Application of Freire's Adult Education Model in Modifying the Psychological Constructs of Health Belief Model in Self-medication Behaviors of Elderly: a randomized controlled trial

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Abstract

Background : As people age, they are more likely to engage in self-medication and suffer from its adverse effects. The present study aimed to modifying knowledge, psychological constructs of Health Belief Model (HBM), and self-medication behaviors using Freire's Adult Education Model (FAEM) among elderlies in Khorramabad, Iran, from 2017 to 2018.

Methods: This research was of a randomized controlled trial conducted on 132 individuals older than 60 who were referred from health care centers. The participants were selected using multistage sampling method and randomly divided into two groups of intervention and control. The data collection instruments included a questionnaire which was designed based on both HBM and self-medication behaviors questionnaire. The phases of adult education model (AEM) was used to modify the psychological constructs of HBM and self-medication behaviors. Data were analyzed using SPSS software version 20 with a significance level of 0.05. Descriptive statistical tests, chi-squared test, paired t-test, independent t-test, and univariate modeling were employed for this purpose.

Results : The mean age of the elderlies was 66.28±7.18 years. There was no significant difference between groups in terms of self-medication. Unawareness of the effects of medicine were the most important cause of self-medication ($p=0.50$). The two groups were not significantly different in terms of knowledge, HBM constructs, and self-medication behaviors ($p>0.05$). However, they came up to be considerably different for the above variables after the intervention was completed ($p<0.05$). When the findings were adjusted for the effects of confounding variables, there were significant differences between almost all constructs of HBM and their behaviors ($p < 0.05$). However, the perceived barrier modality of HBM did not reach to a significant level of difference between two groups.

Conclusion: The educational intervention, which was based on Freire's AEM, had positive effects on the constructs of HBM and consequently on self-medication behaviors. The psychological constructs of HBM were affected at the phases of listening to problems. Self-medication was tempered at the action-reflection phase with shared creation and evaluation of the action plan geared towards the achievement of the behavioral objectives.

Background

Self-medication, as the most common form of self-care is defined as taking the commercially available medications. Some possible methods of getting hold of medications may include access to medicines without a prescription, using previously prescribed medications for similar cases, distributing prescribed medicines among family members and friends, as well as using the leftover medicines (1, 2). In addition, refusing to comply with prescriber's instructions by taking relatively high dose of a medicine or for long period of time, or even declining to complete the prescribed course of treatment can be considered under the same concept (3, 4). Chronic diseases that mostly affect older people lead to pain, disability, decline in quality of life, and increased need for medications. Additionally, aging by itself is associated with

increased side effects of medications because body is not able to metabolize them as well as before (5). Likewise, several studies suggest that the costs of treatment rise as people get older (3, 6). Previous studies show complications of self-medication among elderlies can cause even more harms than good; therefore, it seems to be fundamental to identify such underlying behaviors and try to modify them so that the elderlies can have a long and healthy life (7).

According to a systematic review, self-medication behavior has been increasing in rates in the Middle East (8). The arbitrary drug use rate in Iran is about three times of the global average. As such, Iran is among the first 20 countries in the world where self-medication is extremely common, and has ranked second only after China (9). Investigations indicate that each Iranian national takes averagely 339 tons of active substances annually, which is two to four times of world's standard rate (10). Although in most of the developing countries, there are access to medical treatment, WHO reports more than 50% of patients do not choose to go to a health care provider even if that seems to be necessary (11). It is estimated that 83.3% of Iranians are currently using drugs arbitrarily (12). In Iran, due to the pharmaceutical culture[1] of the community and the relatively high prevalence of chronic disease, elderlies tend to use even greater amount of medications irrationally (3). Elderlies slowly metabolize substances compared to young people. This may cause accumulation of medications in the body; therefore relatively high chance of over dosage of medicine or due toxicities among them (12). This explains the challenges of arbitrary use of medicine among elderlies of developing countries specially when critical medications are available over the counter and each elderly has multiple medications in his or her pocket (13).

Researchers have used models to identify reasons for behavioral changes. Health Belief Model (HBM) is considered a comprehensive and effective program which helps aim this goal. The main components of this model are based on psychological and behavioral theories. This model basically intends to identify and understand factors affecting behaviors as well as the way they may work. This model also offers ways to influence these factors under different circumstances (14). Based on this model, if an individual are to change her or his behavior, she or he first have to believe that she or he is susceptible to a phenomenon, such as self-medication (perceived susceptibility); and understand the depth of related adverse effects on her or his life (perceived severity). Subsequently, she or he should admit the benefits of behavioral changes, and stop using medication on her or his own (perceived benefits). Likewise, she or he should be able to overcome existing barriers to take an action, such as costs (perceived barriers). The fifth structure of the Health Belief Model is called action guides, which include accelerating forces that make one's need for self-medication. Such guides can be internal, such as understanding a physical state, an external situation, like interpersonal interactions or media communication (15). The efficacy of HBM in preventive health behavior has been confirmed in several studies (16-18).

