Original Research

The Effect Of Training Based On Extended Parallel Process Model On Adherence To Medication Regimen Among Diabetic Elderly

Razieh Mahdavi¹, Aminreza Askarpour², Behnam Heydari³, Ashkan Morovati⁴, Zahra Delshad⁵, Ermia Maghsoodloo^{6*}

- 1. Msc of Medical-surgical Nursing, Amiralam Hospital, Tehran Medical Sciences University, Tehran, Iran
- 2. Medical-surgical Nursing (MSc), Javad Al-A'meh Hospital, University of Medical Sciences, Bam, Iran.
- 3. Master's Student in emergency nursing, Faculty of Nursing, Aja university of Medical Sciences, Tehran Iran.
- 4. MSc in Emergency Nursing, Health Department of the Army Ground Forces.sanandaj. Iran.
- 5. Faculty member of Nursing, Islamic Azad University, Kashan Branch, Kashan, IR Iran.
- 6. Msc Student of Geriatric Nursing, School of Nursing and Midwifery, Shahroud University of Medical Sciences, Shahroud, Iran.

*Corresponding Author: Ermia Maghsoodloo, Msc Student of Geriatric Nursing, School of Nursing and Midwifery, Shahroud University of Medical Sciences, Shahroud, Iran. Email: e.maghsoodloo@gmail.com.Orcid: 0000-0001-9146-7850

Abstract:

Background: Diabetes is a common chronic disease in old age. Adherence to medication regimen is one of the principles of diabetes control. The use of health theories plays an important role in the adherence to treatment. Therefore, this study was conducted with the aim of investigating the effect of training based on extended parallel process model on adherence to medication regimen among diabetic elderly.

Methods: This quasi-experimental study was conducted on 60 diabetic elderly people who had been selected by non-random sampling method and divided into two intervention and control groups. In the intervention group, 6 training sessions were conducted based on the extended parallel process model and each session lasted about 45-60 minutes. Data collection tool was the Morisky Medication Adherence Scale (MMAS-8). Data analysis was done by SPSS-19 software, using inferential test (paired t-test, independent t-test, ANCOVA test).

Results: ANCOVA test by removing the effect of pre-test showed that the training based on extended parallel process model increased the diabetic elderly's adherence to medication regimen (Eta = 0.21, p < 0.01).

Conclusion: Education increases adherence to medication regimen. The use of health theories plays an important role in increasing awareness and creating behavioral sensitivities. The use of health theory and model, as an effective and low-cost health education method, has a significant role in increasing the adherence to drug treatment among diabetic patients.

Keywords: Extended Parallel Process Model, Adherence to Medication Regimen, Elderly, Diabetic Submitted: 12 Deceember 2022, Revised: 20 Deceember 2022, Accepted: 28 Deceember 2022

Introduction

Diabetes is a chronic disease and the most common endocrine disorder (1). According to the report of World Health Organization, diabetes is considered a silent epidemic in the world (2). Type 2 diabetes is the most common type of diabetes (3). According to the report of World Health Organization, by 2025, the number of diabetic people in the world will reach to 380 million (4). Diabetes is one of the common diseases of old age (5). The prevalence of diabetes in Iran is 24.6% of the country's population (6). In Iran, more than 40 billion Rials from the budget of Ministry of Health are spent to control diabetes (7). In the world, 174 million US dollars are spent on the treatment of diabetes annually (8, 9). For this reason, diabetes is one of the most important health challenges of current era (10). Adherence to drug regimen is one of the main principles of diabetes control (11). Nonadherence to treatment recommendations is considered as the main cause of treatment failure (6).

The World Health Organization emphasizes on the term "adherence to treatment" in chronic diseases, especially diabetes (12).

Because non-adherence to drug regimen in diabetic patients is associated with frequent hospitalizations, failure of treatment, high medical expenses and frequent GP visits (13, 14). According to the report of World Health Organization, adherence to treatment can reduce 75% of mortality in chronic patients (15). For this reason, continuous adherence to treatment is considered an important factor in disease control (14, 16).

