



Effectiveness of diabetes self-management education among diabetes mellitus patients. Systematic review

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Table 2. Assessment of Bias Risk in the Included Studies.

Studies general information	Random sequence generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessment	Incomplete outcome data	Selective reporting	Other bias	Study quality
[21]	+	+	-	?	+	?	+	Fair
[22]	?	?	-	?	+	+	+	Poor
[23]	+	?	?	?	+	?	+	Poor
[33]	-	?	?	+	-	+	-	Poor
[24]	-	?	?	+	+	+	-	Poor
[34]	-	-	-	?	+	+	No control group	Poor
[27]	+	+	+	+	+	+	+	Fair
[28]	?	+	-	?	+	-	+	Poor
[29]	+	+	?	?	+	+	?	Fair
[25]	+	+	+	+	+	+	?	Fair
[35]	?	?	?	?	+	+	?	Poor
[31]	+	+	-	?	+	+	+	Fair
[32]	+	+	-	?	+	+	+	Fair
[36]	?	?	?	?	+	+	No control group	Poor
[26]	-	?	?	+	+	+	?	Poor
[37]	+	+	+	?	+	+	?	Fair
[38]	-	?	?	?	+	+	No control group	Poor
[39]	-	?	?	?	+	+	No control group	Poor
[30]	+	+	?	?	+	+	+	Fair

Note: (+) shows Low risk of bias; (-) shows high risk of bias; (?) shows unclear risk of bias.

Table 4. Characteristics of the educational interventions evaluated in the studies included in the review.

Studies general information	Type of study	Type of intervention	Follow up period	Characteristics of educational interventions					Theory based	Assessed clinical and patients reported parameters
				Educational sessions, duration	Delivery	Provider	Covered self-care topics	Supporting strategy		
[21]	Experimental design / RCTs	Health promotion – multi-intervention program Individual intervention	18 months	Different return visit time for each patient Use of a mobile application	face to face & online	Team	General information for diabetes Self-care	Mobile tablets,	AADE 7 Self-Care Behaviors program	Biomedical outcomes Psychosocial outcomes
[22]	Experimental design	Education program – multi-intervention program Group education	6 months	2 lecture sessions (40 min each) / week and interactive sessions (20 min)	Face to face	Nurses	General information for diabetes Self-care	Lecturing approach, audio-visual approach, discussion approach	Problem Based Learning	Biomedical outcomes Psychosocial outcomes
[23]	Intervention study	Education program – multi-intervention program Group education Use of "one-to-one" health education	3 months	Not clear	Face to face	Nurses	General information for diabetes Self-care	none	Orem's self-care theory	Biomedical outcomes Psychosocial outcomes
[33]	Prospective study	PAET-Debut DM2 <i>standardized group education</i> <i>Group education</i>	12 months	<i>Phase 1: 2 individual visits (30 min) & 1 telephone visit</i> <i>Phase 2: 3 sessions (1h 30 minutes)</i> <i>Phase 3: Reinforced of knowledge and skills</i>	Face to face	Team	General information for diabetes Self-care	Standardized materials.	AISBE group for chronic diabetes disease	Biomedical outcomes Psychosocial outcomes Behavioral outcomes
[24]	Non randomized controlled study	Implementation of a <i>model</i> Group education	6 months	The first education was outpatient education. Follow-up telephone visits	Face to face and phone call visits	Team	General information for diabetes Self-care	Learning manual, video tutorials, phone call, diabetes clubs, meeting	Omaha System-based integrated nursing management model	Biomedical outcomes Psychosocial outcomes

