



Knowledge of Household Contacts of Diabetic Patients about the Disease

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Abstract

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BACKGROUND: Diabetes is a complex and chronic illness requiring continuous medical care with multifactorial risk-reduction strategies beyond glycemic control. Ongoing patients and their household care givers self-management education and support are critical to preventing acute complications and reducing the risk of long-term complications.

AIM: The aim of the study was to assess the knowledge of household contacts about different aspects of diabetes and determine factors affecting it.

SUBJECTS AND METHODS: A cross-sectional analytic design was conducted in Buraidah city, North central Saudi Arabia among a sample of household contacts of diabetic patients (Type 1 or 2) attending Buraidah diabetic center throughout the period of the study. A valid self-administered questionnaire including question about sociodemographic characteristics of the participants, patient's diabetic characteristics, and knowledge questions regarding diabetes was used for data collection.

RESULTS: The study included 422 household contacts of diabetic patients. The age of 44% of the participants was ranging between 20 and 39 years. Females represent 55.2% of them. Almost two-thirds of the participants (64.4%) expressed adequate level of knowledge about diabetes whereas 12.6% had poor level of knowledge. Their main source of information about diabetes was physicians (56.9%), followed by books/social media (23.9%). Household contacts aged between 20 and 39 years, singles, postgraduate educated, working, and being sons and parents of patients were more knowledgeable about diabetes compared to their counterparts. Participants whose patients had more duration of diabetes, family support, and no foot fungal infection were more knowledgeable about the disease. With increasing in the level of HbA1c% among diabetic patients, the knowledge of household contacts about the disease decreased, $p < 0.001$.

CONCLUSION: Knowledge of household contacts of diabetic patients in Buraidah city, Saudi Arabia, about diabetes was overall adequate with some identified deficient facts. The increase in the level of knowledge was accompanied with more glycemic control.

Introduction

Diabetes mellitus (DM) is a major cause of morbidity and mortality and poses a great burden on community health and economic status [1].

The prevalence of diabetes among adults was estimated to be 6.4% in 2010 worldwide in 2010 and will raise up to 7.7% by 2030 which means an increase of 69% in numbers of diabetic adults in developing countries and a 20% in developed countries [2]. In addition, the International Diabetes Federation estimated that 642 million will be diabetics by 2040 [3].

The World Health Organization documented that Saudi Arabia ranks the second highest country in the Middle East, and seventh in the world as regard the prevalence of DM [4]. The prevalence of DM in Saudi Arabia is 23.9%. However, the worldwide average figure is lower than that figure (8.3%) [5]. Type 2 diabetes represents 90% of cases [6]. An estimated 40% of

patients with DM over the age of 30 are unaware of their disease. Furthermore, 25.5% of those aged over 30 years are displaying signs of pre-diabetes [7]. It has been estimated that by the year 2035, 7.5 million Saudi patients aged between 20 and 79 years will be present [8].

Diabetes is a complex, chronic illness requiring continuous medical care with multifactorial risk-reduction strategies beyond glycemic control. Ongoing patients and their household care givers self-management education and support are critical to preventing acute complications and reducing the risk of long-term complications [9].

As most of a patient's diabetes management usually done at homes [10]. Therefore, investigating the knowledge of family households for diabetic patients regarding different aspects of diabetes is essential.

Despite, household contacts of diabetic patients can play an essential role in a disease management and including them in self-care interventions may influence

patient's diabetes outcomes in a positive way, the evaluation of their knowledge about diabetes was not sufficiently studied all over the world. Therefore, the aim of this study is to assess the knowledge of household contacts about different aspects of diabetes to improve the patient's glycaemic control.

Materials and Methods

A cross-sectional analytic design was conducted in Buraidah city, which is the capital of Al-Qassim Region, North central Saudi Arabia. It has a population of 614,093, according to 2020 estimated census [11], [16]. The study was carried out specifically at Buraidah diabetic center, Ministry of Health, which includes more than 60 clinics/week (Type 1, Type 2, gestational, insulin pump, medication consultation, endocrinology, health education, nutrition, diabetic foot, and retinopathy). Household contacts of diabetic patients (Type 1 or 2) who are officially registered in the Buraidah diabetic center and attending it during the study period were eligible for inclusion.

