UNIVERSITI PUTRA MALAYSIA

EFFECTIVENESS OF SIMPLIFIED DIABETES NUTRITION EDUCATION ON GLYCEMIC CONTROL, AND OTHER DIABETES-RELATED OUTCOMES IN PATIENTS WITH TYPE 2 DIABETES MELLITUS IN BASRAH, IRAQ

ALMALIKI SAMAN AGAD HASHIM

FPSK(p) 2021 6

EFFECTIVENESS OF SIMPLIFIED DIABETES NUTRITION EDUCATION ON GLYCEMIC CONTROL, AND OTHER DIABETES-RELATED OUTCOMES IN PATIENTS WITH TYPE 2 DIABETES MELLITUS IN BASRAH, IRAQ

By

ALMALIKI SAMAN AGAD HASHIM

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Doctor of Philosophy

December 2020

© COPYRIGHT UPM

COPYRIGHT

All material contained within the thesis, including without limitation text, logos, icons, photographs, and all other artwork, is copyright material of Universiti Putra Malaysia unless otherwise stated. Use may be made of any material contained within the thesis for non-commercial purposes from the copyright holder. Commercial use of material may only be made with the express, prior, written permission of Universiti Putra Malaysia.

Copyright © Universiti Putra Malaysia

© COPYRIGHT UPM

DEDICATION

I would like to dedicate this thesis to my great late mother "Jameela"; she taught me perseverance and made me face challenges with confidence and modesty. She was an endless motivation for my study life. Although she is not here to give me support and strength, I always sense her presence has been urged me to pursue my goals in life.

© COPYRIGHT UPM

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Doctor of Philosophy

EFFECTIVENESS OF SIMPLIFIED DIABETES NUTRITION EDUCATION ON GLYCEMIC CONTROL, AND OTHER DIABETES-RELATED OUTCOMES IN PATIENTS WITH TYPE 2 DIABETES MELLITUS IN BASRAH, IRAQ

By

ALMALIKI SAMAN AGAD HASHIM

December 2020

Chairman : Barakatun Nisak binti Mohd Yusof, PhD
Faculty : Medicine and Health Sciences

Type 2 Diabetes (T2DM) is a global public health concern, with the majority of the patients had inadequate glycemic control. In Basrah, Iraq, one of the factors affecting glycemic control is low health literacy (HL) level. T2DM patients with low HL have limited ability to understand and apply the regimen to their diabetes self-management. Therefore, a simplified diabetes nutrition education (SDNE) may be required to ensure optimum diabetes care. This study evaluates the effectiveness of SDNE on glycemic control and other diabetes-related outcomes in patients with T2DM in Basrah, Iraq.

This study involved three phases based on the Generalized Model for Program Planning conducted at Faiha Specialized Diabetes, Endocrine, and Metabolism Centre (FDEMC), in Basrah, Iraq. Phase I was a cross-sectional study that included 280 participants in determining the factors associated with glycemic control. The factors included socio-demographic status, medical characteristics, nutritional status, lifestyle behavior, and HL level. The results from Phase I informed the content for the Phase II study, which involved developing and assessing nutrition education materials. The developed nutrition education materials were assessed for face validity, readability, and acceptability using a 14-item HL Scale and the Suitability Assessment of Materials (SAM) instrument in 30 participants with T2DM. The experts validated the content of the materials. The effectiveness of the developed nutrition education materials named SDNE was evaluated at Phase III using a randomized controlled trial (RCT) on glycemic control and other diabetes-related outcomes for 22 weeks in patients with T2DM (n = 208). The assessments were performed at baseline (T0), at 12-week of intervention (T1), and at 10-week of follow-up (T2). 208 participants were randomly allocated to either the nutrition education group (NEG, n = 104), or the control group (CG, n = 104). Those in the NEG received the SDNE curriculum

© COPYRIGHT UPM

for 12 weeks (12 weekly classes, 1 to 1.5 hours each). Participants in the CG continued with the usual care.

At Phase I, the participants (N = 151) were at their 50s' with the HbA1c, and HL scores were 10.0 ± 2.6% and 45.7 ± 24.6. The majority of the participants (76.4%) had either inadequate (55.7%) or marginal HL (20.7%). Factors associated with glycemic control included low HL score, low total income, self-employed, multiple treatments (oral anti-diabetic drugs and insulin therapy), low physical activity level, presence of comorbidities, and low vegetable intake. All of the factors explained 35% of the total variation in HbA1c (adjusted R2 = 0.35; p = 0.005).

The modifiable nutrition-related factors that were associated with glycemic control (i.e., HL levels, physical activity, and vegetable intakes) were considered the key nutrition component in the development of nutrition education materials at Phase II. The SDNE curriculum emphasizes the use of the Plate Method and "eating vegetables before carbohydrates." The developed SDNE had the HL scale score of 57.1, indicating it was readable and acceptable among participants. The SAM instruments score was 34 out of 40, indicating the SDNE curriculum's suitability. The dietitians and an endocrinologist confirmed the content validity of the SDNE.

At Phase III, a total of 208 patients aged 20-64 years old with a confirmed diagnosis of T2DM participated in the study. At 22 weeks, the interaction effects were significant and more pronounced in NEG than CG for HbA1c ($p < 0.001$) and other diabetes-related outcomes including on total cholesterol ($p = 0.001$), low-density lipoprotein ($p = 0.009$), high-density lipoprotein ($p < 0.001$), triglyceride ($p = 0.01$), waist circumference ($p < 0.001$), BMI ($p = 0.008$), total energy ($p < 0.001$), carbohydrate ($p < 0.001$), and vegetable ($p < 0.001$) intakes. Health belief model (HBM) constructs ($p = 0.003$), diabetes knowledge (DK) ($p = 0.004$), and HL score ($p < 0.001$) were also improved. In conclusion, patients with T2DM in Iraq had poor glycemic status, low HL, low vegetable intake, and decreased levels of physical activity. These components were included in the development of a simplified and visual educational material called SDNE. SDNE was demonstrated to be effective in improving HbA1c, metabolic parameters, dietary intake, and physical activity. Likewise, HBM, DK, and HL. SDNE can be used in Clinics as simplified pictorial leaflets that will assist nutritionists in providing appropriate and accessible nutritional education to patients with T2DM.

© COPYRIGHT UPM

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

PEMBENTUKAN DAN KEBERKESANAN PENDIDIKAN PEMAKANAN DIABETES DIPERMUDAHKAN KE ATAS KAWALAN GLISEMIK DAN HASIL LAIN BERKAITAN DIABETES DALAM KALANGAN PESAKIT DIABETES MELLITUS JENIS *2* DI BASRAH, IRAQ

Oleh

ALMALIKI SAMAN AGAD HASHIM

Disember 2020

Pengerusi : Barakatun Nisak binti Mohd Yusof, PhD
Fakulti : Perubatan dan Sains Kesihatan

Diabetes Jenis 2 (T2DM) adalah isu kesihatan awam sedunia dimana majoriti pesakit tidak mencapai kawalan glisemik yang baik. Di Basrah, Iraq, salah satu faktor yang mempengaruhi kawalan glisemik adalah tahap literasi kesihatan (HL) yang rendah. Pesakit T2DM dengan tahap HL yang rendah mempunyai kemampuan terhad untuk memahami aspek pengurusan kendiri diabetes. Oleh itu, pendidikan pemakanan diabetes yang dipermudahkan (SDNE) mungkin diperlukan untuk memastikan penjagaan diabetes yang optima. Kajian ini menilai keberkesanan SDNE ke atas kawalan glisemik dan hasil lain berkaitan diabetes dalam kalangan pesakit T2DM di Basrah, Iraq.

Kajian ini melibatkan tiga fasa berdasarkan model umum untuk perancangan program yang dijalankan di Pusat Khusus Diabetes, Endokrin, dan Metabolisme Faiha (FDEMC), di Basrah, Iraq. Fasa I menggunakan keratan rentas yang merangkumi 280 peserta untuk menentukan faktor-faktor yang berkaitan dengan kawalan glisemik. Faktor-faktor tersebut merangkumi status sosio-demografi, ciri perubatan, status pemakanan, tingkah laku gaya hidup, dan tahap HL. Hasil dapatan dari Fasa I digunakan untuk membentuk kandungan kajian pada Fasa II, yang melibatkan pembentukan dan penilaian bahan pendidikan pemakanan. Bahan pendidikan pemakanan yang dibentuk dinilai untuk kesahan muka, kebolehbacaan, dan penerimaannya menggunakan skala 14-soalan HL dan instrumen Penilaian Kesesuaian Bahan (SAM) dalam kalangan 30 peserta T2DM. Para pakar mengesahkan kandungan bahan. Keberkesanan bahan pendidikan pemakanan yang dibentuk bernama SDNE dinilai pada Fasa III menggunakan percubaan kawalan secara rawak (RCT) pada kawalan glisemik dan hasil lain yang berkaitan dengan diabetes selama 22 minggu. Penilaian dilakukan pada peringkat awal (T0), pada minggu ke 12

© COPYRIGHT UPM

intervensi (T1), dan pada minggu ke 10 rawatan susulan (T2). Sebanyak 208 peserta diagihkan secara rawak kepada Kumpulan Pendidikan Pemakanan (NEG, n = 104), atau Kumpulan Kawalan (CG, n = 104). Mereka yang berada di NEG menerima SDNE selama 12 minggu (12 kelas mingguan, masing-masing 1 hingga 1.5 jam). Peserta dalam CG meneruskan rawatan seperti biasa.

Pada Fasa I, peserta berusia 50 tahun dengan HbA1c, dan skor HL masing-masing 10.0 ± 2.6% dan 45.7 ± 24.6. Kebanyakan peserta (76.4%) tidak mepunyai HL yang memuaskan (55.7%) atau HL yang rendah (20.7%). Faktor berkait dengan kawalan glisemuk termasuk skor HL yang rendah, jumlah pendapatan yang rendah, bekerja sendiri, mempunyai komorbiditi dan pengambilan sayuran yang rendah. Kesemua faktor menjelaskan 35% jumlah variasi bagi HbA1c (pelarasan R2 = 0.35; p = 0.005).

Faktor berkait pemakanan ini boleh diubah suai berkaitan dengan kawalan glisemik (tahap HL, aktiviti fizikal, dan pengambilan sayur-sayuran) menjadi komponen utama dalam pembentukan bahan pendidikan pemakanan pada Fasa II. Kurikulum SDNE menekankan penggunaan Kaedah Pinggan dan "makan sayur-sayuran sebelum karbohidrat". SDNE yang dibentuk mempunyai skor skala HL 57.1, menunjukkan ia dapat dibaca dan diterima di kalangan peserta. Skor instrumen SAM adalah 34, menunjukkan kesesuaian kurikulum SDNE untuk pelaksanaan di kalangan peserta. Ahli diet dan endokrinologi mengesahkan kesahan kandungan SDNE.

Pada Fasa III, sejumlah 208 pesakit berusia 20-64 tahun yang disahkan mengidap T2DM mengambil bahagian dalam kajian ini. Pada minggu ke 22, kesan interaksi adalah ketara dan lebih ketara di NEG daripada CG untuk HbA1c ($p < 0.001$) dan hasil berkaitan diabetes lain termasuk pada kolesterol total ($p = 0.001$), lipoprotein berkepadatan rendah ($p = 0.009$), lipoprotein berkepadatan tinggi ($p < 0.001$), trigliserida ($p = 0.01$), ukur lilit pinggang ($p < 0.001$), BMI ($p = 0.008$), jumlah tenaga ($p < 0.001$), karbohidrat ($p < 0.001$), dan pengambilan sayur-sayuran ($p < 0.001$). Konstruk Model Kepercayaan Kesihatan (HBM) ($p = 0,003$), pengetahuan diabetes ($p = 0,004$), dan skor HL ($p < 0.001$) juga bertambah baik. Kesimpulannya, pesakit dengan T2DM di Iraq mempunyai status glisemik yang tidak terkawal, rendah HL, pengambilan sayur yang rendah, dan tahap aktiviti fizikal yang rendah. Komponen-komponen ini dimasukkan dalam pembentukan visual bahan pendidikan yang ringkas yang disebut SDNE. SDNE terbukti efektif dalam mengawal HbA1c, parameter metabolik, pengambilan makanan, dan aktiviti fizikal. Begitu juga, HBM, DK, dan HL. SDNE boleh digunakan di Klinik sebagai risalah bergambar yang mudah yang akan membantu pakar pemakanan dalam memberikan pendidikan pemakanan yang sesuai dan mudah akses kepada pesakit T2DM.

ACKNOWLEDGEMENTS

First, praise and thanks be to Allah Almighty for his blessings to complete the research successfully. I want to express my special thanks and gratitude to my primary supervisor, Associate Professor Barakatun-Nisak Mohd Yusof, for allowing me to do the research and provide invaluable guidance throughout this research. She has taught me the methodology to carry out the research and to present the research works as clearly as possible. It was a great privilege and honor to work and study under her guidance. I am very grateful for what she gave me.

I express my sincere appreciation to the other supervisory committee: Prof. Abbas Ali Mansour, Dr. Suriani Ismail, and Dr. Hazizi Abu Saad for their continued support, encouragement, insightful comments challenging questions. I also thank Dr. Hayati Abdul Kader for her continuous statistical assistance in all of our statistical analyses. Likewise, I gratefully acknowledge the valuable collaboration provided by the Chair Diabetes, Endocrine and Metabolism Division, and the staff of Faiha Specialized Diabetes, Endocrine, and Metabolism Center in Basrah, Iraq. Besides, patients who participated in this study.

I am incredibly grateful to the best human in my life, "my father," and my siblings, for their love, prayers, caring, and sacrifices for educating and preparing me for my future and their countless times caring for my children during my journey of obtaining this Ph.D. I am very thankful for my caring, loving, and supportive wife and children for their love, understanding, prayers, and continuing support to complete this study.

© COPYRIGHT UPM

This thesis was submitted to the Senate of the Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follows:

Barakatun Nisak Mohd Yusof, PhD
Associate Professor
Faculty of Medicine and Health Sciences
Universiti Putra Malaysia
(Chairman)

Hazizi Abu Saad, PhD
Associate Professor
Faculty of Medicine and Health Sciences
Universiti Putra Malaysia
(Member)

Suriani Ismail, MD, PhD
Associate Professor
Faculty of Medicine and Health Sciences
Universiti Putra Malaysia
(Member)

Osama Hamdy, MD, PhD, FACE
Associate Professor
Joslin Diabetes Center
Harvard Medical School
United State of America
(Member)

Abbas Ali Mansour, MD, FRCP, FACE
Professor
Faiha Specialized Diabetes, Endocrine and Metabolism Center (FDEMC)
Faculty of Medicine, University of Basrah
Iraq
(Member)

ZALILAH MOHD SHARIFF, PhD
Professor and Dean
School of Graduate Studies
Universiti Putra Malaysia

Date: 12 August 2021

© COPYRIGHT UPM

TABLE OF CONTENTS

		Page
ABSTRACT		i
ABSTRAK		iii
ACKNOWLEDGEMENTS		v
APPROVAL		vi
DECLARATION		viii
LIST OF TABLES		xv
LIST OF FIGURES		xviii
LIST OF APPENDICES		xix
LIST OF ABBREVIATIONS		xx
CHAPTER		
1	**INTRODUCTION**	1
	1.1 Background of the Study	1
	1.2 Problem Statement	3
	1.3 Research Questions	5
	1.4 Objectives of the Study	5
	1.4.1 General Objective:	5
	1.4.2 Specific Objectives:	5
	1.5 Hypotheses	7
	1.6 Operational Definitions	7
	1.7 Conceptual Framework	9
2	**LITERATURE REVIEW**	12
	2.1 Overview of Diabetes Mellitus	12
	2.1.1 Epidemiology of Diabetes	12
	2.2 Glycemic Control Achievements	15
	2.2.1 Poor Glycemic Control	15
	2.2.2 Fasting Blood Glucose	16
	2.3 Factors Associated with Glycemic Control	17
	2.3.1 Socio-Demographic and Glycemic Control	17
	2.3.2 Medical Characteristics and HbA1c	18
	2.3.3 Nutritional Status and Glycemic Control	19
	2.3.3.1 Nutrition Situation in Iraq	19
	2.3.3.2 Body Mass Index	20
	2.3.3.3 Waist Circumference	21
	2.3.3.4 Dietary Intake	21
	2.3.3.5 Metabolic Parameters	22
	2.3.4 Lifestyle Practices and HbA1c	23
	2.3.4.1 Physical Activity and HbA1c	23
	2.3.4.2 Smoking and Drinking Alcohol	23
	2.3.5 Health Literacy and Glycemic Control	24
	2.4 Medical Nutrition Therapy in Diabetes	24
	2.4.1 Nutrition Education and Meal Planning Approaches	27

© COPYRIGHT UPM

2.5 Program-Development Evaluation Theories and Models 28
2.5.1 Transtheoretical Model (Stage of Change) 29
2.5.2 Motivational Interviewing Model 29
2.5.3 Health Belief Model 30
2.6 Development of Diabetes Nutrition Education Materials 32
2.7 Effectiveness of SDNE on HbA1c and Diabetes-related Outcomes 33
2.8 Simplified Diabetes Nutrition Education 36

3 METHODOLOGY 43
3.1 Study Design 43
3.2 Location of the Study 45
3.3 Study Approval 46
3.4 Phase I: Needs Assessment 46
3.4.1 Study Design 46
3.4.2 Subject Selection and Criteria 46
3.4.3 Sample Size 47
3.4.4 Sampling Method 48
3.4.5 Measurements 48
3.4.5.1 Socio-Demographic Status 48
3.4.5.2 Glycemic Control Assessment: 49
3.4.5.3 Nutrition Status Assessment: 49
3.4.5.4 Lifestyle Practice 53
3.4.5.5 Medical Characteristics 55
3.4.5.6 Health Literacy Assessment 55
3.4.6 Data Collection 56
3.4.7 Pre-Test 56
3.4.8 Statistical Analyses 56
3.5 Phase II: Development of Simplified Diabetes Nutrition Education 57
3.5.1 Overview of Development 57
3.5.2 Module and SDNE Materials 58
3.5.3 Contents of the Simplified Diabetes Nutrition Education Materials 60
3.5.4 Assessment of the Simplified Diabetes Nutrition Education Materials 60
3.5.5 Validity and reliability of the SDNE Materials 61
3.6 Phase III: Effectiveness of the Simplified Diabetes Nutrition Education 62
3.6.1 Study Design 62
3.6.2 Participants 62
3.6.3 Inclusion and Exclusion Criteria of Participants 63
3.6.4 Sample Size 63
3.6.5 Study Setting and Data Collection 64
3.6.6 Outcome Measurements 65
3.6.6.1 Socio-Demographic Status 65

