Appendix 1. Search strategy of this study

In [Title]	Health Education on Type 2 diabetes "[Mesh] OR AND Health Education on Type 2 diabetes [Title]" OR Health promotion on Type 2 diabetes [Title]
In [Title, Abstract, Keyword]	"(Educational methods [Title, Abstract, Keyword])" OR
	"(Theory-based interventions [Title, Abstract, Keyword])" OR
	"(Impact [Title, Abstract, Keyword])" OR
	"(Evaluation [Title, Abstract, Keyword])"
	OR(Influnce [Title, Abstract, Keyword])" OR
	[Preventive interventions [MeSH Terms]
	[Evaluation Studies as Topic [MeSH Terms]
	Educational interventions, type-2 diabetes [MeSH Terms]

Appendix 2. The main results of studies reviewed on type 2 diabetes

Code	Time of Study	Authors and Place of Study	Type of study	Theory and Model	Target group, Sample size and Age	Duration of intervention	Content of Intervention	Results	Score (percentage) number
1	2019	Nejhaddadgar N et al Iran	Experimental	PRECEDE-PROCEDE	patients 86 32–86 years	1month	Implementing an educational program for patients as well as holding 2 training workshops for patients' families and health workers. The control group did not receive any education program	All PRECEDE variables, including predisposing factors (knowledge, attitude, and self-efficacy(P<0.001)), enabling factors and reinforcing factors, as well as self-management behaviors, were significantly improved in those of intervention group after the education program (P<0.001).	7 (77 %)
2	2018	Sorkin, D. H et al. American	RCT	-	People at risk 460 -	18 months	The intervention group received a educational program on healthy lifestyle (physical activity and healthy eating) Control group participants received a minimal intervention (only 12 monthly newsletters that provide practical healthy lifestyle tips).	The primary findings of weight loss and the secondary findings of this study were positive results in physical activity, dietary intake, physiological measures and body composition.	19(%76)
3	2018	Tavakoli Z et al. Iran Shiraz	Experimental	-	Pations 34 ≥18	2 month	For the case group 8 sessions (2 months a week for 2 hours) mindful stress reduction intervention Implemented. The control groups did not receive any education.	The findings showed that MBSR had an effect on distress problems and self-regulation of patients with type 2 diabetes with effect size of 0.83% and 0.75%, respectively.	9(%100)
4	2017	Razavi N S et al. Iran Islamshahr	Semi experimental	AIM	Patients 180 ≤50- ≥60	1week	Education for six sessions (10-61 minutes each session) and To methods of displaying photos, slides, films, posters, educational pamphlets, group discussion and brainstorming. The control groups did not receive any education.	There was no significant difference in demographics and AIM model constructs between two groups (p>0.05). After educational intervention, intervention group revealed a significant difference with control group in terms of information (P<0.001), motivation (P<0.001), ability (P<0.001) and level of HbA1C (P<0.001).	9(%100)

5	2017	Talaei B et al. Iran Isfahan	RCT	-	Patients 81 -	2 month	SG group were supplemented with 3 capsules and PG group received 3 microcrystalline cellulose capsules each day. The control group received only placebo.	The results showed significant difference in levels of Apo A1 in SG and P G in the beginning and end of trial (P‹0 .005). Also, no significant disparities were observed in level of Apo B100, total cholesterol, trigl ycerides and HDL-c at the sam e p eriod in studied groups. After intervention Mean FBS level in SG showed a 10.5% decrease (P=0.003), m eanwhile a 21% increase in PG (P=0.01) was reported.	24 (96%)
6	2016	Blanks, S. H.et al. Columbia	Experimental	-	People at risk 79 ≥18 years	7months	3 main components of IAW intervention: (1) a culturally tailored, gender-specific nutrition education program in combination with physical activity: 7 sessions; (2) group cardio and strength/resistance exercise sessions:6 hours; and (3) connecting participants to a primary care physician/medical home and other community resources. The control groups did not receive any education.	Results indicated that participants had greater awareness about nutrition and health, increased engagement in exercise, strategies for prevention and management of obesity and diabetes, and decreased blood pressure, weight, body, and mass index. furthermore, AAW visited a primary care doctor more frequently and indicated greater interest in addressing their health concerns.	7(%77)
7	2016	Ibrahim N et al. Malaysia	Quasi-experimental	-	People at risk 268 18 to 65 years old	12 months	Co-HELP group received twelve group- based sessions and two individual counselling to reinforce behavioural change and Participants in the usual care group received standard health education from primary health providers. The control groups did not receive any education.	Analysis of between-groups revealed that the Co-HELP participants' mean fasting plasma glucose reduced, 2-hour post glucose, HbA1C, diastolic blood pressure and waist circumference, whereas HDL cholesterol increased (p<0.01), compared to the usual care group. Also, Greater proportion of participants from the Co-HELP group met the clinical recommended target of 5% or more weight loss from the initial weight and physical activity of >600 (p<0.001) compared to the usual care group.	8(%88)

