

# Chronic Disease Journal

Chronic Diseases

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3. Kuczmarski RJ, Ogden CL, Grammer-Strawn LM, Flegal KM, Guo SS, Wei R, et al. *CDC growth charts: United States. Advance data from vital and health statistics*. No. 314. Hyattsville, Md: National Center for Health Statistics, 2000. (DHHS publication no. (PHS) 2000-1250 0-0431)

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## The relationship between Internet addiction with depression and anxiety among Iranian adolescents

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### Original Article

#### Abstract

**BACKGROUND:** Currently, the Internet has become an indispensable part of individuals' lives. Given the increasing use of the Internet, especially among students, it is essential to analyze its impacts on the psychological characteristics of individuals. The present study was carried out aiming to determine the relationship between Internet addiction with depression and anxiety among the adolescents.

**METHODS:** This descriptive cross-sectional study was conducted on all high school students of the city of Sanandaj, Iran. The study subjects included 595 students (285 girls and 310 boys) which were selected through cluster random sampling. The data collection tools in this study included Internet Addiction Test (IAT) by Young, Beck Anxiety Inventory (BAI), and Beck Depression Inventory (BDI). Data were analyzed using SPSS software, regression analysis, and chi-square test.

**RESULTS:** It has been found that 28.7% of the students had Internet addiction. There was a significant correlation between Internet addiction and depression ( $P < 0.001$ ), anxiety ( $P < 0.001$ ) and school grade ( $P = 0.002$ ). However, no significant relationship was reported between Internet addiction and sex ( $P = 0.560$ ), parental separation ( $P = 0.860$ ) and parents' death ( $P = 0.722$ ). Moreover, the results of regression analysis showed that these variables altogether could predict 36% of Internet addiction among these subjects.

**CONCLUSION:** The increasing Internet addiction in the Iranian society is associated with depression and anxiety. Therefore, providing educational programs for students and parents to use the Internet properly and diagnosis and treatment of Internet addiction among students are recommended.

**KEYWORDS:** Internet, Addiction, Depression, Anxiety, Adolescents, Students, High School

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### Introduction

Currently, Internet addiction is on the rise among different communities and teenagers are the most vulnerable group.<sup>1-3</sup> The China Internet Network Information Centre (CNNIC) has announced four main incentives for the use of the Internet among the teenagers,

including searching for information (news), interaction with others (sending Emails and chatting), entertainment (games and movies) and commercial activities (online shopping).<sup>4</sup>

Numerous applications of the Internet along with its attractions have resulted in the emergence of a phenomenon called Internet dependency.<sup>5</sup> Internet addiction is a compulsive-impulsive disorder that involves using online and offline computers for at least

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three activities, including extreme games, sexual preoccupation, and emailing and text messages. Internet addiction comprises four parts, including overuse of the Internet which is accompanied by losing track of time and neglecting other stimulants, withdrawal symptoms like feelings of anger, tension and depression in the lack of a computer, tolerance which includes the need for better computer equipment, more software packages and more hours of Internet use, and negative reactions like arguments, lying, social isolation, and fatigue.<sup>6-9</sup>

The number of Internet users in Iran increased to 36% during 2000-2006, growing to more than 11.5 million individuals by 2012.<sup>10</sup> However, other studies have shown the estimated incidence of Internet addiction to be 15.1%, 16.2%, and 0.8% in Taiwan,<sup>11</sup> Poland,<sup>12</sup> and Italy,<sup>13</sup> respectively. Some countries including South Korea have considered internet addiction as one of the most serious public health issues.<sup>14</sup> In this country, high school students use the Internet 23 hours per week, and 2.1 million students are at risk of internet addiction.<sup>15</sup>

Internet addiction can have several consequences including waste of time and money, reduced social and educational performance, psychological damage, loneliness, depression, and anxiety.<sup>2,16-19</sup> Moreover, excessive dependence on the virtual world can lead to decreased happiness and social interaction, shyness, embarrassment, withdrawal from the community, inefficient fantasies and loneliness, which consequently result in depression.<sup>20-22</sup> Approximately 30% of individuals addicted to the Internet have varying degrees of social aversion and abnormal behavior.<sup>23</sup> Accordingly, there is a positive correlation between internet addiction and depression.<sup>2,20,24</sup>

