



Barriers to effective control of type 2 diabetes in outpatient clinics in Mosul: A case control study

Barreras para el control eficaz de la diabetes tipo 2 en clínicas ambulatorias de Mosul: un estudio de casos y controles

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Abstract

Background: Diabetes disease is a heterogeneous disorder with distinct genetic, etiological, immunological, and pathophysiological mechanisms that result in glucose intolerance and hyperglycemia. Barriers to effective diabetes controls are extending and interrelating with one another. Determining these hurdles is critical in enabling patients to improve their diabetes control and long-term problems. **Aim:** To assess barriers to effective control of type-2 diabetes in outpatient clinics in Mosul city. **Patient and method:** a case-control study, was done on 200 diabetic patients, 100 with uncontrolled diabetes and 100 with controlled, who were attending Al-Wafa center for diabetes and endocrinology, and 4 other health centers in Mosul for the period between the 1st of February till the 31st of July 2019. Barriers include communication barriers, personal, self-management, and care barriers. Oral and written consent was taken from each participant. Data was filled by the investigator through direct interviews with the patient or relative. **Results:** study showed that frequency of all barriers domains was high in patients having uncontrolled diabetes and the difference was statistically significant (OR=6.93, 95% CI= 3.50-13.68, p-value=0.0001) in communication barriers and (OR=3.46, 95% CI= 1.94-6.17, p-value=0.0001) in personal barriers (OR=1.84, 95% CI= 1.05-3.23, p=0.033), (OR=1.94, 95% CI= 1.10- 3.43, p=0.022) in self-management barriers and care barriers, respectively. **Conclusion:** frequency of all domains was higher in patients having uncontrolled diabetes and the highest impact on the control of diabetes mellitus type 2 from the communication barriers.

Keywords: Barriers, Type 2 Diabetes, Case-Control Study, Mosul, Iraq.

Resumen

Antecedentes: la diabetes es una alteración metabólica heterogénea por distintos mecanismos genéticos, etiológicos, inmunológicos y fisiopatológicos que dan como resultado intolerancia a la glucosa e hiperglucemia. Las barreras para el control efectivo de la diabetes se están extendiendo y se interrelacionan entre sí. Determinar estos obstáculos es fundamental para permitir que los pacientes mejoren su control de la diabetes y sus problemas a largo plazo. **Objetivo:** evaluar las barreras para el control efectivo de la diabetes tipo 2 en las clínicas ambulatorias de la ciudad de Mosul. **Paciente y método:** estudio de casos y controles realizado en 200 pacientes diabéticos, 100 con diabetes no controlada y 100 con control, que asistían al centro de diabetes y endocrinología Al-Wafa, y otros 4 centros de salud en Mosul para el período comprendido entre el 1 de febrero hasta el 31 de julio de 2019. Las barreras incluyen barreras de comunicación, personales, de autogestión y de cuidado. Se tomaron los consentimientos orales y escritos de cada participante. Los datos fueron llenados por el investigador a través de entrevista directa con el paciente o familiar. **Resultados:** el estudio mostró que la frecuencia de todos los dominios de las barreras fue alta en pacientes con diabetes no controlada y la diferencia fue estadísticamente significativa (OR=6,93, IC del 95%= 3,50-13,68, valor de p=0,0001) en las barreras de comunicación y (OR=3,46, 95% IC= 1,94-6.17, p-value=0,0001) en barreras personales (OR=1,84, 95% IC= 1,05-3,23, p=0,033), (OR=1,94, 95% IC= 1,10-3,43, p=0.022) en barreras de autogestión y barreras de cuidado, respectivamente. **Conclusión:** la frecuencia de todos los dominios fue mayor en pacientes con diabetes no controlada y el mayor impacto en el control de la diabetes mellitus tipo 2 de las barreras de comunicación.

Palabras clave: Barreras, Diabetes tipo 2, Estudio de casos y controles, Mosul, Irak.

