

Effect of Nutrition Education using Electronic Methods on Blood Lipids and Glucose in Type II Diabetic Patients

Mostafa Jafari ^{a*}, Yahya Pasdar ^b, Mansour Rezaei ^c, Parvin Nokhahi ^a, Mozhgan Rostami ^a

^a Department of Public Health, School of Public Health, Kermanshah University of Medical Sciences, Kermanshah, Iran

^b Department of Nutritional Sciences, School of Public Health, Kermanshah University of Medical Sciences, Kermanshah, Iran

^c Department of Biostatistics, Faculty of Public Health, Kermanshah University of Medical Sciences, Kermanshah, Iran

ARTICLE INFO

Article Type:

Original Article

Article History:

Received: 2015-05-12

Revised: 2015-11-05

Accepted: 2016-02-29

ePublished: 2016-04-25

Keywords:

Nutrition education

Electronic methods

Blood lipids and glucose

Diabetes

ABSTRACT

Use of innovative teaching methods may be effective in controlling the disease and reducing its complications. In this study, we aimed to examine the effect of nutrition education using electronic methods on blood lipid and glucose levels in type II diabetic patients in Kermanshah in 2012. The study population comprised type II diabetic patients visiting the Kermanshah diabetic center. Sixty patients, selected by convenience sampling method, were divided into three groups of twenty patients each. Data were collected before, after, and 3 months after intervention by filling in a questionnaire and from blood tests (FBS, HbA1c, T-c, TG, LDL-C, and HDL-C). Data were analyzed using Kruskal–Wallis and Friedman ANOVA using SPSS version 16. FBS, T-C, TG; LDL-C were significantly different in the blog group ($P=0.004$, $P=0.010$, $P=0.017$, and $P=0.001$, respectively). LDL-C decreased in group-collaborative blogs ($P=0.010$), and there was a significant difference in FBS, TG, and LDL-C in the SMS Group ($P=0.004$, $P=0.047$, and $P=0.005$, respectively). The study results showed that using electronic methods can be effective in controlling blood lipid and glucose levels in diabetic patients and may reduce diabetic complications. Thus, provision of increased nutrition knowledge and information via new training techniques by diabetes centers in the country is recommended for diabetic patients.

*Corresponding author: Mostafa Jafari, E-mail: mostafajafari66@yahoo.com

Introduction

Diabetes mellitus is a major health problem due to its pathogenicity and burden on the economy [1]. According to a study conducted by the International Diabetes Federation in 110 countries in 2011, there were 366 million people with diabetes mellitus. This number is predicted to rise to 552 million people by 2030. The prevalence of diabetes in Iran was 9.3% in 2011 and is expected to reach 13.1% by 2030. However, it is not among the ten countries with the largest numbers of people with diabetes [2]. On the basis of an extensive survey of the general population in Isfahan, the overall prevalence of type II diabetes was found to be 6.6%, and the prevalence in women and men was 8.27% and 4.66%, respectively [3]. The prevalence of diabetes and disability-adjusted life year (DALY) during diabetes mellitus is negatively related to the education level [1]. Education on diabetes has positive impact on improvement in the awareness and glycemic control in diabetic patients [4]. Information and communication technology, including the Internet, mobile phone, and telemedicine, can have a positive effect on the self-care of chronic diseases [5]. Recently, mobile phones have become an increasingly important educational tool in human health [6]. Mobile phone is an easy to use and useful tool and is considered as one of the most successful educational methods [7]. Follow-up via SMS leads to improved adherence to health care regimens in patients with diabetes mellitus and improves glycosylated hemoglobin levels. This method can be used to follow-up patients with diabetes mellitus. In France, a study conducted on the education of people with diabetes mellitus via website demonstrated that web users had a high satisfaction with training [8,9]. A study in Iran showed that e-learning can improve knowledge, attitudes, and self-care action of patients with type II diabetes; control indicators of blood sugar; and improve FBG [10]. Raising awareness of diabetic patients about self-care and controlling bio-chemical blood parameters is important. So, to improve these, using various educating techniques such as blog, collaboration-group blog, and text-messaging are other alternatives. There is little knowledge about the effectiveness of applying these new education methods in Iran and no study has been carried out in this regard. Therefore, in this study, we aimed to evaluate the effect of nutrition education using electronic methods such as blogs, collaboration-group blogs, and SMS on blood

lipid and glucose levels in patients with type II diabetes.

