Original Article

The effects of non-attendance information therapy on the control of glycosylated hemoglobin (HbA$_1$C) in type 2 diabetic patients

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ABSTRACT

Introduction: Patient education plays an important role in the control of diabetes. Nonattendance education, enabling elimination of limitations caused by time and space and facilitating the relationship between patient and care liaison is an effective, simple, and cheap method. The aim of this study is determination of the effects of nonattendance information therapy on the control of glycosylated hemoglobin (HbA$_1$C) in type 2 diabetic patients in Isfahan. **Materials and Methods:** The present study was an interventional semi experimental study with pretest and post-test and control groups. Statistical population were type 2 diabetics patients of the Isfahan Endocrine and Metabolism Research Center, of whom 64 people were randomly selected and divided into intervention and control groups. First, the preliminary data were collected using the HbA$_1$c test in patients. Then, the intervention group received training package and Short Message Service (SMS) for eight weeks. After one-month incubation period, HbA$_1$c was again determined in both groups. Data were analyzed using t-test, paired t-test and Mann–Whitney U and Chi-square tests. **Results:** Results showed that diabetes patients' HbA$_1$c in the intervention group was significantly lower after the intervention through training packages and SMS service compared to before the intervention ($P < 0.001$). Comparison of the two groups showed that there was a significant difference in the HbA$_1$C between the intervention and control groups ($P = 0.048$). **Conclusion:** Follow-up of education of patients with type 2 diabetes through training packages and SMS services had significant effects on the control of the patients' HbA$_1$C. Also due to the low cost and high effectiveness of this method, it is recommended to health-care providers and treatment groups. This study also showed that having medical librarians along with treatment group can have a positive effect on the type 2 diabetic patients' health.

Key words: Glycosylated hemoglobin (HbA$_1$C), Isfahan, nonattendance information therapy, type 2 diabetes

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INTRODUCTION

Today, type 2 diabetes is rising rapidly in the world.[1,2] Diabetes, as the most common metabolic disease, causes complications such as eye, renal, neurological, and cardiovascular disorders.[3] Costs associated with the treatment of diabetes is approximately 132 billion dollars per year,[4] and its prevalence is increasing by about 6% in the world each year.[5] Now, according to official statistics of the World Health Organization, 190 million people suffer from this disease worldwide. By 2025, it is estimated that this number would be more than 330 million people and that by 2030, the share of developing countries would be

77.6% of the total number of diabetic patients in the world.[6] Recent evidence from the International Diabetes Federation indicates that diabetes currently affects 246 million people worldwide.[7] Diabetes incidence in Iran is 5-16/3%,[8] and for type 2 in 2010, it was approximately 8%.[9]

Studies have indicated that direct and indirect costs of diabetes and its complications are very high, compared to other diseases. Diabetes is responsible for the deaths of hundreds of thousands of people in the world annually; its prevalence in Tehran is equal to 7.2% in the population aged 30 and more, and it is 6.5% in Isfahan city. Considering high and growing prevalence of type 2 diabetes in Isfahan as the most common metabolic disease, with its inestimable direct and indirect costs,[3] its microvascular complications such as retinopathy, nephropathy, and neuropathy, and its macrovascular complications such as cardiovascular disease.[2,3] It is necessary to pay more attention to this disease and identify easy and cheap ways to prevent it. An important point is that education of people and timely treatment can reduce the incidence of this disease and, to some extent, can prevent its debilitating complications.[3] Most deaths of diabetic patients are due to cardiovascular diseases such as myocardial infarction, which are preventable by glycemic control, blood pressure control, and lipid profile regulation.[3,4] Because education of such patients in Iran does not receive enough attention, patient-centered and community-based interventions with focus on education and its continuance and support of patients can impact significantly on blood glucose control, enhance the quality of life, increase patient satisfaction with care and treatment, and create patient knowledge and awareness.[10]

Because patient education plays an important role in the control of diabetes, identification and use of simple and inexpensive ways to educate these patients amount to necessities of a community. Usually for chronic diseases such as cardiovascular disease, diabetes, and the like, the method of information therapy is a useful option. Information therapy is a new method that provides health-related information for patients and enables patients to make informed decisions about their health and treatment and be a partner in the healing process. This method helps reduce the usage rate of health services and consequently reduces the cost of treatment.[11] Information therapy is a new tool with potential for physicians that can improve knowledge and decision making of patient and the relationship between patient and physician. The most important advantage of this method for someone who receives information therapy is the ability to provide self-care as it allows people to take care of themselves and reduce the use of health-care services and medical care costs. By providing information therapy, people can prevent costly complications of many acute and chronic diseases.[12]