Studies show that educational programs that are based on theories have an important role in changing behaviors (17). The extended parallel process model (EPPM) is one of the models used in recent years to prepare health messages and prevent diseases and risky behaviors (18, 19). This model, which was presented by Kim White in 1992, is a theory of fear motivation

(20, 21). The extended parallel process model includes four constructs of perceived sensitivity, perceived severity of risk, perceived effectiveness of existing solutions to prevent risk, and perceived self-efficacy to deal with existing threats (6).

According to this model, if people do not believe that they are at risk and also if the perceived threat assessment (the sum of perceived sensitivity and perceived severity) is low, they will ignore the health message and not respond to it, because they are not motivated enough to deal with the threat (21). Thus, the advantage of extended parallel process model compared to other health education models is that, this model is based on motivational theory (17).

Method

This semi-experimental study was conducted on 60 people who had been allocated in two intervention and control groups. environment of this study was the nursing consultation center and samples of this study included patients referred to diabetes polyclinic in Gorgan city in 2022. Inclusion criteria were; being over 60 years old and having at least 2 years history of type 2 diabetes diagnosed by an internist or an endocrinologist. All participants were aware of time and place, and had the ability to communicate. Exclusion criteria included not willing to participate in the study. The sample size was calculated to be 60 people (n=30 in each group) based on the study of Zamani et al. (2020), considering the effect size of 0.66, test power of 80% and confidence interval of 95% at the significant level of 0.05. Non-random and convenience sampling method was used in this study. The researcher allocated the first 30 people in the control group and the next 30 people in the intervention group. Data collection tools included a demographic information questionnaire (age, sex, history of illness, marriage, literacy) and Morisky Medication Adherence Scale

(MMAS-8). Morisky scale contains questions, and its scoring method is based on yes or no answer, with "yes" getting a score of 0 and "no" getting a score of 1. Last question in this scale is based on 3-option Likert scale, so that the option "never" gets the score of 1 and options "sometimes" and "always" get the score of 0. The minimum and maximum scores in this scale are 0 and 8, respectively. In this scale, score of 8 indicates high level of adherence, score of 6-8 indicates moderate level of adherence and score of 0-5 indicates low level of adherence (11, 22). The validity of this scale was confirmed in similar articles and also in this study by 10 faculty members of Islamic Azad University. The reliability of this scale was also confirmed (0.85) by the retest method. After approving the project by research council, obtaining the code of ethics bioethics from the committee (IR.IAU.AK.REC.1401.002), and receiving the clinical trial code, the researcher attended the study setting and introduced himself to the polyclinic officials. All participants were assured about the safety of study and maintaining anonymity. They were also informed that, they can withdraw from the study at any time, and then written informed consent was obtained from them. At the beginning of this study, the researcher first helped the participants in both groups to complete the demographic information form and the Morisky scale. Then, routine diabetic care was implemented for patients in the control group. Patients in the intervention group however, received 6 training sessions based on the constructs of extended parallel process model (30-45 minutes each) once a week for 6 weeks (Box 1). At the end, the Morisky scale was completed again by patients in both groups. Data were analyzed by SPSS-19 statistical software, using descriptive statistics (table, mean, standard deviation) and inferential tests (paired t-test, independent t-

test, ANCOVA test) at a significance level of 0.05.

Results

Comparison of demographic characteristics between the two intervention and control groups showed that, the mean age of patients in the intervention group was 67.83 ± 4.37 years and in the control group was 68.3 + 19.92years, while the result of independent t-test did not show any significant difference between the two groups in this regard (P=0.75). The mean duration of diabetes in the intervention group was 15.37 + 6.8 years and in the control group was 16.8 ± 6.34 years, while the result of independent t-test did not show any significant difference between the two groups in this regard (P=0.54). Chi-square test showed no significant difference between the intervention and control groups in terms of gender (P=0.39). Fisher's exact test did not show a significant difference between the two groups in terms of education (P=0.22). Chi-square test also did not show any significant difference between the two groups in terms of occupation (P=0.66). The mean score of adherence to medication regimen before the intervention was 5.43± 1.47 in the intervention group and 5.26 ± 1.2 in the control group, and in this regard the result of independent t-test did not show a significant difference between the two groups before the intervention (p=0.06). The mean score of adherence to medication regimen after the intervention was 6.79 ± 0.86 in the intervention group and 5.63±1.4 in the control group, and in this regard the result of independent t-test showed a significant difference between the two groups (P=0.004). The paired t-test showed a significant difference between the mean scores of adherence to medication regimen in the intervention group before and after the intervention (P< 0.01). However, the paired ttest did not show a significant difference between the mean scores of adherence to medication regimen in the control group before and after the intervention (P = 0.84), (Table 1). The ANCOVA test by removing the effect of pre-test showed that, the training increased the level of adherence to medication regimen (Eta= 0.21), (P < 0.01), (Table 2).