© COPYRIGHT UPM

3.6.6.2 Glycemic Control Assessment: 66
3.6.6.3 Medical Characteristics 66
3.6.6.4 Nutritional Status Assessment 66
3.6.6.5 Lifestyle Practices 67
3.6.6.6 Health Belief Model Scales 67
3.6.6.7 Diabetes Knowledge Assessment 68
3.6.6.8 Health Literacy Assessment 68
3.6.6.9 Attendance of Nutrition Education Group to the Classes 69
3.6.7 Randomization 69
3.6.8 Intervention 69
3.6.9 Implementation of the Intervention 71
3.6.10 Blinding (Masking) 72
3.6.11 Statistical Analyses 72
3.6.12 Quality Control of the Study Instruments 73
3.6.12.1 Validity of the Questionnaires 73
3.6.12.2 The Validity of the Anthropometric Measurements 74
3.6.12.3 Reliability of the Questionnaires 74

4 RESULTS 75
4.1 Phase I (Needs Assessment) 75
4.1.1 Screening and Recruitment of the Study Participants 75
4.1.2 Glycemic control 76
4.1.3 Socio-Demographic Status 76
4.1.4 Medical Characteristics 78
4.1.5 Nutritional Status 79
4.1.5.1 Anthropometric Measurements 79
4.1.5.2 Metabolic Parameters 79
4.1.5.3 Dietary intake 80
4.1.6 Lifestyle Practices 81
4.1.6.1 Physical Activity Level 81
4.1.6.2 Smoking Habits and Alcohol Consumption 81
4.1.7 Health Literacy 82
4.1.8 Association of Socio-Demographic Status and HbA1c 82
4.1.9 Comparison of Medical Characteristics and HbA1c 83
4.1.10 Association between Nutritional Status and HbA1c 84
4.1.10.1 Anthropometric Measurements and HbA1c 84
4.1.10.2 Metabolic Parameters and Blood Pressure with HbA1c 84
4.1.10.3 Association between Dietary Intake and HbA1c 85
4.1.11 Lifestyle Practices and HbA1c 85

© COPYRIGHT UPM

4.1.11.1 Association of Physical Activity and Sitting Behavior with HbA1c 85
4.1.11.2 Comparison of Smoking Habits and Alcohol intake with HbA1c 86
4.1.12 Association between Health Literacy Score and HbA1c 86
4.1.13 Predictors of HbA1c 87
4.1.14 Summary of the Phase I Results 88
4.2 Phase II (Development of SDNE) 88
4.2.1 Analysis of Needs Assessment Results 88
4.2.2 Process of the Development of SDNE 89
4.2.3 Format and Contents of the Developed SDNE 90
4.2.4 Assessment of SDNE 94
4.3 Phase III Results (Effectiveness Simplified Diabetes Nutrition Education) 94
4.3.1 Screening, Recruitment, and Retention Rate 94
4.3.2 Attendance of Nutrition Education Group to the Classes 96
4.3.3 Baseline Comparisons between groups 96
4.3.3.1 Socio-Demographic Status 96
4.3.3.2 Glycemic Control 98
4.3.3.3 Medical Characteristics 98
4.3.3.4 Nutritional Status 99
4.3.3.5 Lifestyle Practices 102
4.3.3.6 Health Belief Model 103
4.3.3.7 Diabetes Knowledge and Health Literacy 103
4.3.4 Effectiveness of Simplified Diabetes Nutrition Education 104
4.3.4.1 Changes in the Glycemic 104
4.3.4.2 Changes in Metabolic Parameters 107
4.3.4.3 Changes in Anthropometric Measurements 109
4.3.4.4 Changes in Dietary Intake and Physical Activity 112
4.3.4.5 Changes in Health Belief, Diabetes Knowledge, and Health Literacy 116
4.3.5 Summary of the Intervention 118
4.3.6 4.3.6 Adverse Event 118

© COPYRIGHT UPM

5	**DISCUSSION**		119
	5.1	Phase I: (Needs Assessment)	119
		5.1.1 Glycemic Control	119
		5.1.2 Factors Associated with Glycemic Control	119
	5.2	Phase II: (Development of SDNE)	122
	5.3	Phase III: (Effectiveness of SDNE)	122
		5.3.1 Comparison of Participants' Baseline Data	122
		5.3.2 Effectiveness of SDNE on Glycemic Control	123
		5.3.3 Effectiveness of SDNE on Other Diabetes-related Outcomes	124
		5.3.3.1 Changes in the Metabolic Parameters	124
		5.3.3.2 Changes in the Anthropometric Measurements	125
		5.3.3.3 Changes in the Dietary Intake	126
		5.3.3.4 Changes in the Physical Activity	127
		5.3.3.5 Changes in the Health Belief Model Constructs	128
		5.3.3.6 Changes in the Diabetes Knowledge	128
		5.3.3.7 Changes in Health Literacy	129
6	**SUMMARY, CONCLUSION, AND RECOMMENDATIONS**		130
	6.1	Summary	130
	6.2	Strength of the study	131
	6.3	Limitations of the Study	131
	6.4	Recommendations	132
REFERENCES			133
APPENDICES			167
BIODATA OF STUDENT			256
LIST OF PUBLICATIONS			257

© COPYRIGHT UPM

LIST OF TABLES

Table		Page
2.1	Medical Nutrition Therapy Recommendations for T2DM	26
2.2	Different approaches to diabetes nutrition educations	28
2.3	Potential change strategies based on the Health Belief Model	31
2.4	Nutrition education approaches that impact glycemic control and diabetes-related outcomes in T2DM	35
2.5	Summary of studies that reported the outcomes of simplified diabetes nutrition education in T2DM	38
3.1	Sample size according to some variables	48
3.2	Normal ranges of glycemic control and metabolic parameters	49
3.3	The World Health Organization classification of body mass index	50
3.4	Waist circumferences cut-off point in males and females	50
3.5	Dietary intake recommendation for patients with T2DM	51
3.6	Goldberg Method cut-off for the FFQ and 24-HR in the Observing Energy Intake	51
3.7	Categorization of physical activity levels	54
3.8	Activity intensity with MET scores	54
3.9	Classification of METs based on physical activity levels	55
3.10	The operational classification of hypertension level	55
3.11	Strategies in the SDNE's module based on the HBM	59
3.12	Contents of the simplified diabetes nutrition education classes	60
3.13	Sample size according to some variables	64
3.14	Intervention measurements over the study period	65
3.15	HBM Scales and nutrition questions with scores	68

© COPYRIGHT UPM

3.16	Results of reliability test for the scales	74
4.1	Glycemic control among participants (N=280)	76
4.2	Participants' socio-demographic status (N = 280)	77
4.3	Distribution of participant based on medical characteristics (*N*= 280)	78
4.4	Anthropometric measurements of participants (N= 280)	79
4.5	Metabolic parameters of participants (N= 280)	80
4.6	Dietary intake of participants (N= 280)	80
4.7	Participants' physical activity level (N= 280)	81
4.8	Participants' smoking habits and alcohol consumption (N= 280)	81
4.9	The health literacy level of participants (N= 280)	82
4.10	Association between socio-demographic status and HbA1c (N= 280)	82
4.11	Participants' HbA1c with socio-demographic (N= 280)	83
4.12	Comparison of HbA1c based on medical characteristics (N= 280)	84
4.13	Association of anthropometric measurements and HbA1c (N = 280)	84
4.14	Association of metabolic parameters with HbA1c (N = 280)	85
4.15	Association of anthropometric measurements and HbA1c (N = 280)	85
4.16	Physical activity and sitting behavior with HbA1c (N = 280)	86
4.17	Comparison of HbA1c with smoking and alcohol intake (N= 280)	86
4.18	Association between health literacy score and HbA1c (N = 280)	86
4.19	Contribution of predictors to HbA1c of participants (N = 280)	87
4.20	The topics of the nutrition education classes	93

© COPYRIGHT UPM

4.21	The response rate of participants over the study period	96
4.22	Adherence of participants to SDNE (N = 104)	96
4.23	Socio-demographic status of participants in NEG and CG at baseline(N =208)	97
4.24	Glycemic control (Mean ± SD) of participants in NEG and CG at baseline (N =208)	98
4.25	Medical characteristics of participants in NEG and CG at baseline (N =208)	99
4.26	Metabolic parameters of participants in NEG and CG at baseline (N =208)	100
4.27	Participants' anthropometric measurements at baseline (N =208)	100
4.28	Dietary intake of participants in NEG and CG at baseline (N =208)	101
4.29	Physical activity of participants in NEG and CG at baseline (N =208)	102
4.30	Smoking and consumption of alcohol in NEG and CG at baseline (N =208)	102
4.31	Baseline health belief of participants in NEG and CG at baseline (N =208)	103
4.32	Diabetes knowledge and health literacy of participants in NEG and CG at baseline (N =208)	103
4.33	Glycemic control of participants over the study period in NEG and CG (N = 208)	105
4.34	Metabolic parameters over the study period in NEG and CG (N = 208)	108
4.35	Anthropometric measurements over the study period in NEG and CG (N = 208)	110
4.36	Dietary intake and physical activity over the study period in NEG and CG (N = 208)	113
4.37	Health belief, diabetes knowledge, and health literacy over the study period in NEG and CG (N = 208)	117

© COPYRIGHT UPM

LIST OF FIGURES

Figure		Page
1.1	Conceptual Framework of the whole study based on the generalized model for program planning	11
2.1	Prevalence of T2DM in Various Iraqi Cities, including other Arab countries	14
3.1	Flow Chart of the Study	44
3.2	Iraq and Basrah Governorate Map	45
3.3	SimplifiedDiabetes Nutrition Education's Flow Chart	70
4.1	Screening and Recruitment of the Study Participants.	75
4.2	Flowchart of the Development of SDNE.	89
4.3	The Combined Plate Method with Eating Vegetables before Carbohydrates Method (Front Page).	91
4.4	Flow Chart of Participants throughout the Study Period.	95
4.5	Glycemic Control Changes (HbA1c (above) and FBG (below)) over the Study Period	106
4.6	Anthropometric Changes (WC (above), BMI (below)) over the Study Period	111
4.7	Dietary Intake Changes (energy intake (above), carbohydrate intake (below)) over the Study Period	114

© COPYRIGHT UPM

LIST OF APPENDICES

Appendix		Page
A 1	Respondent's information sheet and consent form (phase I)	167
A 2	Respondent's information sheet and consent form, Arabic (phase I)	171
B 1	Respondent's information sheet and consent form (phase II)	175
B 2	Respondent's information sheet and consent form, Arabic (phase II)	179
C 1	Respondent's information sheet and consent form (phase III)	183
C 2	Respondent's information sheet and consent form, Arabic (phase III)	187
D 1	Structured questionnaire, English Version (Phase I)	191
D 2	Structured questionnaire, Arabic Version (Phase I)	203
E 1	Structured questionnaire -English Version (Phase III)	214
E 2	Structured questionnaire -Arabic Version (Phase III)	230
F 1	Ethical Approval (UPM, Malaysia)	243
F 2	Ethical Approval (FDEMC, Iraq)	247
G	Suitability Assessment of Materials (SAM) Instrument	248
H	Functional, communicative, and critical HL questionnaire, English version	254
I	Functional, communicative, and critical HL questionnaire, Arabic version	255

© COPYRIGHT UPM

LIST OF ABBREVIATIONS

ADA	American Diabetes Association
ANCOVA	Analysis of Covariance
BMI	Body Mass Index
BMR	Basal Metabolic Rate
BP	Blood Pressure
CG	Control group
CHO	Carbohydrates
CONSORT	Consolidated Standards of Reporting Trials
CVD	Cardiovascular Disease
DBP	Diastolic Blood Pressure
DK	Diabetes Knowledge
dL	Deciliter
DM	Diabetes Mellitus
EI	Energy Intake
FBG	Fasting Blood Glucose
FDEMC	Faiha Specialized Diabetes, endocrine, and metabolism Center
HbA1c	Glycated Hemoglobin
HBM	Health Belief Model
HDL-C	High-Density Lipoprotein Cholesterol
HL	Health Literacy
IDF	International Diabetes Federation
IPAQ	International Physical Activity Questionnaire

© COPYRIGHT UPM

ITT	Intention-To-Treat
Kcal	Kilocalorie
Kg/m2	Kilogram/squared meter
LDL-C	Low-Density Lipoprotein Cholesterol
MENA	The Middle East and North Africa
MET	Metabolic Equivalent Task
MOH	Ministry of Health
NEG	Nutrition education group
OADs	Oral Antidiabetic Drugs
PAL	Physical Activity Level
SBP	Systolic Blood Pressure
SDNE	Simplified Diabetes Nutrition Education
S-TOFHLA	Sort Form Test of Functional Health Literacy for Adults
T2DM	Type 2 Diabetes Mellitus
TC	Total Cholesterol
TEE	Total Energy Expenditure
TG	Triglycerides
WC	Waist Circumference

© COPYRIGHT UPM

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

Diabetes mellitus is a group of metabolic disorders that lead to hyperglycemia due to the absence or deficiencies in insulin action, insulin secretion, or both (ADA, 2020). The long-lasting hyperglycemia of diabetes is related to dysfunction, long-term impairment, and body organs' failure, mainly the kidneys, eyes, heart, nerves, and blood vessels (ADA, 2020). Type 2 diabetes mellitus (T2DM) is the most common diagnosis of all diabetes cases. While there is no cure, proper intervention leads to improved glycemic control and other diabetes-related outcomes (ADA, 2020).

The prevalence of T2DM is increasing around the world (Williams et al., 2019). In 2019, more than 54.8 million (12.8%) of patients with T2DM aged 20-79 years were living in the Middle East and North Africa region (MENA). The number of patients estimated would be increased to 76.0 million by 2030 and 107.6 million by 2045. The increase in the prevalence is considered the second-highest in 2019 among the IDF Regions (IDF, 2019). Iraq has not been spared from this health issue. In 2006, the prevalence of T2DM in Iraq was 15% (MOH/WHO, 2006). Basrah city in the year 2014 has the highest prevalence of T2DM in Iraq (19.7%) (Mansour, Al-Maliky, Kasem, Jabar, & Mosbeh, 2014).

Despite advances in diabetes care, most T2DM patients cannot achieve optimal glycemic control (Moghissi et al., 2009). In Saudi Arabia, almost 80% had inadequate glycemic control (Azab, 2001).In Basrah, Iraq, poor glycemic control (HbA1c) was evident, reported by almost 90% of patients with T2DM (Mansour et al., 2020).

In the literature, studies reported various factors contributing to poor glycemic control among T2DM patients, including diabetes duration, diabetes treatment, medical background, and numerous other factors (Ali, Allela, Salih, & Ahmed, 2019; Dauod, 2018; Mansour et al., 2014). Although different studies have been conducted in this area, the results are inconsistent and vary across countries and between different ethnic groups (Alramadan et al., 2018; Al-Rasheedi, 2015a). Poor glycemic control is commonly due to an unhealthy lifestyle such as physical inactivity, high carbohydrate, and fewer fiber intakes leading to obesity and diabetes-related complications (Janghorbani & Amini, 2012). In Iraq, the nutritional status is not optimal, and an unhealthy lifestyle among patients with T2DM leads to an increase in Body Mass Index (BMI) (Abdul-Hasan & Yassin, 2018). The mean BMI among Iraqi patients with T2DM ranged from 27.4-28.2

© COPYRIGHT UPM

kg/m^2, which were categorized as overweight. with almost 90% of patients with T2DM were either obese or overweight (Hasnawi, Nisak, Hazizi, & Rafi, 2015; Mansour & Ajeel, 2009; Al-Maroof & Al-Sharbatti, 2006).

Furthermore, the non-clinical factors, in particularly the concept of health literacy (HL) has emerged as an influential factor in the health outcomes for patients with complex chronic diseases including T2DM (N'Goran et al., 2018). HL is principally defined as 'the degree to which individuals can obtain, process, understand, and communicate about health-related information needed to make informed health decisions' (Nutbeam, 2008). In other words, HL requires individuals with T2DM to have specific skills to understand the printed information, oral communication, and numeracy to practice self-diabetes care (Ishikawa, Takeuchi, & Yano, 2008). A low HL level is typically reported worldwide, in developing countries was ranging from 40% to 70%, lowest in Saudi Arabia (Abdel-Latif & Saad, 2019), and the highest in Iran (Mohammadi et al., 2015).

The same phenomenon is also observed in Iraq. A study by Abdul-Hasan & Yassin 2018 identified that Iraqi T2DM patients had inadequate HL levels with a mean score of 43.3. In this study, HL scores were significantly associated with poor glycemic control and the presence of diabetes complications (Abdul-Hasan & Yassin, 2018). However, the mentioned study used different instruments that the author self-developed, which was not adequately validated and has not covered the whole spectrum of HL measures. The short-form Test of Functional Health Literacy in Adults (S-TOFHLA) is considered the best (Kim, Love, Quistberg, & Shea, 2004; Schillinger et al., 2002).

A study using S-TOFHLA was conducted among the customers who attended pharmacies in two cities in Iraq. The study identified that about 17% had low HL levels which was lower as compared to the studies in Western countries (Al-Jumaili, Al-Rekabi, & Sorofman, 2015). The data indicate the critical need of having the assessments of HL among patients with T2DM and its association with glycemic control.

Medical Nutrition Therapy (MNT) plays an essential role in diabetes management (ADA, 2020). MNT intervention is delivered via a provision of structured diabetes nutrition education to improve the food-and-nutrition knowledge deficit in facilitating positive dietary practices and lifestyle modifications in patients with T2DM (Coppoolse, Seidell, & Dijkstra, 2020). The provision of structured diabetes nutrition education in T2DM has been proven effective in achieving optimal glycemic control with a 0.6 - 1.9% reduction in HbA1c (Mottalib et al., 2018; Franz et al., 2017). In Oman, a diabetes nutrition education improved HbA1c by 1.8% compared to the minimal care among T2DM. Other improvements included the nutritional status and increased physical activity levels (Al-Shookri, 2013).

© COPYRIGHT UPM

Patients with T2DM are expected to follow a complex set of regimens to effectively self-manage their diabetes, including engaging in appropriate lifestyle practices and adhering to a meal plan (Shrivastava, Shrivastava, & Ramasamy, 2013). A fundamental nutrition strategy in diabetes nutrition is carbohydrate management, either using exchanges or counting methods. Both methods have been associated with improved clinical outcomes (Mohamed, Staite, Ismail, & Winkley, 2019). Nonetheless, the methods require adequate diabetes literacy and numeracy skills. Due to the nutrition regimen's complexity, most patients still identify that adopting diabetes nutrition into their daily routine is the most challenging aspect of self-care (Han et al., 2020).

