DOI: https://doi.org/10.53350/pjmhs22166532

ORIGINAL ARTICLE

Efficacy of Health Belief Model in improving Exercise Behaviors to Prevent Diabetes Mellitus Among Mosul University Employees

FAROUK MOHAMMED NOUR[1], MOHAMMED QASSIM BAKTASH[2]
[1]Telfer sector for primary health care, Nineveh Health Department, Iraqi Ministry of Health, City of Telfer, Iraq; MSN in CHN
[2]Department of clinical nursing science, College of Nursing, University of Telfer, City of Telfer, Iraq. Ph.D. CHEN
Corresponding author: Farouk Muhammed Nour, Email: faroukqaplan92@gmail.com

ABSTRACT

Diabetes is a serious public health problem, and exercise plays an important role in preventing it. The purpose of this study is to determine the efficacy model of Health belief-based health education in improving exercise behaviors among Mosul University employees to prevent Diabetes disease. This study used an experimental design by employing a randomized control approach. The study comprised 81 individuals selected by using a simple random sampling method from five colleges of Mosul University. The sample is divided into two groups: the experimental (41) subjects and the control group (40) individuals. The data is gathered three times (T1, T2, and T3) by adopting the exercise health belief model scale. The study revealed that the sample's mean age (SD) is 45.26 (SD = 8.59) and most of the participants are male (59.3%) and have bachelor's degree certificates (40.7%). On the other hand, the study indicated a significant change in participants' perceived seriousness, F (2, 79) = 9.265, P < .000, perceived benefits of exercise in preventing diabetes, F (2, 79) = 7.868, P < .001, perceived barrier F (2,79) = 7.643, p = 0. 001. The Bonofonei test proved that the change in participants' beliefs is related to the experimental group. This study is clinically important because it shows the role of health education in enhancing some beliefs related to exercise and its role in Diabetes prevention.

Keywords: Health Belief Model, Exercise, Diabetes Meletus

INTRODUCTION

Diabetes is considered one of the significant public health problems that have reached epidemic proportions in many countries around the world, affecting more than half a billion people globally. It is the world's fastest-growing health crisis in the twenty-first century (1,2).

Globally, diabetes' seriousness is demonstrated not only by its propensity to kill its victims (1.5 million people died as a result of diabetes and its complications worldwide in 2021) but also by its ability to impose a significant biopsychosocial burden on those who are affected by it . From a local perspective, the disease is steadily increasing among members of Iraqi society (4,5).

However, diabetes (specifically type II) is among a limited number of preventable diseases (5.6). There are over ten risk factors that might be used to eliminate and/or prevent diabetes (7,8). Among these factors, exercise and physical activity are considered the most beneficial ones (9,10).

The Health Beliefs Model is the most popular and well-known educational theory in guiding disease health education programs (11,12). Some studies indicate the success of the Health Beliefs Model in improving preventive behaviors for many diseases, such as stroke, atrial hypertension, and heart disease (13,14,15,16).

Unfortunately, there are rare studies indicating the role of health beliefs in shaping the preventive behaviors of diabetes mellitus. The purpose of this study is to determine the efficacy model of Health belief-based health education in improving exercise behaviors among Mosul University employees to prevent Diabetes disease(17,18).

METHODOLOGY

Aim of the Study: The purpose of this study is to determine the efficacy model of Health belief-based health education in improving exercise behaviors among Mosul University employees to prevent Diabetes disease

Design of the study: This study is conducted by using an experimental design employing a randomized controlled trial approach.

Setting and Time: The study is being conducted in Iraq, namely in the governorate of Nineveh and at Mosul University. Specifically, the study is conducted in five colleges at the University of Mosul. All of the selected faculties were located on the first campus of the University of Mosul. These randomly selected Colleges and faculties were the college of Arts, the College of Education for Humanities, the College of Education for Girls, the College of Education for Pure Sciences, and the College of Education. The data collection was done in the period between the 12th of January to the 28th of March 2022.

