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ORIGINAL ARTICLE

Using intervention mapping approach to finding socio-cognitive determinants of diabetes preventive behaviors

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Keywords

Fear • Perceived barrier • Behavior change

Summary

Introduction. *Diabetes is one of the most common chronic illnesses with complications. The objective of this study was to determine socio-cognitive determinants of diabetes preventive behaviors among sample of at risk group based on intervention mapping approach (IM) in Kermanshah, the west of Iran.*

Methods. *This cross-sectional study conducted among a total of 200 male and female aged more than 30 years old referred to health centers that randomly selected to participate voluntarily, during 2018. Participants filled out a self-report questionnaire. Data were analyzed by SPSS version 16 using bivariate correlations and linear regression at 95% significant level.*

Results. *The mean age of respondents was 38.4 years [95% CI: 37.3, 39.4], ranged from 30 to 56 years. Socio-cognitive determinants were accounted for 40% of the variation in diabetes prevention behaviors $F = 35.559$, $P < 0.001$. As well as, perceived self-efficacy, perceived severity, and perceived barrier were the most influential predictors on diabetes preventive behaviors.*

Conclusions. *It seems that planning health promotion programs to reduce barrier to perform diabetes preventive behaviors and increase confidence towards ability to perform preventive behaviors, and seriousness about sides effect of diabetes may be usefulness of the results in order to promotion of diabetes preventive behaviors among at risk group.*

Introduction

Diabetes has been known as a major health problems and the most common metabolic disorder with several complications [1]. About 2% diabetics' patients experience blindness after 15 years, visual impairment after 10 years and 50% neuropathy; overall, the risk of death for diabetics is twice higher than of non-diabetics [2]. According to the World Health Organization, the number of diabetics' patients will double by 2030; the prevalence of diabetes among Iranian adults was reported 10.3%, including 9.3% in men and 11.1% in women, it was estimated that the prevalence of diabetes among the population over 30 years old in Iran was more than 14% in 2016 [3]. The proportion per diabetic patient, there is at least one undiagnosed patient in developed countries, while in developing countries; the situation is completely different so that the proportion per diabetic patient, there may be up to four undiagnosed patients [4].

Type 2 diabetes accounts for about 90 to 95% of all diagnosed cases of diabetes, which is the major cause of it related to lifestyle and genetics [5]. There is strong evidence that alterable risk factors such as obesity and physical inactivity are the most important determinants that are fundamentally dependent on the lifestyle [6]. Considering the increasing the number of diabetic cases globally, one of the main strategies for preventing and controlling the disease among the at-risk group is to increase the knowledge of predisposing factors, complications, and disease progression [7]. Recent research also suggests that changes in lifestyles among the at-risk group can prevent, control or, at least, delay Incidence of disease [8]. Lifestyle includes a range of daily activities such as eating, sleep and rest habits, physical activity and exercise, weight control, and smoking, which can largely be effective in prevention and control of chronic lifestyle-related diseases such as diabetes [9]. Although identification of all determinants affecting on health behaviors is complicated, identifying some of the effective determinants can facilitate predicatively of the healthy behavior and helps to health promotion professionals to develop intervention programs [10-13]. Several studies pointed out the role of cognitive determinants in the prevention or control of diabetes [14-22]. Therefore, it seems that the first step in identifying effective determinants by behavioral science professionals is the use of scientific frameworks and one of the common themes is the intervention mapping approach, which has been commonly used in the past three decades [23]. Intervention mapping approach has been used in several studies of diabetes [24, 25].

Regarding the importance of the problem and also the absence of similar studies in this regards with using of the intervention mapping approach among Iranian population, our intervention mapping approach based study addressed on determining of the socio-cognitive determinants of diabetes preventive behaviors among a sample of the at-risk group in Kermanshah, the west of Iran.

