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# KNOWLEDGE LEVEL OF TYPE 1 DIABETES MELLITUS AND ASSOCIATED FACTORS AMONG CARE GIVERS OF CHILDREN ATTENDING DIABETIC CLINIC IN PUBLIC HOSPITALS OF ADDIS ABABA CITY, ETHIOPIA, 2016

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# Abstract

# Background:

Recently Diabetes mellitus is becoming an important clinical and public health problem throughout the world. Especially type 1 diabetes mellitus, which mostly affects children, is now increasing rapidly. In order to prevent and manage it properly, it is crucial to involve care givers who are supportive and knowledgeable about diabetes and can affect its outcome in a good way.

# **Objective:**

To assess the knowledge level of type 1 diabetes mellitus and factors determining it among care givers of children attending diabetic clinic in public hospitals.

# Method:

An institution based cross-sectional study was conducted from March to May 2016, by using systematic random sampling technique. The data was collected using structured interviewer administered questionnaire. Data was analyzed by multivariable logistic regression at P<0.05 with 95% CI considered statistically significant.

# Results:

One hundred forty nine care givers were included in the study. Most of them (55%) had poor knowledge about type1 diabetes mellitus. Sex, level of education, residence, income, presence of parental psychological problem and attending diabetic education previously were the statistically significant variables associated with the level of knowledge of caregivers..

# Conclusion:

Majority of caregivers were less knowledgeable about T1DM which would in turn affect the care they render to their child. Socio demographic factors, presence of parental psychological problem and attending diabetic education previously had significant effect on the level of knowledge of care givers.

Key words: Type 1 diabetes mellitus, Children, Care givers, Knowledge

#### 1. Introduction

Diabetes mellitus (DM) is a group of metabolic diseases characterized by elevated levels of glucose in the blood (hyperglycemia) resulting from defects in insulin secretion, insulin action, or both [1]. It is becoming one of the major health problems and has now reached epidemic proportions globally [2]. The number of people with DM has risen from 108 million in 1980 to 422 million in 2014. The global prevalence of DM among adults over 18 years of age has risen from 4.7% in 1980 to 8.5% in 2014. In addition to the 422 million adults who are estimated to currently have DM, there are 318 million adults with high risk of developing the disease in the future [2, 3]

Globally, urbanization, industrialization and epidemiologic transition has resulted in dramatic changes in lifestyles but the effect is more seen in developing countries because of their high speed of growth. Among the outcomes of this transition, one is a change in disease patterns that is from communicable diseases to chronic non communicable diseases or sedentary life style related diseases like, obesity, cardiovascular disease and cancer. Until recent years, DM was not considered a major health problem in developing countries but now the case is very different [4].

The total cases of DM in adult population of Ethiopia in 2015 were 2,567.9 and its estimated prevalence in adults was 5.2% [5]. DM deaths in Ethiopia reached 9,305 or 1.55% of total deaths. It was the ninth causes of death in the country [6].

Type 1 diabetes mellitus (T1DM) is one of the most common chronic diseases in childhood. Although disease onset can occur at any age, the peak age for diagnosis is in the mid-teens. T1DM develops when the cells that produce the hormone insulin, known as the beta cells, in the pancreas are destroyed. This destruction is initiated or mediated by the body's immune system and limits or completely eliminates the production and secretion of insulin, the hormone that is required to lower blood glucose levels [7 - 9].

Data from large epidemiological studies worldwide indicate that on an annual basis, the overall increase in the incidence of T1DM is around 3% and about 78,000 children under age 15 years develop T1DM worldwide [9]. In 2015 the number of children with type 1 diabetes exceeded half a million for the first time; it is increasing by around 3% every year, particularly among children. In other word, around 86,000 children develop T1DM each year. USA, India, and Brazil are the three top countries with high number of children with T1DM respectively. As a region, Europe has the highest number of children with T1DM; approximately 140,000, and faces an increase of around 21,600 new cases per year [1, 9].

Family education is important in management of T1DM [10]. Children with new-onset type T1DM and their families require intensive diabetes education by an interdisciplinary team to provide them with the necessary skills and knowledge to manage this disease. The complex physical, developmental and emotional needs of children and their families necessitate specialized care to ensure the best long-term outcomes [11].

Many studies revealed that knowledge of the care givers has direct effect on glycemic level of the children's and also on the occurrence of acute and chronic complication of the disease. Caregivers who are knowledgeable about the disease were more likely to follow instruction and medical recommendations for treatment of diabetes. Also, they are more often have better social and living situation, and better access to medical services , while demonstrating less demand for professional health care unlike caregivers who were less knowledgeable about the disease [12-16].

