ISSN: 3032-3134 (ONLINE)
InaJBCS Indonesian Journal of Biomedicine and Clinical Sciences

Incidence rate of depression and associated factors in children and adolescents with type 1 diabetes mellitus (T1DM) in Indonesia (study on Semarang population)

Fadia Raihani Aprilia Herenda[1], Tanjung Ayu Sumekar[2], Agustini Utari[3], Fanti Saktini[2]*

[1]Undergraduate Student, Faculty of Medicine, Universitas Diponegoro, Semarang, [2]Department of Psychiatry, Faculty of Medicine, Universitas Diponegoro, Semarang /Diponegoro National Hospital, Semarang, [3]Department of Pediatric, Faculty of Medicine, Diponegoro University/ Diponegoro National Hospital, Semarang, Indonesia

https://doi.org/10.22146/inajbcs.v57i3.16897

Submitted: 2024-10-08
Accepted : 2025-05-19

ABSTRACT

Type 1 diabetes mellitus (T1DM) is characterized by pancreatic ß-cell damage due to an autoimmune process that causes a lack of endogenous insulin production. In 2018, 1,220 children with T1DM was reported in Indonesia. Children and adolescents with T1DM require lifelong insulin treatment leading to diabetes distress and depression. Type 1 diabetes mellitus and psychological problems are bidirectionally interconnected. This study aimed to determine the incidence of depression and influencing factors in children and adolescents with T1DM in Semarang City, Indonesia. This analytical observational study with a cross-sectional design was conducted from March to October 2023 at Diponegoro National Hospital and Dr. Kariadi General Hospital, Semarang, using consecutive sampling. The inclusion criteria were children aged 7–17 years diagnosed with T1DM and receiving treatment. Parents of respondents provided informed consent before their children completed the Children's Depression Inventory (CDI) questionnaire to assess depression. A CDI score of ≥13 was classified as indication of depression. The data were analyzed descriptively and bivariately using Chi-square and Fisher's exact tests. Among 27 respondents, 8 children were diagnosed with depression and 19 respondents scored on the guilt subscale of the CDI questionnaire, indicating moderate depressive symptoms. Approximately 30% of children and adolescents with T1DM were diagnosed with depression. The most influential factor associated with this depression was a history of chronic disease in children.

ABSTRAK

Diabetes melitus tipe 1 (DMT1) ditandai dengan kerusakan sel ß pancreas akibat proses autoimun yang menyebabkan kurangnya produksi insulin endogen. Pada tahun 2018, dilaporkan 1.220 anak pengidap DMT1 di Indonesia. Anak dan remaja dengan DMT1 membutuhkan insulin seumur hidup sehingga dapat terjadi *diabetes distress* dan depresi. Diabetes melitus tipe 1 dan masalah psikologis saling berhubungan. Penelitian ini bertujuan untuk mengetahui angka kejadian depresi dan faktor-faktor yang memengaruhi pada anak dan remaja dengan DMT1. Penelitian ini menggunakan metode observasional analitik dengan rancangan potong lintang menggunakan data dari kuesioner yang dikumpulkan secara *consecutive sampling*. Orang tua responden telah diberikan *informed consent* sebelum diberikan kuesioner *children's depression inventory* (CDI) untuk mengukur depresi. Nilai CDI ≥ 13 maka anak tersebut dikatakan depresi. Analisis data ini dilakukan secata deskriptif dan bivariat menggunakan Uji *Chi square* dan *Fisher's exact*. Dari 27 responden, 8 responden telah terdiagnosis dengan depresi. Terdapat 19 responden menjawab subskala rasa bersalah dalam kuesioner CDI , menandakan bahwa responden memiliki gejala depresi sedang. Hampir 30% anak dan remaja dengan DMT1 terdiagnosis depresi. Faktor yang paling mempengaruhi terjadinya depresi adalah riwayat penyakit kronik pada anak.

Keywords:
type 1 diabetes mellitus;
depression;
childrens and adolescents;
Children's depression inventor;
risk factors

*corresponding author: fantisaktini@fk.undip.ac.id

INTRODUCTION

Diabetes mellitus (DM) is a complex metabolic disorder characterized by chronic hyperglycemia resulting from impaired insulin secretion, insulin action, or both of them. Inadequate insulin secretion, either alone or accompanied by insulin resistance, reduces insulin effectiveness in target organs, leading to abnormalities in carbohydrate, lipid, and protein metabolism. There are two types of DM, type 1 diabetes mellitus (T1DM) and type 2 diabetes mellitus (T2DM). The main difference between these types lies in the underlying mechanisms causing metabolic dysfunction. Type 1 diabetes mellitus is characterized by hyperglycemia resulting from autoimmune destruction of pancreatic β-cells, leading to absolute insulin deficiency. As a result, patients with T1DM are entirely dependent on exogenous insulin therapy for survival.[1-3]