Simplified education refers to attractive and straightforward education that may help patients apply changes leading to glycemic and diabetes-related outcomes control (Imai et al., 2011; Ziemer et al., 2003; Brown et al., 2001). Hence, it is recommended to provide a simplified diabetes nutrition education (SDNE) that is attractive and straightforward education which may help patients to apply changes leading to improvement of glycemic control and diabetes-related outcomes (Imai et al., 2011; Ziemer et al., 2003; Brown, Lackey, Miller, & Priest, 2001). One of the simplified approaches in SDNE is using the Idaho Plate Method. This method visualized the estimated serving of major food groups on one's plate. The approach is easy to use when eating out, particularly for patients at a low literacy level, have cognitive difficulties, and the elderly (Raidl et al., 2007). Besides, it does not require math skills or a high reading level (Brown et al. 1998). The Plate Method produced comparable improvement in HbA1c as those using the carbohydrate counting than the general education for T2DM patients (Bowen et al., 2016).

Improving the overall dietary quality is also the main nutrition goal in diabetes. One of the recommended eating patterns for diabetes is to include a non-starchy vegetable, which may help achieve dietary fiber needs (Evert et al., 2019). The regular intake of sufficient dietary fiber improved other diabetes metabolic outcomes, including lipid profiles and blood pressures (Jiang et al., 2012; McIntosh & Miller, 2001). Besides, the retrospective observational study that advocates eating vegetables before carbohydrates versus the exchange method among elderly Japanese with T2DM found sustainable improvement in HbA1c and glucose excursion in the acute study. The educational approaches have also reduced starchy consumption and unhealthy food (Imai, Fukui, & Kajiyama, 2014). Therefore, choosing a specific food group may further simplify nutrition education in diabetes.

1.2 Problem Statement

Inadequate glycemic control among Iraqi T2DM is highly prevalent. About 86.2% had poor glycemic control indicated by HbA1c of > 7% (Mansour et al., 2020). The prevalence of T2DM in Iraq increases and causes diabetes-related complications (Ali et al., 2019). This is pertinent in the present context as about

© COPYRIGHT UPM

72% of Iraqi patients with T2DM are without self-care skills toward glycemic control (Razzaq, 2013). T2DM patients with poor glycemic control could be contributed by physical inactivity, low education, obesity, unhealthy diet, and nutritional advice (Faik & Lami, 2016), which warrant further investigation.

Besides, most of the studies conducted in Basrah City, South of Iraq, have focused on several other medical associated factors such as treatment modalities, diabetes complications, diabetes duration, and comorbidities (Mansour, 2012). None of them has focused on nutrition education, nutritional status, HL level, and dietary management among Iraqi patients with T2DM. Besides, low HL is considered the main barrier to usual self-management practices among Iraqi patients with T2DM (Mikhael, Hassali, Hussain, & Shawky, 2019). The data indicate the critical needs of assessing HL among patients with T2DM and its association with glycemic control.

In Iraq, nutritional education is provided using an internal brochure that contains only general nutrition advice for the public such as healthy food and a source of vitamins and minerals that provide somewhat challenging and targeted information to the general public (Abdulah, Hassan, Saadi, & Mohammed, 2018). Nevertheless, until today, the role of plate model intervention or "eating vegetables before carbohydrates" approaches has not been assessed in the Iraqi context. The lack of information about diabetes nutrition education highlighted the need for the current study. In diabetes nutrition, the Plate model is known for its practicability, simplicity, and flexibility. It has been presented to be fruitful in all diabetic populations (Ziemer et al., 2003), but not tested among Iraqi T2DM.

Eating vegetables first before carbohydrate was also considered the beneficial approach in diabetes nutrition education among Japanese T2DM (Imai et al., 2014). Besides, no study has combined the concept of eating vegetables before carbohydrates with the Plate Method concept. Combining both ideas could have a meaningful effect on diabetes management and that lead to optimal glycemic control. However, the application of the combined method among Iraqi patients with T2DM is unknown.

Together with the impact of the gulf war and internal conflicts on the health care system (Hussain & Lafta, 2019), the requirement for a structured SDNE is exact. Since most T2DM patients had inadequate health literacy and hyperglycemia (Abdulah et al., 2018), diabetes nutrition education should be modified and simplified, tailoring to the cultural needs of T2DM patients. At present, the provision of education usually delivers by giving in-house brochures that cover general nutrition advice (Abdulah et al., 2018). Thus, this study determined the effectiveness of SDNE on glycemic control and other diabetes-related outcomes in Iraqi patients with T2DM.

© COPYRIGHT UPM

1.3 Research Questions

1. What is the association of socio-demographic status, medical characteristics, nutritional status, lifestyle characteristics, and health literacy level with HbA1c among patients with T2DM in Basrah, Iraq?
2. What are the significant predictors that can explain variations in HbA1c?
3. How can nutrition education materials be developed, what are the components, and how to assess them?
4. Does the SDNE improves glycemic control (HbA1c and FBG) at baseline (T0), after 12 weeks of intervention (T1), and after 10 weeks of follow-up (T2) among the nutrition education group (NEG) compared to those in the control group (CG)?
5. Does the SDNE improves nutritional status, physical activity, health belief model (HBM) constructs, diabetes knowledge (DK), and health literacy level at T0, after T1, and after T2 among NEG compared to those in NEG?

1.4 Objectives of the Study

1.4.1 General Objective:

To determine the effectiveness of an SDNE on glycemic control and other diabetes-related outcomes in patients with T2DM in Basrah, Iraq.

1.4.2 Specific Objectives:

1. To determine the predictors that explain variations in glycemic control.
2. To develop the SDNE for patients with T2DM in Basrah, Iraq.
3. To determine the effectiveness of SDNE on glycemic control at T0, after T1, and after T2 among NEG compared to those in CG.
4. To determine the effectiveness of SDNE on other diabetes-related outcomes at T0, after T1, and after T2 among NEG compared to those in CG.

© COPYRIGHT UPM

Phase I: Needs Assessment

The main objective was to determine the predictors that explain variations in glycemic control among patients with T2DM in Basrah, Iraq.

Specific Objectives:

1. To determine the glycemic control (HbA1c) among patients with T2DM.
2. To determine the socio-demographic status, nutritional status, lifestyle practices, medical characteristics, and HL level in patients with T2DM.
3. To determine associations of socio-demographic status, nutritional status, lifestyle characteristics, medical characteristics, and HL with HbA1c.
4. To determine the predictors that explain variations in glycemic control among patients with T2DM in Basrah, Iraq.

Phase II: Development

The main objective is to develop and assess the SDNE materials for patients with T2DM in Basrah, Iraq.

Specific Objectives

1. To develop the SDNE materials for patients with T2DM in Basrah, Iraq.
2. To assess the validity, readability, and acceptability of SDNE materials for patients with T2DM in Basrah, Iraq.

Phase III: Evaluation of the SDNE

The main objective is to determine the effectiveness of the SDNE on glycemic control (HbA1c and FBG), and diabetes-related outcomes in patients with T2DM in Basrah, Iraq.

Specific Objectives

1. To determine and compare the glycemic control, socio-demographic status, medical characteristics, nutritional status, lifestyle practices, HBM constructs, DK, and HL between NEG and CG at T0.
2. To determine and compare the effects of SDNE on glycemic control within and between NEG and CG, after T1, and after T2 from T0.

© COPYRIGHT UPM

3. To determine and compare effects of SDNE on diabetes-related outcomes including nutritional status, lifestyle practice, HBM constructs, DK, and HL, within and between NEG and CG, after T1, and after T2 from T0.

4. To determine the differences in glycemic control and other diabetes-related outcomes at T1 from T0 and T2 from T0 within and between NEG and CG.

1.5 Hypotheses

1. There are significant associations of socio-demographic status, medical characteristics, nutritional status, lifestyle characteristics, and HL level with HbA1c in patients with T2DM.

2. Socio-demographic status, medical characteristics, nutritional status, lifestyle characteristics, and HL contribute to HbA1c in patients with T2DM.

3. The SDNE would significantly improve the HbA1c in NEG compared to CG over the study period.

4. The SDNE would significantly improve the other diabetes-related outcomes including, nutritional status, blood pressure, physical activity level, HBM constructs, DK, and HL in the NEG compared to the CG over the study period.

1.6 Operational Definitions

Glycated Haemoglobin (HbA1c)

Provides evidence about a person's average blood glucose during the last two to three months, which is the expected half-life of red blood cells (Khan, Weinstock, Mcpherson, & Pincus, 2011). It is suggested as a standard of care for diabetes monitoring (WHO, 2011b). An HbA1c of 6.0% represents the typical plasma glucose of equal to 6.7 mmol/l. Overall; each 1% rise in HbA1c is a consideration of an increase of average glucose levels of similar 1.7 mmol/l (ADA, 2020).

Poor Glycemic Control

In the current study, "poor glycemic control" is defined, when the HbA1c value is ≥7% for the past three months, according to ADA (ADA, 2020).

© COPYRIGHT UPM

Good Glycemic Control

In the current study, "good glycemic control" is defined when the HbA1c value is equal or less than 6.9% for the past three months, according to ADA (ADA, 2020).

Plate Method

The Plate Method is a meal planning method that works mainly well for patients who consume three meals per day, are with a low level of literacy, have cognitive troubles, have T2DM, and want to lose weight, or are hospitalized and need information for survival. It does not involve calculation skills or a high level of reading (Brown et al., 2001).

Carbohydrate Counting

Carbohydrate counting is a meal planning method ranges from an awareness of foods that have carbohydrate and their outcome on glycemic control, over counting the number of 15 g carbohydrate exchanges, or grams of carbohydrate consumed (Gillespie, Kulkarni, & Daly, 1998).

Anthropometric Measurements

Weight, height, WC, are the measurement which helps to calculate the body mass index and central obesity. It provides detailed information on the different components of the human body structure and helps evaluate nutritional status (Baumgartner, 1993).

Body Mass Index (BMI)

BMI is calculated using weight and height. Weight in kilogram divided by height in meter squared. for normal BMI < 18.5 - 24.9 kg/m2, overweight and obese if BMIs were 25–29.9 kg/m2, and ≥ 30 kg/m2 (WHO, 2004).

Metabolic Equivalents (METs)

Metabolic equivalents are multiples of resting metabolic rates, and a MET-minute is computed by multiplying the MET score of activity by the minutes performed (Craig et al., 2003).

© COPYRIGHT UPM

Crowding Index

The crowding index is a whole number of co-occupants per household, without the newborn infant, divided by the whole number of rooms, without bathrooms and kitchen. The overcrowding standard for persons per room most often reported is a standard of more than 1.5 (Blake, Kellerson, & Simic, 2007).

Type of House

This term refers to the state of the house, whether complete or not (Abdul-Hasan & Yassin, 2018).

Type of Family

This term refers to family status, is it extended (living with another family (s)) or separated (living alone) (Abdul-Hasan & Yassin, 2018).

1.7 Conceptual Framework

Figure 1.1 visualizes the study's conceptual framework based on the Generalized Model for Program Planning conducted in 3 phases (McKenzie, Neiger, & Thackeray, 2009). The Phase I study involved the needs assessment in collecting the preliminary data on the basic needs of Iraqi patients with T2DM and in prioritizing them. Their demands were based on the factors determined to be associated with glycemic control. This phase is intended to investigate the extent to which the need assessment could be helpful to detect the actual needs among patients with T2DM to develop the nutrition education materials tailored to their needs. Therefore, Phase II was to develop the nutrition educational materials supported by phase I. In this context, diabetes nutrition education materials were named SDNE.

The SDNE was developed according to the HBM and utilized the Phase I findings to support content development. The HBM constructs (Glanz, 2005) were measured to determine the beliefs about severity, barriers, and the benefits of the intervention. As well as HBM theory was used as a theoretical framework to guide this intervention and improve its effectiveness. HBM is the most common theoretical framework applied to diabetes and nutrition education (Muchiri, Gericke, & Rheeder, 2009). Therefore, the intervention's focus was to create knowledge among patients and help them develop an accurate perception of their unhealthy diet and physical inactivity.

© COPYRIGHT UPM

Phase III determined the effectiveness of the SDNE among the targeted population, i.e., patients with T2DM on glycemic control and diabetes-related outcomes. The evaluation process was conducted to assess whether the SDNE was delivered as planned (Young et al., 2008). The findings were used to evaluate the intervention in terms of reliability and completeness. The study was initially planned for 24 weeks. Still, it was conducted for 22 weeks due to some conflicts in Iraq at the beginning of December 2019 between the Iraqi people and the government to change some legislation that did not achieve justice between the Iraqi people at that time. Thus, the study was shortened to 22 weeks due to fear of worsening the situation and imposing a Curfew, which prevents study participants from accessing the study site.

© COPYRIGHT UPM

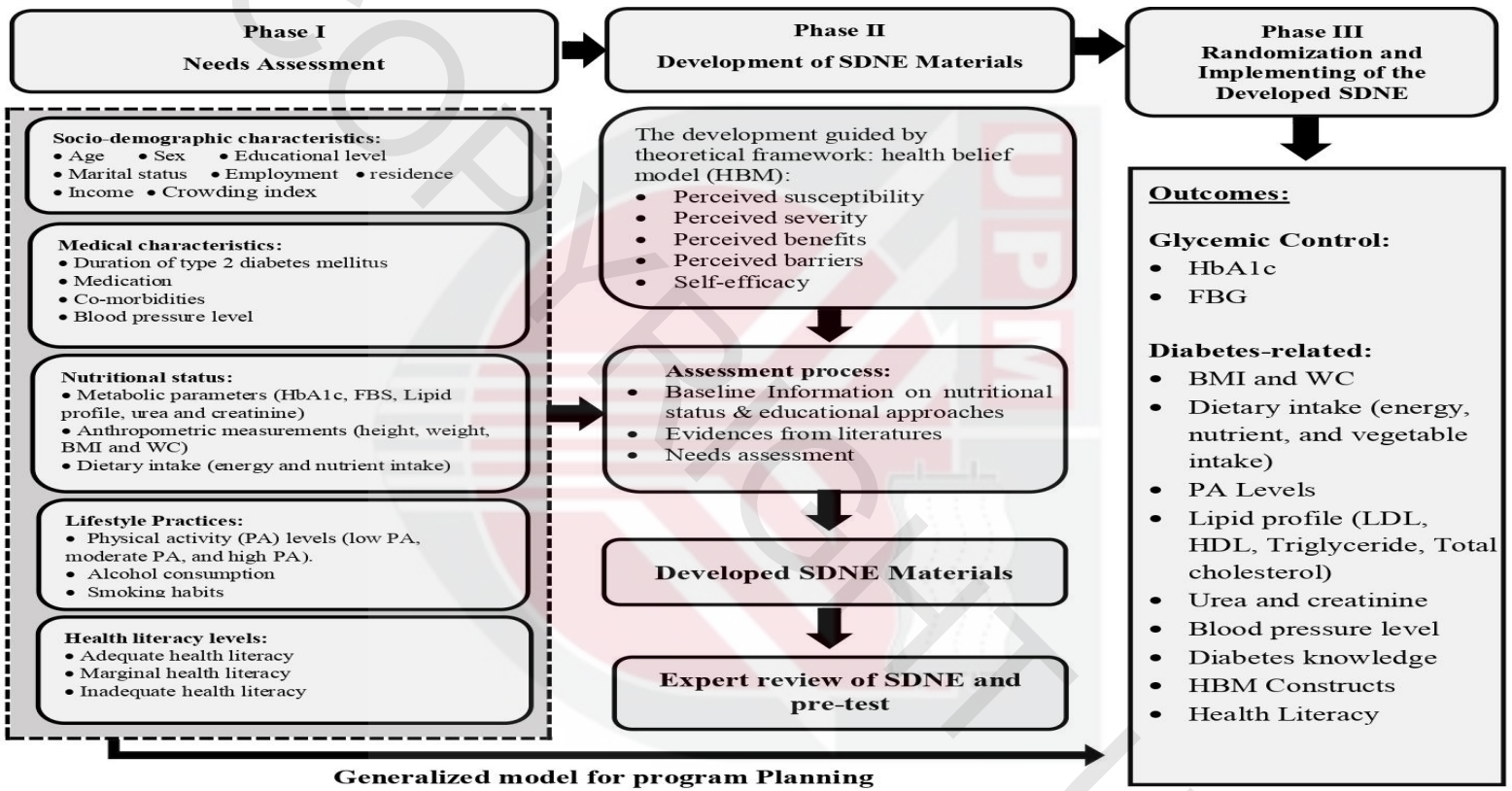

Figure 1.1 : Conceptual Framework of the whole study based on the generalized model for program planning. HbA1c = Glycated hemoglobin, FBG = fasting blood glucose, LDL= low-density lipoprotein, HDL = high-density lipoprotein, BMI = body mass index, WC = waist circumferences, simplified diabetes nutrition education= SDNE.

© COPYRIGHT UPM

REFERENCES

Abdel-Latif, M. M. M., & Saad, S. Y. (2019). Health literacy among Saudi population: a cross-sectional study. Health Promot Int, 34(1), 60-70. doi:10.1093/heapro/dax043

Abdelgadir, E., Alsaeed, M., Hafidh, K., Bashier, A., Rashid, F., Altayb, F., . . . Alawadi, F. (2019). Lipid Control in Patients with Diabetes across Primary and Tertiary Government Health Sectors in Dubai: A Five-year Pattern. Oman Med J, 34(4), 290-296. doi:10.5001/omj.2019.58

Abdelmoneim, I., & Al Homrany, M. A. (2002). Health education in the management of diabetes at the primary health care level: is there a gender difference?

Abdul-Hasan, A., & Yassin, B. (2018). Health Literacy of Diabetic Patients and its Impact on Disease Outcome. Journal of the Faculty of Medicine (Baghdad University). 60(1), 65-68.

Abdulah, D. M., Hassan, A. B., Saadi, F. S., & Mohammed, A. H. (2018). Impacts of self-management education on glycaemic control in patients with type 2 diabetes mellitus. Diabetes Metab Syndr, 12(6), 969-975. doi:10.1016/j.dsx.2018.06.007

Abdullah, A., Liew, S. M., Salim, H., Ng, C. J., & Chinna, K. (2019). Prevalence of limited health literacy among patients with type 2 diabetes mellitus: A systematic review. PLoS One, 14(5), e0216402-e0216402. doi:10.1371/journal.pone.0216402

Abed, R. I., & Yusif, H. K. (2014). Effectiveness of Instructional Intervention on Medical and Health Information of Patients with Diabetes Mellitus Type II nursing national Iraqi specility, 27(2), 31-41.

