

## Applying intervention mapping approach to promoting healthy diet intention among diabetic patients; an efficacy study

Mehdi Mirzaei-Alavijeh<sup>1</sup>, Behzad Karami-Matin<sup>1</sup>, Sanne van Lieshout<sup>2</sup>, Mohammad Mahboubi<sup>3</sup>, Fazel Zinat-Motlagh<sup>4</sup>, Farzad Jalilian<sup>1</sup>

<sup>1</sup> Department of Public Health, Kermanshah University of Medical Sciences, Kermanshah, Iran

<sup>2</sup> Department of Work and Social Psychology, Maastricht University, Maastricht, Netherlands

<sup>3</sup> Abadan School of Medical Sciences, Abadan, Iran

<sup>4</sup> Social Determinants of Health Research Center, Yasuj University of Medical Sciences, Yasuj, Iran

✉ **Reprint or Correspondence:** Farzad Jalilian; Department of Public Health, Kermanshah University of Medical Sciences, Kermanshah, Iran.  
✉ f\_jalilian@yahoo.com.

### ABSTRACT

Diabetes is the most common metabolic disorder and cause serious complications. A healthy diet is essential for diabetic patients in order to control and prevent disease complications. This study was conducted to evaluate the efficacy of a healthy diet promotion program among Type 2 diabetic patients in south of Iran, with applying the theory of planned behavior (TPB) as a theoretical framework. Overall, 150 patients with type 2 diabetic referred to rural health centers were participated in study and randomly allocated in two intervention (n=75) and control groups (n=75). The intervention group received the prepared program and control group received no intervention. The final evaluation took place in both groups, after 3 months of intervention. The data were analyzed using SPSS software, version 21. Findings indicated significant promotion in positive attitude toward healthy diet and general knowledge about nutrition among the intervention group. Considering the change methods and practical applications used in this study have been effective in changes attitude and knowledge determinants, therefore it is proposed to use them in large scale intervention study.

**Keywords:** Health Promotion Planning, Type 2 Diabetes, Intervention.

*Received: 8 October 2016 Accepted: 19 December 2016*

### Introduction

Diabetes is the most common metabolic disorder and according to some studies, the most common endocrine disease (1). The importance of this disease is high both in terms of therapy and disability and it is one of the main health problems in humans (1, 2). According to World Health Organization (WHO) the number of people living with diabetes is 422 million adults (or 8.5%

of the population) in 2014. Diabetes will be the 7<sup>th</sup> leading cause of death in 2030. Type 2 diabetes comprises the majority of people with diabetes around the world (3, 4). According to WHO the prevalence of diabetes in the adult population in Iran is 10.3% (9.6% in men, 11.1% in women) (5). Studies indicated, with increasing age the prevalence of diabetes type 2 is also

Please cite as: Mirzaei-Alavijeh M, Karami-Matin B, van Lieshout S, Mahboubi M, Zinat-Motlagh F, Jalilian F. Applying intervention mapping approach to promoting healthy diet intention among diabetic patients: an efficacy study. *Arvand J Health Med Sci* 2016;1(4):243-50.

increase (6). In addition, prevalence of diabetes in individuals over 30 years old is reported to be over 14% (5). Genetic predisposition and behavioral and environmental risk factors are major factors in the development of diabetes type 2 (7). Regarding diabetes control, it should be pointed out that the change in lifestyle including dietary behaviors has a significant role in diabetes prevention and disease management (8). Nutrition therapy is an essential element in therapeutic programs for diabetics and the use of dietary solutions impacts the complications and the mortality resulting from this disease (9). Also, the significant role of nutrition education in the control of blood glucose has been pointed out (10). Therefore, nutritional education for these patients has been stated to be a necessity (11). Furthermore, studies have indicated that the more effective the programs are based on the theoretical principles (12). In this regard, the Theory of Planned Behavior (TPB) is a behavior change theory that has been employed in different studies in the domain of health behaviors including studies on nutrition (13-17). According to this theory the primary determinant of behavior is behavioral intention which indicates that the "motivation of an individual for adopting a behavior". Behavioral intention is an outcome of 1; Attitude towards behavior; 2; Subjective norms perception of individuals and environment, and 3; Perception of the amount of control the individual has regarding the desired behavior (perceived behavior control) (18). The present study was designed to determine the efficacy of an interventional program in promoting healthy diet intention among type 2 diabetic patients with applying the theory of planned behavior as a theoretical framework.