Materials and methods

Procedure and sampling

This cross-sectional study was conducted among 200 male and female aged more than 30 years old referred to health centers in Kermanshah city, the west of Iran, during 2018. Diabetes screening program in Iran is done with the aim of diabetes early detection among people more than 30 years old [26]. The sample size was calculated at a 95% significance level according to the evidence [3] and a sample of 200 was estimated. To enroll the subjects and data collection the following stages were done. Forasmuch as Kermanshah city has eight geographical regions and twenty-two health centers, at the first stage, the city was classified based on the division of the geographical region, next for each social class one health centers were randomly selected (a total of eight health centers were selected). Then, among the subjects accessible in the health centers some of them randomly enrolled. Only the subjects aged more than 30 years old were eligible to participate. Of the population of 200, 162 (81%) signed the consent form and voluntarily agreed to participate in the study.

Measurements

Questionnaire included three sections that comprised of 48 items.

(A) Demographics

Demographics variable were; age (year), sex (female, male), level of education (under diploma, diploma, and university), occupation (employed, self-worker, and housewife) and positive family history of diabetes (yes, no).

(B) Socio-cognitive determinants

The items which had evaluated the socio-cognitive determinants were driven from the scales of diabetes prevention behaviors [14-22] and also used the first and second steps of the intervention mapping approach [24]. There were 40 items which measured the six determinants includes; 1) attitude, 2) subjective norms, 3) perceived susceptibility, 4) perceived severity, 5) perceived barriers and 6) perceived self-efficacy. Three items measured attitudes towards the diabetes preventive behaviors (e.g., I believe that regular physical activity is effective in preventing diabetes). Three items measured the subjective norms towards the diabetes preventive behaviors (e.g., if I doing diabetes preventive behaviors, my friends will confirm it). Four items measured the perceived susceptibility towards the diabetes preventive behaviors (e.g., If I don't have physical activity, maybe I get diabetes complications). The perceived severity towards the diabetes was measured by six items (e.g., I think that diabetes is a serious disease). Seven items measured perceived barrier to doing diabetes preventive behaviors (e.g., I don't have enough time to doing diabetes preventive behaviors). Moreover, ten items were designed to perceived self-efficacy towards the diabetes preventive behaviors (e.g., I believe that I can do regular physical activity). In order to facilitate participants responses to the attitude, perceived susceptibility, perceived severity, perceived self-efficacy, and perceived barrier items were standardized to a five-point Likert type scaling, ranging from 5 (strongly agree) to 1 (strongly disagree). As well as, A two-order response scale yes (score 1), no (score 0) was developed to measure construct of subjective norms. Estimated reliability using alpha Cronbach coefficient for each cognitive determinants questionnaire were as follows: attitudes ($\alpha = 0.68$); subjective norms ($\alpha = 0.70$); susceptibility ($\alpha = 0.74$); severity ($\alpha = 0.88$); barrier ($\alpha = 0.87$); self-efficacy ($\alpha = 0.95$); and behavior ($\alpha = 0.71$). Furthermore, alpha Cronbach of the measurement tool was equal to 0.78. The results from reliability analysis suggested an acceptable internal consistency for the questionnaire.

(C) Diabetes prevention behaviors

Three questions with yes or no response developed to evaluate diabetes prevention behaviors, "Have you doing regular physical activity, healthy diet, and Blood glucose measurement during last week?". The reliability coefficient for the diabetes prevention behaviors was 0.71.

Ethical considerations

The Research Ethics Committee of Kermanshah University of Medical Sciences (KUMS) approved the study protocol (KUMS.REC.1397.813).

Data analysis

Quantitative determinates were expressed as means with SDs, and qualitative/categorical ones as frequencies and percentages. Bivariate correlations were performed to determine the correlation between socio-cognitive determinants of diabetes preventive behaviors among the participants. As well as, linear regression analysis for predict the variation in diabetes prevention behaviors based on socio-cognitive determinants. The level of significance was ($P < 0.05$). Data were analyzed by the SPSS version 16.

Results

The mean age of respondents was 38.4 years [95% CI: 37.3, 39.4], ranged from 31 to 56 years. The mean age of women was 38.38 (SD: 6.58), and mean age of men 38.63 (SD: 6.33); and there was no significant difference between age among men and women (P: 0.809).

58% (94/162) of participants were women and 42% (68/162) were men. 19.1% (31/162) of participants reported positive family history of diabetes. Respectively 30.2% (49/162), 30.9% (50/162), and 38.9% (63/162) of participant's were reported employed, self-worker and housewife.