More than 90% of diabetes cases in children and adolescents are T1DM worldwide. In 2021, it was estimated that 108,300 children and adolescents under the age of 15 yr were diagnosed with T1DM, and approximately 651,700 were living with the condition.[1-3] Data from the Indonesian Pediatric Society reported that in 2018, there were 1,220 children diagnosed with T1DM in Indonesia. The prevalence of T1DM in Indonesian children increased more than sevenfold over a 10 yr, from 3.88 per 100 million population in 2000 to 28.19 per 100 million in 2010. However, due to a high number of undiagnosed and misdiagnosed cases, the actual prevalence of T1DM in Indonesia is likely to be higher.[4]

Maladaptive coping strategies can lead to various psychological and psychiatric disorders. According to Dybdal *et al.*,[5] there is an increased risk of eating disorders, anxiety, mood disorders, substance abuse, and personality disorders. In general, 15/1000 people annually experience psychiatric disorders. The highest risk is observed at the age of 10-14 yr, with the highest risk increase occuring ≥5 yr after the diagnosis. Therefore, the study recommends that physicians perform routine mental health screening for children and adolescents with T1DM.[5] Patients with T1DM are prone to developing microvascular complications. Among those with such complications, the risk of experiencing depression is significantly higher (24% vs 9%) in T1DM patients without microvascular complications.[6]

It is well known that both acute hyperglycemia and hypoglycemia can influence mood, as the brain depends on a constant supply of glucose as its primary energy source. Rapid fluctuations in blood glucose levels can impair brain function. The amygdala and hippocampus, regions with a high density of insulin receptors, may be particularly affected by abnormal insulin signaling in the brain. This disruption may alter glucose transport across the blood–brain barrier, leading to reduced neuronal glucose uptake, which is indirectly associated with the development of depression.[6]

Children with T1DM require lifelong insulin injection treatment. As a result of this lifelong insulin injection treatment, children and adolescents can experience eating disorders, excessive anxiety, depression, and suicidal thoughts. Diabetes distress is an emotional response to living with diabetes and its management. The continuous demands of treatment tasks and decision-making are the main causes of diabetes distress.[7]

To deal with stress, including stress due to diabetes, adaptive coping strategies are needed.[8]

Children with T1DM require lifelong insulin therapy. As a result, they may experience psychological challenges such as eating disorders, excessive anxiety, depression, and even suicidal thoughts. Diabetes distress refers to the emotional burden of living with diabetes and managing its ongoing demands. The continuous need for treatment adherence and decision-making are major contributors to this distress.[7] To effectively manage stress, including stress related to diabetes, adaptive coping strategies are essential.[8]

Studies on psychological and psychiatric problems in children and adolescents with T1DM in Indonesia remains limited. This study aimed to determine the incidence of depression and influencing factors in children and adolescents with T1DM in Semarang City, Central Java.

MATERIAL AND METHODS

Study design and participants

It was an observational study with a cross-sectional design conducted at the Diponegoro National Hospital, Semarang and Dr. Kariadi General Hospital Semarang, Indonesia from March to October 2023. A consecutive sampling method with Slovin formula was used to select paeticipants who meet the inclusion and exclusion criteria. The inclusion criteria include the children with 7 to 17 y.o. who was diagnosed with T1DM and were undergoing treatment. The exclusion criteria include the children who had more than one chronic disease and unable to read and write. Among 29 respondents who selected, 27 respondents had met the inclusion and exclusion criteria and were willing to participate in this study. Two repondents were excluded due to one respondent had more than one chronic disease and another one unable to read and write.

Data collections

All respondents were first provided with an explanation of the study. Those who agreed to participate were then asked to sign an informed consent prior to data collection. The Children's Depression Inventory (CDI) in Bahasa was used to identify symptoms of depression of respondents. The questionnaire included demographic information (i.e., name, age, gender, school, religion, and address) and consisted of 27 items designed to assess depressive symptoms. The instrument has been tested and demonstrated good reliability, with a Cronbach's alpha of 0.84.[9] Respondents were considered as having depression if their CDI score was ≥13, and as not having depression if their score was <13. This study was approved by the Ethics Research Committee, the Faculty of Medicine, Universitas Diponegoro, with reference number of 281/EC/KEPK/FK-UNDIP/VI/2023.

Data analysis

The questionnaires were checked and cleared to ensure completeness of responses, clarity of handwriting, and consistency of answers across related questions. Data coding was then performed by converting responses from written or categorical form into numerical data, followed by data entry into IBM SPSS Statistics version 29 for Mac for further analysis. Data were presented as frequencies or percentages

and then analyzed statistically using Chi-square and Fisher's exact tests. A p value <0.05 was considered significant.