One of the methods of information therapy is nonattendance and distance training. Because of the elimination of the limitation of time and space and the facility of establishing a relationship with clients, distance learning is an effective method. For nearly two decades, the possibility of reduction in diabetes complications has been proven with proper glycated hemoglobin (HbA$_1$c) control, and there are promising prospects for cardiovascular complications of this disease.

In the recent years, the treatment techniques of diabetes and its complications are more accurate, and public access is more extensive. Relying on the importance of patient education, can speak more confidently about the physical aspects of disease ideal control. But we should not forget that all of these are only part of a comprehensive treatment plan for any type of chronic and serious disease.[13] One of the most valuable services that a medical librarian can provide is helping people understand their information needs. Visiting a good therapist, who by asking skillful questions enables patients to speak about things that are bothering them, can be very similar to an interaction with a physician.[14] In information therapy, medical librarians work with treatment teams and based on the specific information needs of each patient, they share information with patients or their family. This new service and patient participation in their treatment is not possible unless the patient informed, and by providing reliable and evidence-based medical information become powerful and autonomous in the care moments.[15] For more than two decades, information therapy is being offered through medical libraries in developed countries.[16] But in Iran not enough attention is paid to this important matter. Information services of medical librarians in the health are classified into two categories: Direct and indirect services.

Direct role of medical librarians involves providing health-care information about the control and prevention of diseases, public health, complementary medicine, effects and side effects of drugs, fitness, and nutrition directly to patients and the public without any recommendation for decision making, without any prescribed information by the health-care provider such as a doctor. When information has been prescribed by a physician, librarians can play an indirect role in their support; it means providing the right, new, evidence-based, and referred information to patients which has been confirmed by a physician. Providing information to health-care providers can also be included in the indirect role of librarians in the information therapy process.[15,16] On the other hand, many studies have indicated educational programs for diabetic patients improves blood sugar and are effective in its control. Afshar and Izadi[17] showed in their research that education has been successful in controlling blood sugar. Masoudi Alavi *et al.* concluded that after the educational intervention, a statistically significant reduction in HbA$_1$c was observed in both the intervention and control groups, and patient satisfaction increased in both groups; the increase in patient satisfaction in the intervention group was significantly higher than the control. Knowledge and awareness of diabetic patients was significantly increased in both groups.[18]

Zakerimoghadam *et al.* showed in their study that telephone follow-up by nurses led to improved diabetic diet adherence and reduced HbA$_1$C in patients with type 2 diabetes.[19]

Hemmatimaslakpak *et al.* have shown in their research that education and remote follow-up via telephone and SMS services by nurses have significant effects on blood glucose control in patients with diabetes.[20] Özer *et al.* showed that the health scores of diabetic patients who had participated in the training program were twice that of other patients.[21] Adolfsson *et al.* concluded in their research that empowerment through group education can improve knowledge and awareness in diabetic patients in relation to glucose control despite the recurrent nature of diabetes.[22] Rygg *et al.* showed that local educational programs of diabetes self-management in general prevents from increased HbA$_1$c and can have positive effects on patients with high HbA$_1$C levels.[23]

Al-Khawaldeh *et al.* in their study concluded that enhanced self-efficacy and self-management are essential and important components of diabetes education programs. Moreover, behavioral counseling and interventions skills are vital for patients so that they are able to manage their diabetes.[24]

According to what has been discussed, it seems that information therapy for diabetic patients in Isfahan city by medical librarians along with the treatment team can be effective in reducing blood glucose levels in these patients. So, this study is trying to investigate the influence of non-attendance information therapy on the control of HbA$_1$C in type 2 diabetic patients in Isfahan city.