Materials and Methods

This quasi-experimental study was carried out before, immediately after and 3 months after educational intervention. The study population consisted of patients with type II diabetes who were enrolled in the Diabetes Center in Kermanshah city. Sixty patients were selected by convenience sampling method and were divided into three groups of twenty. They were assigned in compliance with the principle of random assignment. The selection criteria required that all diabetic patients in this study have computer literacy, Internet access, and the skills of using the Internet as well as familiarity with the blog, collaboration-group blog, and text-messaging. Afterwards, each group was randomly divided into one of three groups: blog, group-collaboration blog, and SMS. In order to determine the required samples with confidence level of 95% and $\beta < 0.80$ and in accordance with the number of samples in other studies, twenty patients were examined in each group. Data were collected using demographic questionnaire and blood tests. After the approval of the Ethics Committee, Kermanshah University of Medical Sciences, the details of performing research, objectives, and conditions of study were given to the diabetic patients. The initial step included obtaining a written informed consent from the participant and collecting 5 ml blood in order to measure the levels of FBS, HbA_{1c}, TC, TG, LDL-C, and HDL-C. Afterwards, all participants were separately educated regarding nutrition using books (National Diabetes Prevention and Control program [11] and the manual of Diet Therapy [12]) and three methods (blog, group-collaborative blog, and SMS) for 3 months. A) Blog: nutritional information was developed on the web platform for patients with type II diabetes in the form of multimedia. B) Group-collaborative blog: a group of people acted to assemble nutritional information about type II diabetes and shared their own efficacious experiences and new information with each other. The information provided on the web platform was for public use. C) SMS: nutritional content was sent via SMS twice a week. Immediately at the end of this step, laboratory variables of patients (FBS, HbA_{1c}, TC, TG, LDL-C, and HDL-C) were measured again. In addition, 3 months after the educational intervention (6 months after baseline),

the mentioned steps were repeated again (without training). The level of HbA_{1c} was measured by means of NycoCard method (a test for quantitative determination of HbA_{1c}, FBS and lipids (mg/dl) in

one laboratory before, immediately after, and 3 months after intervention using an enzyme assay and Pars test kit (Fig. 1).