Diabetes mellitus is considered a chronic disease caused by deficiency or resistance to insulin¹. Long-standing hyperglycemia linked with diabetes gives rise to serious micro and macrovascular consequences and damage to many body's systems, sugar control has a role in possibly preventing or postponing the incidence of these complications². Barriers that interfere with good control are communication barriers [problems of diabetic patients' illiteracy, care providers not having a full understanding of diabetic patients' circumstances, or a gap between the diabetic patients and the healthcare providers' aims³. A study found that diabetic individuals who observed that their care provider undervalued their emotions, customs, and ethics will get worse or possibly delay the application of diabetic management and control⁴. Personal barriers are patients approaches, economic difficulties, social reflections, self-consciousness or lack of confidence⁵. Studies found that minor salaries were more probable to miss medical injections⁶. Self-Management barriers are poor memory, not having faith in their actions affect the course of the disease, fright of pain⁷. A study found that for blood sugar monitoring, infrequent blood sugar monitoring leads to delicate problem solving and is also associated with unhealthier eating which affects self-management⁸. Care barriers involve lack of a primary level care doctor or endocrinologist able to treat DM and frequent personal-referral, not having fixed check-up visits or a monthly medication assessment⁹. A study found that Primary care is not carrying out regular systematic checks often requiring hospital management^{10,11}. The aim of this study was to assess barriers to effective control of diabetes mellitus type-2 in outpatient clinics in Mosul city.

Subjects and Methods

A case-control design was adopted on 200 diabetic patients, 100 with uncontrolled and 100 controlled diabetic patients, selected by convenience sampling technique from patients attending Al-Wafa Center for diabetes disease and endocrinology, and four other primary health care centers included in the study in Mosul city for the period between 1st of February 2019 to the 31st of July 2019. All patients with DM type 2, aged 40 years or more were included in this study. Patients with diabetes type 1, those younger than 40 years of age, newly diagnosed patients, pregnant women, and patients with chronic renal failure or iron, B12 deficiency, and other hemoglobinopathy were withdrawal from the study. Ethical and scientific formal approval was obtained from Nineveh Health Directorate in Mosul to facilitate data collection. Oral and written consent was attained from each patient in the study. The aim, as well as the objectives of the current study were explained to the participants. No name was taken from

all participants. Information was handled with high confidentiality; data collection tool was prepared to be filled in by the investigator himself by conducting a direct interview with the patients or relatives. Before each interview, the rationale of the study was clearly explained to the patient and verbal agreement consent was obtained. Data collection tool prepared to depend on preview research¹¹:

Part One: information about the socio-demographic characteristic and medical history.

Part 2: Includes information about communication barriers, personal barriers, self-management barriers, and care barriers.

Part 3: Parameter to assess the blood sugar level [HbA1C].

Statistical analysis was used to analyze patients' characteristics using mean, number, and percentage. The characteristics of subjects with controlled and uncontrolled diabetes were examined by odd ratio (OR) and 95% confidence intervals which represented the effects of each barrier on diabetic control; all tests were at a 5% and 1% significance level. P-value refers to the value of significance in a statistical postulation and hypothesis test, which represents the likelihood of a certain event occurring. The OR is a measure of the relationship between an exposure and a result. When the OR is equal to one, it means there is "no link" between the exposure and the disease. If less than one indicates protective, if more than one indicates risk effect, and if the 95% confidence interval for the OR does not contain one, we can statistically conclude that there will be a significant correlation between the disease with the control, all the required percentages will be measured within suitable tables. Chi-square tests of the association was used, data were entered and stored in Microsoft Access Software and analyzed by SPSS version 19.

The demographic profile of the study sample of 200 patients with diabetes type 2 [100 with uncontrolled diabetes and 100 with controlled diabetes] was incorporated in this study demographic characteristics of study participants are shown in Table 1.

Table 2 shows the comparison between patients with uncontrolled versus controlled diabetes concerning the frequency of communication barriers.

Table 1. Demographic Profile of Type 2 Diabetes Patients (n=200).