Discussion and dialogs are among the cornerstones of changes in psychological behaviors (19). Freire's Adult Education Model (FAEM) is suggested to modify the psychological constructs of HBM. The essence of Freire's model is dialog or skill acquisition through mutual communication. Freire's model involves a three-phase process. In the first phase called Listening, the problem is set forth. In this phase, the various aspects of the issue are discussed with equal participation of all individuals. In the second phase called Reflection, emotional and social responses of individuals to the problem are emphasized. The last phase called Action-Reflection involves the joint creation of an operational plan for behavioral changes and its joint assessment (14, 20). So far, several studies have been done to eradicate the habit of self-medication (21, 22) but only few have been conducted to evaluate experience-based education to eliminate self-medication behavior among elderly people. The objective of the present study was modifying knowledge, psychological constructs of HBM, and self-medication behaviors using adult education model among elderlies residing in Khorramabad, Iran, from February 2017 to April 2018.

[1] Unfortunately, people can buy medicines from a pharmacy with no prescription in Iran. The pharmaceutical culture means the way most of the people think about taking medicine; whether the medicine is prescribed by a physician or those are just collected from a pharmacy based on their own thought.

Methods

Study Design

This was a randomized controlled trial registered at the Iranian clinical trials system under the code of 2013091814512N2. The research was approved by the Ethics Committee of the Lorestan University of Medical Sciences, Khorramabad, Iran.

Participants

Participants were recruited from ten different health centers in Khorramabad, Iran, from February 2017 to April 2018. Out of five postal districts in this town, health centers were randomly selected, so that individuals with different socioeconomic statuses were included in the study. The inclusion criteria consisted of having age older than 60 years(23)[1], residing in Khorramabad, Iran, being mentally healthy according to the Iranian health record, being able to perform daily activities independently, and meeting the criteria for self-medication behaviors. Criteria for self-medication behaviors included use of at least a non-prescribed medication for a chronic or acute illness, non-compliance with physician's order with respect to the prescribed medications such as raising or lowering medicine dosage, taking medicine for longer or shorter than recommended period of time, refusing to complete the course of treatment, and failing to take the medication on a timely manner. The exclusion criteria included suffering from

neurological defects, emigration, failure to participate in more than one training session, or having psychological health deficit.

Sampling, randomization and sample size

The Multistage non-probability quota method was used for which the area of Khorramabad was divided into 3 strata of north, south and center. In each geographical stratum, there were some urban health centers. From the health centers of each stratum, two were randomly selected by systematic random sampling. A total of six health centers were selected out of the Khorramabad health centers. Finally, in each selected center, sampling was performed using the non-probability consecutive sampling method until the quota of each center was achieved.

The patients were assigned to the intervention (n=66) and control (n=66) groups using permuted block randomization with a block size of 2 and an allocation ratio of 1:1. By use of random number table for each selected health centers, a random sequence of "intervention" and "control" was generated. A column is randomly selected from the table of random numbers. The numbers are read from top to bottom. For numbers between 0 and 4, the words were sequenced as of "intervention" and then "control". While, for the numbers between 5 and 9, the words were sequenced by "intervention" was followed by "control". Finally, tables were installed in health centers, and the sampler selected 'intervention' or control as the first experimental group for the first qualified person. Obviously, the next word should be used based on random sequence method(24). The primary sample size in each group (intervention and control) was calculated as 63 individuals using the following formula:

[Please see the supplementary files section to view the equation.]

$z_{1-\alpha/2}$: 97.5th percentile of the standard normal distribution corresponding to type I error probability of 0.05 =1.96

$z_{1-\beta}$: 80th percentile of the standard normal distribution corresponding to test power of 0.90=0.84

s: an estimate of the standard deviation of total performance scores change in the both groups=2.00

[Please see the supplementary files section to view the equation.]

d: the minimum mean difference of total performance scores change between the two groups, which is of great importance in the opinion of the researcher=1

Ultimately, (Considering the probability of 5% for loss of samples) therefore, the final sample size in each group was estimated to be 66.

