Understanding Contextual Stimuli of Adherence to Treatment in Heart Failure Patients: Study based on Roy Adaptation Model

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Abstract

Background: Non-adherence to medications and lifestyle recommendations in heart failure is associated with poor clinical outcomes including recurrent hospitalization, deterioration of the disease condition, and increased health care costs.

Objectives: This study aimed to identify the contextual stimuli related with adherence to treatment among the patients with heart failure based on Roy Adaptation Model in the cultural and socio-economical context of Iran.

Methods: This qualitative study was performed in 6 cardiovascular referral centers using the conventional content analysis. Data were collected through semi‑structured interviews in 2017–2018. Each interview was started using general questions about self-care behaviors and barriers/ facilitator to adherence to treatment. Also, the Three‑step content analysis approach proposed by Elo was used for data analysis.

Results: The concepts considered in the experiences of participants as contextual stimuli of treatment adherence were categorized into 16 subcategories and also 4 categories as follows: cultural factors**,** socioeconomic factors, physical / psychological stress, coping abilities and strategies.

Conclusion: Given that HF patients experience numerous self-management challenges to adherence to treatment, Nurses can play an important role in promoting the adaptation and improving the patient adherence through managing the contextual stimuli mentioned in this study by applying Roy Adaptation Model. The relationships among numerous contextual stimuli mentioned in this study should be tested through quantitative studies, and nursing interventions should be developed and tested to improve the adherence to treatment.

Keywords: Adaptation, Treatment Adherence and Compliance, Heart failure

Introduction

Non-communicable diseases, also known as chronic diseases, account for an annual 41 million deaths (71% of all deaths worldwide) with the highest mortality rates ($\approx$ 32 million people) occurring in low-income and middle-income countries. A key element in managing the patients with chronic conditions is to assess the patients' adherence to treatment[1]. Adherence to treatment is defined as a range of medication behaviors and lifestyles that are consistent with agree recommendations from a healthcare providers [2]. The poor treatment adherence in chronic diseases, is considered as a global problem [3, 4] . No-adherence to medications and lifestyle recommendations in Heart Failure (HF), as a chronic disease, is frequent [5] and is associated with poor clinical outcomes including recurrent hospitalizations, worsening conditions of disease, and increased healthcare costs [5-7].

Improving adherence to treatment of this population is considered as one of the priorities for policymakers, researchers, and health care staff[8]. There are different interventions for improving the treatment adherence for HF. Although the long-term use of patient-centered interventions and multidisciplinary collaboration for the management of HF is essential for improving the adherence to treatment and clinical outcomes, the results of a systematic review and meta-analysis indicated the very partial effect of these interventions on improving the treatment adherence and clinical outcomes[10 ,9] . Moreover, the topic that should be addressed is that, to improve the adherence to the treatment, one should at first understand the adherence behavior using theories[11]. In general, various models and theories outside the nursing discipline are presented to explain, predict, and modify the adherence behavior of individuals, in which we can refer to Social Cognitive Theory, Health Belief Model, Theory of Reasoned Action, Theory of Planned Behavior, Self-Regulatory Model, and the Transactional Model of Stress and Coping[12] . However, applying the nursing theories is essential for the development of nursing knowledge[14 ,13] . Since treatment adherence is an adaption behavior[15], it seems that Roy Adaptation Model (RAM) can explain adherence-related behaviors in patients[16]. RAM presents a useful framework for providing nursing care to individuals in situations that they are healthy and with acute, chronic, and terminal diseases[17]. The use of this model has been identified for improvement of the quality of life[20-18], psychological adjustment, maladaptive behavior reduction[21], and improvement of adherence to treatment in individuals with HF[23 ,22]. Most of the research studies that have used RAM to guide their study, have been conducted quantitatively. The results of a review of studies based on RAM over the ten-year period between 1995 and 2005, showed that, only 9 qualitative studies have been conducted regarding this, out of which, one study has examined stimuli and stressors addressed in RAM that highlighted the importance of the usefulness of qualitative methods for developing RAM[24]. Therefore, given that no qualitative study has been found to address the underlying stimuli of treatment adherence in individuals with HF based on RAM, the present study has been conducted to fill this gap

Objectives

The aim of this paper was to identify the contextual stimuli of the adherence to treatment in HF patients based on the RAM in the cultural and socio-economical context of Iran.

