

## Original Article

# The effectiveness of the WhatsApp-based self-care educational program on health-promoting behaviors in individuals with metabolic syndrome

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### Abstract

Metabolic syndrome is a cluster of risk factors associated with cardiovascular disease and diabetes. Lifestyle modification and management of health-promoting behaviors (HPB) are the most important measures to control metabolic syndrome. This study aimed to investigate the effect of the WhatsApp-based self-care educational program on HPB in individuals with metabolic syndrome. The present study was a quasi-experimental performed on individuals with metabolic syndrome referred to comprehensive urban health centers in Iran. The samples consisted of 100 individuals with metabolic syndrome randomly assigned to either the experimental (n=50) or control (n=50) group. Data collection instruments included a demographic questionnaire and the Health Promoting Lifestyle Profile-II (HPLP-II) to determine health-promoting status behaviors. The control and experimental groups were similar in terms of the total mean scores of HPB before the intervention. However, after performing it, the total mean scores of the HPB scale and its subscales were statistically significant in the intervention and control groups. In the intervention group, it was significantly higher than the control group ( $p < 0.0001$ ). The results of the present study showed the positive effect of educational intervention using WhatsApp messenger on the HPB of individuals with metabolic syndrome.

**Keywords:** metabolic syndrome, self-care, health-promoting behaviors.

### Introduction

Metabolic syndrome is a set of metabolic diseases, including central obesity, hyperglycemia, hypertension, and dyslipidemia. This syndrome imposes high costs on the health care system and generally reduces the quality of life [1, 2]. This syndrome is known as a

background of cardiovascular disease, type 2 diabetes, and stroke. Individuals with metabolic syndrome have a higher risk of developing various diseases. The incidence of this complication increases the risk of metabolic diseases, cardiovascular disease, and diabetes by 2 and 5 times, respectively, and the chance of developing myocardial infarction by about 2–4 times [3].



The importance of this disease becomes apparent when, in case of infection, the overall mortality of individuals increases by 20–80%. According to the World Diabetes Federation, a quarter of adults have metabolic syndrome, and its global prevalence is estimated to be between 10–50% [4]. Iran also has one of the highest global rankings in terms of prevalence, and according to this report, its prevalence among Iranian men and women is 42% and 24%, respectively. The prevalence of metabolic syndrome is age-related and increases from 10% in individuals aged 20–29 to 60% in the age group of 69–80 years [5]. It is difficult to control all the risk factors of metabolic syndrome, but all components of this syndrome can be controlled and improved [6].

According to the World Health Organization (WHO), the basic strategy to control this syndrome and the front line of its treatment is to improve lifestyle, that is, to have a healthy and proper diet and regular physical activity to lose weight. Medical treatment and surgery can be effective in acute and severe obesity. Lifestyle modification is one of the most important areas of self-care [7]. Self-care refers to the responsibility of individuals towards their health through adopting a healthy lifestyle, thinking to prevent accidents and diseases, proper maintenance and use of over-the-counter drugs in minor diseases, and optimal care of chronic diseases. Self-care is an integral part of all levels of primary and specialized health care, and facilitating the process of self-care may improve health, economic and social status [8]. Education is the most effective factor in promoting health and the prevention of metabolic syndrome. Education enables the patient to prevent, maintain and promote health and regulate the disease [9]. In education, choosing an education method is an essential step in the instructional design because patients often cannot attend training classes or coordinate their work schedule to attend formal educational programs due to their busy schedules. Mobile communications have created opportunities to take care of the monopoly of hospitals and clinics and move them to patients' places of residence [10]. In this regard, mobile phones are communication methods that play an important role in providing education to patients. Due to its special features, such as temporal and spatial flexibility and decentralization, this device can play a significant role in education [11]. This method is currently used as the main part of health care in developed countries, and the WHO has introduced mobile education as a suitable communication channel between patients and care providers [12]. This study aimed to investigate the effectiveness of implementing a self-care program

using WhatsApp on health-promoting behaviors (HPB) in individuals with metabolic syndrome.