Anxiety is more persistent and is characterized by concerns about the occurrence of bad things in the future. Internet

users may have anxiety and feel guilty for wasting their time on surfing the web or chatting.<sup>25</sup> Moreover, some studies have indicated that anxiety can be a predictor of internet addiction, so that anxious students use the internet excessively to decrease their negative attitude and to eliminate anxiety and stress. In a study by Bahri *et al.*, a significant negative correlation between the Internet addiction and anxiety was reported.<sup>26</sup> However, in another study, teenagers addicted to the Internet had lower levels of anxiety.<sup>2</sup> Furthermore, Kajbaf *et al.* found a significant relationship between the Internet and anxiety.<sup>25</sup>

Depression consists of a group of symptoms including low mood, depression-based thoughts and in extreme cases, biological symptoms. Depression and anxiety are related to the Internet indecency.<sup>2,16,18,19,25</sup> In some cases, it has been shown that the Internet addiction is resistant to treatment since it is associated with other disorders like depression and anxiety. Therefore, psychiatric disorders like depression and anxiety should be taken into account in order to develop a program to prevent the Internet addiction among teenagers.<sup>7,27</sup>

The present study was performed with the aim to determine the relationship between the Internet addiction with depression and anxiety with respect to sex, school grade, and separation and death of parents. We also investigated whether depression and anxiety disorders could predict the Internet addiction among the respondents.

## Materials and Methods

This cross-sectional study was performed on all high school students of Sanandaj, Iran. The study population comprised 595 students (285 girls and 310 boys) aged 14-20 years which were selected through the cluster random sampling. Data collection began after obtaining the legal permission from the regional departments of education in Sanandaj city (regions 1 and 2). All schools in the city

were divided into two clusters, and therefore, the number of schools in each region was calculated in proportion to all schools. Ultimately, 16 schools (four boys' schools and four girls' schools from each region) were randomly selected among all schools in the two regions (regions 1 and 2 included 31 and 28 schools, respectively, Figure 1). The sample size was determined in proportion to the number of students in each school. Then, the number of subjects in each school was determined based on the ratio of the students in different grades, then, the subjects were selected through stratified random sampling. Individuals with a history of psychiatric disorders other than depression and anxiety were excluded from the study. Written informed consent was obtained from the participants in the study.

Data collection was performed in several stages. First, the researchers had to officially apply to the Education Organization of Kurdistan Province, Iran, for the required permission to carry out the study and a letter of permission from the Education Administration of Sanandaj to enter the selected high schools. Then, they performed the required coordination with the principals of these high schools for distributing the

questionnaires. In addition, a brief explanation about the study and its objectives was given to the officials. Then, as discussed earlier, sample selection was performed using the stratified randomized sampling method. In the next step, a clear description of the main purpose of the study and its expected findings, applications and implications of these findings were discussed to encourage the respondents.

Data were collected during July–November 2015 using the demographic information checklist, Internet Addiction Test (IAT), Beck Anxiety Inventory (BAI), and Beck Depression Inventory (BDI). A brief explanation of the study and how to complete the questionnaires were given to the students. Then the researchers distributed the questionnaires BAI and BDI among the participants. The tools used in this study included: IAT, BDI, and BAI.

**IAT:** The IAT consisted of 21 items with choices ranked from never to very much with a score range of 0 to 4, respectively, yielding a total score of to 84. Scores over 44 indicated the Internet addiction. The reliability and validity of this questionnaire has been previously confirmed by Alavi *et al.*<sup>28</sup> The reliability of this test according to the data of the present study was  $\alpha = 94\%$ .