Researchers contacted the elderlies through the contact information available in their records and asked them to appear at the assigned health centers for face-to-face interview. After the interview, 13 people were excluded from the study due to lack of self-treatment behavior and other entry criteria. Criteria for self-medication behaviors included use of at least a non-prescribed medication for a chronic or acute illness, non-compliance with physician's order with respect to the prescribed medications such as raising or lowering medicine dosage, taking medicine for longer or shorter than recommended period of time, refusing to complete the course of treatment, and failing to take the medication on a timely manner. Four of them were reluctant to participate in the study Four of them were reluctant to participate in the study. Three of them were also unable to perform their activities independently due to neurological defects or mental disorders such as dementia. So they were unable to take care of themselves so that we could not investigate their arbitrary use of medicine among them. Therefore, the collected might may not be reliable

After taking informed consent by a health care worker who was not involved in the recruitment of participants, the elderly were randomized into control and intervention groups by permuted block randomization and a table of random numbers (25). The elderly who met the criteria of self-medication behavior filled out the pre-test questionnaires. The corresponding author and research assistants collected the data. The research assistants were graduate students majoring in public health. In February and March 2017, participants were contacted for face-to-face interviews and the eligibility of seniors to participate. In April, May and June 2017, the questionnaire were completed by both intervention and control groups. In July and August 2017, training sessions were held up. The participants in the intervention group received an educational intervention about the regular use of medications in addition to the routine integrated health care services for elderlies. Six months after the intervention was conducted, a researcher who was blinded to group allocation administered the follow-up questionnaire. The post-test questionnaire was completed in March and April 2017.

Intervention

The intervention was carried out according to FAEM and included six 45-minute educational sessions. The number of training sessions was determined based on Clark *et al. method*, which was performed on elderly population (26). The adult learning process was implemented in the following three phases listed below.

Listening Phase

The facilitator raised the issue of self-medication by playing a video about elderly individuals suffering from liver and kidney complications due to self-medication. Brainstorming and subsequently a group discussion were held among the elderlies so that they got a chance to share their experiences regarding

self-medication behaviors. This way, perceived susceptibility was applied. The elderlies were advised about the need for referring to physicians in the event of chronic or acute illnesses, and the necessity of refraining from obtaining medications from pharmacies without a prescription. They were also alerted against the use of herbal and traditional medicines without a physician's prescription. Then, perceived severity was persuaded by presenting statistical information and a case study that emphasized the negative consequences of self-medication. The elderlies talked about the various complications associated with self-medication such as prolongation of the disease, increased costs of treating illnesses newly emerged as a result of self-medication, psychological and social burden of losing health such as reduced overall life satisfaction, and limited communication with friends and family.

Reflection Phase

In each group, the elderlies stated the presence of all potential barriers by brainstorming. They role-played about the barriers under discussion followed by a discussion about the solution to the obstacles that were role-played. In this phase, some beliefs were brought up. Those include the idea that health is so important that some time and money should be put aside for visiting doctors, the treatment offered by doctors should be trusted, and that even if they experience severe pain and do not have access to a physician, they should not self-medicate. To modify the structure of perceived benefits, series of instructions for taking medications such as proper dosage, timing, and course of treatment were discussed with individuals who had chronic illnesses. A discussion was subsequently played on the benefits of refraining from self-medication, including medication safety and receiving quality treatment by medications prescribed by a physician. In the end of this phase, the elderlies expressed their emotional and social concerns to self-medication behaviors. Eventually, the elderly individuals discussed how they can resolve this issue.

Action-Reflection Phase

The behavioral objectives of modifying self-medication behavior were set at this stage. According to these modifications, elderly individual should refrain from taking medications without the prescription of a physician. Likewise, elderly individual should abstain from prolonging or shortening the duration of treatment and complete the course of treatment. Elderly individuals should also avoid increasing or decreasing medication dosage. The elderlies were given recall cards reminding them for regular use of medications in most visible places, such as refrigerators. They read consumer medication information leaflets before taking medications and disposed expired medications. They also created a virtual group with their peers, family members, and health caregivers to monitor their regular use of medicine while sharing their experiences and educational materials. They also increased the number of authoritative sources such as materials by the Ministry of Health and from health caregivers by which they acquired knowledge on the correct use of medications. This way, the construct of external cues to action was

modified. Additionally, they properly paid attention to their achieved general health because of regular use of medications as an internal cue to action.

Outcome Measures

The primary outcome was increased knowledge and improved attitude towards self-medication, which were measured by a questionnaire assessing the participants' knowledge and constructs of HBM at baseline and 6 months following the intervention. The HBM scale was used in a previous researcher's descriptive study of self-medication in the elderlies (18).

Part one describes elderly people's knowledge about self-treatment. Scores 1 indicates a correct answer while scores 0 is considered a wrong one. Part II Includes questions that assesses the health belief model constructs. The perceived sensitivity of the five items measured a person's belief if they were susceptible to self-medication (Example: I may self-medicate when I am ill). Perceived severity of the five items assessed one's belief about the harmful effects of self-treatment on life (Example: I believe self-therapy may in some cases lead to death). Benefits measured by five items measured one's belief in the usefulness of the correct use of medication (Example: I believe that with the proper use of medication the duration of illness is shorter). Barriers perceived by four items assessed one's perceived ability to cope with the challenges and barriers to proper medications use (Example: Due to the high cost of a physician visit, I cannot see a physician during illness). This questionnaire was rated on a 5-point Likert scale from strongly agree to strongly disagree. "I strongly agree" scores 4, "agree" scores 3, "no idea" scores 2, "disagree scores" 1, and "strongly disagree" scores 0.

