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The Relationship between Food Insecurity and Some Socio-Economic Factors in Patients Referring to Diabetes Clinic of Buali Hospital in Zahedan, Iran

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ABSTRACT

Background: There is a close relationship between food insecurity and diabetes. It has been shown that some socio-economic factors can affect Type I diabetes. This study was conducted to investigate the relationship between food insecurity and some socio-economic factors with type 2 diabetes in patients referring to Diabetes Clinic of Buali Hospital in Zahedan city. **Methods:** This case-control study was conducted on 450 patients with type 2 diabetes as the case group and 450 similar participants without diabetes as the control group in 2021. The data were collected for the demographic and socioeconomic characteristics and food insecurity by the 18-item USDA household food security questionnaire. **Results:** The results showed that food insecurity was significantly higher in case group (7.27±5.25) compared to the control group (6.44±5.82). Participants with higher income had lower food insecurity (P=0.0001). Married participants had higher food security compared to other status in both groups (P=0.0001). Individuals with higher education had better food security and diabetic individuals had lower education compared to healthy people (P=0.001). Employee and housewife in case group had higher food security compared to participants with other jobs (P=0.0001). **Conclusion:** Food insecurity was higher in diabetic patients and socio-economic factors had a close relation with food insecurity. Policy makers must consider strategies for improving socio-economic factors in Zahedan city.

Keywords: *Economic factors; Food insecurity; Socioeconomic; Type 2 Diabetes*

Introduction

Food insecurity is a major problem worldwide that almost 800 million people have experienced it (Vilar-Compte *et al.*, 2020). Based on Food and Agriculture Organization (2020) estimates, it has affected 51.6%, 31.70% 22.30%, and 7.90% of population in Africa, Latin America, Asia and North America, and Europe, respectively. Food insecurity is known as restrictions on access to nutritious food affecting lower income households (Flint *et al.*, 2020). It is also defined as restricted access to safe foods and/or restricted ability for obtaining acceptable foods in socially acceptable ways (USDA ERS, 2021). Food insecurity has a positive correlation

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with increased poverty and inequality and also poor economic growth (Vilar-Compte *et al.*, 2020). In addition, differences in socio-economic condition have significant effects on risk exposure and capability for preventing and coping with risks of food insecurity (Ogunniyi *et al.*, 2021). A study reported a relationship between food insecurity with acculturation and socio-economic factors in Australia (Mansour *et al.*, 2020). Socio-economic factors such as limited income, housing costs, unemployment, grocery taxes, climate change, natural disasters, and war can increase food insecurity (Thomas *et al.*, 2021). In Iranian community, the prevalence of food insecurity is significant and studies have reported a rate of 58.40% in East Azerbaijan (Tabrizi *et al.*, 2018), 82% among slum households in Kerman (Amiresmaeili *et al.*, 2021), 56.10% in the elderly population in Qarchak city (Rafat *et al.*, 2021), and 58.80% in Zahedan (Mortazavi *et al.*, 2021).

Food insecurity is associated with low-quality diets such as consumption of highly processed foods, added sugar, and saturated fat (Te Vazquez *et al.*, 2021) that can cause other diseases such as diabetes. It was reported that food insecurity increases the chance of diabetes among adults (Robbiati *et al.*, 2022). Indeed, a healthy diet is essential for preventing diabetes and food insecurity increases its prevalence (Gucciardi *et al.*, 2014). The American Diabetes Association (2019) has recommended tailoring treatments and screening for patients with diabetes and food insecurity. Indeed, food insecurity can cause a twofold-threefold increase in the risk of being obese and diabetes (Vilar-Compte *et al.*, 2020). A study reported that food-insecure individuals had poor glycemic levels (A1c of >8.5%) compared to food-secure ones owing to poor diet, medication adherence, self-management, and inability in coping with emotional stress (Seligman *et al.*, 2012). In Iranian community, studies have reported a significant relationship between food insecurity and gestational diabetes mellitus (Hojaji *et al.*, 2021), food insecurity, and Type 2 diabetes in children (Najibi *et al.*, 2019).

The prevalence of food insecurity is increasing and various factors can affect it. The prevalence rate is different in each region and must be investigated and policy makers consider programs based on each region. According to literature review, there was no study conducted on the relation between food insecurity and type 2 diabetes in Zahedan city. This study aimed to investigate the relationship between food insecurity and some socio-economic factors with type 2 diabetes in patients referring to Diabetes Clinic of Buali Hospital in Zahedan city.