Sampling: The target population for this study is the Mosul University employees. A sampling frame consisted of 750 employees distributed in five colleges at the University of Mosul. The sample size was calculated by using G-Power software with the following parameters (F-Teats ANOVA repeated measure with between interaction, effect size 0.15, alpha error (0.5), and Beta error (0.8). The total estimated sample size was 74 subjects. The study consisted participation of 81 individuals selected randomly by using simple random sampling methods. The exclusion criteria included the University of Mosul employees with diabetes and /or employers with severe psychological problems as well as the employees of the Colleges of the Medical Group at the University of Mosul.

Randomization: Following the participant's informed permission, simple randomization was used to divide the individuals into two groups: experimental (intervention) and control (control) (non-intervention). The random allocation number was obtained using the Statistical Package for the Social Sciences (SPSS) software after each participant was assigned a specific number. After the last phase of randomization, the experimental group had 41 subjects and the control group had 40.

Data collection and Instrumentation: The study's instruments were composed of two parts, which contained the following.

Part I: this part is developed to investigate the sociodemographic characteristics, behavioral habits, and clinical history of the participants. The part includes questions about participants (age, gender, educational level, smoking and alcohol consumption, and clinical risk factors related to diabetes).

Part II: This part of the scale involved the use of a diabetes-exercise-related attitude and beliefs scale. This scale is developed by (Wu et al., 2020). the scale consisted of 14 questions. The items of the scale are distributed among four subscales [perceived seriousness subscale (4) items, perceived susceptibility subscale (3) items, perceived benefits subscale (3) items, perceived barriers subscale (4) items]. The questions of the scale were measured by a 5-point Likert scale. The answer The responses ranged from (1) strongly disagree to (5) strongly agree, with a higher score indicating a more positive perception.

Validity and reliability of the instrument: The questionnaire's validity was determined by presenting it to thirteen (13) professionals in nursing and medicine. Some components were altered and others were modified by the expert's suggestions.

Data from ten employees who were not included in the research were used to verify the instrument's reliability. Cronbach's alphas were used to assess the research instrument's internal consistency (Table 1). The questionnaire's overall internal consistency was acceptable; α=0.79.

Table 1: Internal Consistency of the Study Instrument

Beliefs:	Items	α
perceived seriousness subscale	4	0.8
perceived susceptibility subscale	3	0.9
perceived benefit subscale	3	0.8
perceived barrier subscale	4	0.7

α: Cronbach's alphas

Procedures: After completing the randomization processes and allocating the recruited employees into groups, a baseline assessment of participants' demographical status, behavioral habits, clinical history, and beliefs related to diabetes were performed in the time 0 (T0) test. This procedure is followed by time1 (T1) in which health education about diabetes disorder is provided to the intervention group participants.

Diabetes health education takes about two hours. The contents of health education were delivered to the experimental group participants using a lecture technique using PowerPoint, a data display device, and diabetes figures. The information was divided into two sections and presented by the concepts of the health belief model.

The first section of the lecture, in particular, concentrated on three diabetes-related topics: (1) Diabetes pathophysiology: This included the definition of diabetes, as well as its causes, kinds, signs, and typical symptoms. (2) Diabetes susceptibility: It discussed modifiable and non-modifiable diabetes risk factors, as well as what makes certain individuals more susceptible to developing diabetes. (3) Diabetes severity: included information on the consequences and severity of diabetes.

Part Two: During this section, participants were given information on how to protect themselves against diabetes.

However, emphasis has been placed on the benefits of exercise, and how to remove barriers to practicing exercise.

Two months later, the investigator made further visits to the target colleges and a sample from each group was invited to answer the questionnaire for another time (the post-test 2). This test was necessary to measure the effectiveness of educational sessions in inducing persistent changes in participants' beliefs.

Data analysis: The Statistical Package for Social Science (SPSS) software for Windows Version 25 was used to analyses the data.

RESULTS

Table 2 shows that the mean age (SD) of participants is 45.26 (8.59). The overall mean (SD) BMI of participants = 27.82(4.30).

Concerning D. M's exercise-related beliefs the overall mean (SD) of participants' beliefs about the seriousness of D.M is 2.92 (0.66), susceptibility of diabetes is 3.75 (0.82), benefits of exercise preventing diabetes is 3.76 +(0.76) and perceived barrier to practicing exercise is 2.83 (0.87).