Abiemo, E. E., Alonso, A., Nettleton, J. A., Steffen, L. M., Bertoni, A. G., Jain, A., & Lutsey, P. L. (2013). Relationships of the Mediterranean dietary pattern with insulin resistance and diabetes incidence in the Multi-Ethnic Study of Atherosclerosis (MESA). Br J Nutr, 109(8), 1490-1497. doi:10.1017/S0007114512003339

ADA. (2020). Standards of Medical Care in Diabetes. Diabetes Care, 43(Supplement 1), S1-S2. doi:10.2337/dc20-Sint

ADA. (2016). Standards of Medical Care in Diabetes—2016.

ADA. (2015). Standards of Medical Care in Diabetes. The Journal Of Clinical And Applied Research And Education Diabetes Care. Volume 38 | Supplement 1.

© COPYRIGHT UPM

Ahmad, N. S., Islahudin, F., & Paraidathathu, T. (2014). Factors associated with good glycemic control among patients with type 2 diabetes mellitus. J Diabetes Investig, 5(5), 563-569. doi:10.1111/jdi.12175

Ahmad, N. S., Ramli, A., Islahudin, F., & Paraidathathu, T. (2013). Medication adherence in patients with type 2 diabetes mellitus treated at primary health clinics in Malaysia. Patient preference and adherence, 7, 525-530. doi:10.2147/PPA.S44698

Ahmed, A. T., Karter, A. J., Warton, E. M., Doan, J. U., & Weisner, C. M. (2008). The relationship between alcohol consumption and glycemic control among patients with diabetes: the Kaiser Permanente Northern California Diabetes Registry. J Gen Intern Med, 23(3), 275-282. doi:10.1007/s11606-007-0502-z

Al- Hasnawi, A. K., Mohd Yusof, B. N., Hazizi, A. S., & Rafi, A.-R. (2015). Nutritional Status-Related Factors Contribute to Poor Glycemic Status in a Sample of Iraqi Patients with Type 2 Diabetes.

Al-Haddad. (2009). Prevalence Of Type Two Diabetes Mellitus And Its Relation To Obesity And Socioeconomic state KUFA MEDICAL JOURNAL, 12(1), 69-75.

Al-Hasnawi, A. (2015). Factors Associated with Glycemic Status among Type 2 Diabetes Mellitus Patients in Merjan Diabetic Centre, Iraq

Al-Jumaili, A. A., Al-Rekabi, M. D., & Sorofman, B. (2015). Evaluation of instruments to assess health literacy in Arabic language among Iraqis. Res Social Adm Pharm, 11(6), 803-813. doi:10.1016/j.sapharm.2015.02.002

Al-Khawaldeh, O. A., Al-Hassan, M. A., & Froelicher, E. S. (2012). Self-efficacy, self-management, and glycemic control in adults with type 2 diabetes mellitus. J Diabetes Complications, 26(1), 10-16. doi:https://doi.org/10.1016/j.jdiacomp.2011.11.002

Al-Maroof, R. A., & Al-Sharbatti, S. S. (2006). Serum zinc levels in diabetic patients and effect of zinc supplementation on glycemic control of type 2 diabetics. Saudi Med J, 27(3), 344-350.

Al-Ramadhan, A. N. (2011). Glycemic Control (HbA1c) In Patients with Diabetic Retinopathy Thi-Qar Medical Journal, 5(3), 103-108.

Al-Rasheedi, A. A. (2015a). Glycemic Control among Patients with Type 2 Diabetes Mellitus in Countries of Arabic Gulf. Int. J. Health Sci., 9(3), 345-350.

© COPYRIGHT UPM

Al-Rasheedi, A. A. (2015b). Glycemic Control among Patients with Type 2 Diabetes Mellitus in Countries of Arabic Gulf. International Journal of Health Sciences, 9(3), 345-350.

Al-Shookri, A. O. S. (2013). Effectiveness of practice guidelines nutritional care and basic nutritional care on anthropometric and metabolic outcomes in type 2 diabetes mellitus patients at Sultan Qaboos University Hospital, Oman. WorldCatDissertations database.

Albers, J. W., Herman, W. H., Pop-Busui, R., Feldman, E. L., Martin, C. L., Cleary, P. A., . . . Lachin, J. M. (2010). Effect of prior intensive insulin treatment during the Diabetes Control and Complications Trial (DCCT) on peripheral neuropathy in type 1 diabetes during the Epidemiology of Diabetes Interventions and Complications (EDIC) Study. Diabetes Care, 33(5), 1090-1096. doi:10.2337/dc09-1941

Alhabbo, D. J., Saeed, I. D., & Khalaf, Y. A. (2018). Frequency of type 2 diabetes in young age groups in Northern Iraq. Iraqi JMS. 2018, Vol. 16(1): 66-73. doi:doi: 10.22578/IJMS.16.1.10

Ali, N. S. M., Allela, O. Q. B., Salih, H. M., & Ahmed, I. H. (2019). Prevalence of Type 2 Diabetes Associated Complications in Kurdistan Region Iraq. 2019 Journal of Basic and Clinical Pharmacy(J Basic Clin Pharma 2019; 10:), 1-6.

Allen, P., Bennett, K., & Heritage, B. (2014). SPSS Statistics version 22: A practical guide.

Almadi, M. A., Mosli, M. H., Bohlega, M. S., Al Essa, M. A., AlDohan, M. S., Alabdallatif, T. A., . . . Mandil, A. (2015). Effect of public knowledge, attitudes, and behavior on willingness to undergo colorectal cancer screening using the health belief model. Saudi J Gastroenterol, 21(2), 71-77. doi:10.4103/1319-3767.153814

Alramadan, M. J., Magliano, D. J., Almigbal, T. H., Batais, M. A., Afroz, A., Alramadhan, H. J., . . . Billah, B. (2018). Glycaemic control for people with type 2 diabetes in Saudi Arabia – an urgent need for a review of management plan. BMC Endocrine Disorders, 18(1), 62. doi:10.1186/s12902-018-0292-9

Alzaheb, R. A., & Altemani, A. H. (2018). The prevalence and determinants of poor glycemic control among adults with type 2 diabetes mellitus in Saudi Arabia. Diabetes Metab Syndr Obes, 11, 15-21. doi:10.2147/dmso.s156214

© COPYRIGHT UPM

Apolzan, J. W., Venditti, E. M., Edelstein, S. L., Knowler, W. C., Dabelea, D., Boyko, E. J., . . . Diabetes Prevention Program Research, G. (2019). Long-Term Weight Loss With Metformin or Lifestyle Intervention in the Diabetes Prevention Program Outcomes Study. Annals of Internal Medicine, 170(10), 682-690. doi:10.7326/M18-1605

Asaad, G., Soria-Contreras, D. C., Bell, R. C., & Chan, C. B. (2016). Effectiveness of a Lifestyle Intervention in Patients with Type 2 Diabetes: The Physical Activity and Nutrition for Diabetes in Alberta (PANDA) Trial. Healthcare (Basel), 4(4). doi:10.3390/healthcare4040073

Awadalla, N. (2014). "Assessment of physical inactivity and perceived barriers to physical activity among health college students, south-western Saudi Arabia". East Mediterr Health J, 20, 596-604.

Azab, A. S. (2001). Glycemic control among diabetic patients. Saudi Med J, 22(5), 407-409.

Babic, N., Valjevac, A., Zaciragic, A., Avdagic, N., Zukic, S., & Hasic, S. (2019). The Triglyceride/HDL Ratio and Triglyceride Glucose Index as Predictors of Glycemic Control in Patients with Diabetes Mellitus Type 2. Medical archives (Sarajevo, Bosnia and Herzegovina), 73(3), 163-168. doi:10.5455/medarh.2019.73.163-168

Baker, D. W., Gazmararian, J. A., Williams, M. V., Scott, T., Parker, R. M., Green, D., . . . Peel, J. (2002). Functional health literacy and the risk of hospital admission among Medicare managed care enrollees. Am J Public Health, 92(8), 1278-1283. doi:10.2105/ajph.92.8.1278

Baker, D. W., Williams, M. V., Parker, R. M., Gazmararian, J. A., & Nurss, J. (1999). Development of a brief test to measure functional health literacy. Patient Educ Couns, 38(1), 33-42.

Barnard, N. D., Cohen, J., Jenkins, D. J., Turner-McGrievy, G., Gloede, L., Jaster, B., . . . Talpers, S. (2006). A low-fat vegan diet improves glycemic control and cardiovascular risk factors in a randomized clinical trial in individuals with type 2 diabetes. Diabetes Care, 29(8), 1777-1783. doi:10.2337/dc06-0606

Barreira, E., Novo, A., Vaz, J. A., & Pereira, A. M. G. (2018). Dietary program and physical activity impact on biochemical markers in patients with type 2 diabetes: A systematic review. Aten Primaria, 50(10), 590-610. doi:https://doi.org/10.1016/j.aprim.2017.06.012

Bauer, K., Liou, D, & Sokolik C. (2012). Nutrition counselling and education skill development (3rd edn. ed.). Boston MA: Cengage Learning, .

© COPYRIGHT UPM

Baumgartner, R. N. (1993). Body composition in elderly persons: a critical review of needs and methods. Prog Food Nutr Sci, 17(3), 223-260.

Becker, M. H., & Janz, N. K. (1985). The health belief model applied to understanding diabetes regimen compliance. The Diabetes educator, 11(1), 41-47.

Belkic, K. L., Landsbergis, P. A., Schnall, P. L., & Baker, D. (2004). Is job strain a major source of cardiovascular disease risk? Scand J Work Environ Health, 30(2), 85-128. doi:10.5271/sjweh.769

Beller, E., Gebski, V., & Keech, A. (2002). Randomisation in clinical trials. Medical Journal of Australia, 177, 565-567. doi:10.5694/j.1326-5377.2002.tb04955.x

Black, A. E. (2000). The sensitivity and specificity of the Goldberg cut-off for EI:BMR for identifying diet reports of poor validity. Eur J Clin Nutr, 54(5), 395-404. doi:10.1038/sj.ejcn.1600971

Black, A. E., & Cole, T. J. (2001). Biased over- or under-reporting is characteristic of individuals whether over time or by different assessment methods. J Am Diet Assoc, 101(1), 70-80. doi:10.1016/s0002-8223(01)00018-9

Blake, K. S., Kellerson, R. L., & Simic, A. (2007). Measuring Overcrowding in Housing Retrieved from ICF International Fairfax, Virginia https://www.huduser.gov/publications/pdf/measuring_overcrowding_in_hsg.pdf

Bowen, M. E., Cavanaugh, K. L., Wolff, K., Davis, D., Gregory, R. P., Shintani, A., . . . Rothman, R. L. (2016). The diabetes nutrition education study randomized controlled trial: A comparative effectiveness study of approaches to nutrition in diabetes self-management education. Patient Educ Couns, 99(8), 1368-1376. doi:10.1016/j.pec.2016.03.017

Brown, Blozis, S. A., Kouzekanani, K., Garcia, A. A., Winchell, M., & Hanis, C. L. (2005). Dosage Effects of Diabetes Self-Management Education for Mexican Americans. Diabetes Care, 28(3), 527. doi:10.2337/diacare.28.3.527

Brown, Lackey, H. D., Miller, T. K., & Priest, D. (2001). Controlling Calories—The Simple Approach. Diabetes Spectrum, 14(2), 110. doi:10.2337/diaspect.14.2.110

Carter, P., Gray, L. J., Troughton, J., Khunti, K., & Davies, M. J. (2010). Fruit and vegetable intake and incidence of type 2 diabetes mellitus: systematic review and meta-analysis. BMJ, 341, c4229. doi:10.1136/bmj.c4229

© COPYRIGHT UPM

Castro, A. V. B., Kolka, C. M., Kim, S. P., & Bergman, R. N. (2014). Obesity, insulin resistance and comorbidities? Mechanisms of association. Arquivos brasileiros de endocrinologia e metabologia, 58(6), 600-609. doi:10.1590/0004-2730000003223

Cerhan, J. R., Moore, S. C., Jacobs, E. J., Kitahara, C. M., Rosenberg, P. S., Adami, H. O., . . . Berrington de Gonzalez, A. (2014). A pooled analysis of waist circumference and mortality in 650,000 adults. Mayo Clin Proc, 89(3), 335-345. doi:10.1016/j.mayocp.2013.11.011

Chatterjee, S., Davies, M. J., Heller, S., Speight, J., Snoek, F. J., & Khunti, K. (2018). Diabetes structured self-management education programmes: a narrative review and current innovations. The Lancet Diabetes & Endocrinology, 6(2), 130-142.

Cheng, L. J., Wang, W., Lim, S. T., & Wu, V. X. (2019). Factors associated with glycaemic control in patients with diabetes mellitus: A systematic literature review. J Clin Nurs, 28(9-10), 1433-1450. doi:10.1111/jocn.14795

Chetoui, A., Kaoutar, K., Elmoussaoui, S., Boutahar, K., El Kardoudi, A., Chigr, F., & Najimi, M. (2020). Prevalence and determinants of poor glycaemic control: a cross-sectional study among Moroccan type 2 diabetes patients. International Health. doi:10.1093/inthealth/ihz107

Chiu, C.-J., & Wray, L. A. (2010). Factors predicting glycemic control in middle-aged and older adults with type 2 diabetes. Preventing Chronic Disease, 7(1), A08-A08.

Chodosh, J., Morton, S. C., Mojica, W., Maglione, M., Suttorp, M. J., Hilton, L., . . . Shekelle, P. (2005). Meta-Analysis: Chronic Disease Self-Management Programs for Older Adults. Annals of Internal Medicine, 143(6), 427-438. doi:10.7326/0003-4819-143-6-200509200-00007

Choe, S.-A., Kim, J. Y., Ro, Y. S., & Cho, S.-I. (2018). Women are less likely than men to achieve optimal glycemic control after 1 year of treatment: A multi-level analysis of a Korean primary care cohort. PLoS One, 13(5), e0196719. doi:10.1371/journal.pone.0196719

Clement, S., Ibrahim, S., Crichton, N., Wolf, M., & Rowlands, G. (2009). Complex interventions to improve the health of people with limited literacy: A systematic review. Patient Educ Couns, 75(3), 340-351. doi:10.1016/j.pec.2009.01.008

Cohen, J. (1988). Statistical power analysis for the behavioural sciences (2nd ed. ed. Vol. 1). New York,: Lawrence Erlbaum Associates

© COPYRIGHT UPM

Collins, G. S., Mughal, S., Barnett, A. H., Fitzgerald, J., & Lloyd, C. E. (2011). Modification and validation of the Revised Diabetes Knowledge Scale. Diabet Med, 28(3), 306-310. doi:10.1111/j.1464-5491.2010.03190.x

Contento, I. (2008). Nutrition education: linking research, theory, and practice. Asia Pac J Clin Nutr, 17 Suppl 1, 176-179.

Coppoolse, H. L., Seidell, J. C., & Dijkstra, S. C. (2020). Impact of nutrition education on nutritional knowledge and intentions towards nutritional counselling in Dutch medical students: an intervention study. BMJ Open, 10(4), e034377. doi:10.1136/bmjopen-2019-034377

CPG. (2015). Clinical Practice Guidelines Management of Type 2 Diabetes Mellitus.

Craig, C. L., Marshall, A. L., Sjostrom, M., Bauman, A. E., Booth, M. L., Ainsworth, B. E., . . . Oja, P. (2003). International physical activity questionnaire: 12-country reliability and validity. Med Sci Sports Exerc, 35(8), 1381-1395. doi:10.1249/01.mss.0000078924.61453.fb

Cramer, H., Haller, H., Dobos, G., & Lauche, R. (2016). A Systematic Review and Meta-Analysis Estimating the Expected Dropout Rates in Randomized Controlled Trials on Yoga Interventions. Evidence-based complementary and alternative medicine : eCAM, 2016, 5859729-5859729. doi:10.1155/2016/5859729

Crowe, F. L., Roddam, A. W., Key, T. J., Appleby, P. N., Overvad, K., Jakobsen, M. U., . . . Riboli, E. (2011). Fruit and vegetable intake and mortality from ischaemic heart disease: results from the European Prospective Investigation into Cancer and Nutrition (EPIC)-Heart study. Eur Heart J, 32(10), 1235-1243. doi:10.1093/eurheartj/ehq465

Currie, G. M., & Thomas, C. J. (2018). Reimagining Program Development and Reengineering Program Design. J Nucl Med Technol, 46(3), 247-252. doi:10.2967/jnmt.118.208272

Daniel, W. W. (2009). Biostatistic A Foundation for Analysis in the Health Sciences. (n. edition Ed. nine edition ed.): Wiley, JOHN WILEY & SONS, INC.

Dauod, A. (2018). Glycemic control among type 2 diabetic patients attending the Family Medicine Health Center and the Diabetic Health Center in Erbil, Iraq: a comparative study. Zanco Journal of Medical Sciences (Zanco J Med Sci), 22(3), 332-341. https://doi.org/10.15218/zjms.2018.043.

© COPYRIGHT UPM

Davari, S., Dolatian, M., Maracy, M. R., Sharifirad, G., & Safavi, S. M. (2011). The Effect of A Health Belief Model (HBM)- based Educational Program on the Nutritional Behavior of Menopausal Women in Isfahan. Iranian Journal of Medical Education, 10(5), 1263-1272.