8	2016	Slentz CA et al. American	RCT	-	Patients 237 45-75 year old adults	6 month	Participants were randomly divided into diet and exercise groups and received an intervention designed to achieve 7% weight loss through energy restriction, low-fat diet, and exercise. After four initial counseling sessions, participants participated in 12 intensive two-week group sessions. The control group did not receive any education	Moderate-intensity exercise improved oral glucose tolerance.These data, combined with numerous published observations of the strong independent relation between postprandial glucose concentrations and prediction of future diabetes, suggest that walking ~18.2 km (22.3 km prescribed with 81.6% adherence in the 67 KKW moderate-intensity group) per week may be nearly as effective as a more intensive multicomponent approach involving diet, exercise and weight loss for preventing the progression to diabetes in pre diabetic individuals.	24(%96)
9	2016	Trief PM et al. American	RCT	-	Patients 280 ≥21 years of age	12 Weeks	A randomized trial with the three arms: couples calls, individual calls and diabetes education. All arms had self-management education. CC and IC had 10 additional behavior change calls. CC addressed collaboration and relationships/communication. Participants consisted of 280 couples. The control groups did not receive any education	Intention-to-treat analyses found significant A1C reductions for all, with no differences between arms. Preplanned within-arm analyses were stratified by baseline A1C tertiles: lowest tertile (7.5–8.2%), no change from baseline; middle tertile (8.3–9.2%), only CC led to significantly lower A1C level; and highest tertile (≥9.3%), significant improvement for all interventions. For BMI, CC showed significant improvement, and CC and DE led to decreased waist circumference. The IC group showed greater blood pressure improvement. Results for secondary psychosocial outcomes favored the CC group.	25(100%)
10	2016	Milajerdi AR et al. Iran Natanz	RCT	-	Patients 54 40-65 years	8Weeks	The diabetic patients, randomly received 15 mg saffron extract or placebo capsules twice a day for 8 weeks. The control group received placebo	After the intervention, depression, anxiety and MDA were significantly (P<0.05) attenuated in the saffrongroup (18, 30 and 25% in Beck and 19, 36 and 24% in the Hamilton measures, respectively), while changes in the Placebo group were not significant. In addition, dietary intakes and physical activity of the patients of the two groups did not change significantly during the intervention.	25(100%)