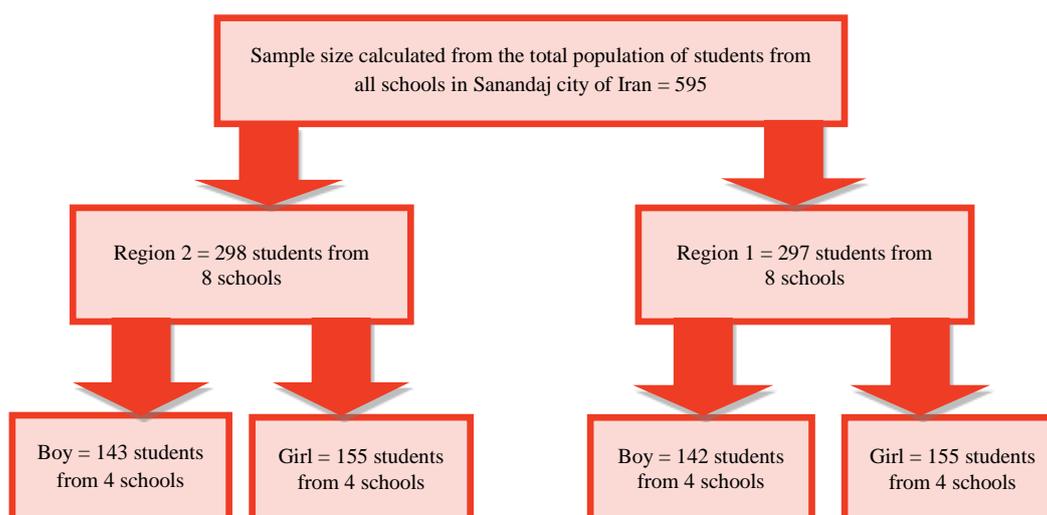


Figure 1. Sampling process

**BDI:** This 21-item questionnaire was first introduced by Beck, Mendelson, and Mockand Arbat in 1961 and was later revised in 1971 and published in 1978. The items have been modified in the current version and there was a high correlation between the two versions of 1971 and 1978. The popularity of this questionnaire comes from the fact that more than 1000 studies have been conducted on it or have used it since its introduction about 30 years ago. The 21 items of BDI have been originally obtained from the observation and summary of the attitudes and symptoms of depressed psychiatric patients.<sup>29</sup> This test consisted of 21 questions and its cutoff point was the score of  $\geq 17$ . Hence, scores  $\geq 17$  and  $< 17$  indicated depression and lack of depression, respectively. The reliability and validity of this questionnaire have been measured by different psychologists and scholars. Stefan-Dobson *et al.* reported a reliability and internal consistency coefficient of 94% and 92% for this questionnaire, respectively.<sup>29</sup> In addition, a reliability of 93% is reported for this questionnaire.<sup>30</sup> The reliability of the items of this questionnaire according to the data obtained in this study was reported to be  $\alpha = 85\%$ . The reliability of this questionnaire has also been evaluated by Stefan-Dobson *et al.* for the Persian population.<sup>29</sup>

**BAI:** BAI was a self-report questionnaire which has been used to measure the level of anxiety among teenagers and adults.<sup>31</sup> This questionnaire included 21 items and its cutoff point was determined based on the normal curve mean  $\pm$  standard deviation (SD) and the study subjects in three different forms as follows: Mean - SD = 3.829, Mean + SD = 23.95, and Mean + SD - (Mean - SD) = 23.95 - 3.829 indicating low anxiety, high anxiety, and moderate anxiety, respectively. The internal consistency (alpha coefficient) of the questionnaire and the test-retest reliability with one week interval were 75% and 92%, respectively, in addition, the correlation of its

components varied from 30-76%. Five types of validity including content, concurrent, construct, diagnostic and factor validities have been measured for this test, all of which reflected the high efficacy of this inventory to measure the severity of anxiety.<sup>32</sup> The reliability of the items of this questionnaire according to the data of the present study was reported to be  $\alpha = 80\%$ . Beck *et al.* reported an alpha of 92% and a test re-tests validity of 75%, showing desirable reliability and validity.<sup>32</sup> The participants who were diagnosed with depression and anxiety using BAI, were referred to school counselors and were interviewed using the Structured Clinical Interview (SCID-1).

**SCID-1:** The SCID-1 is a semi-structured interview which provides diagnoses based on the diagnostic and statistical manual of mental disorders (DSM-IV). SCID-1 is called a semi-structured interview as performing the interview requires clinical judgment of the interviewer about the interviewee's responses. It should be noted that the interviewer should have sufficient clinical knowledge and experience in this regard.<sup>33</sup> Moreover, several studies have indicated acceptable validity and reliability for this questionnaire.<sup>34-37</sup> The reliability of the Persian version of this interview is reported to be 84.6% for all depression disorders.<sup>38</sup> Data were analyzed using SPSS software (version 21, IBM Corporation, Armonk, NY, USA) software. Descriptive statistics were used to calculate the mean and percentage. In addition, the multiple regression analysis (MRA) was applied to analyze the relationship between the Internet addiction with depression, anxiety, sex, school grade, parental separation and parents' death.