As provided officially by the statistical office of Buraidah Diabetic Center, the total number of patients during 2021 was 65147 patients. Using Roasoft statistical online program, the sample size was calculated. By estimating the prevalence of sufficient knowledge about diabetes as 50% (since there is no figure from Saudi Arabia in this regard), the confidence interval of 95%, and a margin of error of 5%, the calculated sample size was 382 and by adding 10% to compensate for possible non-response, the total sample size was approximately 420 persons. A convenience sample of household contacts of all diabetic patients attending outpatient clinics of Buraidah Diabetic center was invited to participate in the study, till the required sample size was achieved.

Data were collected using a valid self-administered questionnaire adopted from a study carried out by Prasad [12], [17]. It is translated into Arabic and retranslated again into English and will be validated by three consultants in Diabetes and community medicine. It includes question about sociodemographic characteristics of the participants such as gender, age, marital status, nationality, residence, level of education, and job status. Furthermore, it included questions on patient's diabetic characteristics such as duration of diabetes, family history, family support, diabetic complications, and source of information on diabetes. In addition, the last level of HbA1c has been obtained from patient's medical files. In addition, knowledge questions regarding diabetes definition, symptoms, diagnosis, management, and complications were included. Permission to use the questionnaire

will be requested from the author through an e-mail communication.

Knowledge score was created in the way that correct answers were given a score of "1" whereas wrong answers were assigned a score of "0". Then, total score and its percentage were computed. Score was classified as adequate if answered correctly by >75%, fair if answered correctly by 50–75%, or inadequate if answered correctly by <50%.

The researchers gave a hard copy of the questionnaire to the selected participant in the waiting area after taking a written consent. For illiterate participants, the researchers themselves or trained nurse read the questionnaire as it is written to the participant and write their answers. The researchers were available in the waiting area and collect the questionnaire back. Then, they checked the file of each participants. Gathering the results of HbA1c, we filled from files either from the electronic version or the paper version.

All necessary official approvals were fulfilled from administration of Buraidah diabetic center. Approval of the research proposal from the Local Research and Ethics Committee was obtained. An individual written consent from each participant in the study was obtained before data collection.

Data were analyzed using the Statistical Program for the Social Sciences software version 25.0. Categorical variables were expressed in frequency and percent while quantitative variables were expressed in mean and standard deviation. Categorical variables were compared with Chi-square and significance was considered at $p < 0.05$.

Results

Sociodemographic characteristics of the household contacts

The study included 422 household contacts of diabetic patients. The age of 44% of the participants was ranging between 20 and 39 years whereas that of 13.5% of them was 60 years or over. Females represent 55.2% of the participants. The majority of them were Saudi Nationals (96.4%). Most of them (70.2%) were married. Almost half of them (49.7%) were university graduated and 44.6% were working. Health professionals represent 14.9% of the respondents. More than half of the participants (55.2%) were parents of patients (Table 1).

Diabetes-related characteristics of patients

As shown in Table 2, the duration of diabetes exceeded 10 years among 46.4% of patients. Family

Table 1: Sociodemographic characteristics of the participants

	Frequency N = 422	Percentage
Age (years)		
20–39	186	44.0
40–49	99	23.5
50–59	80	19.0
≥60	57	13.5
Gender		
Male	189	44.8
Female	233	55.2
Nationality		
Saudi	407	96.4
Non-Saudi	15	3.6
Marital status		
Single	85	20.1
Married	296	70.2
Divorced/widowed	41	9.7
Educational level		
Illiterate	24	5.7
Primary school	42	10.0
Intermediate/secondary school	119	28.2
University	210	49.7
Postgraduate	27	6.4
Job status		
Not working	163	38.6
Working	188	44.6
Retired	71	16.8
Working as a health professional		
No	359	85.1
Yes	63	14.9
Relation to the patient		
Parents	233	55.2
Son	28	6.6
Daughter	45	10.7
Spouse	57	13.5
Others	59	14.0

history of diabetes was reported among 62.6% of patients; mostly among parents (66.3%). Most of patients (77.5%) had family support and 41% had diabetic complications. Foot fungal infection was observed among 26.5% of the patients.