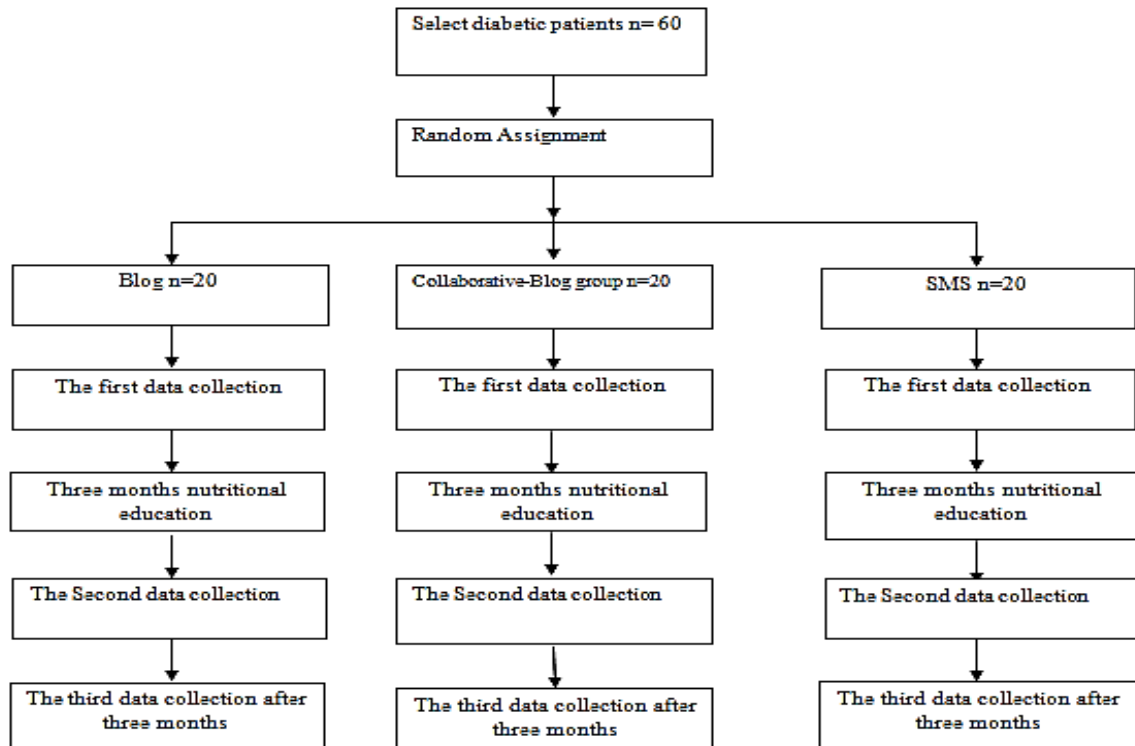


Figure 1. The flowchart of design and methodology of the study

Study design and procedure

Data were collected in three stages: before the intervention, immediately after completion of the intervention, and after 3 months. For data analysis, the Kolmogorov-Smirnov test was used for the quantitative variables in order to normalize the test. In the case of normal data, a one-way ANOVA and post hoc Tukey test was used to compare these variables in three groups (at any stage). In addition, the Kruskal–Wallis test was used for the efficacy of those data that did not have normal requirement, and the Friedman ANOVA was used to compare the three stages in each group. Data were analyzed using SPSS version 16.

Results

In this study, 60 people were examined in blog, group-collaborative blog, and SMS groups equally.

There was no significant difference in terms of age, and family history of diabetes in three groups (Table 1).

At the baseline of the study, the biochemical variables were not significantly different between the groups (Table 2). The results showed that the biochemical variables of blood had significant differences before, immediately after, and 3 months after intervention in the blog group: FBS, T-C, TG, and LDL-C were ($P = 0.004$, $P = 0.010$, $P = 0.017$, and $P = 0.001$, respectively). In the group-collaborative blog one: LDL-C level was significant ($p = 0.010$), while in the SMS group: FBS, TG, and LDL-C in the SMS Group ($P = 0.004$, $P = 0.047$, and $P = 0.005$, respectively). Additionally, there was no significant difference in efficacy between the three groups (Table 3).

Table 1. The comparison of the mean and SD of the participants in terms of age and duration of diabetes in three groups

Demographic characteristics	Blog	Group-collaborative blog	SMS	Total	P-value
Age (years)	50.9 ± 8.2	52.6 ± 8.9	51.0 ± 9.0	51.3 ± 8.5	0.89
Duration of diabetes (months)	82.0 ± 57.9	102.4 ± 62.3	87.4 ± 61.4	90.6 ± 60.1	0.55

Table 2. Comparing the frequency of sex, marital status and education in the three groups

Demographic characteristics		Percentage (number)				P-value
		Blog	Group-collaborative blog	SMS	Total	
Sex	Male	60 (12)	65 (13)	45 (9)	56.7 (34)	0.41
	Female	40 (8)	35 (7)	55 (11)	43.3 (26)	
Marital status	Single	10 (2)	-	-	3.3 (2)	-
	Married	90 (18)	100 (20)	100 (20)	96.7 (58)	
Education	Diploma and below	55 (11)	40 (8)	55 (11)	50 (30)	1.00
	Academic	45 (9)	60 (12)	45 (9)	50 (30)	

Discussion

The results showed that the mean fasting blood sugar level was statistically significant before, immediately after and three months after the intervention in the blog and SMS groups. The findings of this research are consistent with the results of a study by Nouhi *et al.* that is in the fields of e-learning effects on diabetes self-care intervention and in both intervention and control groups [10]. Zolfaghari *et al.* study compared the impact of education on diabetic patients through mobile phones and telephones which is also consistent with the results of the present study [13]. The findings of this study are consistent with the results of Sharifirad *et al.* study which is undertaken about traditional training in intervention and control groups [14]. The results of the present study are also in agreement with Kashefi's study which was about nutrition education and walking [15]. HbA_{1c} level also increased in all three groups, largely due to differences in sample size and researching methods. The sample size of this study is lower than other studies. That is due to the restrictions of accessing to the Internet (website). The research method which is

also used in internal investigations are through traditional training, intervention, and case-control methods and in some studies, nutrition education has been used through walking and exercises, while in this study modern and novel training methods have been exclusively used in the field of nutrition education. Results of the study showed that total blood cholesterol level was statically different before, immediately after and three months after the intervention; that is consistent with the results of Yazdan Panah's *et al.* study but there are no meaningful differences in group-collaborative blog and SMS groups before, immediately after and three months after the intervention, and there is no compatible with the mentioned results [16]. The results of this study indicate that educating via e-learning method by blog can be used to reduce blood cholesterol levels and may lessen the development of cardiovascular complications of diabetes. Blood triglyceride levels showed a significant difference before, immediately after and three months after the intervention in blog and SMS groups that is consistent with Najimi's *et al.* study, but there is no consequential difference in group-collaborative blog and it is not consistent with the present study [17].