Profile		(Uncontrolled)	(Controlled)
		(n=100)	(n=100)
		No. (%)	No. (%)
Age (year)	40-50	35(35.0%)	44(44.0%)
	50-60	35(35.0%)	26(26.0%)
	≥ 60	30(30.0%)	30(30.0%)
Gender	Male	57(57.0%)	52(52.0%)
	Female	43(43.0%)	48(48.0%)
Residence	Urban	67(67.0%)	82(82.0%)
	Rural	33(33.0%)	18(18.0%)
Marital Status	Single	5(5.0%)	10(10.0%)
	Married	92(92.0%)	86(86.0%)
	Widowed	3(3.0%)	2(2.0%)
	Divorced	0(0.0%)	2(2.0%)
Smoking Status	None	59(59.0%)	78(78.0%)
	Smoker	40(40.0%)	20(20.0%)
	Ex-Smoker	1(1.0%)	2(2.0%)
Duration of Illness (year)	1 to 10	39(39.0%)	62(62.0%)
	10 to 20	49(49.0%)	30(30.0%)
	More Than 20	12(12.0%)	8(8.0%)
Patient Education	Illiterate	31(31.0%)	44(44.0%)
	Primary Education	29(29.0%)	34(34.0%)
	Secondary Education	39(39.0%)	14(14.0%)
	Tertiary Education	1(1.0%)	8(8.0%)
Type of Management	Diet Alone	9(9.0%)	42(42.0%)
	Diet and Oral Hypoglycemic Therapy	38(38.0%)	42(42.0%)
	Diet and Insulin	53(53.0%)	16(16.0%)

Table 2. Comparison of Frequency of Communication Barriers between Uncontrolled and Controlled Diabetic Patients.

Items	Agree		95% CI (OR)	OR	P-Value*
	> 7%	≤ 7%			
	(Uncontrolled)	(Controlled)			
	(n=100)	(n=100)			
	No. (%)	No. (%)			
The doctor does not tell enough information about the patient illness.	58(58.0%)	6(6.0%)	8.83-52.73	21.64	0.0001
Patient unable to understand doctor instructions about medications.	67(67.0%)	36(36.0%)	2.02-6.46	3.61	0.0001
The patient feels uncomfortable about asking the doctor questions about her disease or treatment.	26(26.0%)	6(6.0%)	2.20-13.69	5.51	0.0001
The patient feels that doctor does not understand his concerns and does not listen to him/her.	59(59.0%)	6(6.0%)	9.20-54.99	22.55	0.0001

*Chi-square test was used.

The most noticeable communication barrier was (the patient feels that doctor does not understand his /her concerns and does not listen to him/her), the frequency of this barrier in uncontrolled diabetic patients was (59.0%) compared to controlled one (6.0%). The least prominent barrier was (The patient's unable to understand the doctor's instructions about medications). Where the frequency of this barrier in the uncontrolled diabetic patient was (67.0%), compared to the controlled one (36.0%).

Table 3 shows that comparison of the frequency of Personal barriers between patients with uncontrolled versus controlled diabetes. The most protruding Personal Barrier was (irregular blood sugar check), where the frequency of this barrier in uncontrolled diabetes was (72%) compared to controlled diabetic patients (22%). The least prominent personal barrier was (Forgetting medication), where the frequency of this barrier in uncontrolled diabetic patients was (63%), compared to the controlled diabetic one (48%).

Table 4 shows that comparison of the frequency of self-management barriers between patients with uncontrolled versus controlled diabetes, where it can be seen that the frequency of self-management barriers was high in patients with uncontrolled diabetes compared with controlled one, except in patient who believes that diabetes type 2 is not a serious disease, there was no difference in frequency of this barrier between patients with uncontrolled diabetes compared with controlled diabetic patients, the frequency of this barrier was lower in patients having uncontrolled diabetic compared with controlled diabetic one (37) versus (38).

The most prominent self-management barrier was patient believes it is not important to keep blood sugar close to normal, where the frequency of this barrier in uncontrolled diabetes was (24.0%) compared to controlled diabetic patients (4.0%).

The least significant self-management barrier was Patient does not receive education series for diabetes type 2, where the frequency of this barrier in uncontrolled diabetes was (67.0%), compared to controlled diabetic patients (44.0%).

Table 3. Comparison of Frequency of Personal Barriers between Uncontrolled and Controlled Diabetic Patients.