## Material and methods

This quasi-experimental study employed an interventional research design on individuals with metabolic syndrome referred to Andimeshk Comprehensive Urban Health Centers in 2022. For this purpose, two centers were randomly selected from the list of 6 comprehensive health centers in Andimeshk, one as an intervention center and one as a control center. Using the formula

$$n = \frac{(Z_{1-\alpha/2} + Z_{1-\beta})^2 (S_1^2 + S_2^2)}{(\bar{x}_1 - \bar{x}_2)^2}$$

a sample size of 40 subjects per experimental and control group (80 individuals in total) was determined. Then, it was increased to 100 subjects for more accuracy. The subjects were randomly assigned to either the experimental (n=50) or control (n=50) groups based on the inclusion criteria. Inclusion criteria consisted of confirming metabolic syndrome diagnosis, having literacy, not being pregnant, having a smartphone, having WhatsApp installed, having the ability to use WhatsApp, and not suffering from severe mental illness. On the other hand, exclusion criteria included dissatisfaction with participating in the study.

There are different diagnostic criteria for metabolic syndrome; this study determined the subjects based on the diagnostic criteria for metabolic syndrome in the Iranian population. According to this definition, a person with three of the factors including central obesity (95 cm for men and women), high triglyceride (mg/dl) or specific treatment for these fat disorders), lower HDL cholesterol (<40 mg/dl in Men, <50 mg/dl in women or specific treatment for these fat disorders), hypertension (Systolic BP ≥130 mmHg, diastolic BP ≥85 mmHg or previously diagnosed hypertension treatment) and fasting plasma glucose (≥100 mg/dl or have a previous diagnosis of type 2 diabetes is diagnosed as an individual with metabolic syndrome.

Before performing the educational intervention, a meeting was held for each of the two groups of intervention and control, and the researcher, while introducing himself, explained the objectives of the research to the samples, and informed written consent was obtained from them. The educational program was implemented only for the intervention group by creating

a WhatsApp group and providing the necessary education on self-care. The control group did not receive any education. After determining each group's subjects, the objectives of the research were explained to the members of the intervention group. For the intervention group, a group was formed in WhatsApp, through which educational content was extracted from reputable scientific sources of the Ministry of Health (such as family self-care guide health with self-care). They were provided to members at a specific time previously coordinated with the members for two months, each day, in educational text messages, practical tips, and short videos. The group members discussed each topic, and the researcher answered their questions and ambiguities about that topic (Table 1).

The data were collected during the three before the intervention, immediately after the intervention, and two months after the intervention stages. After obtaining a license and code of ethics from the research deputy and coordinating with the city health center, all individuals were asked to fill in informed consent saying that they participated in the study voluntarily and assured of the confidentiality of information to comply with ethical standards. Data collection instruments were demographic characteristics questionnaire (age, sex, level of education, marital status, employment status, economic status, place of residence) and the Health Promoting Lifestyle Profile-II (HPLP-II) to determine the status of HPB. The HPLPII consists of 52 questions and six subscales, including nutrition (9 questions), physical activity (8 questions), health responsibility (9 questions), stress management

(8 questions), interpersonal relationships (9 questions), and spiritual growth and self-actualization (9 questions).

The response scales were based on the Likert scaling method, in which the options are scored as 1 – Never; 2 – Rarely; 3 – Sometimes; 4 – Often. Thus, the maximum and minimum lifestyle scores are 208 and 52 and are calculated separately for each subscale. Mohammadi Zaidi examined the validity and reliability of this questionnaire in Iran, and the Cronbach's alpha coefficient for the whole instrument was 0.82, and for the sub-scales, it was 0.64 to 0.91 [13]. Data description and analysis were performed using SPSS-22 software. Statistical analysis was performed in descriptive statistics, including mean, standard deviation, frequency, and percentage. Inferential statistics was used using the Chi-square test, repeated measures ANOVA, and independent t-test. The significance level of the above tests is considered lower than 0.05.

## Results

Statistical analyses of age, gender, income status, body mass index (BMI), smoking, occupation, and education showed that the two groups were homogeneous regarding these variables (Table 2). The average age of the intervention group was 55.8±5.89 years, and that of the control group was 53.4±7.65 years; no statistically significant difference was observed between them (p=0.08).