Roy Adaptation Model

In RAM, the individual is defined as a system of adaptations that is in a constant interaction with the internal and external environments. The environment is the source of a variety of stimuli that are both threatening and enhancing an individual integrity. The primary task of the individual is to maintain the integrity in the face of these environmental stimuli (focal, contextual, and residual stimuli). The focal stimuli include the immediate internal or external stimuli that individuals are aware of them. The contextual stimuli actually are the environmental factors entering the human adaptation system from the inside out; and although they are not the focus of attention or energy, they can help managing the focal stimuli. The residual stimuli are environmental factors inside or outside the human system whose effects are not clear on a given location[26 ,25]. The individual responses to environmental stimuli are not only inactivated, but also mediated through the functioning of coping mechanisms known as cognator and regulator sub-systems. Although it is not possible to directly observe the processes of these two sub-systems, the behavioral response of these two sub-systems can be observed consistently, efficiently or ineffectively in 4 modes of physiological, role-function, self-concept, and interdependence[17]. Within this conceptual framework, the purpose of nursing has been cited as improving the adaptation and reinforcement of the adherence to treatment[16]..

Methods

The study design and participants

It is notable that the present article is a part of a larger project entitled " Designing and Testing a Treatment Adherence Model Based on the Roy Adaptation Model in Patients With Heart Failure"[27]. Here, one of the themes derived from the findings of the qualitative Study (contextual stimuli of adherence to treatment in HF patients) was discussed in detail. The qualitative study was conducted between 2017 and 2018 using the qualitative content analysis approach.

Sample consist of HF patients who were conveniently and purposefully selected from 6 cardiovascular referral centers affiliated with medical sciences universities in Tehran. Inclusion criteria were persons with HF aged ≥18 years old, HF diagnosed based on medical records for more than 3 months, New York Heart Association classes I–IV, and patients with *HF* with reduced, *mid*-ranged, and preserved *ejection fraction*. Patients with obvious cognitive deficits, comorbidities such as cancer, end-stage renal disease (ESRD), advanced liver failure, cerebrovascular accidents in the past 3 months with major complications, heart transplantation candidacy for the next 6 months, and history of acute myocardial infarction within less than past 3 months were considered as the exclusion criteria.

Data collection

Data were collected through in‑depth semi‑structured interviews. Initially, interviews were started using general questions about disease and self-care behaviors such as "Explain about your heart disease?" and "What do you do to take care of yourself regarding your disease, why?"

Then, to facilitate data collection, an interview guide was used such as "Have you ever faced any situation in which you wanted to follow your own treatment regimen but you could not, due to some reasons?", "What were the reasons?", "What was your reaction in such situations?", and Have there been any situations that have made it easier for you to follow a treatment diet (for example medication, diet, physical activity, etc.)? Describe that situation. Also, what has been the hardest part of following your treatment diet (for example the most difficult part of taking medication)? Why?. Then, probing questions (such as "Please explain more" and "Please provide some examples") were asked to collect more detailed data. . Finally, the interview was finished by asking other open-ended questions such as: "Is there any other item that you may want to add?". Each interview was lasted 45–90 min and was recorded using a voice recorder. Data collection was continued until reaching data saturation.

Ethical considerations

This research project was approved by Iran University of Medical Sciences under the ethics code IR.IUMS.REC.1395.9221199205. Before performing the interviews, participants were informed about the objectives and the methods of the study, voluntariness of participation, and confidentiality of data handling. All participants signed the informed consent form before the start of interviews.

Data analysis and trustworthiness

For data analysis, directed qualitative content analysis based on RAM was used. This content analysis consists of three stages of preparation, organization, and reporting[28]. At the preparation stage, interviews were transcribed, and then, transcriptions were read for several times to obtain a broad understanding about their content. Then, at the organizing stage, the researchers formulated a categorization matrix based on the concepts in the RAM for analysis, and then reviewed the data several times and assigned initial codes. The initial codes implying a single subject, were placed in sub- categories by carrying out constant comparative analysis between the data of each interview and the data of other interviews, while taking into account the similarities, differences, and proportions. Then, categories were classified through constant comparison of the sub- categories. The name of the sub-categories and categories was selected based on the concepts of the RAM. The quality of the data is assessed using Lincoln and Guba's criteria[29]. In the present study, these criteria were addressed through 1‑year prolonged engagement in data collection, member checking, and peer debriefing. For member checking, the results of the study were presented to some of the participants, and their review ensures consistency and further adds to the credibility of the data. For Peer debriefing, the interview texts plus the extracted codes and categories were reviewed and assessed not only by advisors and supervisors, but also by a faculty member with expertise in qualitative studies to determine the accuracy of the encoding process. The present study also attempted to realize the confirmability of the results by clearly documenting each stage of the study. Also, the transferability of the results to similar settings becomes possible for other researchers by seeking to cover a wide range of participants in terms of age, occupation, marital status, severity of the disease, duration of the disease, and education as well as by describing the study context and participants.