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[34]	Program evaluation study	Implementation of the CAIPaDi model Individual intervention	24 months	Intervention visits and two follow up visits (12 and 24 months) Each session is 30 - 60 min long	Face to face	Team	General information for diabetes Self-care	Support in distance system webpage	Patients in the intervention group were managed using the CAIPaDi program	Biomedical outcomes Psychosocial outcomes Behavioral outcomes
[27]	RCTs	Education program – multi-intervention program Individual intervention	24 months	Advice 2–3 educational text messages per week	Text message & face to face	Physicians	General information for diabetes Self-care	None	None	Biomedical outcomes Psychosocial outcomes Behavioral outcomes
[28]	RCTs	Education program – multi-intervention program Group intervention	4 months	1 session 7-15 minutes	Face to face	Not clear	General information for diabetes Self-care	Video – minutes leaflets	None	Psychosocial outcomes
[29]	RCTs	Structured exercise therapy Individual intervention	6 months	The aerobic exercise	Face to face	Physicians	Role of specific exercise	Booklets	None	Biomedical outcomes
[25]	RTCs	Use of a model Multi-intervention program Group education	12 weeks	8 interactive educational sessions	Face to face	Nurses	General information for diabetes Self-care	Handbook; Power and Point slides	Health Belief Model and Self-Efficacy Theory	Biomedical outcomes Psychosocial outcomes Behavioral outcomes
[35]	Intervention study	Psychological intervention Group intervention	12 months	90 - min bi-weekly group sessions over 3 months	Face to face	Clinical psychologist	General information for diabetes Self-care	None	No	Biomedical outcomes
[31]	RCTs	Education program – multi-intervention program Individual & group intervention	30 months	2 individual and 5 group sessions	Face to face	Nurses	General information for diabetes Self-care	Telephone consultation,	None	Biomedical outcomes Psychosocial outcomes Behavioral outcomes
[32]	RCTs	Education program – multi-intervention program Group intervention	8 months	Three monthly 2-hour interactive sessions and one booster session	Face to face	Nurses	Illness perceptions; Developing personalized proactive action plans	Workbook to both patients and partners.	None	Psychosocial outcomes Behavioral outcomes

[36]	Intervention study	Education program – multi-intervention program Individual intervention	6 weeks intervention and 3 months follow up	During the first 6 weeks: Session 1; 5 days Session 2: 14 days Session 3: 14 days Session 4: not clear	Face to face	Not clear	Role of foods and physical activity,	The GEM pocket guide; Text messages	None	Biomedical outcomes Psychosocial outcomes Behavioral outcomes
[26]	Prospective cohort study	Education program – multi-intervention program Individual intervention Use of a mobile application	24 weeks	Use of the medical app to assist in doctor–patient communication,	Online	Physician	General information for diabetes Self-care	Use of other functions of the app software:	None	Biomedical outcomes
[37]	RCTs	Education program – multi-intervention program Individual intervention	8 weeks	Participants received two text messages per week	Online	Not clear	Behavior change	Use of a mobile application	Theory of Planned Behavior	Behavioral outcomes
[38]	Intervention study	Food-based digital education Individual intervention Use of a mobile application	12 weeks	During the weekly coaching calls,	Online	Trained nutritionist	Structured behavior change Role of healthy diet,	The recipe book	None	Biomedical outcomes
[39]	a descriptive pre/poststudy	Food education Individual intervention Use of mobile interactive platform	12 months	5 visits 1st visit at baseline, (30-45 minutes) 2-nd at 2–3 months, 3rd visit at 4 months, 4th visit at 6 months, and the last visit at 12 months (15-20 min each).	Face to face & online (mobile interactive platform)	Six Lebanese dietitians	General information for diabetes Self-care	No information	Academy of Nutrition and Dietetics EBNPGs	Biomedical outcomes Behavioral outcomes
[30]	RCTs	Physical promotion Individual intervention	12 months	Contacted by phone at 3 months' interval	On line call and face to face	Not clear	Role of physical activity	No information	None	Biomedical outcomes Behavioral outcomes

Table 7. The effect of educational intervention on anthropometric parameters.

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Studies general in-formation	Baseline		Post intervention		Change		Absolute effect
	IG	CG	IG	CG	IG	CG	
<i>Effect of educational intervention on Weight</i>							
[21]	67.86±16.84	66.67±17.28	57.5±15.33*	65.65±16.98	-10.36**	-1.02	-9.34
[31]	88.2±16.2	87.7±15.4	86.6±16.1	86.7±14.1	-1.6	-1	-0.6
[37]	89.60 ±20.3	90.2 ± 19.9	90±21.7	90.5 ±19.2	+0.4	+0.3	+0.1
[38]	97.0±13.9	-	87.7±12.1*	-	-9.3		-9.3
[30]	71.47±11.43	71.47±11.43	69.27±13.88	71.20±12.76	-2.2	-0.27	-1.93
Mean ±SD					-4.6	-0.49	-2.94
<i>Effect of educational intervention on BMI</i>							
[21]	25.47(3.31)	25.29(3.25)	25.28(2.93)	24.94(2.89)	-0.19	-0.35	-0.16
[22]	25.70 ± 3.38	25.06 ± 3.38	25.16 ± 3.38	25.28 ± 3.47	-0.54	+0.02	-0.56
[33]	29.6(27.2-34.2)	-	28.8(25.9-32.6)*	-	-0.8*		-0.8
[34]	29.19±4.27	-	28.8±4.2	-	-0.39		-0.39
[31]	29.6(4.9)]	30.1(4.5)	29.2(4.8)*	29.6(4.5)	-0.4	-0.5	-0.1
[36]	36.5(8.1)	-	34.4(8.2)	-	-2.1		-2.1
[26]	26.27±4.64	25.52±4.76	25.68±4.21	25.48±4.65	-0.59	-0.04	-0.55
[37]	31.1 ±6.4	29.9 ±4.7	31.2 ±6.9	31.2 ±4.6±	+0.1	+1.3	-
[38]	32.6±4.6	-	29.4±3.9*	-	-3.2		-3.2
[39]	31.7±4.9	-	30.6±4.9*	-	-1.1±2.7*		-1.1
[30]	27.73±5.14	26.80±2.76	26.97±5.04	26.66±3.18	-0.76	-0.14	-0.62
Mean ±SD					-0.90	0.29	-0.398