The fifth construct of the Health Belief Model is called cues to action, which includes accelerating forces that make one's need for self-medication. Two items on internal and external cues to action have been accounted in form of frequency distributions. The HBM questionnaire had been used in studies by Karimi and Sharifirad performed on elderlies so that the validity and reliability of the questionnaire was confirmed (27, 28).

Section 3 includes reasons of self-treatment by measuring a 14-item checklist. This questionnaire was answered by yes or no, and reported through frequency distribution. The secondary outcome included a reduction in self-medication behaviors which was assessed at baseline and six months after the intervention. A questionnaire was used including a series of dimensions for the purpose of considering behavioral objectives, and measuring self-medication behaviors. The dimensions included refraining from using medications without physicians' prescriptions, refraining from prolonging or shortening the

duration of treatment, refraining from increasing or decreasing dose, and the regular use of medications according to the assigned time for each. Each dimension was evaluated with two questions about chronic and acute illnesses. The options to each question measured the frequency of the said behaviors from Never to More than four times.

Validity

The Health Belief Model provided a conceptual framework for designing the questionnaire. A set of items that measure health belief model constructs on self-medication per capita were created. This model accurately illustrates the relationship between health beliefs and behaviors. This model is specifically tailored for prevention-based interventions as well as interventions that make short-term changes (29). The validity of this questionnaire was evaluated by the following method (30, 31).

Face Validity

Both qualitative and quantitative methods were practical for face validity. For the purpose of qualitative approach, 20 elderies were asked to evaluate each item for imprecision and complexity. In general, there were no problems in reading and understanding the items by elderies. The quantitative face validity was assessed through impact scoring. Impact score for each item was calculated as multiplying the importance of an item by its frequency. The impact scores of greater than 1.5 were considered suitable (32).

Content Validity

An expert panel including experts such as a health education, a statistician, an epidemiologist, a gerontologist, a pharmacologist and a general practitioner examined the content validity. The expert panel was asked to examine each question based on the three-part spectrum "necessary", "useful but not necessary" and "not necessary". The results were used to calculate the content validity ratio (CVR) using the following formula:

The number of specialists who have were chosen the necessary option////////////// half of all evaluators

—The Formulae—

[Please see the supplementary files section to view the equation.]

Based on the Lawshe's table, the expressions for which the CVR value was higher than 62.0 were retained for the later stages (33). In the following, ten experts were asked to comment on three characteristics of the questionnaire, including relevancy, simplicity and clarity in a 4-part Likert scale. For example, for the sake of clearance grading, they scored like "is not clear=1 is relatively clear=2, obviously=3, and it is quite obvious=4". Then, content validity index (CVI) for each item was calculated by dividing the number of experts who agreed with grades 3 and 4 by the total number of specialists. Finally, items were reserved with a CVI value greater than 0.79 (30).

Reliability

Internal consistency of the instrument was assessed by using Cronbach'salpha coefficient (34). An Alpha values of equal or greater than 0.70 was considered as satisfactory.

Statistical Analysis

Stratification variables are presented as frequencies and percentages. They were compared by the chi-square test. Continuous variables are presented as means and standard deviations and tested by paired t-test after evaluating their normality. In order to reduce the effects of confounding variables, two different ANOVA models were used. Those include an ANOVA model which was only adjusted for basic variables. The second ANOVA model was adjusted for basic as well as demographic variables. Statistical analyses were performed using SPSS software version 20.0 (IBM) at the significant level of 0.05.

Ethical Considerations

This research project has been registered at the Research Committee of Lorestan University of Medical Sciences with registration number of 2040. It was reviewed and approved by the Ethics Committee of the Lorestan University of Medical Sciences. All the participants took part in this study voluntarily. Participants signed a consent form before participation. In order to observe the principles of ethics in research, the educational materials were also made available to the control group in the end of the study.

[1] According to the World Health Organization (WHO), the age of onset for being an elderly is defined as 60.

Results

The Kolmogorov-Smirnov test showed the quantitative variables followed a normal distribution (P>0.05). In terms of demographic characteristics, there was no significant difference between the intervention and control groups (Table 1). There was no significant difference between two groups in terms of self-medication causes. Lack of adequate knowledge about the harmful effects of the medicine was the most important cause of self-medicating in both groups (Table 2).