Results

The participants in this study were 18 patients with HF, 10 men and 8 women aged 30-75 years of age (Table) . The theme of the adherence to treatment in patient with HF based on RAM were Focal Stimuli, Contextual

stimuli, and Dimensions of adherence to treatment. Table 2 lists the categories and sub-categories of theme contextual stimuli of the adherence to treatment.

Cultural factors

Culture as the first and most contextual stimuli affecting the adherence to treatment includes the family and community cultural habits, disease stigma, and tendency to use non-medicinal aids. Eating habit of most individuals with HF in this study, was consuming a diet high in salt and oil, which is an important factor in their inability to adhere to the recommended diet. For example, one of Class III participants with one year of the disease history admitted: "Sometimes I added salt when I did not taste to see if it was salty or not. We Iranians love adding salt even though we know that it is an enemy of the body, we use it (P7)". The unsuitably of the foods in the restaurants and parties with the diet recommended to them as well as the health beliefs of the purchaser and the food maker also affected the participants' sodium restricted diet. "My wife had brought a rice and red meat in Kermanshahi oil in a container with salt for my lunch (P3)".

The community-based cultural beliefs lead to individuals' tendency to use non-medicinal aids. One of Class IV participants with 10 years of disease history said: "I am using herbal medicines like apple cider vinegar instead of fat pills because it is harmless and has lower fat, but the medicines are chemical and have much harm (P5)".

In this study, it was indicated that disease stigma and pity causes patients to try to conceal their disease and ignore the treatment regimen in social interactions and attendance. One of Class III participants with 7 years of disease history said: "I have to take this medicine with myself somewhere I go. Well, everybody is sitting there when I get up to take the medicine. All take a pity look and say you are sick. I do not like that (P2)".

Socioeconomic factors

Based on the experiences of the participants, their economic status, employment status, and place of residence have played an important role in adhering to their treatment regimen.

The financial problems were one of the most important barriers to adherence to treatment in this study, which led to different prioritization of treatment regimen through lower cost and more important treatment diet. One of Class II participants with one year history of the disease stated: "We could not afford going to the physician office, which means it was really difficult, so I came to the physician office once every 3 months (P12)".

The occupational status, and consequently, workplace conditions for patients were other factors affecting the adherence to treatment regimen. The employed participants in this study were unable in their workplaces to properly manage their diseases such as timely medication intake, maintaining physical activity, and adhering to a sodium-restricted diet. For example, restricting their access to an appropriate diet to their disease has led to patients' tendency to fast foods or foods served in the workplace, resulting in non-adherence to a sodium-restricted diet. One of participants with 4 years of disease history said "I was a desert driver because I could not get some diet food for the few days I was traveling, so I ate whatever I got (P8)".

The residence of patients, whether living in the city or in the village, was another contextual stimulus affecting the adherence to treatment in this study. So that, shortage of facilities in small towns, distance traveled, transportation problems, and costly travel to visit a physician led to delayed or neglected participation of residents rural and small towns' residents to maintain a physician appointment. One of Class II participants with five-year history of the disease said: "If we had the facilities in our city it was good, but it had no facilities for heart. I did not regularly go there because it was difficult for me and my family (P15)".

Coping abilities and strategies

This category includes knowledge, the daily routine of life, self-control, self-deception, depression / anxiety, and acceptance / denial.

The knowledge of individuals with HF of treatment regimen can be an important coping ability for adaptive or ineffective behaviors in the basic physiological mode need. It was indicated that achieving a level of knowledge is associated with increasing the patient with HF awareness of the disease, its proper management, and consequently, adherence to treatment. Most of the participants had minimal information on diseases and self-care behaviors; therefore, most of them did not follow the treatment plan or arbitrarily omitted aspects of the treatment that led to selective treatment diet adherence. One of the participants with 4 years of the disease said: "Even my wife and I said that we had battery so there is no need to adhere a diet, but suddenly we became aware of that (P8)".