Regarding other characteristics, the majority of participants are male, have bachelor's degree certificates, never smoked, and practice physical activity (1-2) times per week.

On the other hand, the most frequent risk factors of D.M diagnosed among participants are family history of diabetes, arterial hypertension, and hypercholesterolemia.

Finally, table 2 illustrated that there are no statistically significant differences in the baseline (T0) test of participants' characteristics and beliefs between groups

Table 2: homogeneity in the characteristics and beliefs of study participants n= (81)

	Experimental (n=41)		Control (n = 40)		Total (n=81)		
Anthropometric	M	SD	M	SD	M	SD	t
Age	45.66	8.68	44.85	8.58	45.26	8.59	.421
BMI	27.76	3.91	27.88	4.71	27.82	4.30	-.117
Beliefs							
Perceived Seriousness	2.87	.67	2.98	.66	2.92	.66	-.777
Perceived Susceptibility	3.21	.84	2.92	.79	3.07	.82	1.592
Perceived Benefit	3.84	.69	3.68	.83	3.76	.76	.949
Perceived Barrier	2.68	.83	2.99	.71	2.83	.78	-1.765
Characteristics							
Gender							.018
Male	24	58.5	24	60.0	48	59.3	
Female	17	41.5	16	40.0	33	40.7	
Educational level							1.330
Illiterate	0	00	1	2.5	1	1.2	
Write and read	2	4.9	3	7.5	5	6.2	
Elementary school	7	17.1	6	15	13	16	
Intermediate school	17	41.5	16	40	3	40.7	
High school and postgraduate	15	36.6	14	35	29	35.8	
Behavioral habits							
Smoking							.115
Never smoked	30	73.2	28	70.0	58	71.6	
Currently smoker	8	19.5	9	22.5	17	21.0	
Stopped smoking	3	7.3	3	7.5	6	7.4	
Physical activity							.105
Sedentary (never)	15	36.6	14	35.0	29	35.8	
1-2 days per week	16	39.0	17	42.5	33	40.7	
3 or more days / week	10	24.4	9	22.5	19	23.5	
Clinical History (diagnosed with)							
Family history of diabetes	22	53.7	26	65.0	48	59.3	1.079
Hypertension	19	46.3	18	45.0	37	45.7	.015
Hypercholesterolemia	16	39.0	12	30.0	28	34.6	.729
Heart disease	13	31.7	12	30.0	25	30.9	.028
Depression	1	2.4	3	7.5	4	4.9	1.105

F: Frequency, %: Percent, M: Mean, SD: Standard deviation, t: t-test, $\chi 2$: Chi-square, BMI: Body Mass Index, All group differences $p > 0.05$.

Table 3 represents the results of mixed-design analysis of variance (ANOVA) and descriptive statistics measuring changes in the study variables across groups and over time.

From what can be seen in Table 3, the Mean scores and Standard Deviations for the variables under study have changed over time for each participant. A mixed-design analysis of variance (ANOVA) is performed to discover how important these changes in the mean scores are and if our health education session based on the health belief model was successful in making participants' beliefs effective.

There was a factor between subjects in this analysis (ANOVA) (a group with two levels: Experimental [intervention] and control [non-intervention]) and a factor within-subjects (time of testing with three levels: T 0, T 1, T 2). At P 0.05, all effects were

considered significant. This test demonstrated that changes in the mean scores of variables are the effect of time, not of condition (group) or interaction between test time and group types.

Specifically, there is a significant main effect of time on participants perceived seriousness, F (2,79) = 9.265, P < .000, perceived benefits of exercise in preventing diabetes, F (2, 79) = 7.868, P < .001, perceived barrier F (2,79) = 7.643, p = 0.001.

As shown in Table 3 the effect size associated with changed beliefs and variables is observable, with time accountable for about 10% of the variance from changed seriousness, benefits, and barrier.

However, the perceived susceptibility shows no statically differences over time F (2, 79) = 1.822, P < .165, (Table 3). Based on results from table 3, The post-hoc approach employs the Bonferroni corrections test to identify the exact location of differences between changed beliefs and variables. This test demonstrated that the score of modified beliefs and factors varied significantly over time among experimental group members. (p< 0.05) (Table 4).