Davis, C. L., Pollock, N. K., Waller, J. L., Allison, J. D., Dennis, B. A., Bassali, R., . . . Gower, B. A. (2012). Exercise dose and diabetes risk in overweight and obese children: a randomized controlled trial. Jama, 308(11), 1103-1112. doi:10.1001/2012.jama.10762

De Micheli, A. (2008). Italian standards for diabetes mellitus 2007: executive summary : Diabete Italia, AMD Associazione Medici Diabetologi, SID Società Italiana di Diabetologia. Acta Diabetol, 45(2), 107-127. doi:10.1007/s00592-008-0030-2

de Smit, D. J., Weinreich, S. S., & Cornel, M. C. (2014). Effects of a simple educational intervention in well-baby clinics on women's knowledge about and intake of folic acid supplements in the periconceptional period: a controlled trial. Public health nutrition, 18(6), 1119-1126. doi:10.1017/S1368980014000986

de Souza, R. J., Mente, A., Maroleanu, A., Cozma, A. I., Ha, V., Kishibe, T., . . . Anand, S. S. (2015). Intake of saturated and trans unsaturated fatty acids and risk of all cause mortality, cardiovascular disease, and type 2 diabetes: systematic review and meta-analysis of observational studies. BMJ (Clinical research ed.), 351, h3978-h3978. doi:10.1136/bmj.h3978

Dehghani-Tafti, A., Mazloomy Mahmoodabad, S. S., Morowatisharifabad, M. A., Afkhami Ardakani, M., Rezaeipandari, H., & Lotfi, M. H. (2015). Determinants of Self-Care in Diabetic Patients Based on Health Belief Model. Glob J Health Sci, 7(5), 33-42. doi:10.5539/gjhs.v7n5p33

DIABAUD2, S. (2001). Factors Influencing Glycemic Control in Young People With Type 1 Diabetes in Scotland. Diabetes Care, 24(2), 239. doi:10.2337/diacare.24.2.239

Doak, C., Doak, L., & Root, J. (1996). Teaching Patients With Low Literacy Skills. Philadelphia, PA: JB Lippincott; 1996. (Second Edition ed.). Philadelphia: Lippincott;.

Du, G.-l., Su, Y.-x., Yao, H., Zhu, J., Ma, Q., Tuerdi, A., . . . Su, L.-p. (2016). Metabolic Risk Factors of Type 2 Diabetes Mellitus and Correlated Glycemic Control/Complications: A Cross-Sectional Study between Rural and Urban Uygur Residents in Xinjiang Uygur Autonomous Region. PLoS One, 11(9), e0162611. doi:10.1371/journal.pone.0162611

© COPYRIGHT UPM

Dube, L., Van den Broucke, S., Housiaux, M., Dhoore, W., & Rendall-Mkosi, K. (2015). Type 2 diabetes self-management education programs in high and low mortality developing countries: a systematic review. Diabetes Educ, 41(1), 69-85. doi:10.1177/0145721714558305

Dudley, D., Cotton, WG & Peralta, LR (2015). 'Teaching approaches and strategies that promote healthy eating in primary school children: a systematic review and meta-analysis', . International Journal of Behavioral Nutrition and Physical Activity,, vol. 12, p. 28, viewed 23 June 2015.

EFSA. (2013). EFSA (European Food Safety Authority) Panel on Dietetic Products, Nutrition and Allergies (NDA): Scientific Opinion on Dietary Reference Values for energy. . EFSA Journal, 11(1): 3005. doi:doi:10.2903/j.efsa.2013.3005,

Elfhag, K., & Rossner, S. (2010). Initial weight loss is the best predictor for success in obesity treatment and sociodemographic liabilities increase risk for drop-out. Patient Educ Couns, 79(3), 361-366. doi:10.1016/j.pec.2010.02.006

Emerging Risk Factors, C., Sarwar, N., Gao, P., Seshasai, S. R. K., Gobin, R., Kaptoge, S., . . . Danesh, J. (2010). Diabetes mellitus, fasting blood glucose concentration, and risk of vascular disease: a collaborative meta-analysis of 102 prospective studies. Lancet, 375(9733), 2215-2222. doi:10.1016/S0140-6736(10)60484-9

Evert, A. B., Dennison, M., Gardner, C. D., Garvey, W. T., Lau, K. H. K., MacLeod, J., . . . Yancy, W. S. (2019). Nutrition Therapy for Adults With Diabetes or Prediabetes: A Consensus Report. Diabetes Care, 42(5), 731-754. doi:10.2337/dci19-0014

Eyuboglu, E., & Schulz, P. J. (2016). Validation of Turkish health literacy measures. Health Promot Int, 31(2), 355-362. doi:10.1093/heapro/dau111

Faber, M., Laurie, S., Maduna, M., Magudulela, T., & Muehlhoff, E. (2014). Is the school food environment conducive to healthy eating in poorly resourced South African schools? Public Health Nutr, 17(6), 1214-1223. doi:10.1017/s1368980013002279

Faik, M., & Lami, F. A. (2016). Prevalence and determinants of Physical Inactivity among Diabetic and Hypertensive Patients, Baghdad-Iraq, 2015-2016 IRAQI JOURNALOF COMMUNITY MEDICINE, 29(2), 16-22.

FAO/WHO/UNU. (2000). Energy and Protein Requirements. . Retrieved from World Health Organization, Geneva.:

© COPYRIGHT IPM

Farmer, A. J., Wade, A. N., French, D. P., Simon, J., Yudkin, P., Gray, A., . . . Neil, H. A. (2009). Blood glucose self-monitoring in type 2 diabetes: a randomised controlled trial. Health Technol Assess, 13(15), iii-iv, ix-xi, 1-50. doi:10.3310/hta13150

Fedewa, M. V., Gist, N. H., Evans, E. M., & Dishman, R. K. (2014). Exercise and insulin resistance in youth: a meta-analysis. Pediatrics, 133(1), e163-174. doi:10.1542/peds.2013-2718

Fernandez-Silva, M. J., Alonso-Gonzalez, A., Gonzalez-Perez, E., Gestal-Otero, J. J., & Diaz-Gravalos, G. J. (2019). Health literacy in patients with type 2 diabetes: A cross-sectional study using the HLS-EU-Q47 questionnaire. Semergen, 45(1), 30-36. doi:10.1016/j.semerg.2018.08.003

Fitzgerald, J. T., Funnell, M. M., Hess, G. E., Barr, P. A., Anderson, R. M., Hiss, R. G., & Davis, W. K. (1998). The reliability and validity of a brief diabetes knowledge test. Diabetes Care, 21(5), 706-710. doi:10.2337/diacare.21.5.706

Fitzmaurice, C., Allen, C., Barber, R. M., Barregard, L., Bhutta, Z. A., Brenner, H., . . . Naghavi, M. (2017). Global, Regional, and National Cancer Incidence, Mortality, Years of Life Lost, Years Lived With Disability, and Disability-Adjusted Life-years for 32 Cancer Groups, 1990 to 2015: A Systematic Analysis for the Global Burden of Disease Study. JAMA Oncol, 3(4), 524-548. doi:10.1001/jamaoncol.2016.5688

Franz, M. J., MacLeod, J., Evert, A., Brown, C., Gradwell, E., Handu, D., . . . Robinson, M. (2017). Academy of Nutrition and Dietetics Nutrition Practice Guideline for Type 1 and Type 2 Diabetes in Adults: Systematic Review of Evidence for Medical Nutrition Therapy Effectiveness and Recommendations for Integration into the Nutrition Care Process. J Acad Nutr Diet, 117(10), 1659-1679. doi:10.1016/j.jand.2017.03.022

Friedman, L. M. F., C. D.; DeMets, D.; Reboussin, D. M.; Granger, C. B. (2015). Fundamentals of Clinical Trials (fifth edition ed.).

Gao, J., Wang, J., Zheng, P., Haardörfer, R., Kegler, M. C., Zhu, Y., & Fu, H. (2013). Effects of self-care, self-efficacy, social support on glycemic control in adults with type 2 diabetes. BMC Fam Pract, 14(1), 66. doi:10.1186/1471-2296-14-66

Gebreyohannes, E. A., Netere, A. K., & Belachew, S. A. (2019). Glycemic control among diabetic patients in Ethiopia: A systematic review and meta-analysis. PLoS One, 14(8), 1-14. doi:10.1371/journal.pone.0221790

© COPYRIGHT UPM

Gehling, E. (2001). Medical nutrition therapy: an individualized approach to treating diabetes. Lippincotts Case Manag, 6(1), 2-9; quiz 10-12.

Gibbs, H., & Chapman-Novakofski, K. (2012). A Review of Health Literacy and Its Relationship to Nutrition Education. Top Clin Nutr, 27, 325-333. doi:10.1097/TIN.0b013e31826f8dc5

Gillespie, S. J., Kulkarni, K. D., & Daly, A. E. (1998). Using carbohydrate counting in diabetes clinical practice. J Am Diet Assoc, 98(8), 897-905. doi:10.1016/s0002-8223(98)00206-5

Glanz, K., Rimer, B. K., & Su, S. M. (2005). Theory at a glance: A guide for health promotion practice. ((2nd ed.). ed. Vol. (2nd ed.).). USA: Washington, D.C.: U.S. Department of Health and Human Services, National Institutes of Health.

GNR. (2020). Global Nutrition Report, Country Nutrition Profiles, Iraq. Retrieved from https://globalnutritionreport.org/resources/nutrition-profiles/asia/western-asia/iraq/

Goldberg, G. R., Black, A. E., Jebb, S. A., Cole, T. J., Murgatroyd, P. R., Coward, W. A., & Prentice, A. M. (1991). Critical evaluation of energy intake data using fundamental principles of energy physiology: 1. Derivation of cut-off limits to identify under-recording. Eur J Clin Nutr, 45(12), 569-581.

Goorabi, M., Akhoundan, M., Shadman, Z., Hajifaraji, M., & Nikoo, M. (2017). The Effect of Nutritional Education Program Based on Health Belief Model (HBM) on the Knowledge of Fasting Type 2 Diabetic Patients. Nutrition and Food Sciences Research, 4, 15-23. doi:10.18869/acadpub.nfsr.4.2.3

Gopichandran, V., Roy, P., Sitaram, A., Karthick, & John, K. (2010). Impact of a Simple Educational Intervention on the Knowledge and Awareness of Tuberculosis among High School children in Vellore, India. Indian journal of community medicine : official publication of Indian Association of Preventive & Social Medicine, 35(1), 174-175. doi:10.4103/0970-0218.62589

Gordon Singh, S., & Aiken, J. (2017). The effect of health literacy level on health outcomes in patients with diabetes at a type v health centre in Western Jamaica. International Journal of Nursing Sciences, 4(3), 266-270. doi:https://doi.org/10.1016/j.ijnss.2017.06.004

Griffin, J. D., & Lichtenstein, A. H. (2013). Dietary Cholesterol and Plasma Lipoprotein Profiles: Randomized-Controlled Trials. Current nutrition reports, 2(4), 274-282. doi:10.1007/s13668-013-0064-0

© COPYRIGHT IPM

Gutierrez, J., & Long, J. A. (2011). Reliability and validity of diabetes specific Health Beliefs Model scales in patients with diabetes and serious mental illness. Diabetes Research and Clinical Practice, 92(3), 342-347. doi:10.1016/j.diabres.2011.02.018

Ha, K., Joung, H., & Song, Y. (2018). Low-carbohydrate diet and the risk of metabolic syndrome in Korean adults. Nutr Metab Cardiovasc Dis, 28(11), 1122-1132. doi:10.1016/j.numecd.2018.06.007

Haghighatpanah, M., Nejad, A. S. M., Haghighatpanah, M., Thunga, G., & Mallayasamy, S. (2018). Factors that Correlate with Poor Glycemic Control in Type 2 Diabetes Mellitus Patients with Complications. Osong public health and research perspectives, 9(4), 167-174. doi:10.24171/j.phrp.2018.9.4.05

Hagstromer, M., Oja, P., & Sjostrom, M. (2006). The International Physical Activity Questionnaire (IPAQ): A study of concurrent and construct validity. Public health nutrition, 9, 755-762. doi:10.1079/PHN2005898

Hammad, M. A., Syed Sulaiman, S. A., Abubakar, U., & Mohamed Noor, D. A. (2019). The effects of glycemic control on morbidity and survival among diabetic patients. Diabetes Metab Syndr, 13(2), 1035-1040. doi:10.1016/j.dsx.2019.01.001

Han, C. Y., Chan, C. G. B., Lim, S. L., Zheng, X., Woon, Z. W., Chan, Y. T., . . . Chong, M. F.-F. (2020). Diabetes-related nutrition knowledge and dietary adherence in patients with Type 2 diabetes mellitus: A mixed-methods exploratory study. Proceedings of Singapore Healthcare, 29(2), 81-90. doi:10.1177/2010105820901742

Hashim, Barakatun-Nisak, M. Y., Abu Saad, H., Ismail, S., Hamdy, O., & Mansour, A. A. (2020). Association of Health Literacy and Nutritional Status Assessment with Glycemic Control in Adults with Type 2 Diabetes Mellitus. . Nutrients 2020, 12, 3152.

Hashim, Mustafa, H., Al Abdouli, A. O., Abdulla Al, R. A., AlQahtani, S. M., Almajed, S. A., . . . Alkaabi, M. S. (2013). Health education materials for Arab patients: content and design preferences. Med Princ Pract, 22(4), 411-414. doi:10.1159/000346276

Haskell, W. L., Lee, I. M., Pate, R. R., Powell, K. E., Blair, S. N., Franklin, B. A., . . . Bauman, A. (2007). Physical activity and public health: updated recommendation for adults from the American College of Sports Medicine and the American Heart Association. Med Sci Sports Exerc, 39(8), 1423-1434. doi:10.1249/mss.0b013e3180616b27

© COPYRIGHT UPM

Hasnawi, A. K. A., Nisak, M. Y. B., Hazizi, A. S., & Rafi, A.-R. (2015). Nutritional Status-Related Factors Contribute to Poor Glycemic Status in a Sample of Iraqi Patients with Type 2 Diabetes. Journal of Medical Science And clinical Research. doi:10.18535/jmscr/v3i8.51

Hassani, B., Amani, R., Haghighizadeh, M. H., & Araban, M. (2020). A priority oriented nutrition education program to improve nutritional and cardiometabolic status in the workplace: a randomized field trial. Journal of Occupational Medicine and Toxicology, 15(1), 2. doi:10.1186/s12995-020-0252-y

Hector, S., & Prehn, J. H. (2009). Apoptosis signaling proteins as prognostic biomarkers in colorectal cancer: a review. Biochim Biophys Acta, 1795(2), 117-129. doi:10.1016/j.bbcan.2008.12.002

Heins, J., & Delahanty, L. (2001). Tools and Techniques to Facilitate Eating Behavior Change (pp. 105-122).

Helfand, M., Buckley, D. I., Freeman, M., Fu, R., Rogers, K., Fleming, C., & Humphrey, L. L. (2009). Emerging risk factors for coronary heart disease: a summary of systematic reviews conducted for the U.S. Preventive Services Task Force. Ann Intern Med, 151(7), 496-507. doi:10.7326/0003-4819-151-7-200910060-00010

Herman, W. H. (2009). Do race and ethnicity impact hemoglobin A1c independent of glycemia? J Diabetes Sci Technol, 3(4), 656-660. doi:10.1177/193229680900300406

Huang, L., Yan, Z., & Huang, H. (2019). The effect of short message service intervention on glycemic control in diabetes: a systematic review and meta-analysis. Postgrad Med, 131(8), 566-571. doi:10.1080/00325481.2019.1668723

Huizinga, M. M., Carlisle, A. J., Cavanaugh, K. L., Davis, D. L., Gregory, R. P., Schlundt, D. G., & Rothman, R. L. (2009). Literacy, numeracy, and portion-size estimation skills. Am J Prev Med, 36(4), 324-328. doi:10.1016/j.amepre.2008.11.012

Hussain, A. M., & Lafta, R. K. (2019). Accidents in Iraq during the period of conflict (2003-2016). Qatar Med J, 2019(3), 14. doi:10.5339/qmj.2019.14

Hussein, Z., Taher, S. W., Gilcharan Singh, H. K., & Chee Siew Swee, W. (2015). Diabetes Care in Malaysia: Problems, New Models, and Solutions. Ann Glob Health, 81(6), 851-862. doi:10.1016/j.aogh.2015.12.016

© COPYRIGHT UPM

Huxley, R., Barzi, F., & Woodward, M. (2006). Excess risk of fatal coronary heart disease associated with diabetes in men and women: meta-analysis of 37 prospective cohort studies. BMJ, 332(7533), 73-78. doi:10.1136/bmj.38678.389583.7C

IDF. (2019). International Diabetes Federation, DIABETES ATLAS. Ninth edition. USA.

Imai, S., Fukui, M., & Kajiyama, S. (2014). Effect of eating vegetables before carbohydrates on glucose excursions in patients with type 2 diabetes. J Clin Biochem Nutr, 54(1), 7-11. doi:10.3164/jcbn.13-67

Imai, S., Matsuda, M., Hasegawa, G., Fukui, M., Obayashi, H., Ozasa, N., & Kajiyama, S. (2011). A simple meal plan of 'eating vegetables before carbohydrate' was more effective for achieving glycemic control than an exchange-based meal plan in Japanese patients with type 2 diabetes. Asia Pac J Clin Nutr, 20(2), 161-168.

Inoue, M., Takahashi, M., & Kai, I. (2013). Impact of communicative and critical health literacy on understanding of diabetes care and self-efficacy in diabetes management: a cross-sectional study of primary care in Japan. BMC Fam Pract, 14, 40. doi:10.1186/1471-2296-14-40

Iranagh, J. A. (2015). Effectiveness of health education intervention based on health belief model among elderly women in Urmia, Iran. . (Doctoral thesis, Doctoral thesis,), Universiti Putra Malaysia., Universiti Putra Malaysia. Retrieved from http://psasir.upm.edu.my/id/eprint/60420

Ishikawa, H., Takeuchi, T., & Yano, E. (2008). Measuring functional, communicative, and critical health literacy among diabetic patients. Diabetes Care, 31(5), 874-879. doi:10.2337/dc07-1932

Ismail, K. H. (2014). Lipid Profile of Controlled and Uncontrolled Diabetics in Erbil, Iraq. IRAQI JOURNALOF COMMUNITY MEDICINE, 27(1), 10-13.

Jacobs, E. J., Newton, C. C., Wang, Y., Patel, A. V., McCullough, M. L., Campbell, P. T., . . . Gapstur, S. M. (2010). Waist circumference and all-cause mortality in a large US cohort. Arch Intern Med, 170(15), 1293-1301. doi:10.1001/archinternmed.2010.201

Jahanpeyma, P., Makhdoomi, K., & Sajadi, S. A. (2017). The Effect of Nutrition Education Program on Biochemical Parameters Among Patients With Chronic Kidney Disease Undergoing Hemodialysis. 0-0 ,(3)10.

© COPYRIGHT UPM

Jalilian, F., Motlagh, F. Z., Solhi, M., & Gharibnavaz, H. (2014). Effectiveness of self-management promotion educational program among diabetic patients based on health belief model. Journal of education and health promotion, 3, 14-14. doi:10.4103/2277-9531.127580

Janghorbani, M., & Amini, M. (2012). Patterns and predictors of long-term glycemic control in patients with type 2 diabetes. ISRN Endocrinol, 2012, 526824. doi:10.5402/2012/526824

JDC. (2016). Clinical Nutrition Guideline for Overweight and Obese Adults With Type 2 Diabetes, Prediabetes or Those at High Risk for Developing Type 2 Diabetes.