Discussion

Results of this study showed that the level of adherence to medication regimen among diabetic elderly patients was at moderate level. The results also showed that training based on extended parallel process model increased adherence to medication regimen among diabetic patients.

Based on the results of this study and similar studies, it can be said that education and continuous care increases adherence to dietary regimen in diabetic patients (10). Zamani et al. (2020) showed that the use of extended parallel process model increases self-efficacy in diabetic patients (19). Parsaei (2019) argued that training based on expended parallel process model increases adherence to treatment in diabetic elderly (6). Tabarsa et al. (2022) in their study concluded that the use of extended parallel process model reduces risky behaviors (17). In their study, Farahmand et al. (2016) showed the positive effects of health belief model-based training on the self-care of diabetic patients, so that the training improved diet, regular medication use, blood sugar control, and weight loss (23). Sadat-Razavi (2015) in a study showed that cognitive models, by increasing patients' awareness and information, increase understanding adherence to diet and treatment (24). When people deal with a disease or a life-threatening factor, they create a general image and a specific belief about the disease and its treatment in their minds, which is called disease perception. The disease perception has a great impact on one's behavior, his adaptation to the disease, his control of the disease, and the overall outcome of the disease. On the other hand, wrong disease perception plays an

important role in non-adherence to treatment. Therefore, the use of cognitive models leads to a correct perception of disease, complications of disease and importance of disease prevention (25).

Studies show that there is a significant difference between perceived sensitivity in people with high-risk behaviors and people without high-risk behaviors. This difference is often seen in people who have high-risk behaviors but less awareness (26). Therefore, it can be said that increasing awareness and creating sensitivity can play an important role in controlling behaviors (27).

Therefore, the key to success in the treatment of chronic diseases such as diabetes is to increase the awareness of patients and participate them in the treatment process (28). By increasing knowledge and awareness, we can increase the level of literacy and adherence to treatment among diabetic elderly (29), because education plays an important role in increasing adherence to treatment and quality of care (30-32). Given that health care providers play an important role in reducing the concerns of chronic patients, training and follow-up by them increases adherence to treatment (33), which in turn increases the quality of life and reduces the disease complications (34). One of the limitations of this study was the non-random method used for sampling. It is suggested to investigate other variables in chronic patients selected by simple random sampling method in future studies.

Conclusion

The results of this study showed that training based on extended parallel process model was able to increases adherence to medicinal regimen in diabetic elderly. Therefore, the design and implementation of educational program based on extended parallel process model can play an important role in the adherence of diabetic elderly to treatment. It seems that this theory can effectively change

behavior and maintain it for a long time. Therefore, this model while sensitizing patients towards non-adherence to medication regimen and increasing their awareness about disease complications, increases the patients' motivation for treatment and follow-up. It also increases self-care in patients and reduces complications and treatment costs. Therefore, health care providers are recommended to use this model in designing and implementing educational programs for diabetic elderly at different levels of service provision, such as care homes, treatment centers, diabetes clinics, etc.

Acknowledgments

In conclusion, the researcher considers it necessary to express his gratitude to all participants who helped us in this study. This project is approved by the Research Council of Islamic Azad University. This study also has a code of ethics from the Bioethics Committee of Aliabad Kotoul branch (IR.IAU.AK.REC.1401.002) and the IRCTID clinical trial code: IRCT20221231057000N1.

Conflict and interest

No conflict of interest was observed in this study.