Therefore, we can conclude that the diabetes health education sessions elicit statistically significant improvement in participants' diabetes-related beliefs over time.

Table 3: The Results of a Mixed ANOVA and Descriptive Statistics Used to Measure the Variation in Concepts of Health Belief Model Across Study Groups and Over Time

HBM Concepts	Groups	M (SD) (T 0)	(T 1)	(T 2)	Multivariate F
Perceived Seriousness	Ex	2.87 (.67)	3.30 (1.00)	3.13 (.914)	F (2, 79) = 9.265, p < 0.000, η2 = 0 .105
	Co	2.98 (.66)	3.14 (.75)	3.06 (.67)	
Perceived Susceptibility	Ex	3.21 (.84)	3.34 (.877)	3.44 (.97)	F (2, 79) = 1.822, p = .165, η2 = .023
	Co	2.92 (.79)	3.02 (0.65)	2.84 (.87)	
Perceived Benefits	Ex	3.84 (.69)	4.20 (.72)	4.14 (.72)	F (2, 79) = 7.868, p < 0.001, η2 = .101
	Co	3.68 (.83)	3.81 (.83)	3.73 (.85)	
Perceived Barriers	Ex	2.68 (.83)	3.45 (1.10)	3.55 (1.13)	F (2, 79) = 7.643, p = .001, η2 = .088
	Co	2.99 (.71)	2.81 (.86)	2.92 (.98)	

HBM: Model of Health Belief, Co: Control group (n = 40), Ex: Experimental group (n = 41), SD: Standard Deviation,M: mean, Maximum beliefs score = 5, Minimum beliefs score = 1, , η2: eta square, p < 0.05 indicated in bold

Table 4: A posthoc test for beliefs and variables using the Bonferroni Corrections Procedure revealed significant changes over time.

HBM Concepts	Groups	Post hoc Using Bonferroni (T 0) vs (T 1)	(T 0) vs (T 2)	(T 1) vs (T 2)
Perceived Seriousness	Ex	0.000	0.002	1.000
	Co	0.352	1.000	0.863
Perceived Benefits	Ex	.002	.020	.332
	Co	.696	1.000	.210
Perceived Barrier	Ex	0.000	0.000	.614
	Co	.785	1.000	.448

Based on marginal means estimates. At the 0.05 level, the mean difference is significant. Bonferroni correction for multiple comparisons. Ex: Experimental group (n=41), Co: Control group (n=40), p 0.05 shown in bold.

DISCUSSION

Table 2 shows that the mean (± SD) of age is 45.26 (± 8.59). In addition, the same table demonstrated that the body mass index overall mean (± SD) for the study participants is 27.82 (± 4.30).

Concerning other demographic characteristics, it's clear that most of the participants are male and have Bachelor's degree certificates.

On the other hand, Table 2 explains the behavioral habits related to diabetes among study participants. The table illustrates that the most of habits and behaviors adopted by participants are never snookering, not drinking alcohol, and performing physical activity (1- 2 times per week).

Table 2 shows that the participant's diabetes-related beliefs at the baseline (T0) test are homogenous between the experimental and control groups. This result is consistent with the study of (Boudreau & Godin, 2014)which indicated the homogeneity of participants' beliefs and intentions to exercise between the experimental and control group.

Ultimately, Table 2 shows that the most common clinical diabetes risk factors diagnosed among participants are family history of diabetes, arterial hypertension, and hypercholesterolemia. On a gender base, ovarian cyst is the most common clinical risk factor for diabetes among females.

On the other hand, Table 3 demonstrated a significant change in the scores of some of these beliefs after the application of health belief model-based health education to experimental group participants. Specifically, the table shows that there is a high significance improvement in the scores of the three beliefs under study. These changed beliefs were the perceived seriousness of diabetes, perceived benefits of exercise in preventing diabetes, and perceived barriers to exercise(19,20).

However, Table 4 indicated that the improvements in the beliefs scores are related to the experimental group participants.