Correlations between the socio-cognitive determinants and diabetes preventive behaviors were shown in Table I. Our results indicate that for the sample, perform diabetes prevention behaviors was significantly related to attitude (r = 0.272), subjective norms (r = 0.219), perceived susceptibility (r = 0.205), perceived severity (r = 0.336), and perceived self-efficacy (r = 0.542), while inversely correlated with perceived barrier (r = – 0.444). In addition, we use of multivariable linear regression models and backward methods for predict the variation in diabetes prevention behaviors based on socio-cognitive determinants. As can be seen in Table II, collectively, socio-cognitive determinants were accounted for 40% of the variation in diabetes prevention behaviors, F = 35.559, P < 0.001. Final model selected in the step 4.

Discussion

The aim of this study was to determine socio-cognitive determinants related to perform diabetes preventive behaviors among male and female at risk for diabetes in Kermanshah, the west of Iran. The results of the present study indicated that participants was received about half of score of perform diabetes preventive behaviors. This result is similar to the results reported by other studies in Iran [3, 27]. For example, Abedini et al carried out a research on diabetic's patients with aim investigate the knowledge and practice of patient self-care in Qom and reported that diabetic patients had average of self-care behavior [27]. Our finding indicated perform diabetes preventive behaviors was not appropriate; in other hand, several studies indicated comprehensive preventative health education programs need to focus on socio-cognitive determinants that explain health-related behaviors [23]. In addition our findings indicated that three determinants of perceived self-efficacy, severity and barrier were the main predictors of perform diabetes preventive behaviors among participants.

In many studies was reported the positive role of self-efficacy in preventing or adherence to treatment behaviors among diabetic patients. For example, Stuifbergen et al. [14] showed that promoting self-efficacy related to health behaviors helps to develop and improve these behaviors. In addition, Berg et al. [15] and Tamirat et al. [16] suggested similar findings in their studies, which was in line with findings from our study. These studies showed that increasing self-efficacy correlated with following the recommended behaviors in the adherence treatment and control of diabetes. Self-efficacy involves the individual's confidence in the ability to organize the activities and successfully conduct the desired behavior in order to achieve the desired result under given conditions, and the more this assurance is, the more easily the health behaviors is performed [28]. In line with activation of self-efficacy construct, professionals should use methods such as verbal persuasion, modeling, encouraging emotional and behaviors along with the acceptance of failure as a natural part of the learning process to improve patient self-efficacy [23]. Considering the influential role of self-efficacy in adopting preventive behaviors, compliance treatment and control, it is suggested that health-care intervention planners must pay special attention to promoting community-based interventions.

The perceived severity construct in this study was introduced as the second predictor of the model. In this regard, Tan et al. suggested that weak performance of diabetes prevention behaviors had a significant relationship with patients' low perceived severity [17]. Pinto et al. also suggested perceived risk as the most important construct to predict adopting health behaviors among diabetic patients [18]. This finding stresses the importance of perceived severity while designing health interventions. To design interventions for promotion of perceived severity among diabetic patients, Patino et al. suggested that the focus of programs should be on the short-term complications of diabetes, in order to see an appropriate increase in perceived threat levels among patients [16]. A high level of perceived severity may also increase adherence to health behaviors. For exam-

Tab. I. Correlation between socio-cognitive determinants of diabetes preventive behaviors among the participates.

Determinants	Mean (SD)	Range	X1	X2	X3	X4	X5	X6
X1. Attitude	11.70 (2.94)	3-15	1					
X2. Subjective Norms	2.24 (1.03)	0-3	0.099	1				
			0.212					
X3. Susceptibility	15.22 (2.97)	4-20	0.215**	0.244**	1			
			0.006	0.002				
X4. Severity	20.60 (5.14)	6-30	0.055	0.165*	0.210**	1		
			0.495	0.036	0.007			
X5. Barrier	15.96 (5.86)	7-35	– 0.340**	-0.265**	– 0.236**	– 0.096	1	
			< 0.001	0.001	0.003	0.224		
X6. Self-efficacy	34.70 (9.42)	10-50	0.394**	0.261**	0.198*	0.128	– 0.495**	1
			< 0.001	0.001	0.011	0.104	< 0.001	
X7. behaviors	1.29 (1.16)	0-3	0.272**	0.219**	0.205**	0.336**	– 0.444**	0.542**
			< 0.001	0.005	0.009	< 0.001	< 0.001	

*: P < 0.05 Level; **: P < 0.01 level.