11	2016	Akbari abdolabadi M A et al. Iran Tehran	Quasi-experimental	BASNEF	Patients 168 ≥30 years	1Half a month	Six education sessions Implemented for the patients of the intervention group, that the fifth education session for the families and the relevant staff, and the teaching method was group discussion, lectures and brainstorming. The control group did not receive any education.	significant difference was a between a score received on components of barriers to of living with diabetes as well as all variables , before and after the education the significant level was set less than 0.05.	8(%88)
12	2015	Hermanns N.et al. Germany	RCT	-	Patients 172 18-70 years	five lessons (90 min each)	The diabetic patients participated in a standard group-based diabetes educational program. Thise educational program included topics such as diabetes and exercise, healthy diet, and diabetes and legal issues and the program was conducted by diabetes educators. The control group received routine clinic training.	The 12-month follow-up revealed a significantly stronger reduction of depressive symptoms in the DIAMOS group compared with the CG (P=0.021). Of the secondary variables, the Patient Health Questionnaire-9, P = 0.023), Problem Areas in Diabetes scale (P = 0.002), and Diabetes Distress Scale scores (P =0.012) displayed significant treatment effects. Moreover, the risk of incident major depression in the DIAMOS group was significantly reduced (P=0.028).	23 (92%)
13	2015	Buhse S.et al. Germany	RCT	-	Patients 154 40-69 years	90 min group teaching session.	The ISDM-P performed by diabetes educators. Core component is a patient decision help to the prevention of myocardial infarction supplemented by a 90 min group teaching session. Overall, 36 ISDM teaching sessions were given. While The structurally equivalent control intervention in 34 teaching sessions addresses stress issues.	ISDM-P patients achieved higher levels of risk comprehension, mean score 8.25 vs 2.62, difference 5.63, and realistic expectations (score 0-6), 4.51 vs 0.85, 3.67. More ISDM-P patients wished to take statins, 59.2% vs 30.4%, 28.7%; more prioritized blood pressure control, 51.4% vs 25.7%, and fewer intensive glucose control, 33.3% vs 60%, p=0.002. More ISDM-P patients achieved their glycated haemoglobin goals, 95.8% vs 85.7%, 10.1%. Achievement of prioritized goals and medication uptake were comparable between groups.	24(96%)

14	2015	Khani A, Hazavai S. M. M . Iran Shiraz	Quasi-experimental	BASNEF	Patients 100 -	1month	Intervention was conducted for the case group during one month in the form of 4 educational sessions (1 session every 5 days) with lecture, question and answer, group discussion and practical presentation. The duration of each session was -4 minutes. The control group received routine clinic training.	After the educational intervention, there was a significant difference between the mean scores of the variables of BASNEF model between the two groups. And, the intervention group had better performance on blood glucose control behaviors immediately after and 3 months after the end of the interventional program. so that HbA1c (from 8.65 before intervention to 3,7.47 months after intervention) and blood sugar. They also decreased significantly (from 207.08 before the intervention to 124.2, 3 months after the intervention), that was statistically significant.	8(%88)
15	2014	Muzaffar H et al. America	Experimental	TPB	Teens 127 -	1 to 2 weeks	The education was through the website.In the AOL group, the website included interactive elements such as video, narrated text, and knowledge-based games. But in the control group, the website contained only text and images with minimal interaction.	Both groups showed significant improvements from pretest To posttest survey and all Theory of planned behavior constructs were significantly correlated with intentions for pretest and posttest for both groups (P< 0.047). Attitude and behavioral control showed strongest correlations. Also Theory of planned behavior Constructs were predictive of intentions and the predictive power improved post intervention.	7(%77)
16	2013	Engebretson SP.et al. America	RCT	-	Patients 405 Men and women 35 years	6-month	The treatment group (n = 257) received scaling and root planning plus chlorhexidine oral rinse at baseline and supportive periodontal therapy at 3 and 6 months. The control group (n = 257) received no treatment for 6 months. The control group (n = 257) received no treatment for 6 months.	After the 6 months, mean HbA1c levels in the periodontal therapy group increased 0.17%. Periodontal measures improved in the treatment group compared with the control group at 6 months, with adjusted between-group differences of 0.28 mm for probing depth, 0.25 mm for clinical attachment loss, 13.1% for bleeding on probing, and 0.27 for gingival index (P < 0.001 for all).	24 (96%)