Knowledge of caregivers is crucial factor for the outcomes of the child's condition. Prior to giving education to the care givers, it is vital to identify the level of knowledge that they had. In Ethiopia, there is no such type of research that shows the level of knowledge that the care givers had about T1DM and factors affecting it. Therefore, the purpose of this study was to measure the actual level of knowledge that the care givers have and associated factors in the Ethiopian context.

#### **2.** Aim

The aim of this study is to assess the knowledge level of type 1 diabetes mellitus and factors determining it among care givers of children attending diabetic clinic in public hospitals of Addis Ababa city, Ethiopia, 2016.

#### 3. Methods

An institution based cross sectional study was conducted in Addis Ababa, Ethiopia, a city with 12 governmental hospitals. Among the 12 governmental hospitals, only 4 of them had pediatric diabetic clinics. These hospitals were Tikur Anbessa Specialized and Teaching Hospital, Zewditu Memorial Hospital, Yekatit 12 Hospital, and St. Paul Millennium Medical College and Hospital. The study period spanned from March to May 2016.

#### 3.1. Sample Size Determination and Sampling Procedure

A total of 149 study subjects were included in the study using systematic random sampling technique.

# 3.2. Data Collection Procedure and Tool

Data was collected using structured interviewer administered questionnaire [Additional file 1]. It is composed of 2 parts. Part 1 was developed by the investigators addressing factors related to knowledge as it appeared in the literature review [12, 16, 17]. Part 2 of the questionnaire was designed based on the Michigan diabetes knowledge scale [18] and modified according to food habits of Ethiopian. Follow up and supervision by the supervisors and principal investigators occurred throughout the data collection period.

# 3.3. Data Quality Assurance, Entry and Analysis

The data collection instrument was pretested for its relevance, completeness and clarity to address the research objectives and problem. It was corrected prior to the actual data collection period. The pretest was carried out in ten percent of non-study participants outside of the study setting that have diabetic centers.

The collected data was coded, entered and cleaned using the statistical software Epi data. The entered data was subjected to cleaning using simple frequency and tabulation to ensure the validity of the data. Then the analysis was made with IBM SPSS version 22 after exporting the prepared data. Descriptive statistics such as frequency distribution and proportions were computed to describe the major variables of the study. Odds ratios (95% confidence intervals) were used to determine the association of different factors with knowledge of care givers about T1DM. Stepwise binary logistic regression was used to assess presence and degree of association and variables that found to be significant at the 0.2 levels were entered into the multiple logistic regression model. Logistic regression analysis was used to assess the relative effect of determinants on knowledge of care givers. A P<0.05 was considered statistically significant in all tests of significance.

#### 4. Results

#### 4.1. Socio-demographic characteristics of study participants

This study included a total of 149 caregivers from the outpatient department of the diabetic clinics of the selected hospitals. The average age of caregivers was 33.83 years (SD 8.0; range 16 – 62), over half (57.7 %) were found in middle age (31 - 45 years) and mainly consisted of women (59.7 %). Majority of the care givers (47.7 %) were children's mothers and fathers accounted 34.9%. Most of the caregivers (68.5 %) were married. With regard to their religion, 61.7% were orthodox Christians. Majority of them (79.2 %) were living in urban areas and had completed primary school education (30.9 %). Most of the caregivers (66 %) were employed. Regarding their family income, most of them (24.8 %) had monthly income of between 446 – 1200 birr, followed by greater than 3500 birr per month (22.8 %) (Table 1).

# 4.2. Clinical data and previous history of diabetes education among care givers of children with T1DM

Most of the caregivers (67.8 %) had had more than one child. Only 6 % of them had had another child with T1DM, and most of the children (61.7 %) had had T1DM for less than 3 years followed by 4 - 9 years (20.1%). Only 16.1 % of caregivers had been encountered psychological problems. Anxiety was the predominant type of psychological problem that the caregivers encountered (62.5 %). Most of the care givers (91.7 %) encountered psychological problems following the diagnosis of their child for DM. (Table 2)

Almost half of the caregivers (48.3 %) had attended diabetic education, and the rest of them (51.7 %) never attended any kind of education. Among the caregivers who attended diabetic education, most of them (84.7 %) got the education from the hospital, followed by other organizations (12.5 %). (Table 2)