Notes: *Significant difference between pre- and post-intervention in the same group. ** Non-significant difference between pre- and post-intervention in the same group. **Significantly different effect between IG and CG. †No statistical comparison or no data about significance. Studies without control group are not included in the calculation of Absolute effect on anthropometric parameters, IG – intervention group, CG – control group, BMI – Body mass index.

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Table 8. The effect of educational intervention on blood pressure.

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Blood pressure / Studies general information		[21]	[22]	[33]	[34]	[31]	[37]	[39]	[30]	Mean ±SD	
SBP	Baseline	IG	130.24±18.9 2	130.00	130.64±13.5	128.9±16.4	132±13	136.3±17.2	131.3±20.4	128.09±10.7 8	
		CG	128.09±17.3 6	120.00	-	-	133±14	134.0±18.1	-	129.48±10.7 1	
	Post-intervention	IG	131.37±19.1 2	130.00	129.4±14.4	120.86±11.83	135±17	138.2±20.7	124.9±9.9*	119.15±7.75	
		CG	131.15±18.2 4	130.00	-	-	135±15	135.6±20.3	-	119.88±7.31	
	Change	IG	1.13	0	1.24	-8.04	3.0	1.9	-6.4*	-8.94	-2.3±6.5
		CG	3.06	10.00	-	-	3	1.6	-	-9.6	1.61±8.10
	Absolute effect		-	-	-	-8.04	0	-	-6.4*	-0.66	-0.34±7.9
	DBP	Baseline	IG	74.99±13.12	80.00	77.8±9	78.4±7.87	-	83.8±9.5	81.3±12.5	79.33±8.14
			CG	76.22±12.11	80.00	-	-	-	83.3±10.7	-	81.24±8.03
		Post-intervention	IG	75.58±11.04	80.00	76.4±8.4	74.06±6.86	-	82.4±9.8	78.1±9.5	78.15±4.83
CG			78.61±12.98	85.00	-	-	-	84.3±13.2	-	78.73±5.78	
Change		IG	-0.59	0	-1.4	4.34	-	-1.3	-3.1*	1.18±6.48	-0.87±4.5
		CG	2.39	0,5	-	-	-	1.0	-	2.51±6.90	1.6±5.1
Absolute effect		3.98	0,5	-1.4	4.34	-	2.3	-3.1	1.33	0.36±5.5	

Notes: *Significant difference between pre- and post-intervention in the same group. ** Non-significant difference between pre- and post-intervention in the same group. **Significantly different effect between IG and CG. §No statistical comparison or no data about significance. Studies without control group are not included in the calculation of Absolute effect on blood pressure, SBP- systolic blood pressure, DBP - diastolic blood pressure.

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Table 9. Impact of number of patients included in study on HbA1c level.

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Number of patients	Studies general information	Baseline		Post intervention		Change		Absolute effect
		IG	CG	IG	CG	IG	CG	
<50 patients	[21]	8.44±2.28	8.95±2.34	6.92±1.27*	7.82±12.98*#	-1.52 [§]	-1.13	-0.39
	[35]	7.85±1.19	7.32±1.23	6.66±0.84*	6.95±1.31	-1.19**	-0.37	-0.82
	[36]	8.0(1.6)	-	6.2(1.1)*	-	-1.8*#	-	-1.6
		-0.93 ±11.03						
50-100 patients	[22]	7.20(6.40, 9.10)	7.90(6.80, 10.30)	6.20(5.80, 6.60)*	6.70(6.40, 7.30)*	-1**	-1.2	+0.2
	[29]	5.95±0.47	5.95±0.47	5.14±0.36*	5.85±0.37*	-0.81**	-0.1	-0.71
	[25]	6.66±1.09	6.86±1.34	5.85±0.37*	6.97±1.18	-0.81**	+0.11	-0.70
	[31]	6.5(6.2-7.0)	6.6(6.3-7.1)	6.6(6.3-7.1)	6.7(6.3-7.1)	+0.1*#	+0.1	0
	[26]	9.82±2.47	9.05±2.32	6.76±0.50*	7.25±0.98*	-3.03**	-1.8	-1.23
	[39]	9.1±2.3	-	7.4±1.3*	-	-1.7±2.5*	-	-1.7
		-0.69±1.11						
>100 patients	[33]	7.2(6.6-9.2)	6.7(6.4-7.5)	6.2(5.8-6.7)*	6.4(5.8-6.8)	-1 [§]	-0.3	-0.7
	[34]	7.77±2.22	No control group	7.16±1.62	No control group	-0.61*#	-	-0.61
	[27]	9.5±2.1	9.5±2.0	7.4±1.5*	9.5±2.1	-2.1**	0	-2.1
		Mean ±SD - 1.13						