Also, the independent t-test in the two groups showed no statistically significant difference in overall

Table 1: Content of the educational program based on different dimensions of HPB.

Subscales	Educational content titles
<b>Nutrition</b>	Having a proper diet; consuming more fruits and vegetables, dairy products, and whole grains; limiting the consumption of fats and sweets; giving importance to having breakfast; providing nutritional solutions to lower blood pressure, lower blood fats, and lower blood sugar.
<b>Physical activities</b>	Having a regular program for exercise, doing regular exercises tailored to physical conditions such as exercise and daily physical activity, walking, cycling etc.
<b>Health responsibility</b>	Having responsibility for health interventions, being prepared to learn new experiences, requesting information from specialists and health care providers, carefully consuming food, requesting a consultation, regularly visiting physicians, and avoiding smoking.
<b>Stress management</b>	Practicing stress management techniques, including relaxation and muscle relaxation, getting enough sleep, problem-solving strategies.
<b>Interpersonal relationships</b>	Creating a positive attitude towards others, having the ability to communicate effectively with family, friends, relatives etc.
<b>Self-actualization and spiritual growth</b>	Spiritual growth interventions, participation in religious ceremonies, positive thinking.

Table 2: Basic characteristics of the study participant.

Variable		Experiment n (%)	Control n (%)	P-value
Gender	Male	19 (38)	24 (48)	0.31
	Female	31 (62)	26 (52)	
Education level	Less than a diploma	33 (66)	31 (62)	0.83
	Diploma and above	17 (34)	(38) 19	
Job-status	Yes	13 (26)	19 (38)	0.19
	No	37 (74)	31 (62)	
Marital status	Married	31 (62)	39 (78)	0.81
	Single	19 (38)	11 (22)	
Smoking	Yes	2 (4)	4 (8)	0.169
	No	(96) 48	46 (92)	
Income	Sufficient	(36) 18	23 (46)	0.309
	Insufficient	(64) 32	27 (54)	
BMI	Normal	(16) 8	14 (28)	0.34
	Overweight	24 (48)	20 (40)	
	Fat	18 (36)	16 (32)	

mean scores and different subscales of HPB before the intervention ( $p < 0.05$ ). However, in two stages of, immediately and two months after implementing the educational program in the experimental group, a significant increase was observed in the mean scores of all HPB subscales compared to the control group's ( $p < 0.001$ ) (Table 3).

## Discussion

Findings showed that HPB increased significantly in the experimental group after the educational inter-

vention. Based on the results of this study, a significant increase in the mean score of all HPB subscales in the experimental group was observed in the previous stage, immediately and two months after the implementation of the self-care educational program. According to the results, implementing a self-care program impacts all HPB subscales, including nutrition, physical activity, spiritual growth and self-actualization, responsibility for health, interpersonal relationships, and stress management.

The results of this study are consistent with Rastegar et al., who examined the effect of education on a

Table 3: Comparison of the two groups regarding the mean score of lifestyle dimensions before, immediately after, and two months after the intervention.

Domains	Groups	Before education		Immediately after education		Two months after education		Repeated measures ANOVA	
		Mean	SD	Mean	SD	Mean	SD	F	P-value
Spiritual growth	Experimental	23.42	3.58	28.10	2.16	28.72	2.28	48.5	<0.001
	Control	22.34	3.31	22.30	3.81	22.66	4.39	0.122	0.886
	Independent t-test	0.121		<0.001		<0.001		-	-
Health responsibility	Experimental	23.52	1.63	28.30	1.68	28.42	1.79	48.2	<0.001
	Control	23.14	1.66	23.20	1.55	23.38	1.58	2.78	1.05
	Independent t-test	0.252		<0.001		<0.001		-	-

Table 3: Continued.