MATERIALS AND METHODS

The present study is an interventional semiexperimental one, which was conducted with pretest and post-test and two-group design. Statistical population was 6,000 diabetics patients of Isfahan Endocrine and Metabolism Research Center, of whom 64 people with type 2 diabetes according to this formula $n = (Z^1 + Z^2)^2 (2S^2)/d^2$ were randomly selected and with respect to age, sex, education, and HbA$_1$C levels were divided into intervention and control groups (32 persons per group). The diabetes center members were required to participate in six sessions on diabetes education and its care. After this period, these patients, according to their wishes, although not required, sometimes refer to the Isfahan Endocrine and Metabolism Research Center. In this study, we wanted to continue education of diabetes self-management and content of the six sessions of education of the diabetes center as nonattendance information therapy and investigate its effect. Criteria for entry into the groups were having a medical record in the mentioned center, willingness to participate in the information therapy plan, and also previous participation in the six education sessions at the center. Exclusion criteria were unwillingness to participate in the information therapy plan and no previous participation in the education sessions at the Isfahan Endocrine and Metabolism Research Center. At the end of the sixth session in the center, personal data, addresses, and phone numbers from both groups were taken and a consent form was completed. Then, their HbA$_1$C levels were checked and recorded. After that, the intervention group received training under the information therapy plan for two months

to enable their self-care by mailing the training package and sending messages to their mobile phones, the text content of which was confirmed by medical experts. The training packages included 8 brochures and 24 messages whose content matched with the content of the six sessions at the Isfahan Endocrine and Metabolism Research Center and had been approved by the second supervisor (doctor). Every patient received one training package and three messages in a week. After passing the nonattendance information therapy period (two months) and after the incubation period (for its effect), HbA$_1$C level was determined by a blood test again. Data were analyzed by using the SPSS20 software. For statistical analysis, *t*-test, paired *t*-test and Chi-square and Mann–Whitney U tests were used.

RESULTS

The age of the study population ranged from 32 to 74 years. Mean ages of the control and intervention groups were 53 ± 7.3 and 52.6 ± 8.2 years, respectively.

The results of the *t*-test showed that there was no significant difference in mean age between the two groups ($P = 0.79$) [Table 1].

In terms of gender, 41 were men and 23 were women. The Chi-square test showed that there was no significant difference between the groups in sex distribution ($P = 0.79$). The Mann–Whitney U test showed that the level of education of the two groups did not differ significantly ($P = 0.86$); so, there was no significant difference between the intervention and control groups before the intervention in terms of age, sex, and also the main variables of education and training and HbA$_1$C level [Table 2].

Table 3 shows the comparison of HbA$_1$C levels in both intervention and control groups before and after information therapy intervention. Independent *t*-tests showed that before intervention, the HbA$_1$C mean reported no significant differences between the two groups ($P = 0.97$). But after intervention, the HbA$_1$C mean was significantly lower in the intervention group than the control group ($P = 0.048$). The paired *t*-test showed that in the control group there was no significant difference in HbA$_1$C mean ($P = 0.37$) before and after information therapy intervention. However, in the intervention group after the intervention, the HbA$_1$C mean was significantly reduced ($P < 0.001$) [Table 3].

Figure 1 shows the change more clearly.

Table 4 shows the mean change in HbA$_1$C scores in two groups. Independent *t*-tests showed that the mean change in HbA$_1$C was significantly higher in the intervention group than the control group ($P = 0.01$).

DISCUSSION

The results of this study showed that there were no significant difference statistically between the intervention and control

Table 1: Distribution of age in the control and intervention groups

Age	Intervention group	Control group
Means	53.1	52.6
SD	7.34	8.2
Minimum	37	32
Maximum	68	74

SD = Standard deviation

Table 2: Demographic characteristics of the control and intervention groups

Variable	Intervention group		Control group		P value
	Number	Percentage	Number	Percentage	
Sex					
Male	11	34.4	12	37.5	0.79
Female	21	65.6	20	62.5	
Education level					
Elementary	9	28.1	10	31.2	0.86
Secoundry	6	21.96	7	18.8	
Diploma	8	25.0	5	15.6	
Higher diploma	9	28.1	10	31.2	
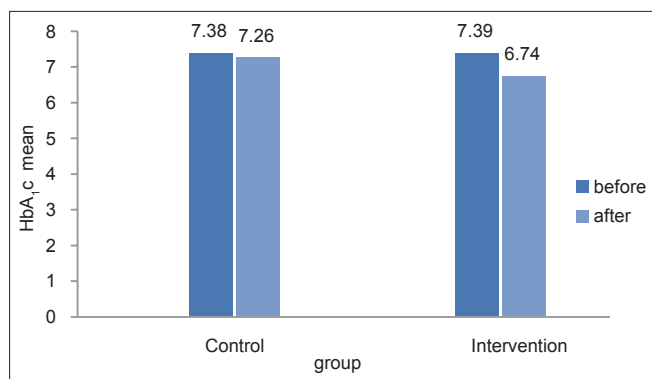
Figure 1: HbA$_1$C mean in both groups before and after intervention. HbA$_1$C: Glycosylated hemoglobin