## **Materials and Methods**

### **Study design, participants and procedure**

The present study was a quasi-experimental intervention study to measure the efficacy of the program prepared on determinants of healthy diet intention among type 2 diabetic patients referred to health centers of Gachsaran city, who had visited the aforementioned centers for receiving health care. At baseline, 150 type 2 diabetic patients (50% in the intervention group and 50% in the control group) started the pilot and filled out the first questionnaire. Furthermore, 68 patients with type 2 diabetic (89.3% in the intervention group), and 57 (76% in the control group) completed questionnaire at 3-month follow-up. All of participants were signed the consent form and voluntarily agreed to participate into the study. For this purpose, among four health centers in Gacharan city in south of Iran, the patients referred in two health centers were randomly considered as intervention group and the patients of the other two centers were considered as the control group. Then 150 patients (75 individuals in the control group and 75 individuals in the intervention group) randomly allocated for entering into the study.

The intervention and control group were matched in terms of background factors like age, sex, education level, duration of affliction with the disease, job and marital status before the implementation of the educational program and there were no differences between the groups in terms of the aforementioned factors and these results are presented in Table 1. The intervention group received the program prepared which called "sugary program" and evaluation of the both groups was done at the beginning of

**Table 1.** Pre-test equivalency results for intervention and control groups

Variable	Intervention mean (±SD)	Control mean (±SD)	P value
Age	56.78 (13.07)	56.37 (12.30)	P=0.874
Disease History	10.85 (6.76)	9.19 (6.22)	P=0.133
	n (%)	n (%)	
Sex			
Women	43 (48.9)	45 (51.1)	P=0.726
Men	27 (51.9)	25 (48.1)	
Educational level			
Illiteracy	22 (49.2)	33 (50.8)	P=0.297
Elementary	7 (46.7)	8 (53.3)	
Guidance	19 (65.5)	10 (34.5)	
Diploma	9 (42.9)	12 (57.1)	
Academic	3 (30)	7 (70)	
Diabetic history in family			
Yes	11 (64.7)	6 (35.3)	P=0.196
No	59 (48)	64 (52)	
Marital status			
Married	58 (48.7)	61 (51.3)	P=0.520
Single	12 (57.1)	9 (42.9)	

SD=Standard deviation

intervention and after 3 months of intervention. In addition a program planned and implemented which called “supportive program” for family members of each participant to achieve purpose of providing information and emotional support about patients.

It should be pointed out that the subjects were justified on the way the study is done, confidentiality of the information and the objective of the study and they all entered the study willingly.

### Sampling

The sample size calculation was done using the following equation:

$$n = \frac{2(z_{1-\frac{\alpha}{2}} + z_{1-\beta})^2}{d^2}$$

In the above quotation d is the Cohen’s effect size and in the present study, using Cohen’s recommendation (19) considering the mean difference (0.5), and test power of 80 percent and type I error (alpha) of 5 percent, the sample size for each group was estimated to be 63

individuals. In this section, considering the probability of 20 percent falling in the samples, 75 individuals were selected for each group.

### Planning program

The basis of intervention planning program in present study was active learning and during the intervention it was tried to encourage the individual actively participate in the program. The program for the patients in the intervention group was implemented in four one-hour sessions in a week based on the views of them and planning program group. In addition two one-hour sessions were held for the one of the family members of each participants in the intervention group as a facilitator and received related program and they act as emotional and informational supportive for patients at home. Also, a 24-hour phone line was used for informational supportive from patients and family members.

Considering the selection of the theory of planned behavior as the theoretical framework of

the present study, the constructs of this theory were considered as the determinants and with according to them theoretical methods selected from taxonomy of behavioral change methods by Kok et al. (20, 21) in addition practical applications produced with cooperation of participants representative and planning group were used for changing behaviors (Table 2, 3). It should be noted that, in order to observe ethics, after the final evaluation, the program prepared was also implemented to the patients in the control group.

**Measures**

The data collection tool in this study was written questionnaire and the information were

collected through completing questionnaire during direct interview and in two sessions: one before the educational intervention and the other after three month after that. Data was collected from an interview with the patient by public health expert. The questionnaire used in the present study consisted of three sections:

**1) Demographic and background questions**

This section was consisted of five questions and assessed the information on the patients regarding age (years), sex (male, female), education level (illiterate, elementary, middle school, diploma, university education), the duration of affliction with the disease (years), and marital status (married, single, widowed).