Reference

- 1 Ttaheri n, hojjati h, mousavi m, afra a, dehghan b. The Survey of Anxiety and Depression Prevalence in Diabetic Patient Referred to Abadan Taleghani and Khorramshahr Valiasr Hospitals in Y·۱۱. zbmu-jdn. Y·۱۴; \(\frac{1}{2}\). \(\frac{1}{2}\).
- 2.Rafiezadeh Gharrehtapeh SH, Tabarsy B, Hassanjani S, Razavi M, Amjadi M, Hojjati H. The Relationship between Health Literacy and Self-efficacy in Patients with Type II Diabetes Admitted to Gorgan Diabetes Clinic in ۲۰۱۴. zbmu-jdn. ۲۰۱۵; (۲): ۲۰-۴۲

- 3.Sadeghigolafshanl M, Rejeh N, Heravi-Karimooi M, Tadrisi SD. The Effect of Model-Based Self-Management Program A on Self-Efficacy of Elderly Patients with Diabetes. zbmu-jdn. ۲۰۲۰; (۱):. ۱۰۰۲-۱۰
- 4.Hekmati pour N, Taheri N, Hojjati H, Rabiee SH. Evaluation of the Relationship between Social Support and Quality of Life in Elderly Patients with Diabetes. zbmu-jdn. Y · 1 &; T(1): FY-4 ·
- 5.Parsai M, Sahbaei F, Hojjati H. Effect of implementing an extended parallel process model on adherence to a medication regimen of the type 'diabetic elderly. mubabol-cjhaa. '\'\'\;\(\delta\)(\'\):.\(\delta\)?-\(\frac{\dagger}{\dagger}\)
- 6.Parsaee M, Sahbaei F, Hojjati H. Effect of Extended Parallel Process Pattern on Diet Adherence in Type II Diabetic Patients. zbmu-jdn. Y · ۱۹; V(*): ٩٥٨-۶٧
- 7. Taghipour A, Moshki M, Mirzaei N. Determination of Effective Factors on Selfcare Behaviors in Women With Diabetes Referring to Mashhad Health Centers. Iranian Journal of Health Education and Health Promotion. ۲۰۱۷; ۵(۴): ۳۲۸-۳۵
- 8. Taher M, Abredari H, Karimy M, Rahmati M, Atarod M, Azaepira H. The Assessment of Social Support and Self-Care Requisites for Preventing Diabetic Foot Ulcer in Diabetic Foot Patients. Journal of Education and Community Health. ۲۰۱۶; ۲(۴):. ۳۴-۴۰
- 10.Tajari M, akhoundzadeh G, Hojjati H. Educational Effect of Short Message Service and Telegram Reminders on Adherence to the Diet in Teenagers with Type I Diabetes in Gorgan . Y · \^\Azbmu-jdn. Y · \^\2\!\(Y\):\\\(Y\!^\forall^\text{F}\)-\\(Y\!^\forall^\text{F}\)
- 11. Tajari M, Mashhadi M, Akhound-Zadeh G, Hojjati H. The effect of SMS and telegram reminder system education on

- 13.Sadeghigolafshanl M, Rejeh N, Heravi-Karimooi M, Tadrisi SD, Yosefi Abdolmaleki E. The Effect of Model-Based Self-Management Program \(^{\delta}\) a on Quality of Life of Elderly Patients with Diabetes. IJNR. \(^{\delta}\):\(^{\delta}\):\(^{\delta}\):\(^{\delta}\)
- 14.Mikaili N, Ghasemi MA, Salari S, Sakeni Z. Theoretical and Practical Dimensions of Adherence to Treatment in Patients: A Review Study. medical journal of mashhad university of medical sciences. Y. 19: f Y (Y): 14. T-19
- 15. Abbaszadeh M, Rejeh N, Tadrisi SD, jafari F. Medication Adherence in Patients Undergoing Repeat Angioplasty: A Crosssectional Study. jccnursing. ۲۰۲۱; ۱۴(۴):۵۰-
- 17. Tabarsa M, Roshangaran F, fakhreazizi S, Khaloobagheri E, Hekmati Pour N. The Effect of Extended Parallel Process Model on Sexual Self- Control of Female Adolescents in Aliabad Kotoul in Y·Y·. Indian Journal of Forensic Medicine & Toxicology. Y·YI; VA(Y):. F9A-9
- 18.Daniel J. Barnett, Nicole A. Errett, Rutkow aL. A Threat- and Efficacy-Based Framework to Understand Confidence in Vaccines among the Public Health Workforce. Vaccines. Y. 17;1(Y):. VY-AY
- 19.zamani K, Akhoundzadeh G, Hojjati H. THE EFFECT OF THE PARALLEL PROCESS PATTERN DEVELOPED ON COMPLIANCE WITH THE DIET OF