Notes: *Significant difference between pre- and post-intervention in the same group. ** Non-significant difference between pre- and post-intervention in the same group. **Significantly different effect between IG and CG. §No statistical comparison or no data about significance. Studies without control group are not included in the calculation of Absolute effect on anthropometric parameters, IG – intervention group, CG – control group.

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Table 10. Impact of follow up on HbA1c level.

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Follow up	Studies general information	Baseline		Post intervention		Change		Absolute effect
		IG	CG	IG	CG	IG	CG	
12 week	[25]	6.66±1.09	6.86±1.34	5.85±0.37*	6.97±1.18	-0.81**	+0.11	-0.70
6 weeks	[36]	8.0(1.6)	-	6.2(1.1)*	-	-1.8*#	-	-1.6
-1.5±0.56								
6 months	[22]	7.20(6.40, 9.10)	7.90(6.80, 10.30)	6.20(5.80, 6.60)*	6.70(6.40, 7.30)*	-1**	-1.2	+0.2
6months	[29]	5.95±0.47	5.95±0.47	5.14±0.36*	5.85±0.37*	-0.81**	-0.1	-0.71
24 weeks	[26]	9.82±2.47	9.05±2.32	6.76±0.50*	7.25±0.98*	-3.03**	-1.8	-1.23
-0.58±31								
12 months	[39]	9.1±2.3	-	7.4±1.3*	-	-1.7±2.5*	-	-1.7
12months	[33]	7.2(6.6-9.2)	6.7(6.4-7.5)	6.2(5.8-6.7)*	6.4(5.8-6.8)	-1 ^s	-0.3	-0.7
12 months	[35]	7.85±1.19	7.32±1.23	6.66±0.84*	6.95±1.31	-1.19**	-0.37	-0.82
-1.07±0.89								
18 months	[21]	8.44±2.28	8.95±2.34	6.92±1.27*	7.82±12.98*#	-1.52 ^s	-1.13	-0.39
24months	[34]	7.77±2.22	No control group	7.16±1.62	No control group	-0.61*#	-	-0.61
24months	[27]	9.5±2.1	9.5±2.0	7.4±1.5*	9.5±2.1	-2.1**	0	-2.1
30 months	[31]	6.5(6.2-7.0)	6.6(6.3-7.1)	6.6(6.3-7.1)	6.7(6.3-7.1)	+0.1*#	+0.1	0.1
-0.72±1.1								

Table 11. Impact of delivery of intervention on HbA1c level.

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Delivery	Studies general information	Baseline		Post intervention		Change		Absolute effect
		IG	CG	IG	CG	IG	CG	
Face to face	[22]	7.20(6.40, 9.10)	7.90(6.80, 10.30)	6.20(5.80, 6.60)*	6.70(6.40, 7.30)*	-1**	-1.2	+0.2
Face to face	[33]	7.2(6.6-9.2)	6.7(6.4-7.5)	6.2(5.8-6.7)*	6.4(5.8-6.8)	-1 ^s	-0.3	-0.7
Face to face	[34]	7.77±2.22	No control group	7.16±1.62	No control group	-0.61*#	-	-0.61
Face to face	[29]	5.95±0.47	5.95±0.47	5.14±0.36*	5.85±0.37*	-0.81**	-0.1	-0.71
Face to face	[25]	6.66±1.09	6.86±1.34	5.85±0.37*	6.97±1.18	-0.81**	+0.11	-0.70
Face to face	[35]	7.85±1.19	7.32±1.23	6.66±0.84*	6.95±1.31	-1.19**	-0.37	-0.82
Face to face	[31]	6.5(6.2-7.0)	6.6(6.3-7.1)	6.6(6.3-7.1)	6.7(6.3-7.1)	+0.1*#	+0.1	0
Face to face	[36]	8.0(1.6)	-	6.2(1.1)*	-	-1.8*#	-	-1.6
-0.61±0.5								
Online	[26]	9.82±2.47	9.05±2.32	6.76±0.50*	7.25±0.98*	-3.03**	-1.8	-1.23
-1.23±0.03								
Face to face & mobile application	[21]	8.44±2.28	8.95±2.34	6.92±1.27*	7.82±12.98*#	-1.52 ^s	-1.13	-0.39
Face to face & mobile messages	[27]	9.5±2.1	9.5±2.0	7.4±1.5*	9.5±2.1	-2.1**	0	-2.1
Face to face & mobile application	[39]	9.1±2.3	-	7.4±1.3*	-	-1.7±2.5*	-	-1.7
-1.39±2.4								