17	2012	Matsuhashi, T.iet al. Japanese	RCT	-	Patients 78 29-80 years	over 6 month	Participations had been treated with conventional oral antidiabetic agents, diet and exercise therapy for over 6 month. The control group did not receive sitagliptin and did not participate in the diet and exercise educational program.	Both add-on sitagliptin and switching from α-glucosidase inhibitors to sitagliptin prevented the seasonal deterioration of glycemic control. Furthermore, both adding and switching to sitagliptin were negatively correlated with deterioration of glycemic control. In 44 patients, elevation of HbA1c was suppressed without adverse effects ($P < 0.001$).	18(%72)
18	2012	Yazdanpanah B et al Iran Yasouj	Experimental	PATCH	People at risk 405 30-65 years	13-week	Nutrition education was given to the intervention group, that was divided into eight groups (50 people) by three nutritionists, and the education was by lecture method. The control group did not receive any education.	After completion of the intervention, the mean FBS, HbA1C, TG and cholesterol were decreased significantly. Although systolic and diastolic blood pressure and body mass index were decreased too, the differences were not statistically significant. The mean physical activity increased and consumption of fried foods and saturated oil decreased significantly.	8(88%)
19	2012	Archuleta M et al. American	Quasi-experimental	-	Patients 107 30-85 years	2month	educational classes were held for Diabetic patients and their families and the classes featured current nutrition recommendations for Diabetic patients. The control group did not receive any education.	The intakes of energy, fat grams, percentage of calories from fat, saturated fat grams, cholesterol, sodium, and carbohydrate grams of Participants decreased ($P<.05$).	88(%88)
20	2011	Ferrara A.et al. American	RCT	-	Patients 197 21-30 years	2 month	Prenatal phase consisted of one in-person session and two intervention women were referred to a lactation consultant, offered a breast pump, and encouraged the women to exclusively breastfeed. The lactation consultant then scheduled calls in the rst 6 weeks after delivery to evaluate latch and feeding techniques and to review the maintenance of milk supply and The sessions were conducted over the telephone. The control group did not receive any education.	The proportion of women who reached the postpartum weight goal was higher, although not statistically significant, in the intervention condition than among usual care (37.5 vs. 21.4%, P=0.07). The intervention was more effective among women who did not exceed the recommended gestational weight gain (P=0.04). The intervention condition decreased dietary fat intake more than the usual care (P=0.002) and increased breastfeeding, although not significantly (condition difference in proportion: 15.0%, P=0.09).	23 (92%)

21	2010	Coppell, Kirsten J et al. New Zealand	RCT	-	Patients 93 less than 70 years	6 months	Each participant had two individual sessions with dietitian after randomization, then monthly sessions for five months. Also, One group education session and a telephone call between visits, provided opportunities to reinforce the dietary advice and give additional support. Control participants continued with their usual medical surveillance.	The difference in HbA1c between the intervention and control groups at six months was highly statistically significant (P=0.007), as were the decreases in weight (−1.3 kg, −2.4 to −0.1 kg; P=0.032), body mass index (−0.5, −0.9 to −0.1; P=0.026), and waist circumference (−1.6 cm, −2.7 to −0.5 cm; P=0.005). A decrease in saturated fat (−1.9% total energy, −3.3% to −0.6%; P=0.006) and an increase in protein (1.6% total energy, 0.04% to 3.1%; P=0.045) in the intervention group were the most striking differences in nutritional intake between the two groups.	23 (92%)
22	2009	Kashfi SM et al. Shiraz, Iran	Experimental	-	Pations 100 40-65 years	1 month	The educational intervention for the case group was conducted in a form of lecture, question and answer, group discussion and practical demonstration. The control group did not receive any education.	The result indicated that after the educational intervention, the mean scores of the patients' nutritional behavior and jogging significantly increased in the experimental group compared to the control group. Also, the rate of HbA1c (before intervention: %8.65, after three months: %7.47) and FBS level (before intervention: 207.08, after three months: 124.2) improved significantly among experimental group compared to the control group.	9(%100)
23	2008	Zakerimoghadam M B et al. Tehran, Iran	Quasi experimental	-	Patients 60 <65 years	1Half a month	Telephone intervention was performed in the experimental group for 12 weeks. The control group did not receive any intervention from the researchers.	There were significant differences in HbA1c, weight, body mass index, and waist circumference between control and interventional groups after the intervention (P=0.035). A decrease in saturated fat and an increase in protein in the intervention group were the most remarkable differences in nutritional intake between the two groups.	8(%88)

| 24 | 2008 | Hazavehei MM et al. Iran Shiraz | Quasi-experimental | BASNEF | Patients 100 40 -65 years | 1month | The educational intervention for the case group was conducted in a form of lecture, question and answer, group discussion and practical demonstration during one month. The duration of each session was -4 minutes. The control group did not receive any education. | Our findings indicated that mean scores of BASNEF Model variables (beliefs, attitudes, subjective norm, enabling factors) were significantly increased in the experimental group compared to the controls after intervention. Also, behavioral eye care, rate of HbA1c (before intervention as 8.65% after three months 7.47%) and FBS levels (before intervention 207.08, after three months 124.2) improved significantly among the experimental group, compared to control group. | 8(%88) |