Characters tics	Frequency	Percent				
Age in years						
15-30	54	36.2				
31-45	86	57.7				
46-65	9	6.0				
Sex						
Male	60	40.3				
Female	89	59.7				
Relation with the child						
Father	52	34.9				
Mother	71	47.7				
Guardian	13	8.7				
Other/specify	13	8.7				
Marital status						
Married	102	68.5				
Unmarried	24	16.1				
Divorced	16	10.7				
Widowed	7	4.7				
Religion						
No religion	3	2.0				
Orthodox	92	61.7				
Islam	38	25.5				
Protestant	14	9.4				
Catholic	1	0.7				
Residence						
Urban	118	79.2				
Rural	31	20.8				
The highest level of schooling you attended						
Illiterate(can't read and write)	16	10.7				
Primary(grade1-8)	46	30.9				
Secondary(9-12)-	35	23.5				
Vocational school	27	18.1				
College and above	25	16.8				
Employment status						
Unemployed	51	34.2				
Gainfully employed	98	65.8				
Monthly income of the family						
Less than 445 Birr	26	17.4				
Between 446-1200 Birr	37	24.8				
Between 1201-2500 Birr	27	18.1				
Between 2500-3500 Birr	25	16.8				
Above 3500 Birr	34	22.8				

**Table 1:** Socio-Demographic characteristics among caregivers of children with T1DM, Addis Ababa, Ethiopia, 2016 (N=149).

Characters tics	Frequency	Percent
Number of children		
Only one child	48	32.2
more than one child	101	67.8
Presence of another child with T1DM		
Yes	9	6.0
No	140	94.0
Duration of diabetes in years		
1-3	92	61.7
4-9	30	20.1
11-15	23	15.4
>16	4	2.7
Encountered psychological problem		
Yes	24	16.1
No	125	83.9
kind of psychological problem		
Anxiety	15	62.5
Depression	9	37.5
Onset of the psychological problem		
Before diagnosis of the child	2	8.3
After diagnosis of the child	22	91.7
Attended diabetic education previously		
Yes	72	48.3
No	77	51.7
Duration of Diabetes class attendance in		
years		
<3	55	76.4
4-9	11	15.3
>10	6	8.3
Get the diabetic education from		
Hospital	61	84.7
Other organization	9	12.5
Media	2	2.8

# 4.3. Level of knowledge of care givers about T1DM

Knowledge scores ranged between 0 and 25 in the overall sample, with a mean score of 10.11. Caregivers who scored below the mean value were considered as having poor knowledge towards T1DM and those who scored above the mean value were considered as knowledgeable towards the matter of interest. In this study, it was found that 55% of caregivers had poor knowledge about T1DM (Figure 1).



Figure 1: Level of Knowledge of care givers about T1DM, Addis Ababa, Ethiopia, 2016.

# 4.4. Factors affecting the level of knowledge of caregivers

As noted from the result of bivariate and multivariate analysis, sex, residence, educational level, family income, attending DM education previously and psychological problem were variables which showed significant association with the level of knowledge of care givers. (Table 3)

Other variables such as age, marital status, religion, ethnicity, employment status, the number of children in the family, the presence of another child with diabetes didn't show any association with the level of knowledge (Table 3). Duration of diabetes in years showed associations with the level of knowledge at the bivariate level, but when the cofounders were controlled it was not associated with the knowledge level of the caregivers. (Table 3)

LEVEL OF KNOWLEDGE					
Variables	Good Knowledge	Poor Knowledge	COR(95% C.I)	AOR(95% C.I)	
Sex					
Female	46	43	2.0(1.2, 3.9)	<b>3.2</b> (1.3 , 7.9)*	
Male	21	39	1.0	1.0	
Residence					
Urban	60	56	39(16 99)	<b>3.1</b> (1 1 8 9)*	
Rural	7	26	10	10	
Education level			1.0	1.0	
Well educated	17	8	31(13 78)	<b>4</b> . <b>7</b> (1.4 15.5)*	
Less educated	50	74	10	10	
Family income			1.0	1.0	
High income	40	19	49(2499)	<b>60</b> (2.4 14.9)**	
Poor income	27	63	10	10	
Attending DM			1.0	1.0	
Education before					
Yes	46	26	47(24 95)	5.5(2.3 13.3)**	
No	21	56	10	10	
Encountered				1.0	
Psychological					
problem					
No	64	61	7.3(2.1, 25.9)	<b>9.1</b> (2.1, 41.4)*	
Yes	3	21	1.0	1.0	

**Table 3:** Bivariate and multivariate logistic regression analysis of level of Knowledge Addis Ababa, Ethiopia, 2016(N=149).

\*P value is significant at P<0.05 \*\*p value is significant at P<0.001

#### 5. Discussion

In this study, more than half (55%) of the caregivers had poor level of knowledge. This is higher than the study finding of Egypt which was 38 %. This difference may be related to different study setup and socio-economic status of the care givers. Finding of this study is consistent with the study finding of Saudi and Tanzania which mentioned that mothers had limited knowledge about diabetes mellitus [10, 19]. This study was also almost comparable with the study from Poland which stated that majority (56.7 %) of families supporting the patient had poor knowledge about the disease [12].