RESULTS

A total 27 respondents who met the inclusion and exclusion criteria were involved in this study. The characteristics of T1DM children with depression are presented in TABLE 1. The respondents majority were aged 12-17 years, female, not experiencing depression, and had parents' who graduated from senior high shool (n = 20). The respondents majority did not have a history of chronic disease. There were 3 respondents who had consulted psychiatry and 24 who had never consulted psychiatry. The majority of respondents visit to the doctor ≥1 times in 3 months. There were 8 respondents who had depression. There was a significant association between history of chronic illness in children and depression. Meanwhile, other variables did not show a significant association with depression (TABLE 1).

TABLE 1. Characteristics of T1DM children with depression (n=27)

Variable	Depression [n (%)]		Total	p
	Yes	No		
Age				
7-11	1 (16.67)	5 (83.33)	6 (100)	0.43
12-17	7 (33.33)	14 (66.67)	21 (100)	
Childs' education level				
Pre school	0 (0.0)	3 (100)	3 (100)	
Elementary school	2 (28.57)	5 (71.42)	7 (100)	0.67
Junior high school	4 (36.36)	7 (63.63)	11 (100)	
Senior high school	2 (33.33)	4 (66.66)	4 (100)	
Gender				
Male	2 (15.38)	10 (83.33)	12 (100)	0.40
Female	6 (40.00)	9 (60.00)	15 (100)	
Parents' education level				
<Senior high school	2 (28.57)	5 (71.43)	7 (100)	0.94
≥Senior high school	6 (30.00)	5 (70,00)	20 (100)	
History of chronic diseases of the children				
Yes	7 (70.00)	3 (30.00)	10 (100)	0.001*
No	1 (5.88)	16 (94.12)	17 (100)	
Control frequency				
<1 time/3 mo	2 (100)	0 (0.0)	2 (100)	0.08#
≥1 time/3 mo	6 (24.00)	19 (76.00)	25 (100)	
History with psychiatrist				
Ever	1 (33.33)	2 (66.66)	3 (100)	0.88
Never	7 (29.17)	17 (70.83)	24 (100)	

Note: *Chi-square test; #Fisher's exact test; significance (p<0.05)

TABLE 2. CDI questionnaire analysis

CDI dimensions/ Discussion statement	No Symptoms	Moderate Symptoms	Severe Symptoms
Negative mood			
Sadness	27	-	-
Concerns	24	3	-
Guilt	8	19	-
Cry	25	2	-
Dependency	24	3	-
Indecision	16	7	4
Total	124	34	4
Interpersonal problem			
Negative Self-Image	25	2	-
Withdrawal	13	11	3
Social Problems	16	7	4
Self-Blame	15	11	1
Total	69	31	8
Ineffectiveness			
Incompetence	20	6	1
Motivation	17	6	4
Feeling of Failure	13	14	-
Incapacity	16	10	1
Total	66	36	6
Anhedonia			
Melancholy	10	17	-
Sleep Disorders	20	6	1
Fatigue	18	5	4
Appetite	26	1	-
Health	13	14	-
Loneliness	21	4	2
Boredom	16	10	1
Friendship	18	8	1
Total	142	65	9
Negative self-esteem			
Decision	15	8	4
Self-hatred	24	3	-
Suicide	24	3	-
Appearance	12	13	2
Feeling of Love	23	3	1
Total	98	30	7

DISCUSSION

People with diabetes become depressed because they require long-life treatment, there is even a term for it, namely diabetes distress. In this study, there were 8 respondents who were diagnosed with depression. All were adolescents aged 12–17 years, a developmental stage characterized by heightened emotional variability, identity formation, increasingly complex peer relationships, and the transition to adulthood, which may contribute to vulnerability to depression.[5,10-11]

People with T1DM may experience self-blame for their illness as an attribution of the inner self to negative events. Within the broader scope of self-blame there are two dominant moral emotions: shame and guilt. The difference between shame and guilt lies in the conceptualization of the self. In shame, the self is the focus of negative evaluation, whereas in guilt, the actions taken are the focus of negative evaluation. When individuals feel guilty, they tend to think about how their behavior affects those around them.[12]

Patients with diabetes have to maintain their glucose spikes and they have a recommended diet. However, they are also humans that can deviating from their recommended diet. After consuming food outside the recommended diet they often feel guilty. Which in turn resulted in more negative emotions. Although they enjoy every mouthful, still could not avoid the feelings of guilt afterward.[13]

In this study found that there was significant correlation between children and adolescents with T1DM that having chronic disease in depression. Respondents who have chronic disease are proven to experience depression. Because the treatment of T1DM itself is quite a lot and will use medication for lifetime, especially if they have other chronic disease.[14,15]

Respondents with chronic disease experience more negative events in life than healthy people or respondents who don't have chronic disease because the less medication, the less stress they experience. Chronic diseases have negative impacts not only on respondents but also on family relationships and social interactions and lead to more negative life events and stressful emotions. Present study found that negative life events are associtated with depressive symptomps.[15]

Patients who often suffer from pain because of diseases are prone to be depressed and have poor mental health impacts. This is in accordance with a former study which revealed that chronic pain, often induces depression. Up to 85% of patients with chronic pain were affected by severe depression.[15]

CONCLUSION

The incidence rate of depression among children and adolescents with T1DM in Semarang is 30%. This condition is closely associated with chronic diseases of the T1DM patients. Therefore, a multidisciplinary treatment of depression among T1DM patients involving educators, psychologist, and psychiatrists is essential for the effective treatment of depression in patients with T1DM.