**Table 2.** Scopes and sequence of sugary and supportive program

Week 1			
<i>Patients</i>			
Session 1	Session 2	Session 3	Session 4
Type 2 diabetes control	Basics of a healthy diabetes diet	Diabetes meal plans and a healthy diet	Better choosing
<i>Family members</i>			
Session 1	Session 2		
What is type 2 diabetes and a healthy diet in diabetics patients	Family members emotional support in adherence to diabetes control		

**Table 3.** Determinants, Methods, Practical Applications, Channels and Vehicles of sugary and supportive program

Determinants	Method	Practical Application	Channel	Vehicle
<i>Patients</i>				
Attitude	Active learning, participate,	Role playing	Interpersonal	Health care provider
Subjective norms	Argument	Discussion	Videotape	Television
Perceived behavioral control	Verbal persuasion	Discussion	Videotape	Television
Knowledge	Advance organizers	Discussion	Display print	Pamphlets, Leaflet and Brochures
<i>Family members</i>				
Attitude	Active learning, participate,	Discussion	Interpersonal	Health care provider
Subjective norms	Argument	Discussion	Interpersonal	Health care provider
Perceived behavioral control	Verbal persuasion	Discussion	Interpersonal	Health care provider

## 2) The items based on determinants

In order to measure the constructs of the theory of planned behavior, the research team designed the above questionnaires in a Likert style and using 5-point scoring scale using the similar studies on health behaviors conducted using this theory (13-15). Evaluation and confirmation of the content and construct validity of the designed questionnaire was done using the views of a group of experts in the field of the study. Also, in order to measure the reliability of the questionnaire, a preliminary study was conducted on 30 diabetic patients and it was explored using coefficient alpha. Twenty-two items were composed under four major constructs, 1) positive attitude toward healthy diet; 2) subjective norms about healthy diet; 3) perceived behavioral control to healthy diet; 4) behavioral intention to healthy diet. Six items were designed to measure attitude (e.g., "I believe, if I had awareness of information toward healthy diet, or thinking about healthy diet is effective on preventing the diabetes complications") with score range 6-30. Four items were designed to measure subjective norms (e.g., "Dialogue toward healthy diet is not important in my family") with score range 4-20. Six items were designed to perceived behavioral control (e.g., "I believe that I can search information toward healthy diet") with score range 6-30. Six items were designed to evaluate behavioral intention (e.g., "I intend have dialogue toward healthy diet in my family") with score range 6-30. In order to facilitate respondents' responses to the items, all items were standardized to a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). Estimated reliability coefficients for each TPB constructs questionnaire were as follows: attitude ( $\alpha=0.86$ ); subjective norms ( $\alpha=0.75$ ); perceived behavior control ( $\alpha=0.70$ ) and

behavioral intention ( $\alpha=0.81$ ). These results demonstrated that questionnaires were internally consistent.

## 3) Nutritional knowledge questions

The nutritional knowledge used in this study was a researcher designed questionnaire and consisted of 15 multiple choice questions (a choice was considered as the correct answer and three choices were wrong answers). A score of 1 was considered for each correct answer and a score of 0 was considered for each wrong answer or no answer, and higher scores indicated more nutritional knowledge of the patients. Example of items included: A dietary pattern that includes carbohydrate from fruits, vegetables, whole grains, legumes, and low-fat milk is encouraged for good health. The reliability coefficient for the nutritional knowledge scale was 0.61.

## Data analyses

Analyses were conducted by using SPSS-21 and a probability level of 0.05 was used throughout. Chi-squared and independent sample t-test, paired sample t-test was employed to determine comparability of the intervention and control group.

## Results

The information in table 4 shows the coefficient of variation of the mean for the constructs of the theory of planned behavior which was obtained based on the reduction of the scores before from the scores after the educational intervention. As it shown in table 4 and 5 average response for positive attitude was 18.28 increased to 19.47 after intervention. The same results were found for knowledge and average response was improved from 5.35 to 6.14 after implementing educational program. However, it was not found significant improvement for score of subjective norms and

**Table 4.** Average responses for theory of planned behavior variables about healthy nutrition behavior among diabetic patients before and after educational program

Independent variables	Before intervention mean ( $\pm$ SD)*	After intervention mean ( $\pm$ SD)	P- value
Attitude			
Intervention group <sup>a</sup> (n=67)	18.28 (3.17)	19.47 (2.15)	0.003
Control group <sup>b</sup> (n=58)	18.70 (3.08)	19.19 (3.77)	0.428
Subjective norms			
IG	14.59 (3.81)	15.23 (3.72)	0.333
CG	14.82 (4.03)	15.03 (4.10)	0.598
Perceived behavior control			
IG	18.07 (3.18)	18.50 (3.05)	0.118
CG	17.94 (3.90)	18.22 (3.92)	0.244
Behavioral intention			
IG	18.14 (4.95)	19.04 (4.51)	0.214
CG	18.40 (5.80)	18.87 (4.57)	0.506

\*SD: Standard deviation; <sup>a</sup>: IG, <sup>b</sup>: CG

**Table 5.** Average responses national knowledge before and after educational program

Independent variables	Before intervention mean ( $\pm$ SD)*	After intervention mean ( $\pm$ SD)	P value
Intervention group	5.35 (1.25)	6.14 (1.35)	< 0.001
Control group	5.17 (2.11)	5.39 (2.35)	0.417

\*SD=Standard deviation

perceived behavioral control. In table 5 the mean of changes of general knowledge score in the control and intervention groups is presented.