Most participants in the study viewed their actions as a set of behavioral habits that they consider all their actions to be the result of longstanding habits that have been engraved in their minds over many years of repeating specific behaviors. Accordingly, these habits and life routines make the way easier or more difficult to attain the objective of health or disease control through the adherence to treatment and self-care. For example, one participant stated: "I do not follow because of the habit of not eating or exercising first, so it is difficult to

try to live a different life now, but in the mornings and at nights, as usual with breakfast and dinner I took my medicines as to get used to the habit (P16)".

The important and significant coping abilities and practices to the adherence to treatment may be self-control or will power. Self-control enables individuals with HF to control their own behaviors, avoid temptations, and resist inappropriate behaviors and desires, which can facilitate their adaptation to conditions and adherence to complex treatment. One of Class I participants with two years of the disease history said: "I have a very strong will, and this is what I came up with when I got sick and the physician said that I should limit salt too much and quit smoking, I was there because I love salt, and had been smoking for many years I could have quit (P18)".

Self-deception and reality avoidance are concepts often used by the participants to justify their non-adherence behaviors. The individuals with HF used this method of coping to embody emotions experiencing less suffering from the limitations of lifestyle adjustment. This method of responding treatment was observed as a form of threats when a person with HF convinced himself to do what he knew was wrong and believed in two contradictory actions at one time. The patients involved in this process understand the threat to their life by failing to adhere to the treatment and acknowledge the reality; however, they try to deceive themselves to cope with the emotional stress resulting from it. One of Class 2 participants with 5 years of history of the disease said: "I know cigarettes are very harmful, and I do not smoke while everyone smokes, but this is my own trick. I find that I can justify my smoking by finding a solution (P10)".

Life with chronic diseases and the complex and multidimensional treatment for individuals with HF were associated with emotions such as denial, hopelessness, depression, and anxiety, due to lifelong, untreatable, and unpredictable diseases. These emotion-focused coping mechanisms in response to understand the disease as a form of loss are destructive and threatening the active role of individuals with HF in self-care and adherence to treatment. For example, one of the Class *IV* participants with a year history of the disease acknowledged: "I have nothing more important than my health. When I get sick, I feel like every sadness in the world is in my heart. I was even bored to take my medicines on time and doing exercise (P9)". Feeling anxious for some of the research participants followed the perceived threat caused by changes in lifestyle and the adherence to treatment. This feeling was motivating for some participants and led to the adherence to treatment and has prevented some of their efforts to be adapted to the disease and adhere to the treatment. One of the Class *IV* participants with 5 years history of the disease said: "When I get this heart disease, I was really worried about what is going to happen. Sometimes I get so frustrated that I do not think I've ever had a medicine. I do not care (P14)".

Physical stressor factors

The physical stressors of patients included comorbidities, the mean *number of doses* per day and *number* of *medications*, and the adverse effects of medicines.

Most participants had an average of 3 comorbidities. The interaction between HF and comorbidities poses a greater burden on the participants health because comorbidities complicate disease management for patients through monitoring of signs and symptoms related to the disease and the adherence to treatment. One of Class **II** participants with 5 years of history of the disease said: "The patients with HF just do not have the same disease, they usually have diabetes, hypertension, and orthopedic problems that complicated conditions on how they can manage it (P10)".

The results show that some comorbidities have led to dietary limitations for individuals with HF. For example, participants in the warfarin consumption group were challenged with a sodium limitation diet. For example, they stated that fresh fruits and vegetables contain low levels of sodium; however, they are concerned about maintaining the blood level of warfarin by eating such foods. One of Class **II** participants with 5 years history of the disease said: "I do not have to eat salt because my heart is weak, so I went to query. It is said that fresh fruit and vegetables are low in salt and good, but I should not eat vegetables because of warfarin. So, I cannot keep up with my diet too much (P15)".

The complexity of medicine regimens such as the number of medicines used and the dose received for participants, are not uncommon due to age and the presence of multiple comorbidities and is associated with lower medicine adherence. Most participants in the study consumed an average of 5 to 10 medicines per day, and they believed that with the increase in the number of medicines, the likelihood of forgetfulness would increase, which lead to unintentional adherence. For example, One of Class 3 participants said: "I am taking medicines so much that it seems to me to be okay even to forget take medicines (P1)."

Most participants believed that the medicine used to manage the disease have led to a variety of adverse effects affecting their motivation to take the medicine and lead to deliberate non-adherence due to the experience of adverse effects of the medicine. For example, a participant stated: "I took Plavix and Aspirin, which the

physician had given me last year, my nose was bloody, so I stopped taking Aspirin myself and I only took Plavix (P6)".