Appendix 3. The main findings of theoretically designed studies' effectiveness

Theoretical frame work	Study title	positive effect	No effect	Result	Follow-up period
Structures of PRECEDE-PROCEDE: Predisposing, reinforcing, and enabling constructs in educational diagnosis and evaluation - policy, regulatory, and organizational constructs in educational and environmental development	The effectiveness of self-management program for Patients with type 2 diabetes mellitus based on PRECEDE-PROCEDE model	✓	-	All variables improved after the implementation of the educational program in the intervention group.	6 months
None	Assessing the effect of a Diabetes-Specic Cognitive Behavioral Treatment Program for people with type 2 diabetes and subclinical depression: results of RCT	✓	-	Revealed a reduction of depressive symptoms and the risk of incident major depression but Inflammatory variables were not substantially affected.	12 month
Ability, Information, Motivation (AIM)	Assess the educational intervention on treatment adherence based on AIM model among diabetic patients	✓	-	Educational interventions had a positive effect on improving adherence to the treatment of diabetic patients and promoted knowledge and belief in the disease, motivating patients to pursue treatment.	6 months
None	Community Engaged Lifestyle Modification Research: Engaging Diabetic and Prediabetic African American Women in Community-Based Interventions	✓	-	After the educational intervention, participants' knowledge about nutrition and health, strategies for prevention and management of obesity and diabetes was increased.	-
Beliefs, Attitudes, Subjective Norms and Enabling Factors (BASNEF)	Assess the educational intervention on barriers of living with diabetes in knowledge and belief, lifestyle, adaptation, and support dimensions model among diabetic patients	✓	-	Components of Knowledge, Lifestyle, support and compatibility (living barriers with diabetes) declined	2 months
Beliefs, Attitudes, Subjective Norms and Enabling Factors (BASNEF)	Assess the educational program based on BASNEF model on glycemic control in diabetic patients.	✓	-	The diabetic patients' training program for blood sugar control using the Beliefs model was very useful and effective.	3 months
Beliefs, Attitudes, Subjective Norms and Enabling Factors (BASNEF)	Assess the educational program based on BASNEF model on diabetic (Type II) eyes care in Kazemi's clinic	✓	-	Beliefs, attitudes, enabling factors, social norms and behavioral intention after intervention increased.	3 months
None	The outcome of Saffron Hydro-alcoholic Extract on Mild to Moderate Mixed Depression-Anxiety Treatment in Type 2 Diabetes: A Triple-blind Randomized Placebo-controlled Clinical Trial	✓	-	Depression, anxiety and MDA were attenuated but dietary intakes and physical activity of the patients not changed.	8 weeks
Theory of planned behavior (TPB)	The HOT project. Using a web-based medium to influence, subjective norm, attitude, perceived behavioral control and intention for obesity and type 2 diabetes prevention	✓	-	After the educational intervention, attitude, behavioral belief, mental norm, perceived behavioral control, awarness and behavioral intention were increased.	6 months
None	Sitagliptin counteracts seasonal fluctuation of glycemic control	✓	-	sitagliptin and switching improved HbA1c. No changes of weight, calorie intake and physical activity were observed.	2 years
None	A pregnancy and postpartum lifestyle intervention in women with gestational diabetes mellitus decrease diabetes risk factors: a feasibility randomized control trial	✓	-	The proportion of women who reached the postpartum weight goal, decreased dietary fat and increased breastfeeding were higher, although not statistically significant. No differences in postpartum physical activity were observed.	6 weeks 7 months 12 months
Planned Approach to Community Health (PATCH)	survey the effect of community-based participatory diabetes care on diabetes control and its risk factors in the western suburbs of Yasui, Iran	✓	-	Community-based participatory diabetes care program improved diabetes control and risk factors patients.	13 weeks