## Discussion

Diabetes is one of the diseases in which a high portion of the treatment burden is upon the patient and having knowledge on different subjects especially nutrition is highly important. The objective of this research was to assess the effectiveness of a diabetes behavioral intention healthy nutrition promotion program. The theory of planned behavior was conducted as theoretical framework to assess educational need assessment among diabetic patients. Even though the duration of the educational intervention in this study was short, it was found significant improvements after manipulation. Analysis of the baseline and three months' follow-up clearly established significant program effects on the participants' attitude,

intention and their diabetes nutritional knowledge among intervention group.

The findings of the present study indicates a significant increase in the mean of nutritional knowledge score in the patients of the intervention group after the educational intervention which in turn indicates a positive impact of the provided educational program. Different studies have pointed out the usefulness of education regarding the improvement of the nutritional knowledge in diabetic patients (22-23). It seems that providing necessary education on the importance of observing diet in diabetic patients can be useful in the increase of nutritional knowledge in diabetic patients.

Our results indicated that the applied educational program had significant effect to modify participants' attitude and intention towards nutrition behavior. Despite theoretical framework of TPB that education program could not improve average response for participants'

subjective norms and their perceived behavioral control towards nutrition behavior. Attitude means an individual's positive or negative evaluation of self-performance of the particular behavior (18). Of course it has been pointed out in some studies that attitude alone cannot guarantee performance and in fact despite the correlation of attitude and behavior with each other, according to theories behavior is impacted by different factors such as intention and subjective norms and this again verifies the necessity of employing model and theories in behavioral change issues (23).

Concerning the effectiveness of the intervention, in spite of increasing the mean of subjective norms and perceived behavior control toward nutrition behavior after intervention it was not found significant between intervention and control groups and these outcomes. Non-significant increasing the mean of subjective norms and perceived behavior control toward nutrition behavior after implementing educational program between both intervention and control groups might be because of low sample size, and limitation of resource to design comprehensive educational program.

Behavior intention means an indication of an individual's readiness to perform a given behavior (17). Our finding showed significant promotion of behavioral intention toward healthy diet behavior among intervention group. This result is similar to the results reported by other study (24).

The increase of behavior intention for having a healthy diet in diabetic patients as a pre-behavior stage can be a strong positive factor for the improvement of nutritional behaviors in diabetic patients and shows the usefulness of an educational intervention that is based on the constructs of the theory of planned behavior using intervention mapping and the taxonomy of behavior change methods and practical

applications provided in this intervention and focusing on the role of family in this regard.

This study has a few limitations. First, data collection was based on self-reporting, which is usually prone to recall bias (25); Second, the internal consistency of the questionnaire was relatively low ( $\alpha=0.61$ ) for assessing nutrition knowledge.

## Conclusion

Our result showed education program based on TPB was improved of attitude toward healthy diet and national knowledge among the diabetic patients. This study as an efficacy evaluation intervention about promotion healthy diet among type 2 diabetics patients although showed beneficial results but such as other similar studies (26) is an example of how such a program can be evaluated in the complex populations.

## Acknowledgement

The researchers appreciate all the diabetic patients participated in the study.

## Conflict of Interest

The author Declare no conflict of interest.

## References

1. Hameed I, Masoodi SR, Mir SA, Nabi M, Ghazanfar K, Ganai BA. Type 2 diabetes mellitus: from a metabolic disorder to an inflammatory condition. *World J Diabetes* 2015; 6: 598-612.
2. Hall CE, Hall AB, Kok G, Mallya J, Courtright P. A needs assessment of people living with diabetes and diabetic retinopathy. *BMC Res Notes* 2016; 9: 1-3.
3. Mathers CD, Loncar D. Projections of global mortality and burden of disease from 2002 to 2030. *PLOS Med* 2006; 3: e442.
4. Global report on diabetes. World Health Organization, Geneva, 2016. [http://apps.who.int/iris/bitstream/10665/204871/1/9789241565257\\_eng.pdf](http://apps.who.int/iris/bitstream/10665/204871/1/9789241565257_eng.pdf).