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Table 12. Impact of provider of intervention on HbA1c level.

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Provider	Studies general information	Baseline		Post intervention		Change		Absolute effect
		IG	CG	IG	CG	IG	CG	
Nurses	[22]	7.20(6.40, 9.10)	7.90(6.80, 10.30)	6.20(5.80, 6.60)*	6.70(6.40, 7.30)*	-1**	-1.2	+0.2
Doctors	[27]	9.5±2.1	9.5±2.0	7.4±1.5*	9.5±2.1	-2.1**	0	-2.1
Doctors	[29]	5.95±0.47	5.95±0.47	5.14±0.36*	5.85±0.37*	-0.81**	-0.1	-0.71
Nurses	[25]	6.66±1.09	6.86±1.34	5.85±0.37*	6.97±1.18	-0.81**	+0.11	-0.70
Psikologu	[35]	7.85±1.19	7.32±1.23	6.66±0.84*	6.95±1.31	-1.19**	-0.37	-0.82
Nurses	[31]	6.5(6.2-7.0)	6.6(6.3-7.1)	6.6(6.3-7.1)	6.7(6.3-7.1)	+0.1*#	+0.1	0
Doctor	[26]	9.82±2.47	9.05±2.32	6.76±0.50*	7.25±0.98*	-3.03**	-1.8	-1.23
Dietans	[39]	9.1±2.3	-	7.4±1.3*	-	-1.7±2.5*	-	-1.7
								-0.87±0.67
Team	[21]	8.44±2.28	8.95±2.34	6.92±1.27*	7.82±12.98*#	-1.52 ^S	-1.13	-0.39
	[33]	7.2(6.6-9.2)	6.7(6.4-7.5)	6.2(5.8-6.7)*	6.4(5.8-6.8)	-1 ^S	-0.3	-0.7
	[34]	7.77±2.22	No control group	7.16±1.62	No control group	-0.61*#	-	-0.61
								0.56±0.78

Table 13. Impact of type of intervention on HbA1c level.

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Type of intervention	Studies general information	Baseline		Post intervention		Change		Absolute effect
		IG	CG	IG	CG	IG	CG	
Intervention education in group patients	[22]	7.20(6.40, 9.10)	7.90(6.80, 10.30)	6.20(5.80, 6.60)*	6.70(6.40, 7.30)*	-1**	-1.2	+0.2
	[25]	6.66±1.09	6.86±1.34	5.85±0.37*	6.97±1.18	-0.81**	+0.11	-0.70
	[35]	7.85±1.19	7.32±1.23	6.66±0.84*	6.95±1.31	-1.19**	-0.37	-0.82
	[33]	7.2(6.6-9.2)	6.7(6.4-7.5)	6.2(5.8-6.7)*	6.4(5.8-6.8)	-1 ^S	-0.3	-0.7
								-0.50±0.87
Intervention education in person (individual education)	[27]	9.5±2.1	9.5±2.0	7.4±1.5*	9.5±2.1	-2.1**	0	-2.1
	[29]	5.95±0.47	5.95±0.47	5.14±0.36*	5.85±0.37*	-0.81**	-0.1	-0.71
	[26]	9.82±2.47	9.05±2.32	6.76±0.50*	7.25±0.98*	-3.03**	-1.8	-1.23
	[39]	9.1±2.3	-	7.4±1.3*	-	-1.7±2.5*	-	-1.7
	[21]	8.44±2.28	8.95±2.34	6.92±1.27*	7.82±12.98*#	-1.52 ^S	-1.13	-0.39
	[34]	7.77±2.22	No control group	7.16±1.62	No control group	-0.61*#	-	-0.61
								-1.12±0.46
Intervention education in group patients and individual	[31]	6.5(6.2-7.0)	6.6(6.3-7.1)	6.6(6.3-7.1)	6.7(6.3-7.1)	+0.1*#	+0.1	0
								No evident changes

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