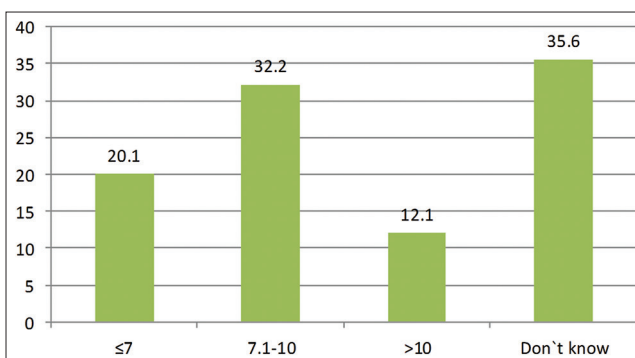
Figure 1 shows that the level of HbA1c ranged between 7.1% and 10% among almost one-third of diabetic patients whereas it exceeded 10% among 12.1% of them.

Knowledge of the household contacts about diabetes

Majority of the participants could recognize that it is important for diabetic patients to take care of any injury (94.8%), wounds heal slowly in diabetic patients (87.9%), it is important for diabetic patient to check eyes periodically (87.2%), diabetes is a status that can

Table 2: Diabetes-related characteristics of the diabetic patients

	Frequency	Percentage
Duration of diabetes among patients		
<2 years	61	14.5
2–5 years	68	16.1
6–10 years	97	23.0
>10 years	196	46.4
Family history of diabetes		
No	158	37.4
Yes	264	62.6
Parents	175	66.3
Siblings	36	13.6
Others	16	6.1
Most of family members	37	14.0
Patient has family support		
No	95	22.5
Yes	327	77.5
Patient has complications		
No	249	59.0
Yes	173	41.0
Patient had foot fungal infection		
No	310	73.5
Yes	112	26.5

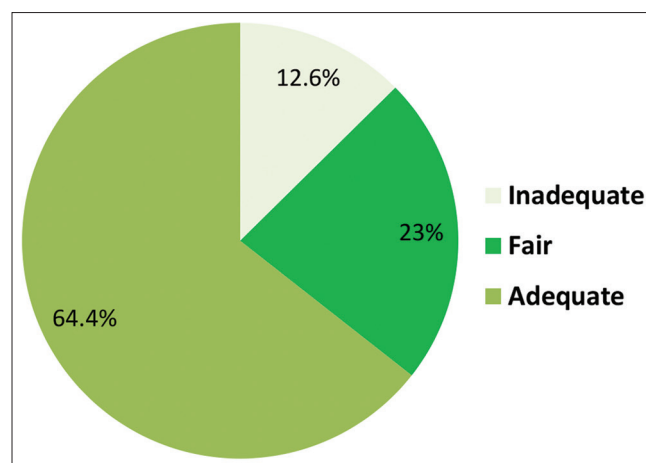
**Figure 1: Level of glycosylated hemoglobin (HbA1c) among the diabetic patients**

be controlled (86.3%) and insulin should be stored in the refrigerator (86.3%). On the other hand, about half of them knew the normal blood sugar level for diabetic patients during fasting (53.2%) and the normal blood sugar level 2 h postprandial (49.5%) (Table 3).

Table 3: Responses of the householder contacts of diabetic patients to diabetes knowledge statements

	Correct answer	
	No.	%
What is the common diagnostic definition of diabetes? (Increase in blood glucose level as a result of insulin deficiency or insufficiency)	305	72.3
What is the commonest type of diabetes in Saudi Arabia? (Type II)	269	63.7
Diabetes is a status.? (that can be controlled)	364	86.3
Normal blood sugar level? (75–100 mg/dL)	311	73.7
Normal blood sugar level for diabetic patients during fasting (80–130 mg/dL)	227	53.8
Normal blood sugar level 2 h postprandial (<180 mg/dL)	209	49.5
What are the complications of uncontrolled diabetes? (vision problems, renal problems, cardiovascular problems, and foot ulcers)	299	70.9
Numbness and tingling are symptoms of what? (peripheral neuritis)	274	64.9
Is it important for diabetic patient to check eyes periodically (Yes)	368	87.2
Is it important for diabetic patients to take care of any injury? (Yes)	400	94.8
Wounds heal slowly in diabetic patients (Yes)	371	87.9
Where insulin should be stored (In the refrigerator)	364	86.3

Overall, almost two-thirds of the participants (64.4%) expressed adequate level of knowledge about diabetes whereas 12.6% had poor level of knowledge as illustrated in Figure 2.