Materials and Methods

Study design and participants: This case-control study was conducted on 450 patients with type 2 diabetes as the case group and 450 similar participants without diabetes as the control group in 2021. This study was conducted in Diabetes Clinic of Buali Hospital in Zahedan city.

Sampling: The participants were selected based on convenience sampling method among people referring to Diabetes Clinic of Buali Hospital in Zahedan city.

Inclusion criteria: The inclusion criteria in the case group were diagnosis of diabetes by medical specialists, willingness to participate in the study, non-administration of insulin, and age range of 18-55 years. The criteria in control group were lack of involvement with diabetes and lack of close relationship with the case group.

Exclusion criteria: The exclusion criteria were lack of consent for participation in the study and other diseases in both groups.

Study settings: The studied individuals were screened and eligible people were referred to the principal investigator as the interviewer. The clinic is in a region that different social and economic classes refer to it.

Tools: After providing an explanation for the study, the questionnaires for general scales and food insecurity status were completed by the respondents. The general questionnaire included demographic and socioeconomic characteristics such as age, marital status, employment status, education level, family size, and monthly income.

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The food security status was investigated by the 18-item USDA household food security questionnaire (Bickel *et al.*, 2000). Items of the questionnaire included worry about running out of food, inability to eat balanced meals, dependency for low-cost food for children, lack of enough food, low eating, decreased meal sizes, feeling hungry, losing weight, decreased food volume, lack of consumption of food for one day in adults and reduced food portion size of children. Score 1was given to options "often", "sometimes", "almost every month", "some months", and "yes" and score 0 to options "not correct", "refused or did not know", "only once or twice a month", and "no". Food security was scored as food secure (0-2 positive answers), food insecure without hunger (3-7 positive answers), food insecure with moderate hunger (8-12 positive answers), and food insecure with severe hunger (13-18 positive answers).

Ethical considerations: The current study has been confirmed by the Research Council and Ethics Committee of Zahedan University of Medical Sciences, with IR.ZAUMS.REC.1399.475 code number. The participants signed the informed consent form.

Data analysis: The data for demographic data were reported as frequency. The results for age, family size and food insecurity score were analyzed by t-test. The chi-square test was used to investigate food insecurity status in case and control groups. Data were analyzed by SPSS software (version 23). A $P<0.05$ was considered significant.

Results

Table 1 shows the results for demographic characteristics in both groups. The results showed that women had higher participation compared to men in both groups. Most of participants had education lower than diploma and were housekeeper in both groups. Monthly income was lower than 22 million riyals for most participants in the case and control groups. Married participants comprised a major part of participants. The results showed that the mean age was significantly higher in the case group compared to the control group (P=0.041). In addition, food insecurity (P=0.026) and family size (P=0.001) were significantly higher in case group compared to control group.

Table 2 shows the relationship between demographic characteristics with food insecurity status in participants with and without type 2 diabetes. The results showed significant differences in the groups, so that participants with higher income had lower food insecurity (P=0.0001). Most of the participants had lower income than 22 million riyals. Moreover, significant differences were found between participants in diabetic group (P=0.0001) and control group (P=0.034). Married participants had higher food security compared to others in both groups. Most of the participants were married in both groups. The results for the case (P=0.0001) and control (P=0.0001) groups showed that individuals with higher education had better food security. In addition, patients with diabetes had lower education compared to healthy people (P=0.001). A significant difference was also observed in case group, so that employees and housewives had higher food security (P=0.0001).

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Table 1. Demographic characteristics of case and control groups.