Items	Agree		95% CI (OR)	OR	P- Value*
	> 7%	≤ 7%			
	(Uncontrolled) (n=100) No. (%)	(Controlled) (n=100) No. (%)			
The patient feels that lifestyle changes and medications are not helpful.	59(59.0%)	20(20.0%)	3.07-10.78	5.76	0.0001
Investigations and medication costs prevent the patient from testing blood sugar or taking medication	73(73.0%)	46(46.0%)	1.76-5.72	3.17	0.0001
The family does not support a meal plan.	55(55.0%)	24(24.0%)	2.12-7.07	3.87	0.0001
Cost prevents the patient from following a meal plan.	69(69.0%)	44(44.0%)	1.59-5.04	2.83	0.0001
Lack of daily exercise.	80(80.0%)	58(58.0%)	1.55-5.42	2.90	0.0001
Forgetting medication.	63(63.0%)	48(48.0%)	1.05-3.24	1.85	0.0001
Irregular blood sugar check.	72(72.0%)	22(22.0%)	4.80-17.30	9.12	0.0001

*Chi-square test was used.

Table 4. Comparison of Frequency of Self-Management Barriers between Uncontrolled and Controlled Diabetic Patients.

Items	Agree		95% CI (OR)	OR	P- Value*
	> 7%	≤ 7%			
	(Uncontrolled) (n=100) No. (%)	(Controlled) (n=100) No. (%)			
Patient believes it is hard to keep blood sugar close to normal.	83(83.0%)	74(74.0%)	0.87-3.39	1.72	0.121
Patient believes it is not important to keep blood sugar close to normal.	24(24.0%)	4(4.0%)	2.63-21.75	7.58	0.000
Patient believes that type 2 diabetes is not a serious disease.	20(20.0%)	20(20.0%)	0.50-1.99	1.00	1.000
Patient believes that he/she does not know enough information about type 2 diabetes to manage health effectively.	37(37.0%)	38(38.0%)	0.54-1.70	0.96	0.884
Patient does not understand how to calculate calories and choose the right foods.	86(86.0%)	48(48.0%)	3.37-13.14	6.66	0.000
Patient not receiving type 2 diabetes education series.	67(67.0%)	44(44.0%)	1.46-4.58	2.58	0.000

* Chi-square test.

Table 5 shows that comparison of the frequency of care barriers between patients with uncontrolled versus controlled diabetes, where it can be seen that in all care barriers the frequency of these barriers was high in patients with uncontrolled diabetes compared with controlled diabetes patients, except in patients who did not have a primary caregiver and diabetes specialist and patient who does not have scheduled appointments with their physician and diabetes specialist.

The most projecting care barrier was patient who does not have ophthalmic and feet check-up regularly once per a year, at least, where the frequency of this barrier in uncontrolled diabetes was (84.0%) compared to controlled diabetic patients (56.0%), the least significant care barrier was in Patient who does not takes medications that are prescribed by different doctors, where the frequency of

this barrier in uncontrolled diabetes was (76.0%), compared to controlled diabetic patients (56.0%).

Table 6 shows that comparison of the frequency of barriers of domains between patients with uncontrolled versus controlled diabetes and reveals that the frequency of all barriers domains was high in patients having uncontrolled diabetes compared with controlled one and the difference was statistically significant ($p=0.0001$) in communication barriers and ($p=0.0001$) in personal barriers ($p=0.022$) in care barriers and ($p=0.033$) in self-management barriers respectively.

The highest impact on control of diabetes mellitus was from communication barriers (OR=6.93, 95% CI= 3.50-13.68, p -value=0.000) and the least impact on control of DM type-2 was from self-management barriers (OR=1.84, 95% CI=1.05-3.23, p -value=0.033).

Table 5. Comparison of Frequency of Care Barriers between Uncontrolled and Controlled Diabetic Patients.

Items	Agree		95% CI (OR)	OR	P- Value*
	> 7%	≤ 7%			
	(Uncontrolled) (n=100)	(Controlled) (n=100)			
	No. (%)	No. (%)			
Patient does not have a primary care physician & diabetes specialist.	43(43.0%)	42(42.0%)	0.60-1.82	1.04	0.886
Patient does not have scheduled appointments with their physician & diabetes specialist.	66(66.0%)	64(64.0%)	0.61-1.95	1.09	0.767
Patient takes medications that are prescribed by different doctors.	76(76.0%)	56(56.0%)	1.36-4.54	2.49	0.000
A diabetes doctor or primary care doctor does not know about all the medications you take.	61(61.0%)	34(34.0%)	1.71-5.39	3.04	0.000
A patient does not have their eyes and feet checked regularly at least once a year.	84(84.0%)	56(56.0%)	2.13-7.97	4.13	0.000

*Chi-square test was used.