**Figure 2: Level of knowledge about diabetes among household contacts of diabetic patients**

Their main source of information about diabetes was physicians (56.9%), followed by books/social media (23.9%), friends (17.5%), and other sources (1.7%).

Factors associated with knowledge about diabetes

Socio-demographic characteristics of household contacts

The highest level of adequate level of knowledge was observed among household contacts aged between 20 and 39 years (72.6%) compared to 36.8% among those aged 60 years or above, $p < 0.001$. Males were more knowledgeable compared to females as adequate level of knowledge was reported among 69.3% and 60.5% of them, respectively. However, this difference was borderline insignificant, $p = 0.052$. Regarding the marital status, the highest level of adequate knowledge was reported among single household contacts (87.1%) whereas the lowest rate was reported among divorced/widowed participants (36.6%), $p < 0.001$. Postgraduate educated household contacts had the highest rate of adequate knowledge (77.8%) whereas primary school graduated participants had the lowest rate (28.6%), $p < 0.001$. Working participants (73.4%) were more knowledgeable than not working (63.8%) or retired (42.3%) ones, $p < 0.001$. Concerning relationship to patients, sons and parents reported the highest rates of adequate knowledge (76.9% and 76.8%, respectively) whereas daughters reported the lowest rate (51.1%), $p = 0.002$. Nationality and working as a health professional were not significantly associated with level of DM knowledge (Table 4).

Table 4: Household contacts of diabetic patient's sociodemographic factors associated with their knowledge about diabetes

	Level of knowledge about diabetes			p-value*
	Inadequate N = 53 N (%)	Fair N = 97 N (%)	Adequate N = 272 N (%)	
Age (years)				
20–39 (n = 186)	13 (7.0)	38 (20.4)	135 (72.6)	<0.001
40–49 (n = 99)	7 (7.1)	27 (27.3)	65 (65.7)	
50–59 (n = 80)	12 (15.0)	17 (21.3)	51 (63.7)	
≥60 (n = 57)	21 (36.8)	15 (26.3)	21 (36.8)	
Gender				
Male (n = 189)	16 (8.5)	42 (22.2)	131 (69.3)	0.052
Female (n = 233)	37 (15.9)	55 (23.6)	141 (60.5)	
Nationality				
Saudi (n = 407)	52 (12.8)	94 (23.1)	261 (64.1)	0.712
Non-Saudi (n = 15)	1 (6.7)	3 (20.0)	11 (73.3)	
Marital status				
Single (n = 85)	1 (1.2)	10 (11.8)	74 (87.1)	<0.001
Married (n = 296)	33 (11.1)	80 (27.0)	183 (61.8)	
Divorced/widowed (n = 41)	19 (46.3)	7 (17.1)	15 (36.6)	
Educational level				
Illiterate (n = 24)	6 (25.0)	5 (20.8)	13 (54.2)	<0.001
Primary school (n = 42)	18 (42.8)	12 (28.6)	12 (28.6)	
Intermediate/secondary school (n = 119)	16 (13.4)	29 (24.4)	74 (62.2)	
University (n = 210)	12 (5.7)	46 (21.9)	152 (72.4)	
Postgraduate (n = 27)	1 (3.7)	5 (18.5)	21 (77.8)	
Job status				
Not working (n = 163)	20 (12.3)	39 (23.9)	104 (63.8)	<0.001
Working (n = 188)	12 (6.4)	38 (20.3)	138 (73.4)	
Retired (n = 71)	21 (29.6)	20 (28.2)	30 (42.3)	
Working as a health professional				
No (n = 359)	46 (12.8)	86 (24.0)	227 (63.2)	0.435
Yes (n = 63)	7 (11.1)	11 (17.5)	45 (71.4)	
Relation to the patient				
Parents (n = 233)	20 (8.6)	55 (23.6)	158 (67.8)	0.002
Son (n = 28)	3 (10.7)	6 (21.4)	19 (67.9)	
Daughter (n = 45)	15 (33.3)	7 (15.6)	23 (51.1)	
Spouse (n = 57)	6 (10.5)	18 (31.6)	33 (57.9)	
Others (n = 59)	9 (15.3)	11 (18.6)	39 (66.1)	

*Chi-square test.