Jeihooni, A. K., Kashfi, S. M., Mohammad, S., & Hazavehei, M. (2013). Effects of the BASNEF model-based educational programs on blood sugar control,(Type 2 Diabetes). Health Education & Health Promotion (HEHP), 1(1), 33-49.

Jensen, M. D., Ryan, D. H., Apovian, C. M., Ard, J. D., Comuzzie, A. G., Donato, K. A., . . . Tomaselli, G. F. (2014). 2013 AHA/ACC/TOS guideline for the management of overweight and obesity in adults: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and The Obesity Society. Circulation, 129(25 Suppl 2), S102-138. doi:10.1161/01.cir.0000437739.71477.ee

Jiang, J., Qiu, H., Zhao, G., Zhou, Y., Zhang, Z., Zhang, H., . . . Xu, W. H. (2012). Dietary fiber intake is associated with HbA1c level among prevalent patients with type 2 diabetes in Pudong New Area of Shanghai, China. PLoS One, 7(10), e46552. doi:10.1371/journal.pone.0046552

Jones, A. M., Lamp, C., Neelon, M., Nicholson, Y., Schneider, C., Wooten Swanson, P., & Zidenberg-Cherr, S. (2015). Reliability and validity of nutrition knowledge questionnaire for adults. J Nutr Educ Behav, 47(1), 69-74. doi:10.1016/j.jneb.2014.08.003

Jouda, A. K. M., I. K. ; Al-Jaff, H. K. . (2016). Correlation of blood, salivary glucose levels and bloo HbA1c% in healthy and previously diagnosed Diabetes Mellitus Type 2 in a sec ion of patients of Baghdad hospital, Iraq. Al-Kindy College Medical Journal, 12(1), 16-20.

Jumaah, I. A. (2016). Comparison between Fasting Plasma Glucose and HbA1c in Glycemic Control of Type-2 Diabetic Patients. Journal of University of Babylon, 24(9), 2633-2644.

© COPYRIGHT UPM

Kaliyappan, R., Nordin, S. A., Yusof, B. N. M., Chin, S. C., & Ming, G. H. (2016). Metagenome: Differences in the Gut Microbiota among Healthy, Obese and Type 2 Diabetes Adults. Genomics and Applied Biology. doi:10.5376/gab.2016.07.0003

Kamran, A., Sharifirad, G., Heydari, H., & Sharifian, E. (2016). The Effect of Theory Based Nutritional Education on Fat Intake, Weight and Blood Lipids. Electronic physician, 8(12), 3333-3342. doi:10.19082/3333

Kamuhabwa, A. R., & Charles, E. (2014). Predictors of poor glycemic control in type 2 diabetic patients attending public hospitals in Dar es Salaam. Drug, healthcare and patient safety, 6, 155-165. doi:10.2147/DHPS.S68786

Kang, H. (2013). The prevention and handling of the missing data. Korean journal of anesthesiology, 64(5), 402-406. doi:10.4097/kjae.2013.64.5.402

Karimy, M., Araban, M., Zareban, I., Taher, M., & Abedi, A. (2016). Determinants of adherence to self-care behavior among women with type 2 diabetes: an explanation based on health belief model. Med J Islam Repub Iran, 30, 368.

Kashfi, S. M., & Hatami, M. (2009). 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 Journal, 12(3), 54-60.

Kasila, K., Poskiparta, M., Karhila, P., & Kettunen, T. (2003). Patients' readiness for dietary change at the beginning of counselling: a transtheoretical model-based assessment. J Hum Nutr Diet, 16(3), 159-166. doi:10.1046/j.1365-277x.2003.00437.x

Kassahun, Eshetie, T., & Gesesew, H. (2016). Factors associated with glycemic control among adult patients with type 2 diabetes mellitus: a cross-sectional survey in Ethiopia. BMC Res Notes, 9, 78. doi:10.1186/s13104-016-1896-7

Kassahun, Gesesew, H., Mwanri, L., & Eshetie, T. (2016). Diabetes related knowledge, self-care behaviours and adherence to medications among diabetic patients in Southwest Ethiopia: a cross-sectional survey. BMC Endocrine Disorders, 16(1), 28-28. doi:10.1186/s12902-016-0114-x

Kaur, J. (2014). A comprehensive review on metabolic syndrome. Cardiol Res Pract, 2014, 943162. doi:10.1155/2014/943162

© COPYRIGHT UPM

Keogh-Brown, M. R., Bachmann, M. O., Shepstone, L., Hewitt, C., Howe, A., Ramsay, C. R., . . . Campbell, M. J. (2007). Contamination in trials of educational interventions. Health Technol Assess, 11(43), iii, ix-107.

Keogh, J. B., & Clifton, P. M. (2012). Meal replacements for weight loss in type 2 diabetes in a community setting. J Nutr Metab, 2012, 918571. doi:10.1155/2012/918571

Khan, M., Weinstock, R., Mcpherson, R., & Pincus, M. (2011). Henry's clinical diagnosis and management by laboratory methods.

Khattab, M., Khader, Y. S., Al-Khawaldeh, A., & Ajlouni, K. (2010). Factors associated with poor glycemic control among patients with type 2 diabetes. J Diabetes Complications, 24(2), 84-89. doi:10.1016/j.jdiacomp.2008.12.008

Kien, C. L., & Ugrasbul, F. (2004). Prediction of daily energy expenditure during a feeding trial using measurements of resting energy expenditure, fat-free mass, or Harris-Benedict equations. The American journal of clinical nutrition, 80(4), 876-880. doi:10.1093/ajcn/80.4.876

Kim, Kwon, S., & Ly, S. Y. (2010). Effects of Low Glycemic Index Nutrition Education on the Blood Glucose Control in Patients with Type 2 Diabetes Mellitus. Korean J Nutr, 43(1), 46-56.

Kim, Love, F., Quistberg, D. A., & Shea, J. A. (2004). Association of health literacy with self-management behavior in patients with diabetes. Diabetes Care, 27(12), 2980-2982. doi:10.2337/diacare.27.12.2980

Krishnaswamy, K., & Gayathri, R. (2018). Nature's bountiful gift to humankind: Vegetables & fruits & their role in cardiovascular disease & diabetes. The Indian journal of medical research, 148(5), 569-595. doi:10.4103/ijmr.IJMR_1780_18

Laaksonen, D. E., Lindstrom, J., Lakka, T. A., Eriksson, J. G., Niskanen, L., Wikstrom, K., . . . Uusitupa, M. (2005). Physical activity in the prevention of type 2 diabetes: the Finnish diabetes prevention study. Diabetes, 54(1), 158-165. doi:10.2337/diabetes.54.1.158

Ladan, E. P., Shayesteh, S., Reza, P. K., Gholamhosein, A., & Azam, S. (2013). Assessing the Effect of Healthy Belief Model Application on Behavior Change of the Patients with Myocardial Infarction.

Lappan, S. N., Brown, A. W., & Hendricks, P. S. (2020). Dropout rates of in-person psychosocial substance use disorder treatments: a systematic review and meta-analysis. Addiction, 115(2), 201-217. doi:10.1111/add.14793

© COPYRIGHT UPM

Lee, Y. J., Shin, S. J., Wang, R. H., Lin, K. D., Lee, Y. L., & Wang, Y. H. (2016). Pathways of empowerment perceptions, health literacy, self-efficacy, and self-care behaviors to glycemic control in patients with type 2 diabetes mellitus. Patient Educ Couns, 99(2), 287-294. doi:10.1016/j.pec.2015.08.021

Lim, H.-M., Park, J.-E., Choi, Y.-J., Huh, K.-B., & Kim, W.-Y. (2009). Individualized diabetes nutrition education improves compliance with diet prescription. Nutrition research and practice, 3(4), 315-322. doi:10.4162/nrp.2009.3.4.315

Livesey, G., Taylor, R., Livesey, H. F., Buyken, A. E., Jenkins, D. J. A., Augustin, L. S. A., . . . Brand-Miller, J. C. (2019). Dietary Glycemic Index and Load and the Risk of Type 2 Diabetes: Assessment of Causal Relations. Nutrients, 11(6), 1436. doi:10.3390/nu11061436

Lynch, Helmrich, S. P., Lakka, T. A., Kaplan, G. A., Cohen, R. D., Salonen, R., & Salonen, J. T. (1996). Moderately intense physical activities and high levels of cardiorespiratory fitness reduce the risk of non-insulin-dependent diabetes mellitus in middle-aged men. Arch Intern Med, 156(12), 1307-1314.

Lynch, Strom, J. L., & Egede, L. E. (2011). Disparities in diabetes self-management and quality of care in rural versus urban veterans. J Diabetes Complications, 25(6), 387-392. doi:10.1016/j.jdiacomp.2011.08.003

Ma, J., Stevens, J. E., Cukier, K., Maddox, A. F., Wishart, J. M., Jones, K. L., . . . Rayner, C. K. (2009). Effects of a protein preload on gastric emptying, glycemia, and gut hormones after a carbohydrate meal in diet-controlled type 2 diabetes. Diabetes Care, 32(9), 1600-1602. doi:10.2337/dc09-0723

Mahdizadeh, M., Peymam, N., Taghipour, A., Esmaily, H., & Mahdizadeh, S. M. (2013). Effect of health education program on promoting physical activity among diabetic women in Mashhad, Iran: applying social cognitive theory. J Res Health Sci, 13(1), 90-97.

Maheri, A., Asnaashari, M., Joveini, H., Tol, A., Firouzian, A. A., & Rohban, A. (2017). The impact of educational intervention on physical activity, nutrition and laboratory parameters in type II diabetic patients. Electronic physician, 9(4), 4207-4214. doi:10.19082/4207

Mahjouri, M. Y., Arzaghi, S. M., Qorbani, M., Nasli-Esfahani, E., & Larijani, B. (2011). Evaluation of psychometric properties of the third version of the Iranian Diabetes Attitude Scale (IR-DAS-3). Journal of diabetes and metabolic disorders, 10, 8.

© COPYRIGHT UPM

Malaguti-Boyle, M. (2016). Evidence for the effectiveness of clinical nutrition therapy in diabetes mellitus type 2: Management in primary care (Vol. 22).

Maneze, D., Everett, B., Astorga, C., Yogendran, D., & Salamonson, Y. (2016). The Influence of Health Literacy and Depression on Diabetes Self-Management: A Cross-Sectional Study. Journal of diabetes research, 2016, 3458969-3458969. doi:10.1155/2016/3458969

Mann, J. I., De Leeuw, I., Hermansen, K., Karamanos, B., Karlström, B., Katsilambros, N., . . . Vessby, B. (2004). Evidence-based nutritional approaches to the treatment and prevention of diabetes mellitus. Nutr Metab Cardiovasc Dis, 14(6), 373-394. doi:10.1016/s0939-4753(04)80028-0

Mansour, A. A. (2012). Prevalence and control of hypertension in iraqi diabetic patients: a prospective cohort study. Open Cardiovasc Med J, 6, 68-71. doi:10.2174/1874192401206010068

Mansour, A. A. (2008). Patients' opinion on the barriers to diabetes control in areas of conflicts: The Iraqi example. Confl Health, 2, 7. doi:10.1186/1752-1505-2-7

Mansour, A. A., & Ajeel, N. A. (2009). Parity is associated with increased waist circumference and other anthropometric indices of obesity. Eat Weight Disord, 14(2-3), e50-55.

Mansour, A. A., Al-Hassan, A. A., & Al-Jazairi, M. I. (2007). Cut-off values for waist circumference in rural Iraqi adults for the diagnosis of metabolic syndrome. Rural Remote Health, 7(4), 765.

Mansour, A. A., Al-Maliky, A. A., Kasem, B., Jabar, A., & Mosbeh, K. A. (2014). Prevalence of diagnosed and undiagnosed diabetes mellitus in adults aged 19 years and older in Basrah, Iraq. Diabetes Metab Syndr Obes, 7, 139-144. doi:10.2147/dmso.s59652

Mansour, A. A., Alibrahim, N. T. Y., Alidrisi, H. A., Alhamza, A. H., Almomin, A. M., Zaboon, I. A., . . . Hussein, I. H. (2020). Prevalence and correlation of glycemic control achievement in patients with type 2 diabetes in Iraq: A retrospective analysis of a tertiary care database over a 9-year period. Diabetes & Metabolic Syndrome: Clinical Research & Reviews, 14(3), 265-272. doi:https://doi.org/10.1016/j.dsx.2020.03.008

Mansour, A. A., & Wanoose, H. L. (2007). Insulin crisis in Iraq. Lancet, 369(9576), 1860. doi:10.1016/s0140-6736(07)60849-6

© COPYRIGHT UPM

Mansour, A. A., Wanoose, H. L., Hani, I., Abed-Alzahrea, A., & Wanoose, H. L. (2008). Diabetes screening in Basrah, Iraq: a population-based cross-sectional study. Diabetes Res Clin Pract, 79(1), 147-150. doi:10.1016/j.diabres.2007.07.016

Mc Sharry, J., Dinneen, S. F., Humphreys, M., O'Donnell, M., O'Hara, M. C., Smith, S. M., . . . Byrne, M. (2019). Barriers and facilitators to attendance at Type 2 diabetes structured education programmes: a qualitative study of educators and attendees. Diabetic Medicine, 36(1), 70-79. doi:10.1111/dme.13805

McCoy, C. E. (2017). Understanding the Intention-to-treat Principle in Randomized Controlled Trials. The western journal of emergency medicine, 18(6), 1075-1078. doi:10.5811/westjem.2017.8.35985

McIntosh, M., & Miller, C. (2001). A diet containing food rich in soluble and insoluble fiber improves glycemic control and reduces hyperlipidemia among patients with type 2 diabetes mellitus. Nutr Rev, 59(2), 52-55.

McKenzie, J. F., Neiger, B. L., & Thackeray, R. (2009). Planning, implementing, & evaluating health promotion programs. San Francisco: Pearson Benjamin Cummings.

Mehrabian, F., Farmanbar, R., Mahdavi-Roshan, M., Omidi, S., & Aghebati, R. (2018). The Effect of Nutrition Education Based on DASH Diet on Blood Pressure and Dietary Adherence Among Patients With Hypertension. Caspian Journal of Health Research, 3, 48-52. doi:10.29252/cjhr.3.2.48

Meng, Y., Bai, H., Wang, S., Li, Z., Wang, Q., & Chen, L. (2017). Efficacy of low carbohydrate diet for type 2 diabetes mellitus management: A systematic review and meta-analysis of randomized controlled trials. Diabetes Res Clin Pract, 131, 124-131. doi:10.1016/j.diabres.2017.07.006

Merlotti, C., Ceriani, V., Morabito, A., & Pontiroli, A. E. (2017). Subcutaneous fat loss is greater than visceral fat loss with diet and exercise, weight-loss promoting drugs and bariatric surgery: a critical review and meta-analysis. Int J Obes (Lond), 41(5), 672-682. doi:10.1038/ijo.2017.31

Mikhael, E. M., Hassali, M. A., Hussain, S. A., & Shawky, N. (2019). Self-management knowledge and practice of type 2 diabetes mellitus patients in Baghdad, Iraq: a qualitative study. Diabetes, metabolic syndrome and obesity : targets and therapy, 12, 1-17. Retrieved from doi:10.2147/DMSO.S183776

Miller, W. R., & Rollnick, S. (2012). Motivational interviewing: Helping people change: Guilford press.

© COPYRIGHT UPM

Minet, L., Møller, S., Vach, W., Wagner, L., & Henriksen, J. E. (2010). Mediating the effect of self-care management intervention in type 2 diabetes: A meta-analysis of 47 randomised controlled trials. Patient Educ Couns, 80(1), 29-41. doi:https://doi.org/10.1016/j.pec.2009.09.033

Moghissi, E. S., Korytkowski, M. T., DiNardo, M., Einhorn, D., Hellman, R., Hirsch, I. B., . . . American Diabetes, A. (2009). American Association of Clinical Endocrinologists and American Diabetes Association consensus statement on inpatient glycemic control. Diabetes Care, 32(6), 1119-1131. doi:10.2337/dc09-9029

MOH. (2016). Annual Statistical Report, Ministry of Health and Environment, 2016, Iraq. Retrieved from Bagdad, Iraq:

MOH/WHO. (2006). National Survey for Non-Communicable Diseases Risk Factors in Iraq 2006. Baghdad, Ministry of Health and Ministry of Planning and Amman, World Health Organization/Iraq Office.

Mohamed, A., Staite, E., Ismail, K., & Winkley, K. (2019). A systematic review of diabetes self-management education interventions for people with type 2 diabetes mellitus in the Asian Western Pacific (AWP) region. Nursing Open, 6(4), 1424-1437. doi:10.1002/nop2.340

Mohammadi, Karim, N. A., Talib, R. A., & Amani, R. (2018). The impact of self-efficacy education based on the health belief model in Iranian patients with type 2 diabetes: a randomised controlled intervention study. Asia Pac J Clin Nutr, 27(3), 546-555. doi:10.6133/apjcn.072017.07

Mohammadi, Tehrani, B. A., Asgharifard, H., Bahramian, M., Baradaran, H. R., & Khamseh, M. E. (2015). Health literacy and its influencing factors in Iranian diabetic patients. Med J Islam Repub Iran, 29, 230-230.

MOP, I. (2013). Central statistical organization, ministry of planning, republic of Iraq. Environmental statistics of Iraq for November. . Retrieved from IRAQ: www.cosit.gov.iq

Morrow, B. (2008). Randomized controlled trials: Fundamental concepts. International Journal of Therapy and rehabilitation, 15, 290-296. doi:10.12968/ijtr.2008.15.7.30408

Mottalib, A., Salsberg, V., Mohd Yusof, B. N., Mohamed, W., Carolan, P., Pober, D., . . . Hamdy, O. (2018). Effects of nutrition therapy on HbA1c and cardiovascular disease risk factors in overweight and obese patients with type 2 diabetes. Nutrition journal, 17, 42. doi:10.1186/s12937-018-0351-0

© COPYRIGHT UPM

Muchiri, J. W., Gericke, G., & Rheeder, P. (2009). Elements of effective nutrition education for adults with diabetes mellitus in resource-poor settings: A review. 2009, 14(1). doi:10.4102/hsag.v14i1.413

Muchiri, J. W., Gericke, G. J., & Rheeder, P. (2016). Impact of nutrition education on diabetes knowledge and attitudes of adults with type 2 diabetes living in a resource-limited setting in South Africa: a randomised controlled trial. Journal of Endocrinology, Metabolism and Diabetes of South Africa, 21(2), 26-34. doi:10.1080/16089677.2016.1200324

Murphy-Knoll, L. (2007). Low health literacy puts patients at risk: the Joint Commission proposes solutions to national problem. J Nurs Care Qual, 22(3), 205-209. doi:10.1097/01.ncq.0000277775.89652.30

Musaiger, A. O. (2011). Food Composition Tables for Bahrain Kingdome.