Variables	Control group	Case group	P-values[a]
Gender			0.31
Men	258(57.3)[b]	294(65.30)	
Women	192(42.7)	156(34.7)	
Education			0.03
Under diploma	383(85.11)	218(48.45)	
Diploma	67(14.89)	67(14.89)	
Occupation			0.04
Housekeeper	187(41.60)	286(63.50)	
Unemployment	48(40.70)	10(2.20)	
Employee	97(21.60)	71(15.80)	
Worker	35(7.80)	51(11.40)	
Self-employed	62(13.80)	32(7.10)	
Student	21(4.70)	0(0.00)	
Monthly income (Rial)			0.042
<22000000	230(51.10)	248(55.20)	
22000000-50000000	113(25.10)	84(18.70)	
50000000<	107(23.80)	2118(6.10)	
Marital status			0.787
Single	31(6.90)	3(0.7)	
Married	404(89.80)	422(93.80)	
Deceased spouse	3(0.70)	5(1.10)	
Divorced	12(2.80)	20(4.50)	
Age (year)	37.70 ± 12.33[c]	48.84 ± 4.31	0.041
Food insecurity score	6.44 ± 5.82	7.27 ± 5.25	0.026
Family size	3.92 ± 1.37	4.53 ± 1.51	0.001

[a]: P-values were obtained from independent samples t□test for continuous variables and Chi□square test for categorical ones; [b]: n(%); [c]: Mean ± SD

Table 2. The relationship between demographic characteristics with food insecurity in case and control groups.

Variables	Insecurity status	Case	Control
Monthly income			1
	Food secure	2 (0.8)[a]	8 (8.0)
<2.2 million riyals	Food insecure without hunger	30 (12.0)	33 (14.0)
	Food insecure with moderate hunger	129 (52.0)	82 (36.0)
	Food insecure with severe hunger	87 (35.0)	97 (42.0)
	Food secure	17 (20.0)	54 (48.0)
22-50 million riyals	Food insecure without hunger	40 (48.0)	38 (34.0)
	Food insecure with moderate hunger	20 (24.0)	18 (16.0)
	Food insecure with severe hunger	7 (8.0)	3 (2.0)
	Food secure	99 (85.0)	90 (85.0)
>50 million riyals	Food insecure without hunger	12 (10.0)	11 (10.0)
	Food insecure with moderate hunger	5 (4.0)	5 (4.0)
	Food insecure with severe hunger	1 (1.0)	1 (1.0)
P-value[b]		0.0001	0.0001
Marital status			
	Food secure	1 (33.0)	9 (29.0)
Single	Food insecure without hunger	2 (66.7)	9 (29.0)
	Food insecure with moderate hunger	0(0.0)	8 (26.0)
	Food insecure with severe hunger	0(0.0)	5 (16.0)
	Food secure	117 (28.0)	151 (37.0)

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Married	Food insecure without hunger	77 (18.0)	73 (18.0)
	Food insecure with moderate hunger	145 (34.0)	93 (23.0)
	Food insecure with severe hunger	83 (20.0)	87 (22.0)
	Food secure	0(0.0)	0(0.0)
Deceased spouse	Food insecure without hunger	2 (40.0)	0(0.0)
	Food insecure with moderate hunger	2 (40.0)	1 (33.0)
	Food insecure with severe hunger	1 (20.0)	2 (67.0)
	Food secure	1 (5.0)	2 (17.0)
Divorced	Food insecure without hunger	1 (5.0)	0.00
	Food insecure with moderate hunger	7 (35.0)	3 (25.0)
	Food insecure with severe hunger	11 (55.0)	7 (58.0)
P-value		0.0001	0.034
Education			
	Food secure	81 (21.14)	38 (16.30)
Under diploma	Food insecure without hunger	64 (16.70)	47 (20.20)
	Food insecure with moderate hunger	146 (38.12)	70 (30.00)
	Food insecure with severe hunger	92 (24.02)	78 (33.50)
	Food secure	38 (56.71)	124 (54.60)
Diploma	Food insecure without hunger	18 (26.86)	35 (15.41)
	Food insecure with moderate hunger	8 (12.00)	35 (15.41)
	Food insecure with severe hunger	3 (4.40)	33 (14.50)
P-value		0.0001	0.0001
Job			
	Food secure	57 (20.0)	37 (20.0)
Housewife	Food insecure without hunger	39 (14.0)	31 (17.0)
	Food insecure with moderate hunger	113 (39.0)	59 (32.0)
	Food insecure with severe hunger	77 (27.0)	60 (32.0)
	Food secure	0 (0.0)	2 (4.0)
Unemployment	Food insecure without hunger	3 (30.0)	8 (17.0)
	Food insecure with moderate hunger	7 (70.0)	13 (27.0)
	Food insecure with severe hunger	0 (0.0)	25 (52.0)
	Food secure	56 (79.0)	77 (80.0)
Worker	Food insecure without hunger	11 (15.0)	14 (14.0)
	Food insecure with moderate hunger	4 (6.0)	4 (4.0)
	Food insecure with severe hunger	0 (0.0)	2 (2.0)
	Food secure	6 (19.0)	30 (48.0)
Self-employed	Food insecure without hunger	20 (62.0)	19 (31.0)
	Food insecure with moderate hunger	4 (13.0)	11 (18.0)
	Food insecure with severe hunger	2 (6.0)	2 (3.0)
	Food secure	6(19.0)	14 (67.0)
Student	Food insecure without hunger	0(0.0)	4 (19.0)
	Food insecure with moderate hunger	0(0.0)	2 (9.5)
	Food insecure with severe hunger	0(0.0)	1 (4.5)
P-value		0.001	0.26