- 20.Sadeghnejad F, Niknami S, Hydarnia A, A. M. Using Extended Parallel Process Model (EPPM) to improve seat belt wearing among drivers in Tehran. Iran Payesh. Y. 17; 10(1)::1.7-11
- 21.Fatemeh S, Shamsaddin N, Alireza H, Ali M. Using Extended Parallel Process Model (EPPM) to improve seat belt wearing among drivers in Tehran, Iran. payeshj.
- 22.Maleki L, Azami M, Sadeghigolafshanl M, Yousefzadeh S, Yousefzadeh R, Nafise HP, et al. The effect of SMS reminder system training and cyberspace on adherence to medication regimen in patients with a diabetic foot ulcer in Golestan province in Y. 19. Pakistan Journal of Medical and Health Sciences.
- 23.Farahmand Z, Shojaeizadeh D, Tol A, Azam K. The Impact of an Educational Program Based on the Health Belief Model on Diabetic Foot Care in Type- \(^1\)Diabetic Patients. Journal of School of Public Health and Institute of Public Health Research. \(^1\)\(^1\)\(^1\)\(^1\)
- 24.Razavi Ns, Majlessi F, Mohebbi B, Tol A, Azam K. Assessing the effect of educational intervention on treatment adherence based on aim model amon patients with tYpe Y diabets. Iranian Journal of Diabetes and Lipid Disorders. Y · ۱۷; ۱۶ (۳):. ۱۷۳-۸۲
- 25.sadeh tabarian m, Ghiyasvandian S, haghani s. The effect of education based on Leventhal's model on perception of disease in diabetic patients. IJNR. Y \9;\\(\gamma\);\\(\gamma\).
- 26.Rahmani E, Arefi M, Afsharineya K, Amiri H. Designing the educational package of sexual education based on Iranian culture and effectiveness on social self-efficacy and sexual risk-taking in middle school girl

Downloaded from intjmi.com on 2025-10-24

- psychologicalscience. students. 7.11:17(7.):.720-44
- 27.Eckstrand KL, Choukas-Bradley Mohanty A, Cross M, Allen NB, Silk JS, et al. Heightened activity in social reward networks is associated with adolescents' risky sexual behaviors. Dev Cogn Neurosci. 7.14:14:1-9
- 28. Epakchipoor F, Bastani F, Pashaei Sabet Self-management and Medication Adherence in Older Adults with Type II Diabetes Referring to the Endocrinology Clinics of the Teaching Hospital Affiliated to Iran University of Medical Sciences (1.19). IJN. 1.11; 44(179):.1-14
- 29.Goli Roshan A, Hosseinkhani Norouzadeh R. The Relationship between Health Literacy of Elderly Diabetics and Adherence to Treatment, Babol, Iran, Y.YI. muq-journal. Y.YI; IF(IY):.Y.-A.
- 30.Cross AJ, Elliott RA, Petrie K, Kuruvilla L, George J. Interventions for improving medication-taking ability and adherence in older adults prescribed multiple medications. The Cochrane database of systematic reviews. $7 \cdot 7 \cdot 3(\Delta):CD \cdot 1799$ CD.