5. Najafipour H, Sanjari M, Shokoohi M, Haghdoost AA, Afshari M, Shadkam M, et al. Epidemiology of diabetes mellitus, pre-diabetes, undiagnosed and uncontrolled diabetes and its predictors in general population aged 15 to 75 years: A community-based study (KERCADRS) in southeastern Iran. *J diabetes* 2015; 7: 613-21.
6. Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes estimates for the year 2000 and projections for 2030. *Diabetes care* 2004; 27: 1047-53.
7. Tuolimehto J, Lindstrom J, Eriksson J, Valle TT, Hamalainen H, Llanne-Parika P, et al. Prevention of Type2 Diabetes Mellitus by Changes in life style among subjects with Impaired Glucose Tolerance. *N Engl J Med* 2001; 18: 1343-50.
8. Knowler WC, Barrett-Connor E, Fowler SE, Hamman RF, Lachim JM, Walker EA, et al. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *N Engl J Med* 2002; 346: 393-403.
9. John PB, Christine AB, John DB, Jean-Louis C, Abhimanyu G, Lea A H. Evidence Based Nutrition Principles and Recommendations for the Treatment and Prevention of Diabetes and Related Complications. *Diabetes Care* 2002; 25: 148-198.
10. Rizvi AA. Nutritional challenges in the elderly with diabetes. *Int J Diabetes Mellit* 2009; 1: 26-31.
11. Skamagas M, Breen TL, Leroith D. Update on diabetes mellitus: prevention, treatment, and association with oral diseases. *Oral Dis* 2008; 14:105-14.
12. Kok G. A practical guide to effective behavior Change: How to apply theory- and evidence-based behavior change methods in an intervention. *Eur Health Psychol* 2014; 16: 156-170.
13. Blue CL. Does the Theory of Planned Behavior Identify Diabetes-Related Cognitions for Intention to Be Physically Active and Eat a Healthy Diet?. *Public Health Nurs* 2007; 24: 141-50.
14. Kim K, Reicks M, Sjoberg S. Applying the theory of planned behavior to predict dairy product consumption by older adults. *J Nutr Educ Behav* 2003; 35: 294-301.
15. Fila SA, Smith C. Applying the theory of planned behavior to healthy diet behaviors in urban Native American youth. *Int J Behav Nutr Phys Act* 2006; 3: 1.
16. Armitage CJ, Conner M. Efficacy of the theory of planned behavior: A meta-analytic review. *Br J Soc Psychol* 2001; 40: 471-99.
17. Godin G, Kok G. The theory of planned behavior: a review of its applications to health-related behaviors. *Am J Health Promot* 1996; 11: 87-98.
18. Ajzen I. The theory of planned behavior. *Organ Behav Hum Decis Process* 1991; 50: 179-211.
19. Pallant J. SPSS survival manual: A step by step guide to data analysis using SPSS. Open University Press. 4th edition 2010.
20. Kok G, Gottlieb NH, Peters GJ, Mullen PD, Parcel GS, Ruiter RA, Fernández ME, Markham C, Bartholomew LK. A taxonomy of behaviour change methods: an intervention mapping approach. *Health Psychol Rev* 2015 19:1-6.
21. Eldredge LKB, Markham CM, Ruiter RA, Fernandez M, Kok G, Parcel GS. Planning health promotion programs: an intervention mapping approach. John Wiley & Sons, 2016
22. Brown SA, Gracia AA, Kouzekanani K, Hanis CL. Culturally component diabetes self-management education for Mexican American: The Starr County border health initiative. *Diabetes Care* 2002; 25: 259-68.
23. Mirzaei-Alavijeh M, Hidarnia A, Kok G, Niknami Sh, Motlagh MI. Family-based cognitive factors effective on preventing the onset of substance use in iranian society's children: applying the intervention mapping protocol. *Acta Medica Mediterranea* 2016; 32: 1015-20.
24. Tankova T, Dakovaska G, Koven D. Education of diabetic patients a one year experience. *Patient Educ Couns* 2001; 43: 139-145.
25. Velicer WF, Prochaska JO, Rossi JS, Snow MG. Assessing outcome in smoking cessation studies. *Psychol Bull* 1992; 111: 23-41.
26. van Lieshout S, Mevissen FE, van Breukelen G, Jonker M, Ruiter RA. Make a Move A Comprehensive Effect Evaluation of a Sexual Harassment Prevention Program in Dutch Residential Youth Care. *J Interpers Violence* 2016 27:0886260516654932.