The mean score of knowledge, psychological constructs of health belief model and self-care behaviors significantly improved after intervention in the related group (Table 3). Table 4 shows the results of univariate modeling in two models.univariate model showed that there were no significant differences between the intervention and control groups after eliminating the effects of pre-intervention measurements, except for of behaviors (P>0.001) and perceived benefits(P=0.002), respectively. Model 2 shows intervention measurement's values as well as the demographic variables following adjustment. There are significant differences between the intervention and control groups in terms of all other examined variables. Cold and headaches were the most common diseases for which both men and women had self-medication behavior (Table 5). Antibiotics, cold medicines and painkillers had the highest rates in both sex. (Table6)

Among participants, a number of 56 elderlies (42.4%) mentioned recall cards, 53(40.2%), ———of elderlies stated families and acquaintances, 14 elderlies (10.6%) declared physicians, and 6 elderlies (6.8%) pointed out television as the most important external cues to action. This adds up to 129 individuals, while three participants refused to talk about it. Likewise, a number of 94 elderlies (71.2%) aknowledged fear of being affected by the adverse effects of self-medication, 22 participants (16.7%) confirmed not believing in self-medication, and 16 (12.1%) individuals affirmed general good health as the most important internal cues to action which persuaded them to undertake preventive behaviors. This added up to 132 individuals.

Discussion

The present study aimed to modify knowledge, psychological constructs of HBM, and self-medication behaviors using adult education model. The results showed there is a significant difference between intervention and control groups after intervention, when the effects of confounders such as demographic variables, knowledge, behaviors, and constructs of HBM were controlled. According to the results of final multivariate model, the educational intervention had significant impacts on self-medication behaviors. Application of HBM in combination with Freire's adult educational model (FAEM) enhanced its effectiveness in elderlies. According to *Peyman et al*, educational intervention in framework of Freire's educational model created favorable changes in attitudes and eating disorders of the students (35). The main point in Freire's model is the problem-posing technique. This approach is completely different from traditional educational methods. In Freire's model, there are no pre-made solutions and individuals look for an action upon solution by considering different aspects of the problems (36).

According to a previous study HBM affected behaviors through several factors. A study was designed using SMS wording based on HBM to improve adherence to treatment in low-resource settings. The study showed that behaviors would change by SMS wording in which touches on themes of HBM is effective (37). Moreover, in another trial that was conducted to reduce self-medication behaviors among hypertensive elderlies, a personal educational program designed to promote adherence to treatment through psychological constructs led to a change in intent; thus, improved behaviors (38). At this point, The findings of the present study are consistent with two other studies by Shamsi and Movahedi (39, 40).

The intervention had three different phases. In the Listening Phase, the elderlies encountered with subject of self-care through strategies used in this phase which increased sensitivity and perceived severity toward the subject. It was observed that the majority of participants in the intervention group came to believe that they were susceptible to the adverse effects of self-medication after the intervention. This finding is consistent with the results of three different studies by Moghadam, Niksadat and Heydartabar (41-43). As long as an elderly finds her or him more susceptible to a self-limited disease, she is more likely to take precautionary measures. According to previous studies, perceived severity was a predictor of self-medication behaviors among elderlies (18, 44). In the present study, the perceived severity of elderlies increased in terms of the extent of harm caused by the arbitrary use of medications. Likewise, in a study conducted on pregnant women, the participants were considerably concerned about self-medication's side effects during pregnancy, the consequent birth of an abnormal baby, and emergence of domestic problems following an educational intervention (39).

In the end of the listening phase, the elderlies' knowledge about definition of self-medication, variables such as the adverse effects of medicine, organs susceptible to self-medication, correct method of keeping medications, and recognizing expired drugs all significantly increased. According to the previous studies, mutual learning with feedback from learners is more effective and enduring. In fact, good knowledge is a predictor of positive attitude. While, a reverse relationship was found between knowledge and performance of the elderlies (8). This issue also emphasizes the need for retraining programs for physicians and pharmacists, so that physicians can put more effort into educating elderlies about proper use of medications. In our study, inadequate knowledge about the harmful effects of medications was the most important reason for self-medication in both intervention and control groups. In line with the current study, a systematic review showed that most patients do not have enough knowledge about active agents, as well as the methods of taking medications, and medications' side effects. A proportion of 60% of patients do not read consumer' medicine information leaflets enclosed within the drug packaging (8).

The second phase called Reflection was about finding an answer to the question of how elderly people can explain the situation and take control of it. In this phase, the costs of and barriers to performing the behaviors and possible solutions to overcoming were discussed by brainstorming. In this way, the constructs of perceived barriers and benefits were modified. As such, perceived barriers were found as predictor of self-medication behaviors among elderlies. According to a meta-analytic study by Carpenter, it was generally suggested that the construct of perceived barriers in HBM is an important factor to prevent or avoid unhealthy behaviors (45). The construct of perceived barriers refers to beliefs about the actual and feasible costs of persuading regular use of drugs which declined after intervention in the intervention group.