Table 3: Comparison of mean glycosylated hemoglobin (HbA$_1$C) between intervention and control groups before and after information therapy

Groups	HbA$_1$C				P value**
	Before		After		
	Mean	SD	Mean	SD	
Intervention	7.39	1.03	6.74	1.27	0.001
Control	7.38	1.11	7.26	1.05	0.37
P value*	0.97		0.048		

*Independent *t* test, **Paired *t* test, SD = Standard deviation

Table 4: Mean change in glycosylated hemoglobin (HbA$_1$C) in both intervention and control groups

Change HbA$_1$C	Intervention group	Control group
Mean	−0.65	−0.12
SD	0.15	0.13
Minimum	−2.2	−1.3
Maximum	1	1.5

SD = Standard deviation, HbA1C = Glycosylated hemoglobin

groups in terms of confounding variables that may have an influence on the study results; in other words, the two groups were similar in terms of sex, age, education, previous training, as well as initial HbA$_1$C levels. So, significant differences in the independent variables in the intervention group before and after intervention showed a positive effect of the educational follow-up and information therapy in patients with type 2 diabetes. The findings showed that after nonattendance information therapy by training packages and SMS service, the HbA$_1$C mean was significantly decreased in the intervention group. These findings are in agreement with the findings of Afshar and Izadi,[17] which reported that training had been successful in controlling blood sugar. They were also in agreement with the research of Masoudi-Alavi *et al.*,[17] which showed that after the intervention in both intervention and control groups there was a statistically significant reduction in HbA$_1$C levels. Sharifirad *et al.*[25] and Najimi *et al.*[26] also concluded that training in diet is

effective in lowering blood sugar in type 2 diabetic patients. Zakerimoghadam and colleagues[19] showed that follow-up through telephone by nurses results in improved adherence to the diabetic diet, reducing the HbA$_1$C in patients with type 2 diabetes. The findings of the present study is in agreement with various foreign studies, including Adolfsson *et al.*,[22] who reported that empowerment through group training improves knowledge and awareness of diabetic patients for control of blood sugar despite the recurrent nature of the disease; Rygg *et al.*[23] also showed that local educational diabetes self-management programs in general prevents an increase in HbA$_1$C and can have an impact on patients with high HbA$_1$C levels. However, the results of the study by Wong *et al.*,[27] investigating the effect of telephone follow-up by nurses on diabetes status, were inconsistent with the result of our study as there was no difference between the HbA$_1$C levels in the intervention and control groups. It seems that long interval between calls and short duration of the follow-up calls in the study of Wong *et al.*[27] was responsible for difference in the two groups. Also, findings of the present study is unlike the research of Maljanian *et al.*,[28] which reported that telephone follow-up and the training during three months had no effect on the HbA$_1$C level and the quality of life of diabetic patients and it only promoted instruction adherence of the diabetes association and medical care.

CONCLUSIONS

The present study showed that a simple and inexpensive way such as nonattendance information therapy is effective in reducing HbA$_1$C in diabetic patients. In a diabetic patient, treatment will not be effective unless the patient clearly understands the nature of his disease and take steps to deal with it. Training is one the most important components of treatment in diabetic patients.[20,26] Nonattendance education and follow-up and reminder instructions for the care and treatment of diabetic patients will lead to improved results in

the treatment process, and consequently, the number of visits of these patients to medical centers and the related direct and indirect costs will be reduced.

Therefore, it is suggested to conduct nonattendance information therapy for diabetic patients in all diabetes research centers by competent authorities with the co-operation of medical librarians and also use e-mail and SMS systems in diabetes research centers to facilitate nonattendance information therapy process.

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