[a]: n(%); [b]: P-values were obtained from independent samples t□test for continuous variables and Chi□square test for categorical ones.

Discussion

This study investigated the relationship between food insecurity and some socio-economic factors with type 2 diabetes in patients referring to Diabetes Clinic of Buali Hospital in Zahedan. The findings showed that food insecurity was significantly higher in diabetic patients. The results are consistent with results reported by other studies indicating that higher food insecurity in diabetic patients compared to healthy people (Abdurahman *et al.*, 2019, Fitzgerald *et al.*, 2011, Flint *et al.*, 2020, Gucciardi *et al.*, 2009, Hopkins and Holben, 2018, Najibi *et al.*, 2019, Seligman *et al.*, 2007). Food insecurity causes a decrease in spending on food and dietary intake, and changes the consumed food type, all of which can be closely related to

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diabetes (Najibi *et al.*, 2019). Based on the findings, people with low income and education had greater food insecurity. It shows that having more income can increase food accessibility and also preparation of high quality food. In addition, higher education helps to prepare foods with higher quality that can alleviate and/or prevent diabetes. Indeed, food insecurity is associated with diets poor in quality, not necessarily quantity.

Family size was significantly higher in diabetic patients. The results are in agreement with results reported by other studies (Najibi *et al.*, 2019). A cross-sectional study on patients with diabetes in Tehran showed a positive relationship between family size and risk of diabetes (Farvid *et al.*, 2010). Families with higher size consume low fruits and vegetables and other foods protecting against diabetes and are at higher risk of diabetes. In addition, greater size of family affects both food quality and quantity which can lead to diabetes.

The results showed that people with lower incomes had higher food insecurity in both groups. In agreement with the findings, other studies have reported a positive relation between food insecurity and low income (Farrell *et al.*, 2018; Penne & Goedemé, 2021). Insufficient income in people with food insecurity cause them to buy cheaper and high-calorie food leading to obesity and increased susceptibility to metabolic disorders such as diabetes (Najibi *et al.*, 2019).

Moreover, married people in both groups had lower food insecurity compared to others. The results are not in line with findings of other studies indicating that marital status did not have any significant association with food insecurity (Najibi *et al.*, 2019). However, the results are in agreement with studies showing a significant relation between marital condition and food insecurity (Lee *et al.*, 2020)).

Food insecurity was significantly higher in people with low education. The results are in agreement with previous studies that showed a negative association between low education and higher food security (Najibi *et al.*, 2019). People with higher education are aware of food security, consume high quality food, and care about their health. They spend more on high-quality food types that affect diabetes and diabetes prevention.

The results showed a close relationship between food insecurity and occupation. Employees and housewives had lower food insecurity. Other studies have also reported a significant relation between food insecurity and employment (Gucciardi *et al.*, 2014, Najibi *et al.*, 2019). Having a secure job provides enough income to purchase high-quality food. In addition, housewives monitor the quality of food and food considerations.

The study had some limitations. In the case-control study, they generally do not allow calculation of incidence and sampling is slow due to selecting newly diagnosed patients and specific clinics. Moreover, some patients did not cooperate.

Conclusion

Food insecurity was significantly higher in diabetic patients and it had a significant relationship with income, occupation, education, and marital status. It is suggested that policy makers plan to increase food accessibility and also increase food quality for people of Zahedan, especially people with diabetes.

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Authors' contributions

Masoumi SM and Okati M designed the study and collected the data. Eslahi H analyzed the data and wrote the first draft of the paper. Shahraki M critically reviewed the paper.

Conflict of interest

None

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