Domains	Groups	Before education		Immediately after education		Two months after education		Repeated measures ANOVA	
		Mean	SD	Mean	SD	Mean	SD	F	P-value
Interpersonal relationships	Experimental	25.18	1.59	29.22	2.34	29.22	2.34	108.1	<0.001
	Control	24.70	1.23	24.80	1.21	25.02	1.42	4.12	0.479
	Independent t-test	0.096		<0.001		<0.001		-	-
Stress management	Experimental	25.82	2.96	28.94	1.59	28.98	1.43	81.9	<0.001
	Control	25.78	1.54	26.02	1.64	26.20	1.81	5.13	0.754
	Independent t-test	0.933		<0.001		<0.001		-	-
Physical activity	Experimental	13.80	3.56	24.22	3.23	24.74	3.08	133.4	<0.001
	Control	14.20	2.91	14.36	3.57	14.34	3.57	0.066	0.798
	Independent t-test	0.540		<0.001		<0.001		-	-
Nutrition	Experimental	16.84	1.84	28.78	2.29	28.94	2.03	48.7	<0.001
	Control	15.96	2.90	16.06	2.73	16.24	2.72	4.85	1.21
	Independent t-test	0.074		<0.001		<0.001		-	-
Total	Experimental	128.58	7.33	167.56	5.61	169.02	5.39	118.5	<0.001
	Control	126.12	5.93	126.74	6.22	127.84	7.24	2.98	0.09
	Independent t-test	0.068		<0.001		<0.001		-	-

health-promoting lifestyle (HPL) in healthcare providers; Rastegar *et al.* showed that education has a positive effect on improving the level of lifestyle and HPB [14]. Also, the results of the present study were consistent with those of Tahmasebi *et al.*, who showed that educational intervention has improved HPB and the lifestyle of the elderly [15].

One of the HPB subscales in the present study was spiritual growth and self-actualization as the most important dimensions that positively affect health and well-being. Today, reducing mortality risk using this health dimension has been proven [16].

This study showed that the scores of spiritual growth and self-fulfillment immediately and two months after the educational program implementation in the experimental group compared to the control group had a significant increase.

Ashvandi *et al.* also showed that educational intervention improves and promotes spiritual growth and self-actualization [17]. Rastegar *et al.* achieved similar results to investigate the effectiveness of education on an HPL in health care providers [14].

Aiming to investigate the effect of the HPB educational program on the lifestyle of the elderly, Ebrahimi *et al.* showed that the score of spiritual growth in the intervention group increased after implementing the educational program [18].

Nutrition is another HPB subscale examined in this study. Metabolic syndrome is a multifactorial disorder in which diet plays a significant role [19]. A healthy eating pattern can effectively reduce the risk of metabolic syndrome [20]. Therefore, since metabolic syndrome is an important precondition for the spread of chronic diseases, dietary modification is one of the main factors in treating metabolic syndrome [21]. Findings indicate a significant increase in the mean scores of nutrition in two stages immediately and two months after implementing the educational program in the experimental group compared to the control group.

Physical activity and exercise are another HPB subscale closely related to nutrition in individuals with metabolic syndrome. Physical inactivity and obesity are important factors associated with metabolic syndrome [22]. Nowadays, increasing physical activity and

exercise are proposed as an essential and low-cost component in the treatment process of metabolic syndrome [23] because exercise plays a vital role in the prevention and treatment of obesity and weight gain, so it prevents weight gain by directly increasing the energy consumption, modulating the appetite, or reducing the energy intake indirectly [24].

The results showed that in the experimental group, there was a statistically significant difference between the mean scores of physical activity and exercise in the two stages of immediately and two months after the educational program, while in the control group, the mean scores of physical activity and exercise did not show a statistically significant difference in the two stages of immediately and two months after the intervention. These findings are consistent with Gerstel et al., examining the effect of lifestyle intervention on body weight, metabolic syndrome parameters, nutrition, and physical activity in-home care providers. Their results showed that in the intervention group, body weight, waist circumference, and systolic blood pressure decreased significantly during 12 months after the educational intervention. Also, the incidence of metabolic syndrome in the intervention group decreased by 50% 12 months after implementing the educational program. Besides, LDL was lower than HDL and blood sugar, and the participants' percentage of physical activity in the intervention group increased [25].