The improvement of belief scores clarifies that after the application of health belief model-based health education the participant of the experimental group felt that diabetes is a serious disease with harmful consequences. In addition, they recognized the usefulness of exercise in preventing diabetes as well as their perception of the exercise barrier is enhanced(21,22).

These results and their interpretations conclude the successful model of health belief-based health education in changing and improving some diabetes and exercise-related beliefs. These results are consistent somewhat with the results of studies (23,24,25)These studies reported the role of the education in improving exercise-related beliefs.

CONCLUSIONS

The majority of participants in the study are in middle adulthood age, overweight, male, and possess a bachelor's degree certificate. This study concludes that most university Mosul employees do not smoke tobacco or drink alcohol, consume three meals per day, adopted to using fast food during work time as well as are having a sedentary lifestyle. The study found that the most common risk factors of diabetes among university Mosul employees are family history of diabetes, arterial hypertension, and hypercholesterolemia. The study concludes the efficacy of HBM based- health education in enhancing many beliefs related to exercise behaviors and its role in preventing diabetes disease.

Ethical Considerations Compliance with Ethical Guidelines: All procedures in human-participant studies were carried out by the institutional and/or national research committee's ethical standards, as well as the 1964 Helsinki Declaration and its subsequent amendments or modifications. Informed consent was obtained from all individual participants involved in the study. This work was carried out under the research program of the nursing College at the University of Mosul.

Funding: This study can be clinically significant since it highlighted the role of health education in enhancing some of the beliefs related to exercise and its role in diabetes prevention.

Author's Contributions: Study concept; Writing the original draft;D data collection; Data analysis and Reviewing the final edition by the author.

Disclosure statement: The authors report no conflict of interest.

REFERENCES

1 Forouhi, N. G., & Wareham, N. J. (2014). Epidemiology of diabetes. Medicine (Abingdon, England: UK ed.), 42(12), 698-702. https://doi.org/10.1016/j.mpmed.2014.09.007

2 Naji AB, Ahmed MM, Younis NM. Adherence the Preventive Measure Against for COVID-19among Teachers at University of Mosul. In J Med Tox Leg Med 2021;24(3&4).pp:273_277.

3 Mahmoud Mohammed Ahmed, Nasir Muwfaq Younis and Ahmed Ali Hussein. Prevalence of Tobacco use among Health Care Workers at Primary Health care Centers in Mosul City. Pakistan Journal of Medical and Health Sciences, 2021, 15(1), pp. 421–424

4 Sun, H., Saeedi, P., Karuranga, S., Pinkepank, M., Ogurtsova, K., Duncan, B. B., Stein, C., Basit, A., Chan, J. C., & Mbanya, J. C. (2021). IDF Diabetes Atlas: Global, regional, and country-level diabetes prevalence estimates for 2021 and projections for 2045. Diabetes research and clinical practice, 109119.

5 Kerner, W., & Brückel, J. (2014). Definition, classification, and diagnosis of diabetes mellitus. Experimental and clinical endocrinology & diabetes, 122(07), 384-386.

6 Younis NM, Mahmoud M, Ahmed A, et al. University Students' Attitude Towards E-Learning. Bahrain Medical Bulletin 2021;43(2):460-2.

7 Safajou, S., Rezaeian, M., Abadi, Y. S., & Nasirzadeh, M. (2021). The Effect of Educational Intervention Based on Health Belief Model on Preventive Behaviors of Type 2 Diabetes Among at-risk Male Students.

8 Muwfaq YN, Ahmed MM, Abdulsalam RR. Assessing Quality of Life in Palliative Care. Bahrain Medical Bulletin 2021;43(3):594-6.

9 Rossen, J., Yngve, A., Hagströmer, M., Brismar, K., Ainsworth, B. E., Iskull, C., Möller, P., & Johansson, U.-B. (2015). Physical activity promotion in the primary care setting in pre-and type 2 diabetes-the Sophia step study, an RCT. BMC Public Health, 15(1), 1-11.