Diabetes-related characteristics of patients

It is obvious from Table 5 that with increasing in the duration of diabetes among patients, the knowledge of household contacts about the disease increased; ranging from 54.1% with duration of < 2 years to 69.4% at duration of more than 10 years, $p < 0.001$. Patients who had family support, their household contacts were more knowledgeable about the disease (68.5% vs. 50.5%), $p = 0.001$. Furthermore, patients who had no foot fungal infection, their household contacts were more knowledgeable about the disease (67.7% vs. 55.4%), $p = 0.003$. Family history of diabetes and history of complications among patients were not associated with household contacts knowledge about diabetes. With increasing in the level of HbA1c% among diabetic patients, the knowledge of household contacts about the disease decreased; ranging from 75.3% with level of 6.5–7–68.6% with level exceeded 10%. In addition, the level of knowledge was lowest among those who did not know HbA1c% of their patients (46.7%) $p < 0.001$. Participants who had their information about diabetes mainly from other sources (e.g., internet and mass media) compared to only 45.9% of those had information from friends/relatives expressed adequate level of knowledge about diabetes, $p < 0.001$.

Table 5: Diabetes-related characteristics of patients associated with their household knowledge about diabetes

	Level of knowledge about diabetes			p-value*
	Inadequate N = 53 N (%)	Fair N = 97 N (%)	Adequate N = 272 N (%)	
Duration of diabetes among patients				
<2 years (n = 61)	19 (31.1)	9 (14.8)	33 (54.1)	<0.001
2–5 years (n = 68)	11 (16.2)	20 (29.4)	37 (54.4)	
6–10 years (n = 97)	7 (7.2)	24 (24.7)	66 (68.0)	
>10 years (n = 196)	16 (8.2)	44 (22.4)	136 (69.4)	
Family history of diabetes				
No (n = 158)	19 (12.0)	42 (26.6)	97 (61.4)	0.397
Yes (n = 264)	34 (12.9)	55 (20.8)	175 (66.3)	
Patient has family support				
No (n = 95)	12 (12.6)	35 (36.8)	48 (50.5)	0.001
Yes (n = 327)	41 (12.5)	62 (19.0)	224 (68.5)	
Patient has complications				
No (n = 249)	28 (11.2)	63 (25.3)	158 (63.5)	0.309
Yes (n = 173)	25 (14.5)	34 (19.7)	114 (65.9)	
Patient had foot fungal infection				
No (n = 310)	29 (9.4)	71 (22.9)	210 (67.7)	0.003
Yes (n = 112)	24 (21.4)	26 (23.2)	62 (55.4)	
HbA1c%				
6.5–7 (n = 85)	5 (5.9)	16 (18.8)	64 (75.3)	<0.001
7.1–10 (n = 136)	4 (2.9)	29 (21.3)	103 (75.8)	
>10 (n = 51)	6 (11.8)	10 (19.6)	35 (68.6)	
Don't know (n = 150)	38 (25.3)	42 (28.0)	70 (46.7)	
Main source of information about diabetes				
Family/friends (n = 74)	21 (28.4)	19 (25.7)	34 (45.9)	<0.001
Physicians (n = 240)	19 (7.9)	57 (23.8)	164 (68.3)	
Books/social media (n = 101)	13 (12.9)	21 (20.8)	67 (66.3)	
Others (n = 7)	0 (0.0)	0 (0.0)	7 (100)	

*Chi-square test.

Discussion

For better control and prevention of DM adverse consequences, increase awareness about DM, for patient's household contacts is essential. Therefore, this study was carried out to assess the level of knowledge about DM and its determinants among T2DM patient's

household contacts attending the diabetic center in Buraidah city, North central Saudi Arabia. Findings from the study may play a role in designing appropriate interventional strategies to reduce the burden of the disease in our region.

Since most of the studies investigating knowledge about diabetes were conducted either among patients themselves or a specific group of general population with very limited studies carried out among household contacts or family members, the discussion of our finding is quite difficult. However, we tried our best to compare our findings with these few studies and justifying the difference between the present study and those studies.