Consistent with the results of the present study, Simona et al., in a study titled "Effectiveness of a lifestyle intervention on the metabolic syndrome: a randomized controlled trial", showed that in the experimental group, the consumption of saturated fats reduced, and the consumption of unsaturated fats and exercise increased significantly, compared to the control group. Weight, waist circumference, cholesterol, and most components of metabolic syndrome decreased in the intervention group and increased after 12 months in the control group. This intervention dramatically reduced the prevalence of central obesity, hypertension, and diabetes. The results showed that educational lifestyle intervention was effective [26].

Health responsibility was another HPB subscale investigated in this study. Beizhu stated that health responsibility involves following a healthy lifestyle to feel better and spend less [27]. In this case, the person actively takes responsibility for his health and acquires the necessary knowledge in medical care [28]. Asci et al. indicated a positive effect of educational intervention on the experimental group's nutritional status and physical activity [29].

In the present study, the mean scores of the experimental group increased at the two immediate and two months after the intervention stages in terms of this subscale. Also, the mean scores of the experimental group showed a statistically significant increase after the intervention, while in the control group, no significant change was observed. These results are consistent with Shahraki et al., who designed an educational program to investigate the effect of the health-promoting intervention on students' HPB: the program increased the health responsibility in the experimental group [30]. Other studies also confirmed the results of the present study [17, 18]. This indicates that individuals who feel more responsible for their health are in better health conditions and understand what activities they need to do to be healthier.

This study also investigated interpersonal relationships as another HPB subscale. Metabolic syndrome is a chronic complication that requires extensive behavioral changes and adherence to a complex care regimen, so having healthy interpersonal relationships and social support is one of the most important and effective factors in self-care [31]. Social support depends on social ties and healthy relationships. Therefore, these relationships can help create security, respect, and peace of mind, whose achievement necessitates learning the required skills [32].

The results showed that in the experimental group, the mean scores of the interpersonal relationships of the educational intervention increased, and the difference in the mean scores of this subscale in the experimental and control groups was statistically significant. Ashvandi [17], Tahmasebi [15], and Rathnayake [33] found similar results, confirming the findings of the present study.

In terms of stress management, the mean scores obtained in the experimental group after implementing the educational program were statistically significant. However, no statistically significant difference was observed in the control group between the mean scores of this subscale before the educational intervention and immediately and two months after implementing it.

In Tahmasebi [15] and Rathnayake [33], there was a significant difference between the mean scores of stress management in the two groups, consistent with the present study results. Hashemi et al. also showed that training in stress management skills increases mental health and reduces anxiety, social dysfunction, and depression [34]. Zheng et al. also showed that the mean scores of stress management in patients with metabolic syndrome increased significantly [35].

## Conclusion

The research findings showed that the mean scores of HPL in the experimental group increased significantly after implementing the educational program compared to the control group. Therefore, the overall results of the present study indicate that self-care education effectively improves the HPB of individuals with metabolic syndrome. Generally, according to the effective results of this study, the use of WhatsApp messenger to improve the dimensions of HPB in individuals with metabolic syndrome can be the basis for designing similar interventions in health education and promotion. It is also recommended that educational planners of health centers use these tools to educate their clients.

One of the advantages of the present study was using WhatsApp as a modern mobile phone technology. It seems that the availability of mobile phones and reminders through it has increased HPB. This issue emphasizes using new technologies. In particular, mobile phones are employed in health education because they are available to almost everyone, and this can overcome many obstacles, including access to different groups of society, lack of financial resources, and lack of physical space. One of the limitations of this study was extracting the subjects' characteristics and addresses from the Comprehensive Health Center based on the inclusion criteria. Simultaneously implementing the present study with the spread of COVID-19 disease and its subsequent limitations and the high workload of health-care workers, the researcher faced problems such as increasing the execution time.

## Conflict of interest

The authors declare no conflict of interest.

## Ethics approval

The approval for this study was obtained from the Ethics Committee of the Shiraz University of Medical Sciences (approval ID: IR.SUMS.REC.1399.1236).

## Consent to participate

Written informed consent was obtained from all participants in this study.

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