Tab. II. Predictors of the Diabetes preventive behaviors among the participants.

Model	Un-standardized coefficients		Standardized coefficients	T	P value
	B	Std. error	Beta		
Step 1					
Constant	– 1.197	0.715		– 1.674	0.096
Attitude	0.014	0.034	0.029	0.421	0.674
Subjective norms	0.015	0.075	0.013	0.201	0.841
Susceptibility	0.006	0.026	0.015	0.226	0.822
Severity	0.059	0.014	0.260	4.057	< 0.001
Barrier	– 0.042	0.015	– 0.211	– 2.851	0.005
Self-efficacy	0.048	0.009	0.386	5.123	< 0.001
Step 2					
Constant	– 1.181	0.708		– 1.667	0.098
Attitude	0.014	0.034	0.028	0.411	0.681
Subjective norms	0.007	0.026	0.017	0.264	0.792
Severity	0.059	0.014	0.261	4.111	< 0.001
Barrier	– 0.042	0.014	-0.213	– 2.918	0.004
Self-efficacy	0.048	0.009	0.388	5.221	< 0.001
Step 3					
Constant	– 1.102	0.640		– 1.723	0.087
Attitude	0.015	0.034	0.031	0.450	0.653
Severity	0.060	0.014	0.264	4.248	< 0.001
Barrier	– 0.043	0.014	– 0.216	– 2.988	0.003
Self-efficacy	0.048	0.009	0.389	5.252	< 0.001
Step 4					
Constant	– 0.945	0.535		– 1.766	0.079
Severity	0.060	0.014	0.264	4.258	< 0.001
Barrier	– 0.044	0.014	– 0.221	– 3.129	0.002
Self-efficacy	0.049	0.009	0.398	5.608	< 0.001

ple, Ayele et al. in their study among diabetic patients in Ethiopia showed that high levels of perceived severity could significantly elevate self-care behaviors by 12.3% odd ratio [20]. According to our finding, and introducing perceived severity as the second influential construct in the hypothesized model, it seems necessary to focus on it while designing interventions. Regarding the perceived severity, which was chosen as one of the predictive constructs in this study, it should be mentioned that although in several studies the less role of constructs based on fear in encouraging and modifying behavior has been emphasized [29], contrary to these results, studies on Iranian society reported the stronger role of these constructs [30] which needs to be further reviewed and perhaps in the closest analysis, these results are attributed to the cultural context of the Iranian community, especially in more traditional societies.

Another finding of the present study was the importance of perceived barriers as the third determinant in predicting the hypothesized model. In this regard, Chao et al. described the high level of perceived barriers as the most important predictor to noncompliance of proper treatment among diabetic patients [21]. In line with the findings of this study, Rickheim et al. introduced perceived barriers as the most important predictor to diet and metabolic control among diabetic patients [22].

Finally, the findings of our study indicated that investigated constructs could predict 40% of the variance of diabetes prevention behaviors among at risk grope. This finding was largely in line with other studies in this area. For example, Chen et al showed that self-efficacy; history of diabetes and awareness estimated 59% of the variance in self-care behaviors among pre-diabetic patients [31].

Though this research faced several strengths such as using intervention mapping approach to assess the cognitive-related behaviors of diabetes prevention in Iranian society; it had some limitations such as being limited to Kermanshah city in western Iran that made it difficult to generalize it to the whole society. About thirty-eight participants did not finish the study and rejection rate of our study was 19% was another limitation to the present study, which suggests that similar studies should be carried out in other communities with a larger sample size, so that the generalizability of the results cannot be addressed.

Conclusions

The results of the present study indicated that socio-cognitive determinants were accounted for 40% of the variation in diabetes preventive behaviors and perceived self-efficacy, severity and barrier were the most influential predictors on perform diabetes preventive behaviors.

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Conflict of interest statement

None declared.

Authors' contributions

Study design: MM-A and FJ. Data analysis: FJ and MMA. Study supervision: MM-A. Manuscript writing and revisions: MM-A, FJ, MIM, FJ and TAJ.

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