In the present study, almost two-thirds of the household contacts of diabetic patients (64.4%) expressed adequate level of knowledge about diabetes whereas only 12.6% had poor level of knowledge, which are encouraging findings. Some other studies carried out in South Africa [13], Ethiopia [14] and Kenya [15] indicated that diabetic patients and their family members lack sufficient knowledge on diabetes and its management. Furthermore, in a study carried out in Poland [16], more than half (56%) of family member caregivers' had no knowledge about diabetes risk factors and complications. In another study carried out in Ethiopia [17], it was observed that 78.3% of primary and secondary diabetic patient's family members had good level of knowledge about diabetes and its prevention and this was almost 3-folded that of control group. Robert *et al* [18], observed that African Americans with DM family history were more aware about DM risk factors than those without such history. Difference between various studies could be attributed to participants' characteristics and using tool to assess knowledge about DM. The considerable high level of knowledge among household contacts of diabetic patient in the present study is quite expected as they have a greater chance to be in contact with diabetic patients and so expected to have better knowledge about DM. In addition, DM is a very prevalent disease in Saudi Arabia, therefore adequate knowledge about it, particularly among household contacts of patients is not a surprise.

The main source of information about DM among participants in this study was physicians, followed by books/social media. Participants who got their information from these two sources were more knowledgeable about DM compared to those obtained their sources from friends/family members. However, the highest rate of knowledge was observed among those obtained their information from the internet and mass media. Therefore, physicians should be encouraged to have more active role in providing information about the diabetes and its management to family members and household contacts of diabetic patients during follow-up visits.

The highest level of adequate level of knowledge was observed among single, working

household contacts aged between 20 and 39 years. Most probably, this group is more educated than others. In accordance with others [14], [15], [17], [19], [20] more educated household contacts were more knowledgeable about DM.

In the present study, and in agreement with others [19], family members and household contacts whose diabetic patients had longer duration of diabetes were more knowledgeable about the disease as they got more experience in dealing with patients during the management of the disease.

Household contacts of diabetic patients who had no foot fungal infection were more knowledgeable about the disease. This finding could reflect the impact of knowledge of the household contact about the disease control and management on prevention of severe complications, particularly foot fungal infection.

In the present survey, it has been observed that with increasing in the level of HbA1c% among diabetic patients, the knowledge of household contacts about the disease decreased. Interestingly, the level of knowledge was lowest among household contacts who did not know HbA1c% of their patients. This finding confirms the fact that knowledgeable household contacts could play an important role in diabetes control.

Knowledgeable family members/caregivers of diabetic patients usually express more care for their patients and consequently better control and less complications. In a study carried out in Poland, Abramczyk observed that diabetic patients of more knowledgeable family members/caregivers showed more care regarding oral hygiene, self-care, self-management, in addition, they had no somatic or psychoemotional complaints, no additional medical problems and their weight, blood pressure, and triglycerides were normal [16]. However, in a systematic review carried out by Baig *et al.*, they cannot determine how family members participation in diabetes management can affect patient's clinical outcomes [10].

This study is one of the limited studies carried out to assess knowledge of household contacts of diabetic patients in the Kingdom of Saudi Arabia. However, it has some limitations that should not be addressed. The cross-sectional design adopted in this study is considered one of the limitations of the study. Furthermore, conduction of the study in one health institution in Buraidah city limits the generalization of its findings.

Conclusion

Knowledge of household contacts of diabetic patients in Buraidah city, Saudi Arabia, about diabetes was overall adequate with some identified deficient facts

related to the normal blood glucose levels during fasting and postprandial. Their main source of information was physicians. Household contacts aged between 20 and 39 years, singles, postgraduate educated, working, and being sons and parents of patients were more knowledgeable about diabetes compared to their counterparts. Furthermore, those whose patients had more duration of diabetes, family support, and no foot fungal infection were more knowledgeable about the disease. With increasing in the level of HbA1c% among diabetic patients, the knowledge of household contacts about the disease decreased. Based on findings of the study, the following are recommended

- Organizing health education activities at diabetic centers and primary care settings for the whole community about diabetes, its complication, and management.
- Encourage physicians and other health-care team to give enough time to educate patients and their household contacts about different aspects of the disease.
- Further large scale interventional study to assess the impact of health education of patients and their relatives on the level of glycemic control.
- Conduction of the same study in many other areas of the Kingdom to have a clearer profile of the situation.

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