Discussion

This is the first research presenting a picture of the contextual stimuli of adherence to treatment in patients with HF based on RAM.

From the perspective of RAM, culture is the most common contextual stimulus affecting the behavior in all adaptation modes, as well as the total response of the adaptation system. Culture includes a system of beliefs, habits, and practices that may affect one or all aspects of one's life as a system of adaptation[30].. The cultural habits of the community and family in the context of diet and exercise, and community-based cultural beliefs on inappropriateness of too much medicine consumption has led the patients to avoid treatment recommendations and lifestyle modifications, and on the other hand, move to non-medicinal additional matter to control symptoms related to the disease. This finding is consistent with the results of other studies. Accordingly, studies have shown that cultural beliefs (cultural priorities and preferences) affect self-care behaviors and the adherence to treatment [33-31].

The patients' socioeconomic state was another common contextual stimulus affecting the adherence to treatment in this study. The financial problem was one of the barriers to adherence to treatment, and in some cases, selective adherence to treatment was through a less costly and more important treatment for some participants and consistent with other qualitative studies[35 ,34]. The fact that in rural and small towns, Patients less benefit from healthcare services suggested the adverse conditions in relation to the adherence to treatment in this study. Shahrbabaki et al. concluded that patients with HF in small towns and villages receive less care, and have to endure the difficulty and cost of receiving treatment in larger urban centers[36]. Studies have shown that health-related outcomes in chronic patients living in rural areas are worse due to their low access to medicines and healthcare services[37-39].The type of job and its related characteristics such occupational conditions, were influential factors on the adherence to the treatment for the participants in the present study and qualitative study by Naghavi et al[40].

Another category related to the contextual stimuli is coping abilities and strategies such as knowledge, life daily routine, self-control, acceptance / denial, and self-deception. Diagnosis of chronic HF, and a complex and multidimensional treatment regimen associated with this disease, has been a stressful event for the participants who have sought adaptive responses to this new situation. Coping is a cognitive and behavioral effort to manage the stressful events, and coping strategy as a kind of emotional and cognitive response to stressful situations, has a significant effect on coping with chronic diseases[30]. The results showed that self-management of HF is strongly influenced by patients' knowledge of disease and treatment, which is consistent with other studies. In most studies, patients' knowledge has been identified as one of the factors affecting the adherence to treatment[42 ,41]. However, the results of the synthesis of qualitative studies conducted by Daley et al., showed that patients can have medicinal adherence even if they have no adequate knowledge[43].

The response of most participants to changes in lifestyle and the adherence to treatment can be attributed to their lifestyle habits and routines, so that most of these individuals were unable to abandon their old habits and tend to their daily life similar to their pre-existing disease, which is consistent with the study results performed by Sezgin et al[44]. The reason for the unintentional medicine adherence of the participants, was the forgetfulness of the medicine at a given time, so keeping the medicine in sync with the daily routine of the particular patient eliminated the need for him to remember and think about the medicine. The use of daily routine has been recognized as an effective strategy for preventing the forgetfulness of the medicine and managing the correct administration of the medicine in other studies [47-45].

Another problem with the adherence to treatment is the self-control conflict between motivations related to short-term pleasures and long-term rational objectives[48]. The individuals with HF have to do unpleasant activities (for example self-monitoring of weight and edema, and physical activity) and avoid desired activities (for example consumption of sodium-restricted foods) for attaining better health outcomes. Self-control and will-power are among the reasons of adapting individuals with HF to meet the challenges of changing their lifestyle. Studies have suggested that self-control is associated with psychological adaptation and a sense of well-being, which may be due to the effect of self-control on important life outcomes such as improving the quality of life[50 ,49].. Regarding the extensive research in the field of self-control and in particular health, only a few studies have examined self-control for adherence to treatment in chronic diseases. The results indicate the role of this construct in the adherence to treatment and psychological adaptation to the disease[52 ,51].