Table 6. Impact of the Four Domains Barriers on Control of Type 2 Diabetes.

Barrier's domains	Agreement Ratio		CI %95	OR	P-Value*
	> %7	≤ %7			
	(Uncontrolled) (n=100)	(Controlled) (n=100)			
	No. (%)	No. (%)			
Communication Barriers	53(53.0%)	14(14.0%)	3.50-13.68	6.93	0.000
Personal Barriers	67(67.0%)	37(37.0%)	1.94-6.17	3.46	0.000
Self-Management Barriers	53(53.0%)	38(38.0%)	1.05-3.23	1.84	0.033
Care Barriers	66(66.0%)	50(50.0%)	1.10-3.43	1.94	0.022
Total	60(60.0%)	35(35.0%)	1.57-4.93	2.79	0.000

The results of the study demonstrated that there is a dissatisfaction with communication between health care providers and uncontrolled diabetic patients compared to the controlled one; these findings are representing the differing understanding of diabetes between health providers and people with diabetes. The most obvious communication barrier was the patient who feel that the doctor is not understanding his /her concerns and does not listen to him/her, these results agree with the result of another study done by¹² who demonstrated that the ability of individuals with diabetes to control disease was negatively influenced by difficulty communicating with a health care suppliers¹². An agreement with this result was also observed in a study done by¹³ on Native Americans and American Indians, who found that barriers encountered by participants during their interactions with the doctors is the fact that the doctors were not listening to their needs demonstrated the importance of patient–clinician collaboration. Another study from the doctors’ point of view done by¹⁴ a qualitative systematic review, showed that primary care clinicians face multiple challenges in the management of diabetes, they frequently find it hard to distribute responsibility successfully with patients and they lack confidence in their information of guidelines and skills in particular tasks. The present study showed that uncontrolled diabetic patients compared to the controlled ones found it difficult to control diabetes and they found it hard to establish a routine schedule for doing or remembering. The most protruding personal barrier was an irregular blood sugar check. In agreement with this result was the finding in a study done by¹⁵ that assess this barrier in detail and indicates that irregular blood glucose may be due to financial barriers or that pain and/or fear of pain associated with glucose examination prevent them from regular checking. Also, another study done in Kenya by¹⁶ revealed inadequate blood sugar checking in diabetic patients in Kenya due to economic barriers and a low level of awareness of the test. Another study was done in Baghdad by¹⁷ which found a significantly high percentage of patients who didn’t check blood sugar. This result was controversial with the result of another study done by¹⁸ which showed that most participants assumed that if they did not treat their diabetes appropriately, it would have undesirable health outcomes. Moreover,¹⁹ in his study on white England people found that the quality of life was an important concern for people with diabetes. This meant balancing diabetes control with things they liked by outlawing food or alcohol. Finally, the present study demonstrated that the frequency of this barrier was higher in patients having uncontrolled diabetes compared to control one, the most prominent care barrier was patient who does not have their ophthalmic and feet checkups regularly once a year, at least. This result agrees with the result of another study done by²⁰. In rural

areas of South Australia found that limited specialized health professional services, such as dieticians, podiatrist concern a great obstacle by preventing rural patients from receiving adequate diabetic control. Furthermore, health professionals reported giving specialized information outside of their qualifications due to shortages of specialist services in rural, as well as remote areas. Additionally, it was noted that where there was access to specialized health professionals²¹⁻²⁴. The present study showed that the frequency of all domains was higher in patients with uncontrolled diabetes compared to controlled one, the most prominent domain barrier was the communication barriers, care barriers and finally the self-management barriers which show less frequency with uncontrolled diabetes compared with controlled one. This result differs from study which showed that lifestyle behavior change “self-management” appeared to be the hardest part of diabetic control, for most participants. Specifically, diet was the biggest element in his study²⁰.

Conclusions

The frequency of all domains was higher in patients with uncontrolled diabetes compared to the controlled one, and the difference was statically significant the highest domain barrier on control of diabetes mellitus type 2 was from the communication barriers and the least from the self-management barriers.

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