Studies on the construct of perceived barriers have yielded conflicting results (39, 40, 46). This can be attributed to the variety of perceived barriers such as financial, physical, psychological, and social barriers, as well as different effects of educational interventions on modifying these barriers (47). According to the univariate modeling, when the effects of demographic variables were taken into the account, the impact of educational intervention on perceived barriers did not look to be significant. From the other hand, it was believed that the construct of perceived benefits increased the relative efficacy of known methods of elderlies for preventing self-medication after intervention. Indeed, understanding the proper use of medicine can reduce the due adverse effects and help quick recovery from certain diseases which can be effective in improving perceived benefits. This finding was similar to that of the study by Shamsi which was conducted on pregnant women in Arak, Iran(39). However, based on a study by Movahedi, no significant changes occurred following an intervention (40). This could be due to long term adverse effects of unhealthy behaviors which were intangible for the students participating in the study.

In the Action-Reflection phase, behavioral goals were set to modify self-medication behaviors. After the educational intervention, self-medication behaviors were significantly eliminated in the intervention group compared to the control group. The proper behavior of medication use was the final result of the intervention in which conceptual framework of adult education was used. According to previous studies, behavioral habits such as regular use of medications in accordance with physicians’ prescriptions were influenced the development of these behaviors (38, 49). Recall cards were the main guide for elderlies’ action on correct use of medications. Accoeding to a study to reduce accidents, installation of labels containing messages against drivers' eyes was the best method of information delivery. Family members, friends and health care providers have been considered in other studies as role models or mental health as the most important health promoting people. As result, the participants acted intelligently in regard to medication use. They shared their experiences with friends, family members, and caregivers in virtual groups in order to help monitor their regular use of drugs.

After discussing how to implement educational intervention in this study, it is necessary to talk about the types of diseases and medications that older men and women mostly undergo self-medication. According to the study results, headaches and cold accounted for the highest rates of self-medication among both men and women. In addition, the use of antibiotics, cold medicines and painkillers was the highest frequency in both men and women. Previous studies also indicate colds and headaches are the most common diseases that are self-medicated in Iran. In addition this study showed that analgesics, antibiotics and cold medicines are the most common drugs for self-medication (50). Likewise, a systematic review showed painkillers and antibiotics are the main medicine that was self medicated in Middle East population. This systematic review, found 91 percent of Iranians with migraine headaches take acetaminophen and codeine without a doctor's prescription. Yuz reported 32 to 42 percent of people of other counties in the Middle East take antibiotics with no prescription compared to 53 percent of Iranians(51). There is limited knowledge if any infection requires antibiotics and those are safe enough to be taken with no prescription. For example, a study found that 67.1% of general population believe cough and cold require antibiotics for treatment, and many people use antibiotics for viral infections as well. Likewise, a percentage of 28.1% use antibiotics instead of painkillers. In addition, people were identified as being poorly compliant with antibiotics because they did not take it until the end of the course but for a couple of days only(52).

The first highlight of the conceptual framework of Freer's adult education used in this study is to establish a two-way communication between elderlies. Since the discussion on the issue is the essence of this approach, it is also called collaborative research. The second highlight of the methodology of this conceptual framework was the problem design. Students who are elderly people should search for solutions themselves and implement those to an action plan. Nonetheless, this study had a limitation as well. Likewise, this is because the self-medication questionnaire was actually a self-report questionnaire. The researchers were limited to collecting required data to view and complete checklists, so the findings were just reported by elderlies; thus, the findings might be affected by recall bias. However, according to previous research, self-reporting id considered, as a common way to evaluate performance in the behavioral sciences(18, 28, 53-55). Given that the adult education approach has been used in a limited number of studies, the discussion of the results are limited in scope. Therefore, it was attempted to compare and discuss the results of close studies.

Conclusion

More attention should be paid to the growing risk of drug abuse for illnesses such as cold and pain. Training physicians to prescrib right medication is an approach that may persuade appropriate use of antibiotics and painkillers. In addition, a right policy must be implemented to limit the sale of over-the-counter drugs. The framework of FAEM was suitable for modifying the psychological construct of HBM in regards to self-medication behaviors among elderlies. The constructs of perceived susceptibility and perceived severity were trained by subjecting the aspects of the issue of self-medication to discussion.

The construct of perceived benefits and barriers were trained by discussing possible solutions and the benefits of it. In the end, the elderly can use medicine wisely by creating a joint action plan geared towards the behavioral objectives. It is recommended that health personnel are trained well in order to apply adult education framework to comprehensive health centers and nursing care centers so that health behaviors such as adherence to treatment and proper drug use may improve.