In this study, caregivers' mean knowledge was 10.11. This is lower than the study finding of Iran which was 17.72 [20]. This might be attributed to difference in socio-economic status as well.

Sex of the caregivers showed significant association with the level of their knowledge. Female caregivers were more likely knowledgeable than male caregivers [AOR= 3.2; 95% CI (1.3-7.9)]. This might be due to the reason that women (mothers) were more dedicated to the care of their children than men (fathers) so that they spent more time in order to figure out what is best for their child and in the mean time they became more knowledgeable than male caregivers. Similar findings were also observed in earlier studies conducted in Tanzania [12] and Brazil [21]. In other similar studies, sex was not mentioned as a factor that can affect knowledge level of caregivers. It might be due to the reason that those studies focused only on one sex, which is women (mothers); men (fathers) were not included in these studies [16, 22].

This study showed that caregiver's residential place was significantly associated with the level of knowledge they had. Caregivers who reside in urban were more knowledgeable than those who live in rural [AOR= 3.1; 95% CI (1.1- 8.9)]. This may be partly caregivers in urban areas were closer to information compared to those from rural ones that makes it easy for them to get education and training from the health facilities and other sources. As a result, they became more knowledgeable compared to the rural ones. It is consistent with the study conducted previously in Egypt [22].

In this study, education level of the care givers were found highly associated with level of knowledge [AOR = 4.7; 95% CI (1.4 - 15.5)]. Similar findings were observed in earlier studies conducted in Israel, Kingdom of Saudi and Egypt [15, 16, 22]. A study done in USA also stated

that literacy and numerical skills of caregivers significantly influence glycemic control of their children with type 1 diabetes [23], which implies their level of education affect their knowledge level since knowledge level and glycemic control are directly related. This might be due to the fact that as their level of education increases, they became more aware of the disease through reading and searching more about the disease.

In this study, family income was one of the variables that were highly associated with level of knowledge of the caregivers [AOR= 6.0; 95% CI (2.4 - 14.9)]. This finding is consistent with studies done in Bosnia Herzegovina, Kingdom of Saudi, Iran and Egypt [14, 16, 20, 22]. All these studies concluded that the higher the income the higher the knowledge level.

Finding from this study showed that attending diabetic education previously was one of the major variables that could affect the knowledge of the caregivers. It revealed that attending diabetic education previously had significant association with the level of knowledge [AOR= 5.5; 95% CI (2.3 - 13.3)]. It is consistent with findings that came from different countries. Studies done in Kingdom of Saudi, Egypt and USA indicated that statistically significant association was observed between attending workshop about DM and knowledge and practices of caregivers [10, 22, 23].

According to this study, the strongest predictor of knowledge level of the care givers was absence of psychological problem. Presence of parental psychological problems, specifically anxiety and depression, had a highly significant effect on the level of knowledge [AOR= 9.1; 95% CI (2.1 - 41.4)]. It was consistent with a study done in USA, which mainly focused on depression [24]. In the contrary, other study that was done in another state of USA revealed that disease related parenting stress in caregivers of younger children is an indicator of greater adherence behaviors, as these parents often take on more responsibility for disease management [25].

#### 6. Conclusion

In conclusion, most of the caregivers (55%) have knowledge deficit towards T1DM. This study also found that sex, place of residence, educational level, family income, attending diabetic education previously and presence of psychological problem were variables that showed a statistical significant association with the level of knowledge of caregivers.

Knowledge is a key factor for the good management of diabetes and prevention of its complications. This study informs policy/decision makers and concerned institutions on factors associated to the knowledge of care givers about type 1 diabetes mellitus. It is also beneficial for health professionals, especially for those who work on child health, to build up knowledge and implement evidence based practice on areas related to care of diabetic children and its management, and organizes effective education programs. Furthermore, the study suggested that giving ongoing trainings and preparing different workshops for the caregivers is beneficial for improving their level of knowledge with ultimate goal of bringing better outcome of children with T1DM.

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# Ethics approval and consent to participate

To conform the Declaration of Helsinki (1964) and Population Screening Act, Addis Ababa University Institutional Review Board approved the study. Participation was voluntary, and information was collected anonymously after obtaining written consent from each respondent. Confidentiality of data was ensured throughout the study.

# List of abbreviations

AOR: Adjusted Odds Ratio COR: Crude Odds Ratio DM: Diabetes Mellitus HbA1C: Glycosylated hemoglobin level IDF: International Diabetic Federation JDM: Juvenile Diabetes Mellitus SPSS: Statistical Package for Social Sciences TIDM: Type 1 Diabetes Mellitus WHO: World Health Organization

# **Conflict of interest**

The authors declare no conflict of interest, financial or otherwise

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