10 Nasir Muwfaq Younis ,Mahmoud Mohammed Ahmed, and Ahmed Ali Hussein.Nurses' knowledge, attitude and practice towards preparedness of disaster management in emergency of mosul teaching hospitals. Medico-Legal Update, 2020, 20(3), pp. 775–779.

11 Mahmood Mohammed Ahmed, Nasir Muwfaq Younis, Nawaf Mohammed Dhahir, Kareem Nasir Hussain. Acceptance of Covid-19 vaccine among nursing students of Mosul University, Iraq. Rawal Medical Journal: Apr-Jun 2022. Vol. 47, No. 2,pp:254_258

12 Fithri, R., Athiyah, U., & Zairina, E. (2021). The development and validation of the health belief model questionnaire for measuring factors affecting adherence in the elderly with hypertension. Journal of Basic and Clinical Physiology and Pharmacology, 32(4), 415-419.

13 Mirotznik, J., Feldman, L., & Stein, R. (1995). The health belief model and adherence with a community center-based supervised coronary heart disease exercise program. Journal of community health, 20(3), 233-247.

14 Organization, W. H. (1999). Definition, diagnosis, and classification of diabetes mellitus and its complications: report of a WHO consultation. Part 1, Diagnosis and classification of diabetes mellitus.

15 Muwfaq Younis N , Efficacy of Health Beliefs Model-Based Intervention in Changing Substance Use Beliefs among Mosul University Students: A Randomized Controlled Trial. Revis Bionatura 2022;7(2) 35. http://dx.doi.org/10.21931/RB/2022.07.02.35

16 Shatha Abdul Rahman H. Al-Ghurairi, Nasir Muwfaq Younis , Mahmoud Mohammed Ahmed.Prevalence of weight gain among students of Mosul University, Iraq during quarantine 2020. Rawal Medical Journal: 2022. Vol. 47, No. 3.

17 Ahmed Salem Abbas , Nasir Muwfaq Younis.Efficacy of Pender's Health Promotion-based Model on Intervention for Enhancing University of Mosul Hypertensive Employees' Eating Behaviors: A randomized Controlled Trial. Revis Bionatura 2022;7(3) 35.

18 Ahmed MM, Younis NM, Hussein AA. Violence towards nurses staff at teaching hospitals in Mosul City. Indian J. Forensic Med. Toxicol 2020;14(3):2598-603.

19 Al-Mutairi, R. L., Bawazir, A. A., Ahmed, A. E., & Jradi, H. (2015). Health beliefs related to diabetes mellitus prevention among adolescents in Saudi Arabia. Sultan Qaboos University Medical Journal, 15(3), e398.

20 Mahmoud Mohammed Ahmed, Nasir Muwfaq Younis and Ahmed Ali Hussein. Prevalence of Tobacco use among Health Care Workers at Primary Health care Centers in Mosul City. Pakistan Journal of Medical and Health Sciences

21 Boudreau, F., & Godin, G. (2014). Participation in regular leisure-time physical activity among individuals with type 2 diabetes does not meet Canadian guidelines: the influence of intention, perceived behavioral control, and moral norm. International journal of behavioral medicine, 21(6), 918-926.

22 Naji AB, Ahmed MM, Younis NM. Adherence the Preventive Measure Against for COVID-19among Teachers at University of Mosul. In J Med Tox Leg Med 2021;24(3&4).pp:273_277., 2021, 15(1), pp. 421–424

23 Nasir Muwfaq Younis,Mahmoud Mohammed Ahmed and Nawaf Mohammed Dhahir. Prevalence of Covoravirus among Healthcare Workers. International Journal of Medical Toxicolgy&Legal Medicine.Volume 24,Nos.1-2,jan-jaune 2021.pp:267-269.

24 Qassim, M., & Naji, A. (2019). Efficacy of Health Belief Model in Enhancing Weight Loss Behaviors to Prevent Stroke among Overweight and Obese Geriatrics Homes Residents in Baghdad City. 9, 1-8.

25 NASIR MUWFAQ YOUNIS, MAHMOUD MOHAMMED AHMED, NAWAF MOHAMMED DHAHIR. Knowledge and Attitude toward older adults among Nursing Students .2021.P J M H S Vol. 15, NO. 3,pp:683_685.