Abbreviations

HBM: Health Belief Model

FAEM: Freire's Adult Education Model

Declarations

Ethics approval and consent to participate

The Ethics Committee of the Lorestan University of Medical Sciences approved the study protocol with the approval number IR.Lums.REC 2040. Informed consent was obtained from the elderlies. Consent to participate was verbal. Because the studied topic was not sensitive and that the information obtained in the study did not entail adverse social and individual consequences, the Ethics Committee approved that obtaining verbal consents of the participants was adequate.

Consent to Publish: Not applicable

Availability of Data and Materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing Interests

All authors have read and approved the content of the article. The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article. Marzieh Araban is a member of the editorial board of the journal of Public Health.

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Author's Contribution

KB and FB have made substantial contributions to the conception and design. MA and FE participated in the study design and data acquisition. MA, FB, KGh and AA were involved in drafting and revising the manuscript, which was critically for important intellectual content.

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Statement

The present study adheres to CONSORT guidelines and a completed CONSORT checklist has been included as an additional file when was submitting the manuscript.

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Tables

Table 1. The relative frequency distribution of the participants based on age, gender, educational attainment level, marital status, income, and insurance status in the control and intervention groups

Demographic Characteristics		Number		p-Value
		Control Number(Percent)	Intervention Number(Percent)	
Gender	Male Female	33(50%) 33(50%)	34(51.5%) 32(48.5%)	0.50
Age (years)	60-69 70 and older	56(84.8%) 10(15.2%)	47(71.2%) 19(28.8%)	0.092
Education	Sub-secondary Secondary University	57(86.4%) 6(9.1%) 3(4.5%)	59(89.4%) 5(7.6%) 2(3%)	0.66
Marital Status	Single, Widow, Widower Married	12(18.2%) 54(81.8%)	19(28.8%) 47(71.2%)	0.10
Income	Low Middle Good and High	20(30.3%) 16(24.2%) 30(45.5)	31(47%) 12(18.2%) 23(34.9%)	0.14
Insurance Status	Insured Without Insurance	46(69.7%) 20((30.3%)	43(65.2%) 23(34.8%)	0.35
occupation	Employed Housewife Retired	12(18.2%) 33(50%) 21(31.8%)	10(15.2%) 32(48.5%) 24(36.4%)	0.82

Table 2. The frequency distribution of reasons for self-medication

Reasons for Self-medication	Intervention	Control	p-Value
	Number (%)	Number (%)	
The Insistence of Others	21(31.8%)	23(34.8%)	0.43
Lack of Access to a Physician	18(27.3%)	16(24.2%)	0.42
High Costs of Visiting a Doctor	24(36.4%)	21(31.8%)	0.36
Considering the Disease as not Serious	23(34.8%)	27(40.9%)	0.30
Lack of Enough Time for Referring to a Physician or Hospital	14(21.2%)	23(34.8%)	0.06
Previous Experience with the Disease	38(57.6%)	40(60.6%)	0.43
Availability of Medicines (at home, from friends and acquaintances, etc.)	34(51.5%)	38(57.6%)	0.30
Being Able to Easily Obtain Drugs from Pharmacies without the Need for Prescriptions	18(27.3%)	27(40.9%)	0.07
Not Having Health Insurance	9(13.6%)	8(12.1%)	0.50
Not Trusting Physicians	8(12.1%)	10(15.2%)	0.40
Not Knowing Enough About the Effects of Drugs	40(60.6%)	39(59.1%)	0.50
The Belief that Drugs do not Have Side Effects	27(40.9%)	18(27.3%)	0.07
total N =	132(100%)		

Table 3. The comparison of the mean scores of awareness, perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and self-medication behaviors in the intervention and control groups before and after the intervention

Variables	Groups	Before Intervention	After Intervention	p-value[b]	Mean Difference± SD	95% confidence interval for Difference	
		Mean± SD	Mean± SD			Lower	Upper
Awareness	Intervention	48.63±18.21	82.87±12.24	< 0.001	-34.25±19.77	-39.10	-29.38
	Control	44.45±19.86	45.3±19.70	0.44	-6.66±10.86	-9.33	-0.99
	p-value[a]	0.85	< 0.001				
Perceived Susceptibility	Intervention	47.65±15.49	78.79±17.58	< 0.001	-31.14±24.65	-37.19	-2508
	Control	48.10±17.02	50.12±15.71	0.59	-2.05±31.33	-9.75	5.66
	p-value[a]	0.87	< 0.001				
Perceived Severity	Intervention	49.53±16.08	62.22±14.05	< 0.001	-12.70±20.98	-17.85	-7.54
	Control	45.46±13.38	44.51±11.47	0.3	1.14±4.09	0.13	2.14
	p-value[a]	0.13	< 0.001				
Perceived Benefits	Intervention	53.10±19.44	75.75±11.24	< 0.001	-22.65±17.83	-27.03	-18.26
	Control	55.75±6.39	56.89±5.99	0.2	-1.14±2.89	-1.85	-0.43
	p-value[a]	0.29	<0.001				
Perceived Barriers	Intervention	58.10±17.66	53.33±18.48	0.04	4.78±19.18	0.06	9.49
	Control	50.60±18.19	50.83±16.88	0.81	-0.23±7.77	-2.13	1.67
	p-value[a]	0.01	0.41				
Self-Medication Behavior	Intervention	45.74±11.98	15.53±5.82	< 0.001	30.21±12.50	27.14	33.28
	Control	48.48±17.59	45.92±15.44	0.20	2.56±4.35	1.49	3.63
	p-value[a]	0.29	<0.001				