Table 3. Mean and standard deviation of biochemical variables of blood before, after and three months after intervention in the three groups

Variable	Group	Before	After	Three months after intervention	P-value*
FBS (Mg/ dl)	Blog	151.2 ± 53.9	125.7 ± 51.4	157.8 ± 62.1	0.044
	group-collaborative	163.9 ± 54.9	163.4 ± 59.6	167.2 ± 64.6	0.397
	P-value**				
HbA _{1c} (%)	Blog	166.8 ± 52.2	151.1 ± 52.0	59.10 ± 188.6	0.004
	Group-collaborative	7.7 ± 1.3	8.0 ± 1.2	8.09 ± 1.35	0.607
	P-value**	0.622	0.092	0.269	-
T-C (mg/dl)	Blog	7.73 ± 1.4	8.7 ± 1.7	8.47 ± 1.7	0.003
	Group-collaborative	8.08 ± 1.8	7.8 ± 1.3	8.0 ± 1.5	0.307
	P-value**	0.621	0.498	0.596	-
TG (mg/dl)	Blog	188.6 ± 38.4	166.5 ± 30.0	175.7 ± 38.3	0.010
	Group-collaborative	187.20 ± 45.8	167.3 ± 40.4	176.3 ± 35.3	0.064
	P-value**				
HDL-C (mg/dl)	Blog	187.0 ± 53.9	171.0 ± 42.9	178.6 ± 47.7	0.137
	Group-collaborative	180.2 ± 112.5	148.6 ± 104.7	183.5 ± 106.6	0.047
	P-value**	0.995	0.900	0.097	-
LDL-C (mg/dl)	Blog	151.0 ± 54.4	142.1 ± 57.60	177.4 ± 104.6	0.017
	Group-collaborative	211.1 ± 171.2	171.80 ± 108.76	173.6 ± 82.6	0.086
	P-value**	180.2 ± 112.5	148.6 ± 104.7	183.5 ± 106.6	0.047
HDL-C (mg/dl)	Blog	48.6 ± 9.8	48.05 ± 9.5	46.6 ± 11.2	0.422
	Group-collaborative	42.8 ± 6.9	42.2 ± 7.3	41.2 ± 7.20	0.243
	P-value**	45.1 ± 8.8	46.30 ± 9.2	43.6 ± 10.9	0.107
LDL-C (mg/dl)	Blog	95.7 ± 22.2	77.0 ± 16.2	90.6 ± 22.2	0.001
	Group-collaborative	89.2 ± 16.8	77.7 ± 18.5	93.2 ± 20.3	0.010
	P-value**	91.3 ± 24.7	79.8 ± 19.5	92.3 ± 25.3	0.005

The results showed that in all groups, there were no significant and tangible changes in the amount of HDL-C before, after, and 3 months after intervention. According to previous studies, interventions of nutrition education have negligible effects on HDL-C levels alone. However, a combination of interventions of nutrition education and physical activities could improve HDL-C levels [18]. In addition, the results showed that LDL-C levels in all three groups before, immediately after, and 3 months after the intervention had a significant difference ($p < 0/01$). This result is consistent with a study conducted by Goodarzi et al., investigating the interventions of nutritional education via mobile phones in patients with type II diabetes [19]. However, this study is not consistent with the Pimentel study, examining the field of long-term (12 months) nutrition education program in order to reduce the

risk factors of type II diabetes in patients with impaired glucose tolerance [20].

Conclusions

The results showed that nutrition education via electronic methods can be effective in controlling blood cholesterol and sugar levels in people with type II diabetes and may contribute to reduction in diabetes complications.

Acknowledgments

This study was supported by grants from the Deputy of Research and Technology and Research Project Number 91117. At last we appreciate the participants' efforts in this study and also staffs' sincere cooperation in Diabetes Research Center, Kermanshah.

