Ultimately, more research needs to be conducted in assessing the benefits and potential risks of early intervention of children with ACEs and the change in trajectory of T2DM in their adult life.

REFERENCES:

1. Hughes, K., Bellis, M. A., Hardcastle, K. A., Sethi, D., Butchart, A., Mikton, C., ... & Dunne, M. P. (2017). The effect of multiple adverse childhood experiences on health: a systematic review and meta-analysis. *The Lancet Public Health*, 2(8), e356-e366.
2. Hackett RA, Steptoe A. Type 2 diabetes mellitus and psychological stress - a modifiable risk factor. UCL Discovery - UCL Discovery.
<https://discovery.ucl.ac.uk/id/eprint/1562662/>. Published June 30, 2017. Accessed August 7, 2022.
3. AuYoung M, Moin T, Richardson CR, Damschroder LJ. The Diabetes Prevention Program for Underserved Populations: A Brief Review of Strategies in the Real World. *Diabetes Spectr*. 2019;32(4):312-317. doi:10.2337/ds19-0007
4. Hargreaves MK, Mouton CP, Liu J, Zhou YE, Blot WJ. Adverse Childhood Experiences and Health Care Utilization in a Low-Income Population. *J Health Care Poor Underserved*. 2019;30(2):749-767. doi:10.1353/hpu.2019.0054
5. Bryant C, VanGraafeiland B. Screening for Adverse Childhood Experiences in Primary Care: A Quality Improvement Project. *J Pediatr Health Care*. 2020;34(2):122-127. doi:10.1016/j.pedhc.2019.09.001
6. Aponté, E., & Kalmakis, K. (2017). *ScholarWorks@UMass Amherst Adverse Childhood Screening Among Adult Primary Care Patients*.
7. Huang H, Yan P, Shan Z, et al. Adverse childhood experiences and risk of type 2 diabetes: A systematic review and meta-analysis. *Metabolism*. 2015;64(11):1408-1418. doi:10.1016/j.metabol.2015.08.019

8. Ittoop T, Jeffrey K, Cheng CI, Reddy S. The Relationship Between Adverse Childhood Experiences and Diabetes in Central Michigan Adults. *Endocr Pract.* 2020;26(12):1425-1434. doi:10.4158/EP-2020-0239