- Mahla Y, Maryam 31.Sadegh Η, Ebrahimpour R, Fatemeh A, Zahra Abdolreza G, Somayeh A, et al. The Effect of Spiritual Self-care Training on the Anxiety of Mothers of Premature Infants Admitted **NICUs** .Journal of to Pharmaceutical Negative Results. . 7 . 77: 779_47
- 32. Mehrangiz G, Fatemeh M, Maryam Z, Raziye M, Maryam K, Aminreza A, et al. The Effect of Implementing Pain Control Guidelines on the Pain of Patients Admitted to the Intensive Care Unit. Journal of Pharmaceutical Negative Results. . 7 . 77: 744- 1
- 33.Pasebani Y, Alemzade Ansari MJ, Ghaffari Nejad MH, Khaleghparast S. Factors affecting adherence to treatment in people with cardiovascular disease: A review study. IJCN. Y.Y.;9(1):.YY9-TY
- 34.Park NH, Song MS, Shin SY, Jeong JH, Lee HY. The effects of medication adherence and health literacy on healthrelated quality of life in older people with hypertension. Int J Older People Nurs. 7.11:17(T):e.17196

[Downloaded from intjmi.com on 2025-10-24]

Tables
Box 1: Content of training sessions in the intervention group

Session	Construct	Session's objectives	Session's content		
1	Perceived	Getting to know the	Introduction of the researcher and the patients,		
	sensitivity	patient and checking the	talking about the purpose of training.		
		risk factors for diabetes	Discussing the onset of the disease, history of the		
			disease, history of hospitalization, and hereditary		
			history.		
2	Perceived	Identification of	Definition of diabetes and its types, causes of		
	sensitivity	sensitivities and patient's	diabetes, and related factors.		
		understanding of the	Questions about normal blood sugar level, ways to		
		condition	control blood sugar and complications and		
			symptoms of the disease with the aim of		
			discovering educational needs.		
2	Perceived	Training based on patient	Training based on diabetes risk factors.		
	severity	understanding,	Weight control, cholesterol control and blood sugar		
		familiarizing patient with	control training.		
		the symptoms, and	Familiarizing patients with the symptoms of high		
		sensitizing the patient	blood sugar.		
3	Self-	Examining the patient's	The researcher evaluates the patient's level of		
	efficacy	level of awareness to	interest and ability, and determines whether the		
	assessment	provide training	patient has the knowledge, attitude and		
			understanding of education.		
4	Sensitivity	Getting familiar with	The patient knows the effect of diet in treatment.		
	Perceived	permitted and prohibited	The patient should be informed about the		
	severity	dietary supplements and	complications of non-adherence to diet regimen.		
		diets	The patient should be familiar with the		
			complications of increasing and decreasing blood		
			sugar.		
			The patient should be introduced to permitted		
			foods.		
5	Self-	Evaluation of knowledge	The patient expressed the importance of following		
	efficacy	and training given during	the diet.		
	assessment	the sessions	The patient expressed the effect and types of		
			permitted and non-permitted foods and snacks.		
5	Self-	Getting familiar with	The patient while getting familiar with the		
	efficacy	diabetic complications	neurological/vascular/visual complications,		
	assessment		explained the diabetic foot complications and ways		
			to deal with the progression of diabetic foot.		
			The patient was introduced to the nursing care of		
			diabetic foot		
6	Patient self-	The purpose of	Questions and answers with patients and their		
	efficacy	determining the	families.		
		effectiveness of training	Decreased blood sugar of the patient.		
			The patient should be able to wash his feet properly		
			and follow the food pyramid.		

Time	Before intervention	After intervention	P-value
Group			
Intervention	5.43 ± 1.27	6.79 ± 0.86	P < 0.01
Control	5.36 ± 1.2	5.63 ± 1.4	P = 0.84
P-value	P = 0.06	P = 0.004	

Table 2: The effect of training based on extended parallel process model on adherence to medication regimen among diabetic elderly

Source of	Sum of	Degree of	Mean of	F-value	Level of	Eta
variance	squares	freedom	squares		significant	
Modified	50.31	2	25.15	35	P < 0.01	0.55
model						
Post-test	26.81	1	26.8	37.9	P < 0.01	0.4
separator						
Group	38.16	1	11.07	15.68	P < 0.01	0.21
Error	40.27	57	0.7			
Sum	2311	60				
Total	90.58	59				