ACKNOWLEDGMENT

Authors would like to thank *Ikatan Keluarga Penyandang Diabetes Anak dan Remaja (IKADAR)* for their support to conduct this study.

REFERENCES

1. Libman I, Haynes A, Lyons S, Pradeep P, Rwagasor E, Tung JY, *et al.* Definition, epidemiology, and classification of diabetes in children and adolescents: ISPAD Clinical

Practice Consensus Guidelines 2022. Pediatr Diabetes 2022; 23(8):1160-74 https://doi.org/10.1111/pedi.13454
2. Kahkoska AR, Dabelea D. Diabetes in youth: a global perspective. HHS Public Access 2021; 491-512. https://doi.org/10.1016/j.ecl.2021.05.007
3. Pulungan AB, Annisa D, Imada S. Diabetes mellitus type 1 in children: the situation in Indonesia and management. Sari Pediatri 2019; 20(6):392. https://doi.org/10.14238/sp20.6.2019.392-400
4. Pulungan AB, Fadiana G, Annisa D. Type 1 diabetes mellitus in children: experience in Indonesia. Clin Pediatr Endocrinol 2021; 30(1):11-8. https://doi.org/10.1297/cpe.30.11
5. Dybdal D, Tolstrup JS, Sildorf SM, Boisen KA, Svensson J, Skovgaard AM, *et al.* Increasing risk of psychiatric morbidity after childhood onset type 1 diabetes: a population-based cohort study. Diabetologia 2018; 61(4):831-8. https://doi.org/10.1007/s00125-017-4517-7
6. Nouwen A, Adriaanse MC, van Dam K, Iversen MM, Viechtbauer W, Peyrot M, *et al.* Longitudinal associations between depression and diabetes complications: a systematic review and meta-analysis. Diabet Med 2019; 36(12):1562-72. https://doi.org/10.1111/dme.14054
7. Iturralde E, Rausch JR, Weissberg-Benchell J, Hood KK. Diabetes-related emotional distress over time. Pediatrics 2019; 143(6):e20183011. https://doi.org/10.1542/peds.2018-3011
8. De Wit M, Gajewska KA, Goethals E, McDarby V, Zhao X, Hapunda G, *et al.* Psychological care of children, adolescents, and young adults with diabetes: ISPAD Clinical Practice Consensus Guideline 2022. Pediatr Diabetes 2022; 23(8):1373-89. https://doi.org/10.1111/pedi.13428
9. Suryandari D. Relationship between depression and academic performance among students at SMP Muhammadiyah 3 Yogyakarta [Doctoral dissertation]. Universitas Muhammadiyah Yogyakarta; 2019. Page 31-2.
10. Priasmoro Dp, Ispriantari A. Prediksi tingkat depresi remaja dengan insulin dependent diabetes mellitus (IDDM) Di Ikatan Diabetesi Anak Dan Remaja Kota Malang. Dunia Keperawatan 2017; 5(2):96. https://doi.org/10.20527/dk.v5i2.4113
11. Bustomi S, Prihayati, Puspitasari Y. Factors that affect mental health in adolescents: a literature review. HtechJ 2024; 2(4):389-404. https://doi.org/10.53713/htechj.v2i4.222
12. Solomon E, Salcedo VJ, Reed MK, Brecher A, Armstrong EM, Rising KL. "I'm going to be good to me": exploring the role of shame and guilt in patients with type 2 diabetes. Diabetes Spectr 2022 Spring; 35(2):216-22. https://doi.org/10.2337/ds21-0062
13. Amankwah-Poku, M. Wavering diabetic diet: "I break the diet and then I feel guilty and then I don't go back to it, in case I feel guilty again". Sage Open 2020; 10(1):215824402091457 https://doi.org/10.1177/2158244020914577
14. Holt RI, de Groot M, Golden SH. Diabetes and depression. Curr Diab Rep 2014; 14(6):491. https://doi.org/10.1007/s11892-014-0491-3
15. Ma Y, Xiang Q, Yan C, Liao H, Wang J. Relationship between chronic diseases and depression: the mediating effect of pain. BMC Psychiatry 2021; 21(1):436. https://doi.org/10.1186/s12888-021-03428-3