Myers, E. F., Trostler, N., Varsha, V., & Voet, H. (2017). Insights From the Diabetes in India Nutrition Guidelines Study: Adopting Innovations Using a Knowledge Transfer Model. Top Clin Nutr, 32(1), 69-86. doi:10.1097/tin.0000000000000089

N'Goran, A. A., Pasquier, J., Deruaz-Luyet, A., Burnand, B., Haller, D. M., Neuner-Jehle, S., . . . Bodenmann, P. (2018). Factors associated with health literacy in multimorbid patients in primary care: a cross-sectional study in Switzerland. BMJ Open, 8(2), e018281. doi:10.1136/bmjopen-2017-018281

Naghashpour, M., Shakerinejad, G., Lourizadeh, M. R., Hajinajaf, S., & Jarvandi, F. (2014). Nutrition education based on health belief model improves dietary calcium intake among female students of junior high schools. Journal of health, population, and nutrition, 32(3), 420-429.

NDG. (2009). National Diabetes Guidelines of United Arab Emirates. National Diabetes Commetee. (pp. 118): UAE.

Neter, J. E., Stam, B. E., Kok, F. J., Grobbee, D. E., & Geleijnse, J. M. (2003). Influence of weight reduction on blood pressure: a meta-analysis of randomized controlled trials. Hypertension, 42(5), 878-884. doi:10.1161/01.hyp.0000094221.86888.ae

NICE. (2009). National Institute for Health and Clinical Excellence: Guidance. In N. Centre for Clinical Practice at (Ed.), Type 2 Diabetes: Newer Agents for Blood Glucose Control in Type 2 Diabetes. London: National Institute for Health and Clinical Excellence (UK)

National Institute for Health and Clinical Excellence.

© COPYRIGHT UPM

NIHR. (2016). Good Clinical Practice (GCP), Reference Guide Conditions and Principles, which apply to all Clinical Trials (pp. 26). Geneva, Switzerland: National Institute for Health Research, Clinical Research Network (NIHR CRN).

Nilsen, P. (2015). Making sense of implementation theories, models and frameworks. Implement Sci, 10, 53. doi:10.1186/s13012-015-0242-0

Nooriani, N., Mohammadi, V., Feizi, A., Shahnazi, H., Askari, G., & Ramezanzade, E. (2019). The Effect of Nutritional Education Based on Health Belief Model on Nutritional Knowledge, Health Belief Model Constructs, and Dietary Intake in Hemodialysis Patients. Iranian journal of nursing and midwifery research, 24(5), 372-378. doi:10.4103/ijnmr.IJNMR_124_18

Nutbeam, D. (2014). Health promotion glossary. World Health Organization (WHO), Oxford University Press, Great Britain, 2014 .

Nutbeam, D. (2008). The evolving concept of health literacy. Soc Sci Med, 67(12), 2072-2078. doi:10.1016/j.socscimed.2008.09.050

Nydahl, M., Gustafsson, I.-B., Eliasson, M., & Karlström, B. (1993). A study of attitudes and use of the plate model among various health professionals giving dietary advice to diabetic patients. Journal of Human Nutrition and Dietetics, 6(2), 163-170. doi:doi:10.1111/j.1365-277X.1993.tb00359.x

Omar, M. S., Khudada, K., Safarini, S., Mehanna, S., & Nafach, J. (2016). DiabCare survey of diabetes management and complications in the Gulf countries. Indian J Endocrinol Metab, 20(2), 219-227. doi:10.4103/2230-8210.176347

Orji, R., Vassileva, J., & Mandryk, R. (2012). Towards an effective health interventions design: an extension of the health belief model. Online J Public Health Inform, 4(3). doi:10.5210/ojphi.v4i3.4321

Ouyang, C.-M. (2017). Dietary education for patients with type 2 diabetes: failure or success? Diabetes management, 7, 377-382.

Ozcelik, F., Yiginer, O., Arslan, E., Serdar, M. A., Uz, O., Kardesoglu, E., & Kurt, I. (2010). Association between glycemic control and the level of knowledge and disease awareness in type 2 diabetic patients. Pol Arch Med Wewn, 120(10), 399-406.

© COPYRIGHT UPM

Parra, A., Menárguez, María C., Granda, M., Tomey, M., Padilla, B., & Bouza, E. (2010). A Simple Educational Intervention to Decrease Incidence of Central Line-Associated Bloodstream Infection (CLABSI) in Intensive Care Units with Low Baseline Incidence of CLABSI. Infection control and hospital epidemiology : the official journal of the Society of Hospital Epidemiologists of America, 31, 964-967. doi:10.1086/655841

Pengpid, S. P., K. (2020). Overweight and Obesity Among Adults in Iraq: Prevalence and Correlates From a National Survey in 2015. . doi:doi: 10.20944/preprints202011.0489.v1

Pereira, D. A., Costa, N. M., Sousa, A. L., Jardim, P. C., & Zanini, C. R. (2012). The effect of educational intervention on the disease knowledge of diabetes mellitus patients. Rev Lat Am Enfermagem, 20(3), 478-485. doi:10.1590/s0104-11692012000300008

Pi-Sunyer, X. (2014). The Look AHEAD Trial: A Review and Discussion Of Its Outcomes. Current nutrition reports, 3(4), 387-391. doi:10.1007/s13668-014-0099-x

Pinto, A. S., Chedid, M. F., Guerra, L. T., Araújo, A. d., Guimarães, L. S., Leipnitz, I., . . . Kruel, C. (2016). Estimating Basal Energy Expenditure in Liver Transplant Recipients: The Value of the Harris-Benedict Equation. Arquivos brasileiros de cirurgia digestiva : ABCD = Brazilian archives of digestive surgery, 29(3), 185-188. doi:10.1590/0102-6720201600030013

Pischon, T., Boeing, H., Hoffmann, K., Bergmann, M., Schulze, M. B., Overvad, K., . . . Riboli, E. (2008). General and abdominal adiposity and risk of death in Europe. N Engl J Med, 359(20), 2105-2120. doi:10.1056/NEJMoa0801891

Plescia, M., & Groblewski, M. (2004). A community-oriented primary care demonstration project: refining interventions for cardiovascular disease and diabetes. Ann Fam Med, 2(2), 103-109. doi:10.1370/afm.42

Pourhoseingholi, M. A., Vahedi, M., & Rahimzadeh, M. (2013). Sample size calculation in medical studies. Gastroenterol Hepatol Bed Bench, 6(1), 14-17.

Pradhan, P. M. S., Dhital, R., & Subhani, H. (2016). Nutrition interventions for children aged less than 5 years following natural disasters: a systematic review. BMJ Open, 6(9), e011238-e011238. doi:10.1136/bmjopen-2016-011238

© COPYRIGHT UPM

Prochaska, J. O., & DiClemente, C. (1986). Treating addictive behaviours: processes of change. . In New York: Pergamon (Ed.). New York: Pergamon, .

Qaddoumi, M., Al-Khamis, Y., Channanath, A., Tuomilehto, J., & Badawi, D. (2019). The Status of Metabolic Control in Patients With Type 2 Diabetes Attending Dasman Diabetes Institute, Kuwait. Frontiers in Endocrinology, 10(412). doi:10.3389/fendo.2019.00412

Qin, L., & Xu, H. (2016). A cross-sectional study of the effect of health literacy on diabetes prevention and control among elderly individuals with prediabetes in rural China. BMJ Open, 6(5), e011077. doi:10.1136/bmjopen-2016-011077

Quah, J. H. M., Liu, Y. P., Luo, N., How, C. H., & Tay, E. G. (2013). Younger adult type 2 diabetic patients have poorer glycaemic control: a cross-sectional study in a primary care setting in Singapore. BMC Endocrine Disorders, 13, 18-18. doi:10.1186/1472-6823-13-18

Rabiei, S. (2013). The Effects of Nutrition Education and Diet Therapy on Glycemic and Lipidemic Control in Iranian Patients with Type 2 Diabetes Faezeh. . Journal of Obesity & Weight Loss Therapy, S3(05). https://doi.org/10.4172/2165-7904.1000186.

Raidl, M., Spain, K., Lanting, R., Lockard, M., Johnson, S., Spencer, M., . . . Hartman-Cunningham, M. (2007). The healthy diabetes plate. Preventing Chronic Disease, 4(1), A12-A12.

Rana, J. S., Li, T. Y., Manson, J. E., & Hu, F. B. (2007). Adiposity compared with physical inactivity and risk of type 2 diabetes in women. Diabetes Care, 30(1), 53-58. doi:10.2337/dc06-1456

Rees, K., Dyakova, M., Wilson, N., Ward, K., Thorogood, M., & Brunner, E. (2013). Dietary advice for reducing cardiovascular risk. Cochrane Database of Systematic Reviews(12). doi:10.1002/14651858.CD002128.pub5

Rizor, H. M., & Richards, S. (2000). All our patients need to know about intensified diabetes management they learned in fourth grade. Diabetes Educ, 26(3), 392-394, 396, 400-392 passim. doi:10.1177/014572170002600307

Rolls, B. J., Roe, L. S., & Meengs, J. S. (2010). Portion size can be used strategically to increase vegetable consumption in adults. The American journal of clinical nutrition, 91(4), 913-922. doi:10.3945/ajcn.2009.28801

© COPYRIGHT UPM

Rosenstock, I. M., Strecher, V. J., & Becker, M. H. (1988). Social learning theory and the Health Belief Model. Health Educ Q, 15(2), 175-183. doi:10.1177/109019818801500203

Rosner, B. (2010). Fundamentals of Biostatistics (BROOKS/COLE Ed. Seven Edition ed.). USA: Harvard University.

Ross, R., Neeland, I. J., Yamashita, S., Shai, I., Seidell, J., Magni, P., . . . Després, J.-P. (2020). Waist circumference as a vital sign in clinical practice: a Consensus Statement from the IAS and ICCR Working Group on Visceral Obesity. Nature reviews. Endocrinology, 16(3), 177-189. doi:10.1038/s41574-019-0310-7

Rostambeigy, P., Ghaemi, S. Z., Shirazi, F. M., & Hashemi, N. (2014). The Effects of Nutrition Education and Insulin Injection Training on Glycemic Control in Iranian Patients with Type 1 Diabetes.

Rothman, Malone, R., Bryant, B., Horlen, C., DeWalt, D., & Pignone, M. (2004a). The relationship between literacy and glycemic control in a diabetes disease-management program. Diabetes Educ, 30(2), 263-273. doi:10.1177/014572170403000219

Saadi, H., Carruthers, S. G., Nagelkerke, N., Al-Maskari, F., Afandi, B., Reed, R., . . . Benedict, S. (2007). Prevalence of diabetes mellitus and its complications in a population-based sample in Al Ain, United Arab Emirates. Diabetes Res Clin Pract, 78(3), 369-377. doi:10.1016/j.diabres.2007.04.008

Sabag, A., Way, K. L., Keating, S. E., Sultana, R. N., O'Connor, H. T., Baker, M. K., . . . Johnson, N. A. (2017). Exercise and ectopic fat in type 2 diabetes: A systematic review and meta-analysis. Diabetes Metab, 43(3), 195-210. doi:10.1016/j.diabet.2016.12.006

Saeed, H., Saleem, Z., Naeem, R., Shahzadi, I., & Islam, M. (2018). Impact of health literacy on diabetes outcomes: a cross-sectional study from Lahore, Pakistan. Public Health, 156, 8-14. doi:10.1016/j.puhe.2017.12.005

Saghaei, M. (2004). Random allocation software for parallel group randomized trials. BMC Med Res Methodol, 4, 26. doi:10.1186/1471-2288-4-26

Sainsbury, E., Kizirian, N., Partridge, S., Gill, T., Colagiuri, S., & Gibson, A. (2018). Effect of dietary carbohydrate restriction on glycemic control in adults with diabetes: A systematic review and meta-analysis. Diabetes Research and Clinical Practice, 139. doi:10.1016/j.diabres.2018.02.026

© COPYRIGHT UPM

Salahshouri, A., Zamani Alavijeh, F., Mahaki, B., & Mostafavi, F. (2018). Effectiveness of educational intervention based on psychological factors on achieving health outcomes in patients with type 2 diabetes. Diabetol Metab Syndr, 10, 67-67. doi:10.1186/s13098-018-0368-8

Salimi, Momtazi, S., & Zenuzian, S. (2016). A Review on Effectiveness of Motivational Interviewing in the Management of Diabetes Mellitus. J Psychol Clin Psychiatry 5(4): 00294. DOI: 10.15406/jpcpy.2016.05.00294.

Salimi, Sarchahi, S., Zolfaghari, P., Daghyanous, B., Mozaffari, H., Montazeri, M., & Sohrabi, M. B. (2017). Health Literacy among Patients with Diabetes Mellitus Type 2 in Northeast Area of Iran. International Journal of Health Studies; Volume 3, Issue 1, 2017DO - 10.22100/ijhs.v3i1.183.

Sami, W., Ansari, T., Shafique, B. N., & Ab, H. M. R. (2017). Effect of diet on type 2 diabetes mellitus: A review. International Journal of Health Sciences, 11(2), 65-71.

Sapra, A., & Bhandari, P. (2020). Diabetes Mellitus. [Updated 2020 Jun 7]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2020 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK551501/.

Saslow, L. R., Mason, A. E., Kim, S., Goldman, V., Ploutz-Snyder, R., Bayandorian, H., . . . Moskowitz, J. T. (2017). An Online Intervention Comparing a Very Low-Carbohydrate Ketogenic Diet and Lifestyle Recommendations Versus a Plate Method Diet in Overweight Individuals With Type 2 Diabetes: A Randomized Controlled Trial. J Med Internet Res, 19(2), e36. doi:10.2196/jmir.5806

Sattar, A. N. (2015). The Adequateness of Glycemic Control in Type 2 Diabetes Mellitus. Medical Journal of Babylon, 12(4), 1129-1136.

Sattar, A. N. (2013). Gender aspects in type 2 diabetes mellitus and cardiometabolic risk. Best Pract Res Clin Endocrinol Metab, 27(4), 501-507. doi:10.1016/j.beem.2013.05.006

Schillinger, D., Grumbach, K., Piette, J., Wang, F., Osmond, D., Daher, C., . . . Bindman, A. B. (2002). Association of health literacy with diabetes outcomes. Jama, 288(4), 475-482.

Schillinger, D., Piette, J., Grumbach, K., Wang, F., Wilson, C., Daher, C., . . . Bindman, A. B. (2003). Closing the loop: physician communication with diabetic patients who have low health literacy. Arch Intern Med, 163(1), 83-90. doi:10.1001/archinte.163.1.83

© COPYRIGHT IPM

Schulz, K. F., Altman, D. G., Moher, D., & Group, C. (2010). CONSORT 2010 Statement: updated guidelines for reporting parallel group randomised trials. BMC Med, 8, 18. doi:10.1186/1741-7015-8-18

Scott, T. L., Gazmararian, J. A., Williams, M. V., & Baker, D. W. (2002). Health literacy and preventive health care use among Medicare enrollees in a managed care organization. Med Care, 40(5), 395-404.

Seidell, J. C. (2010). Waist circumference and waist/hip ratio in relation to all-cause mortality, cancer and sleep apnea. Eur J Clin Nutr, 64(1), 35-41. doi:10.1038/ejcn.2009.71

Shabibi, P., Zavareh, M., Sayehmiri, K., Qorbani, M., Safari, O., Rastegarimehr, B., & Mansourian, M. (2017). Effect of educational intervention based on the Health Belief Model on promoting self-care behaviors of type-2 diabetes patients. Electronic physician, 9(12), 5960-5968. doi:10.19082/5960

Shamshirgaran, S. M., Mamaghanian, A., Aliasgarzadeh, A., Aiminisani, N., Iranparvar-Alamdari, M., & Ataie, J. (2017). Age differences in diabetes-related complications and glycemic control. BMC Endocrine Disorders, 17(1), 25. doi:10.1186/s12902-017-0175-5

Sharifirad, Hazavehie, S. M., Mohebi, S., Rahimi, M. A., & Hasanzadeh, A. (2006). The effect of educational programme based on Health Belief Model (HBM) on the foot care by type II diabetic patients. Iranian Journal of Endocrinology and Metabolism, 8(3), 231-239.

Sharifirad, Najimi, A., Hassanzadeh, A., & Azadbakht, L. (2011). Application of BASNEF educational model for nutritional education among elderly patients with type 2 diabetes: improving the glycemic control. J Res Med Sci, 16(9), 1149-1158.

Sharifirad, G., Entezari, M. H., Kamran, A., & Azadbakht, L. (2009). The effectiveness of nutritional education on the knowledge of diabetic patients using the health belief model. Journal of research in medical sciences: the official journal of Isfahan University of Medical Sciences, 14(1), 1.