References

- [1] Le C, Lin L, Jun D, Jianhui H, Keying Z, Wenlong C et al. The economic burden of type 2 diabetes mellitus in rural southwest China. *International Journal of Cardiology*. 2011; 65:273-277.
- [2] Whiting D, Guariguata L, Weil C, and Shaw J. *IDF Diabetes Atlas: Global estimates of the prevalence of diabetes for 2011 and 2030*. Diabetes research and clinical practice. 2011; 94:311-321.
- [3] Meraci M, Feizi A, Bagher Nejad M. Investigating the Prevalence of High Blood Pressure, Type 2 Diabetes Mellitus and Related Risk Factors According to a Large General Study in Isfahan- Using Multivariate Logistic Regression model. *Journal of Health System Research*. 2012; (2)8:193-203. [Persian]
- [4] Qingqing L, Liaofang W, Xia Di, Meijuan C, Yu R. Diabetes education in mainland China-A systematic review of the literature. *Patient education and counseling*. 2011; 85:336-347.
- [5] El-Gayara O, Timsinaa p, Nawarb N, Eidd W. A systematic review of IT for diabetes self-management: Are we there yet? *International Journal of Medical Informatics*. 2013; 82 (8): 637-652.
- [6] Klasnja P, Pratt W. Health care in the pocket: mapping the space of mobile-phone health interventions. *Journal of Biomedical Informatics*. 2012; 45(1):184-198.
- [7] Yengina I, Karahocab A, Karahocab D, Uzunboyluc H. Is SMS Still Alive For Education: Analysis of Educational Potentials of SMS technology? *Procedia Computer Science*. 2011; 3:1439-1445.
- [8] Zolfaghari M, Mousavifar S, Haghani H. Mobile phone text messaging and Telephone follow-up in type 2 diabetic patients for 3 months: a comparative study. *J Diabetes Metabolic Disorder*. 2012; 11:21.
- [9] Beynat J, Ben Mehidi A, Aubert JP, Bron AM, Massin P, Creuzot-Garcher C. Assessmalet of a continuing medical education website for the improvemalet of diabetic retinopathy managemalet. *Diabetes & Metabolism*. 2011; 37:118-123.
- [10] Noohi1 E, Khandan M, Mirzazadeh A. Effective of electronic education on knowledge attitude and self-care in patient's diabetic type II refer to diabetic center of Kerman University of medical science. *Nursing Research J*. 2011; 6 (22):73-80. [Persian]
- [11] Delavarie AR, Mhdavi hzaveh AR, navroozinejad A, Yarahmadi Sh. *National Diabetes Prevention and Control Program*. Tehran: Sadra Publication, 2004; 24-63. [Persian]
- [12] Sheykh F. *Manual of Diet Therapy: Iranian nutrition Society*. Second Edition, Tehran: Salemi Publicationi, 2003, 206-210. [Persian]
- [13] Zolfaghari M, Mousavifar S, Haghani H. Mobile phone text messaging and Telephone follow-up in type 2 diabetic patients for 3 months: a comparative study. *J Diabetes Metabolic Disorder*. 2012; 11:21.
- [14] Application of BASNEF educational model for nutritional education among elderly patients with type II diabetes: Improving the glycemic control. *J Res Med Sci*. 2011; 16(9):1149-58
- [15] Kashfi SM, Khani Jeihooni A, Bahadori khalili R, Hatami M. Evaluation of the effects of educating about nutrition and jogging on the blood sugar of type II diabetic patients of a clinic in Shiraz, Iran. *Hakim Research J*. 2009; 12(3):54- 60. [Persian]
- [16] Yazdanpanah B, Safari M, Yazdanpanah Sh, Angha P, Karami M, Emadi M, and et al. The effect of participatory community-based diabetes cares on the control of diabetes and its risk factors in western suburb of Yasouj, Iran. *Health Educ Res*. 2012; 27(5):794-803 [Persian].
- [17] Najimi A, Azadbakht L, Hassanzadeh A, Sharifirad GH. The effect of nutritional education on metabolic outcomes based on BASNEF model in elderly patients with type II diabetes. *Health System Research*. 2010; 6(3):549-558. [Persian]
- [18] Rush EC, Chandu V, Plank LD. Reduction of abdominal fat and chronic disease factors by lifestyle change in migrant Asian Indians older than 50 years. *Asia Pac J Clin Nutr*. 2007; 16(4):671-6.
- [19] Goodarzi M, Ebrahimzadeh I, Rabi A, S aedipoor B, Jafarabadi MA. Impact of distance education via mobile phone text messaging on knowledge, attitude, practice and self efficacy of patients with type 2 diabetes mellitus in Iran. *J Diabetes Metab Disord*. 2012; 11(1):10.
- [20] Pimaletel GD, Portero-McLellan KC, Oliveira EP, Spada AP, Oshiiwa M, Zemdeg JC et al. Long-term nutrition education reduces several risk factors for type 2 diabetes mellitus in Brazilians with impaired glucose tolerance. *Nutr Res*. 2010; 30(3):186-90.