HF, due to its chronic nature, has been perceived as a form of loss for some participants and has been associated with feelings such as denial, depression, hopelessness, and anxiety. These reactions are the most common

compromised processes associated with the individual. The focal stimuli of these reactions include perceived threats such as actual or anticipated loss experience, sudden changes in lifestyle, whether positive or negative, and unknown or fatal disease prognosis[30]. The lifelong, untreatable, and unpredictable life-threatening heart disease has led to a perception of the threat to the individual stability of a patient with HF that has contributed to some of the participants' adherence to a consistent path through adherence to treatment and has activated them, and has been also a deterrent to others, hampering their efforts to adapt to the disease, and resulting in non-adherence to treatment which is consistent with other studies. HF and treatment regimen are associated with emotions such as denial, fear, anxiety, and depression that lead to the loss of ability and distrust in life, which can reduce the patients' adherence to treatment and self-care behaviors [55-53 ,40].

Adherence to treatment among individuals with HF can be affected by physical stressors such as comorbidities, the number of medicines, the number of doses, and adverse effects of the medicine. Stress and physical or psychological states and conditions impede adaptation[30]. Comorbidities, medicine regimen complexity, and adverse effects of the medicine have been identified as barriers to medicine adherence in other studies [58-56 ,40], which is consistent with the results of the present study. Comorbidities challenge the disease management for individuals with HF through monitoring the disease-related signs and symptoms, increasing medicines, experiencing more adverse effects of the medicine, and limiting dietary choices and adherence, which make treatment adherence more complicated.

Limitations

Given that, the adherence to treatment is affected by indigenous, cultural, and health care system in any society, some of the themes associated with these factors less reported. The exclusion bias in this study was due to the withdrawal of patients with cognitive impairment and end-of-life diseases. Therefore, the generalizability of the results for this group of patients should be done with caution.

Conclusion

Adherence to treatment in chronic diseases, especially HF, is a major health issue. Considering that nurses play an important role in managing HF and improving the patients' adherence to treatment, there is a need for more comprehensive understanding of the reasons why patients do not adhere to the therapeutic regimen. The use of nursing theories has led to a shared understanding of nurses about the human and health needs, and consequently, more uniform nursing care. RAM, focusing on the adaptation of individuals with different environmental stimuli (focal, contextual, and residual stimuli), is one of the most effective models on the care of patients with chronic diseases and an effective guide for nurses' performance for the care of patients with HF.

Using this conceptual model, the nurses can play an important role in promoting adaptation and improving the adherence to patients through management of the contextual stimuli mentioned in this study. Given that HF patients experience numerous self-management challenges to the adherence to treatment; this study has provided fields that nurses should pay attention to their efforts to increase patient adherence to treatment. The study results indicate that several contextual stimuli can explain and / or predict treatment adherence, so these relationships should be tested through quantitative studies and nursing interventions should be developed and tested to improve the adherence to treatment.

Consent for publication

We obtained informed written consent from all participants

Availability of data and material

The data used to support the findings of this study are available from the corresponding author upon request

Competing interests

The authors declare that they have no competing interests.

Ethical issues

None to be declared

Table1. Participants' characteristics

Code	Age	Gender	Education Level	Employment	NYHA *Functional* Classification	Duration of disease
1	67	Female	Primary school	Housewife	III	< 1 years
2	55	Female	middle school	Housewife	III	7 years
3	57	Male	middle school	Retired	III	4 years
4	50	Male	Primary school	Unemployed	IV	1.5 years
5	70	Female	Illiterate	Housewife	III	10 years
6	59	Female	Primary school	Housewife	II	2 years
7	56	Male	master degree	Employed	III	1 years
8	61	Male	Illiterate	Employed(Driver)	III	4 years
9	71	Male	Illiterate	Shepherd	IV	1 years
10	48	Female	master degree	Employed	II	5 years
11	76	Male	middle school	Retired	III	4 years
12	72	Male	Primary school	Retired	II	1 years
13	75	Male	middle school	Retired	III	1.5 years
14	65	Female	Illiterate	Housewife	IV	5 years
15	63	Female	Diploma	Housewife	II	5 years
16	61	Male	Bachelor	Retired	IV	20 years
17	38	Male	Bachelor	Employed	III	10 years
18	65	Female	Diploma	Retired	I	1years

Table 2. Categories and sub-categories

Sub-Category	Category	Theme
Family and community cultural habits	Cultural factors	contextual stimuli of the adherence to treatment
Disease stigma		
Tendency to use non-medicinal aids		
Economic status	Socioeconomic factors	
Employment status		
Place of residence		
Knowledge	Coping abilities and strategies	
Daily routine of life		
Self-control		
Self-deception		
Depression / Anxiety		
Acceptance / Denial		
Comorbidity	Physical stressor factors	
Number of *medications*		
The mean *number of doses* per day		
The adverse effects *medication*		

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