Sherman, J., & Muehlhoff, E. (2007). Developing a nutrition and health education program for primary schools in Zambia. J Nutr Educ Behav, 39(6), 335-342. doi:10.1016/j.jneb.2007.07.011

Shirai, K., Saiki, A., Oikawa, S., Teramoto, T., Yamada, N., Ishibashi, S., . . . Saito, Y. (2013). The effects of partial use of formula diet on weight reduction and metabolic variables in obese type 2 diabetic patients--multicenter trial. Obes Res Clin Pract, 7(1), e43-54. doi:10.1016/j.orcp.2012.03.002

© COPYRIGHT UPM

Shrivastava, S. R., Shrivastava, P. S., & Ramasamy, J. (2013). Role of self-care in management of diabetes mellitus. Journal of diabetes and metabolic disorders, 12(1), 14-14. doi:10.1186/2251-6581-12-14

Silva, D. A. S., Naghavi, M., Duncan, B. B., Schmidt, M. I., de Souza, M. d. F. M., & Malta, D. C. (2019). Physical inactivity as risk factor for mortality by diabetes mellitus in Brazil in 1990, 2006, and 2016. Diabetol Metab Syndr, 11, 23-23. doi:10.1186/s13098-019-0419-9

Smith, M. P., Berdel, D., Nowak, D., Heinrich, J., & Schulz, H. (2016). Physical Activity Levels and Domains Assessed by Accelerometry in German Adolescents from GINIplus and LISAplus. PLoS One, 11(3), e0152217. doi:10.1371/journal.pone.0152217

Song, X., Jousilahti, P., Stehouwer, C. D., Soderberg, S., Onat, A., Laatikainen, T., . . . Qiao, Q. (2013). Comparison of various surrogate obesity indicators as predictors of cardiovascular mortality in four European populations. Eur J Clin Nutr, 67(12), 1298-1302. doi:10.1038/ejcn.2013.203

Souza, J. G., Apolinario, D., Magaldi, R. M., Busse, A. L., Campora, F., & Jacob-Filho, W. (2014). Functional health literacy and glycaemic control in older adults with type 2 diabetes: a cross-sectional study. BMJ Open, 4(2), e004180. doi:10.1136/bmjopen-2013-004180

Squires, A., Sindi, A., & Fennie, K. (2010). Health system reconstruction: Perspectives of Iraqi physicians. Glob Public Health, 5(6), 561-577. doi:10.1080/17441690903473246

Squires, A., Sindi, A., & Fennie, K. (2006). Reconstructing a health system and a profession: priorities of Iraqi nurses in the Kurdish region. ANS Adv Nurs Sci, 29(1), 55-68. doi:10.1097/00012272-200601000-00006

Stratton, I. M., Adler, A. I., Neil, H. A., Matthews, D. R., Manley, S. E., Cull, C. A., . . . Holman, R. R. (2000). Association of glycaemia with macrovascular and microvascular complications of type 2 diabetes (UKPDS 35): prospective observational study. BMJ, 321(7258), 405-412.

Strom, J., Lynch, C., & Egede, L. (2011). Rural/Urban Variations in Diabetes Self-Care and Quality of Care in a National Sample of US Adults With Diabetes. The Diabetes educator, 37, 254-262. doi:10.1177/0145721710394875

© COPYRIGHT UPM

Takahashi, K., Kamada, C., Yoshimura, H., Okumura, R., Iimuro, S., Ohashi, Y., . . . Ito, H. (2012). Effects of total and green vegetable intakes on glycated hemoglobin A1c and triglycerides in elderly patients with type 2 diabetes mellitus: the Japanese Elderly Intervention Trial. Geriatr Gerontol Int, 12 Suppl 1, 50-58. doi:10.1111/j.1447-0594.2011.00812.x

Tang, Y. H., Pang, S. M., Chan, M. F., Yeung, G. S., & Yeung, V. T. (2008). Health literacy, complication awareness, and diabetic control in patients with type 2 diabetes mellitus. J Adv Nurs, 62(1), 74-83. doi:10.1111/j.1365-2648.2007.04526.x

Tavakoly Sany, S. B., Peyman, N., Zadehahmad, Z., Ferns, G., & Doosti, H. (2019). Effect of educational interventions on health literacy in patients with heart failure. International Journal of Health Promotion and Education, 57(1), 23-36. doi:10.1080/14635240.2018.1545597

Tay, J., Thompson, C. H., Luscombe-Marsh, N. D., Wycherley, T. P., Noakes, M., Buckley, J. D., . . . Brinkworth, G. D. (2018). Effects of an energy-restricted low-carbohydrate, high unsaturated fat/low saturated fat diet versus a high-carbohydrate, low-fat diet in type 2 diabetes: A 2-year randomized clinical trial. Diabetes Obes Metab, 20(4), 858-871. doi:10.1111/dom.13164

Temple, J., Johnson, K., Archer, K., Lacarte, A., Yi, C., & Epstein, L. (2011). Influence of simplified nutrition labeling and taxation on laboratory energy intake in adults. Appetite, 57, 184-192. doi:10.1016/j.appet.2011.04.018

Templeton, F. (2011). A Two-Step Approach for Transforming Continuous Variables to Normal: Implications and Recommendations for IS Research. Communications of the Association for Information Systems, 28. 41-58. 10.17705/1CAIS.02804.

Teo, K., Chow, C. K., Vaz, M., Rangarajan, S., & Yusuf, S. (2009). The Prospective Urban Rural Epidemiology (PURE) study: examining the impact of societal influences on chronic noncommunicable diseases in low-, middle-, and high-income countries. Am Heart J, 158(1), 1-7.e1. doi:10.1016/j.ahj.2009.04.019

Thomas, E. R., Brackenridge, A., Kidd, J., Kariyawasam, D., Carroll, P., Colclough, K., & Ellard, S. (2016). Diagnosis of monogenic diabetes: 10-Year experience in a large multi-ethnic diabetes center. J Diabetes Investig, 7(3), 332-337. doi:10.1111/jdi.12432

© COPYRIGHT UPM

Thompson, J., & Hill, H. (2016). Health literacy as a moderator in the relationship between diabetes knowledege and diabetes outcomes. University of Southern Mississippi, Hattiesburg :. Retrieved from http://aquila.usm.edu/cgi/viewcontent.cgi?article=1390&context=dissertations ElectronicBooks database.

Tiew, K. F. (2015). Efficacy of a Plate Model on Glycemic Control among Individuals with Type 2 Diabetes Mellitus. (PhD.), UPM, Malaysia.

Tikkanen, & Urho. (2009). Free school meals, the plate model and food choices in Finland. . British Food Journal. 111. 102-119. 10.1108/00070700910931940.

Tooze, J. A., Krebs-Smith, S. M., Troiano, R. P., & Subar, A. F. (2012). The accuracy of the Goldberg method for classifying misreporters of energy intake on a food frequency questionnaire and 24-h recalls: comparison with doubly labeled water. European Journal Of Clinical Nutrition, 66(5), 569-576. doi:10.1038/ejcn.2011.198

Tseng, H. M., Liao, S. F., Wen, Y. P., & Chuang, Y. J. (2017). Stages of change concept of the transtheoretical model for healthy eating links health literacy and diabetes knowledge to glycemic control in people with type 2 diabetes. Prim Care Diabetes, 11(1), 29-36. doi:10.1016/j.pcd.2016.08.005

Umpierre, D., Ribeiro, P. A., Kramer, C. K., Leitao, C. B., Zucatti, A. T., Azevedo, M. J., . . . Schaan, B. D. (2011). Physical activity advice only or structured exercise training and association with HbA1c levels in type 2 diabetes: a systematic review and meta-analysis. Jama, 305(17), 1790-1799. doi:10.1001/jama.2011.576

Vallis, M., Ruggiero, L., Greene, G., Jones, H., Zinman, B., Rossi, S., . . . Prochaska, J. O. (2003). Stages of Change for Healthy Eating in Diabetes. Relation to demographic, eating-related, health care utilization, and psychosocial factors, 26(5), 1468-1474. doi:10.2337/diacare.26.5.1468

Vazini, H., & Barati, M. (2014). The Health Belief Model and Self-Care Behaviors among Type 2 Diabetic Patients. Iranian Journal of Diabetes and Obesity, 6(3), 107-113.

Verheggen, R. J., Maessen, M. F., Green, D. J., Hermus, A. R., Hopman, M. T., & Thijssen, D. H. (2016). A systematic review and meta-analysis on the effects of exercise training versus hypocaloric diet: distinct effects on body weight and visceral adipose tissue. Obes Rev, 17(8), 664-690. doi:10.1111/obr.12406

© COPYRIGHT UPM

Wahbeh, H. E., S. M.; Oken, B. S. (2008). Mind-body interventions: applications in neurology. Neurology, 70(24), 2321-2328. doi:10.1212/01.wnl.0000314667.16386.5e

Wan, W., Juni, M., Ariffin, A., & Rahman, Z. (2016). Factors Associated with Glycaemic Control among Type 2 Diabetes Mellitus Patients. International Journal of Public Health and Clinical Sciences, 3, 89-102.

Wang, Fang, J. C., Gao, Z. H., Zhang, C., & Xie, S. Y. (2016). Higher intake of fruits, vegetables or their fiber reduces the risk of type 2 diabetes: A meta-analysis. J Diabetes Investig, 7(1), 56-69. doi:10.1111/jdi.12376

Wang, Liu, K., Mi, M., & Wang, J. (2014). Effect of fruit juice on glucose control and insulin sensitivity in adults: a meta-analysis of 12 randomized controlled trials. PLoS One, 9(4), e95323. doi:10.1371/journal.pone.0095323

Wang, Wang, Q., Hong, Y., Ojo, O., Jiang, Q., Hou, Y., . . . Wang, X. (2018). The Effect of Low-Carbohydrate Diet on Glycemic Control in Patients with Type 2 Diabetes Mellitus. Nutrients, 10(6), 661. doi:10.3390/nu10060661

Wattana, C., Srisuphan, W., Pothiban, L., & Upchurch, S. L. (2007). Effects of a diabetes self-management program on glycemic control, coronary heart disease risk, and quality of life among Thai patients with type 2 diabetes. Nurs Health Sci, 9(2), 135-141. doi:10.1111/j.1442-2018.2007.00315.x

Welch, Antoine, J., Berta, J., Bub, A., de Vries, J., Guarner, F., . . . International Life Sciences Institute Europe Functional Foods Task, F. (2011). Guidelines for the design, conduct and reporting of human intervention studies to evaluate the health benefits of foods. Br J Nutr, 106 Suppl 2, S3-15. doi:10.1017/S0007114511003606

Welch, G., Rose, G., & Ernst, D. (2006). Motivational Interviewing and Diabetes: What Is It, How Is It Used, and Does It Work? Diabetes Spectrum, 19(1), 5-11. doi:10.2337/diaspect.19.1.5

West, J. D., & Goldberg, K. L. (2002). Diabetes self-care knowledge among outpatients at a Veterans Affairs medical center. Am J Health Syst Pharm, 59(9), 849-852. doi:10.1093/ajhp/59.9.849

Whittemore, R., & Grey, M. (2002). The systematic development of nursing interventions. J Nurs Scholarsh, 34(2), 115-120.

© COPYRIGHT UPM

WHO. (2018). Nutrition interventions. e-Library of Evidence for Nutrition Actions (eLENA) Retrieved from http://www.who.int/elena/intervention/en/

WHO. (2016a). Global report on diabetes. Geneva, World Health Organization. Retrieved from

WHO. (2011a). Waist circumference and waist–hip ratio, Report of a WHO expert consultation, Geneva, 8-11 December 2008. (ISBN: 978 92 4 150149 1). Retrieved from http://www.who.int/nutrition/publications/obesity/WHO_report_waist circumference_and_waisthip_ratio/en/

WHO. (2004). The International Classification of adult underweight, overweight and obesity according to BMI. Global Database on Body Mass Index. Retrieved APRIL 2018, from WHO http://apps.who.int/bmi/index.jsp?introPage=intro_3.html

WHO. (1996). Health Education For People With Diabetes (pp. 58). Eygept WHO/EMRO.

Williams, Baker, D. W., Parker, R. M., & Nurss, J. R. (1998). Relationship of functional health literacy to patients' knowledge of their chronic disease. A study of patients with hypertension and diabetes. Arch Intern Med, 158(2), 166-172. doi:10.1001/archinte.158.2.166

Williams, Colagiuri, S., Chan, J., Gregg, E., Ke, C., Lim, L.-L., & Yang, X. (2019). IDF Atlas 9th Edition 2019.

Williamson, D. F., Thompson, T. J., Thun, M., Flanders, D., Pamuk, E., & Byers, T. (2000). Intentional weight loss and mortality among overweight individuals with diabetes. Diabetes Care, 23(10), 1499-1504.

Wilna, O.-T. N., Carin. . (2011). Nutrition education tools for primary school children in the Vaal region. . Development Southern Africa. 28. 283-292. 10.1080/0376835X.2011.570075.

Wolever, T. M. (2016). Nutrition and Diabetes. Can J Diabetes, 40(4), 277. doi:10.1016/j.jcjd.2016.05.019

Wolfenden, L., & Wiggers, J. (2007). Addressing the health costs of the Iraq war: the role of health organisations. Med J Aust, 186(7), 380-381.

Wong, J. M., & Jenkins, D. J. (2007). Carbohydrate digestibility and metabolic effects. J Nutr, 137(11 Suppl), 2539s-2546s.

© COPYRIGHT UPM

Yamazaki, D., Hitomi, H., & Nishiyama, A. (2018). Hypertension with diabetes mellitus complications. Hypertens Res, 41(3), 147-156. doi:10.1038/s41440-017-0008-y

Yannakoulia, M. (2006). Eating behavior among type 2 diabetic patients: a poorly recognized aspect in a poorly controlled disease. Rev Diabet Stud, 3(1), 11-16. doi:10.1900/RDS.2006.3.11

Yasir, A. A. (2014). Determination of health care awareness at the patients toward diabetic foot in Al-Hila teaching hospital. Kufa Journal for Nursing Sciences, 2(2), 4.

Ye, M., Robson, P. J., Eurich, D. T., Vena, J. E., Xu, J.-Y., & Johnson, J. A. (2019). Anthropometric changes and risk of diabetes: are there sex differences? A longitudinal study of Alberta's Tomorrow Project. BMJ Open, 9(7), e023829-e023829. doi:10.1136/bmjopen-2018-023829

Young, D. R., Steckler, A., Cohen, S., Pratt, C., Felton, G., Moe, S. G., . . . Raburn, B. (2008). Process evaluation results from a school- and community-linked intervention: the Trial of Activity for Adolescent Girls (TAAG). Health Educ Res, 23(6), 976-986. doi:10.1093/her/cyn029

Zareban, I., Karimy, M., Niknami, S., Haidarnia, A., & Rakhshani, F. (2014). The effect of self-care education program on reducing HbA1c levels in patients with type 2 diabetes. Journal of education and health promotion, 3, 123. doi:10.4103/2277-9531.145935

Zhang, Y., & Chu, L. (2018). Effectiveness of Systematic Health Education Model for Type 2 Diabetes Patients. Int J Endocrinol, 2018, 6530607-6530607. doi:10.1155/2018/6530607

Zheng, Y. P., Wu, L. F., Su, Z. F., & Zhou, Q. H. (2014). Development of a diabetes education program based on modified AADE diabetes education curriculum. Int J Clin Exp Med, 7(3), 758-763.

Ziemer, D. C., Berkowitz, K. J., Panayioto, R. M., El-Kebbi, I. M., Musey, V. C., Anderson, L. A., . . . Phillips, L. S. (2003). A simple meal plan emphasizing healthy food choices is as effective as an exchange-based meal plan for urban African Americans with type 2 diabetes. Diabetes Care, 26(6), 1719-1724. doi:10.2337/diacare.26.6.1719

Zimbabwe_Hand_Jive. The Zimbabwe Hand Jive: A Simple Method of Portion Control. [(accessed on 2 December 2019)].

© COPYRIGHT UPM

BIODATA OF STUDENT

Saman Agad Hashim was born on 11th April 1979 in Najaf, Iraq. He started primary school at Al-Thaora school in Erbil. Later, he continued his secondary school at Al-Farazdak School in Basrah. He had finished his high school at Al-Shaab School in Basrah. In 2000, he did his university education at the medical institute, Southern Technical University, in Basrah, and graduated in 2003 with a Diploma in community health. After graduated, he was offered as a medical assistant at Al-Sader Teaching Hospital in Basrah before persuading his Bachelor and master's degrees. In 2008, he completed his Bachelor of Science (Community Health) at the faculty of medical technology, Middle Technical University, in Baghdad. Almost three years before persuading his Master, he had involved as a health educator in the public health clinic in Al-Sader Teaching Hospital in Basrah City. In 2011, he received his master's degree in Medical Sciences (Community Health) at the faculty of medical technology, Middle Technical University, in Baghdad with a thesis entitled "Risk Factors of Low birthweight Neonates in Governmental Hospitals in Basrah City." Almost six years before persuading his Ph. D, he was involved in the nutrition clinic as a nutritionist at Al-Sader Teaching Hospital in Basrah. He improved and gained more knowledge and experience in managing weight and dietary planning. He persuaded his Ph.D. in the year 2017 – 2020. He continues his Ph.D. due to his interest in Clinical Nutrition in Universiti Putra Malaysia (UPM).

© COPYRIGHT UPM

LIST OF PUBLICATIONS

Journals:

Hashim, S. A., Barakatun-Nisak, M. Y., Abu Saad, H., Ismail, S., Hamdy, O., & Mansour, A. A. (2020). Association of Health Literacy and Nutritional Status Assessment with Glycemic Control in Adults with Type 2 Diabetes Mellitus. . Nutrients 2020, 12, 3152.

Hashim, S. A., Barakatun-Nisak, M. Y., Abu Saad, H., Ismail, S., Hamdy, O., & Mansour, A. A. (2021). Effectiveness of Simplified Diabetes Nutrition Education on Glycemic Control and other Diabetes-related Outcomes in Patients with Type 2 Diabetes Mellitus. Clinical Nutrition ESPEN. doi:https://doi.org/10.1016/j.clnesp.2021.07.024.

Wafaa, F. T., & **Saman, A. H.** (2012). Risk Factors of Lowbirthweight Neonates at Governmental Hospitals in Basrahcity *The Medical Journal of Basrah University, 30*(1), 40-48.

© COPYRIGHT UPM

UNIVERSITI PUTRA MALAYSIA

STATUS CONFIRMATION FOR THESIS / PROJECT REPORT AND COPYRIGHT

ACADEMIC SESSION : _____

TITLE OF THESIS / PROJECT REPORT :

_____

_____

_____

NAME OF STUDENT : _____

I acknowledge that the copyright and other intellectual property in the thesis/project report belonged to Universiti Putra Malaysia and I agree to allow this thesis/project report to be placed at the library under the following terms:

1. This thesis/project report is the property of Universiti Putra Malaysia.
2. The library of Universiti Putra Malaysia has the right to make copies for educational purposes only.
3. The library of Universiti Putra Malaysia is allowed to make copies of this thesis for academic exchange.

I declare that this thesis is classified as :

*Please tick (√)

☐	**CONFIDENTIAL**	(Contain confidential information under Official Secret Act 1972).
☐	**RESTRICTED**	(Contains restricted information as specified by the organization/institution where research was done).
☐	**OPEN ACCESS**	I agree that my thesis/project report to be published as hard copy or online open access.

This thesis is submitted for :

☐	**PATENT**	Embargo from_____ until _____ (date) (date)

Approved by:

_____	_____
(Signature of Student)	(Signature of Chairman of Supervisory Committee)
New IC No/ Passport No.:	Name:
Date :	Date :

[Note : If the thesis is CONFIDENTIAL or RESTRICTED, please attach with the letter from the organization/institution with period and reasons for confidentially or restricted.]