a: Significant, Independent -samples t-test; b: Significant, Paired-samples t-test.

Table 4. The results of modeling the effects of the educational intervention on awareness, the constructs of HBM, and behavior, taking the effect of time into account

Variable	The intervention group		The control group		p-Value in Model 1	p-Value in Mode 2
	Before	After	Before	After		
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD		
Awareness	48.63 ± 18.21	82.87 ± 12.24	44.45 ± 19.86	45.30 ± 19.70	0.27	< 0.001**
Perceived Susceptibility	47.65 ± 15.49	78.79 ± 17.58	48.10 ± 17.02	50.15 ± 15.71	0.4	0.02*
Perceived Severity	49.53 ± 16.08	62.22 ± 14.05	45.46 ± 13.38	44.51 ± 11.47	0.5	< 0.001**
Perceived Benefits	53.10 ± 19.44	75.75 ± 11.24	55.75 ± 6.39	56.89 ± 5.99	0.002**	0.003**
Perceived Barriers	58.10 ± 17.66	53.33 ± 18.48	50.60 ± 18.19	50.83 ± 16.88	0.14	0.03*
Behavior	45.74 ± 11.98	15.53 ± 5.82	48.48 ± 17.59	45.92 ± 15.44	< 0.001**	< 0.001**

Model 1: The model adjusted for the pre-intervention measurements.

Model 2: The model adjusted for the pre-intervention measurements, gender, age, educational level, occupation, income, and insurance status.

Table 5. Distribution of diseases based on sex of the studied individuals

Diseases	Male	Female	p-Value
	Number (%)	Number (%)	
Cold	55(82.1%)	55(84.6%)	0.44
Headaches	66(98.5%)	63(96.9%)	0.49
Anemia	13(19.4%)	60(92.3%)	>0.001**
Skin Diseases	3(4.5%)	4(6.2%)	0.48
Gastrointestinal Diseases	21(31.3%)	5(7.7%)	0.001**
Joint Diseases	11(16.4%)	12(18.5%)	0.47
Muscular Diseases	1(1.5%)	0(0.0%)	0.50
Neurologic Diseases	14(20.9%)	23(35.4%)	0.04*
Menstrual Diseases	0(0.0%)	11(16.9%)	>0.001**
Blood Pressure	9(13.4)	9(13.8%)	0.57
Osteoporoses Diseases	2(3%)	6(9.2%)	0.13
Diabetes	2(3%)	4(6.2%)	0.33
Urologic Diseases	4(6%)	3(4.6%)	0.52
total N =	132(100%)		

Table 6. Frequent distribution of arbitrarily used medications based on sex in the subjects studied

Medications	Male	Female	**p-Value**
	Number (%)	**Number (%)**	
Multivitamin	13(19.4%)	50(76.9%)	>0.001**
Folic acid	4(6%)	44(67.7%)	>0.001**
Ferrous Sulfate	11(16.4%)	59(90.8%)	>0.001**
Antibiotics	52(77.6%)	55(86.2%)	0.15
Laxatives	3(4.5%)	4(6.2%)	0.49
Cold Syrup	50(74.6%)	50(76.9%)	0.46
Cold Medicines	64(95.5%)	61(93.8%)	0.48
Sedatives	13(19.4%)	14(21.5%)	0.46
Painkillers	59(88.1%)	53(81.5%)	0.22
Sedatives Agents	16(23.9%)	24(36.9%)	0.07
Sleep aids	5(7.5%)	16(24.6%)	0.006**
Anti acids	17(25.4%)	4(6.2%)	0.002**
Anti emetic	0(0.0%)	3(4.6%)	0.12
Antihypertensive	9(13.4%)	8(12.3%)	0.52
Hormonal Medicines	7(10.4%)	17(26.2%)	0.01
Herbal Medicines	19(28.4%)	39(60%)	>0.001**
total N =	132(100%)		

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- Equations.docx
- CONSORT2010Checklist.doc
- CONSORT2010FlowDiagram.doc