## Results

285 (47.9%) and 310 (52.1%) of the study participants were respectively girls and boys aged 14-20 years. In terms of educational grade, 121 (20.3%), 166 (27.9%), 154 (25.9%), and 154

(25.9%) of the subjects were the first grade, second grade, third grade, and fourth grade students, respectively. According to the results of the study, 28.7% of the students had the Internet addiction. Distribution of age group, grade, depression, anxiety, and internet dependence rates between the boys and girls are shown in table 1.

MRA was conducted to predict the Internet addiction from predictors' variables. As shown in table 2, 13% accounted for a significant amount of the Internet indication. In addition, it has been found that sex, age, grade, father or mothers' job, and anxiety were significantly

related to the Internet addiction ( $P \leq 0.050$ ), while there was no significant relationship between depression and the Internet addiction ( $P \geq 0.050$ ).

## Discussion

This study was conducted to determine the incidence of the Internet addiction and its relationship with depression and anxiety among high school students. It was hypothesized that the Internet addiction could be a good predictor for the increased depression and anxiety disorders among students in particular.

**Table 1. Frequency distribution of depression, anxiety, and the Internet dependency by sex, age group, and school grade**

Variables	Internet dependence [n (%)]		Anxiety [n (%)]	Depression [n (%)]		Mother's death [n (%)]		
	Yes	No	Low Average High	Yes	No	Yes	No	Yes
Sex								
Boy	74 (26.0)	211 (74.0)	18 (6.3) 195 (68.4) 72 (25.3)	144 (50.5)	141 (49.5)	2 (0.7)	283 (99.3)	6 (2.1)
Girl	213 (68.7)	97 (31.3)	58 (18.7) 219 (70.6) 33 (10.6)	135 (43.5)	175 (56.5)	1 (0.3)	309 (99.7)	6 (1.9)
Age group								
14-17	141 (31.1)	313 (68.9)	60 (13.2) 317 (69.8) 77 (17.0)	208 (45.8)	246 (54.2)	3 (0.7)	451 (99.3)	9 (2.0)
18-20	30 (21.3)	111 (78.7)	16 (11.3) 97 (68.8) 28 (19.9)	71 (50.4)	70 (49.6)	0 (0)	592 (100)	3 (2.1)
Grade								
First year	38 (31.4)	83 (68.6)	22 (18.2) 75 (62.9) 24 (19.8)	45 (13.2)	76 (62.8)	1 (0.8)	120 (99.2)	39 (2.6)
Second year	54 (32.5)	112 (67.5)	21 (12.7) 112 (67.5) 33 (19.9)	80 (48.2)	86 (51.6)	1 (0.6)	165 (99.2)	3 (1.8)
Third year	53 (34.4)	101 (65.6)	12 (7.8) 122 (79.2) 20 (13.0)	79 (51.3)	75 (48.3)	1 (0.6)	153 (99.4)	3 (1.9)
Fourth year	26 (16.9)	128 (83.1)	21 (13.6) 105 (68.2) 28 (18.2)	75 (48.7)	79 (51.3)	0 (0)	154 (100)	3 (1.9)

**Table 2. Multiple regression analysis (MRA) on the Internet addiction (n = 594)**

Predictors	Unstandardized Coefficients		Standardized Coefficients	t	P
	B	Standard Error	Beta		
Constant	-32.07	16.86		-1.90	0.058**
Sex	3.82	1.57	0.090	2.42	0.010***
Age	3.31	1.12	0.190	2.95	0.003***
Grade	-5.29	1.15	-0.290	-4.57	P < 0.001***
Father's job	1.53	0.72	0.080	2.12	0.030**
Mather's job	3.07	0.70	0.170	4.39	P < 0.001***
Depression	0.14	0.08	0.079	1.74	0.082
Anxiety	0.29	0.08	0.155	3.38	0.001***

Dependent Variable: Internet addiction;  $R^2 = 0.13$

\*\*( $P \leq 0.050$ );\*\*\*( $P \leq 0.001$ ),

The obtained results showed an incidence rate of 28.7% for the Internet addiction among high school students of Sanandaj city. The Internet addiction rates for other populations in Turkey,<sup>39</sup> Birjand city, Iran,<sup>24</sup> and United Kingdom (UK)<sup>39</sup> have been reported as 9.7%, 40.7%, and 3.2%, respectively. Compared with the results obtained in the present study, it can be argued that the incidence of the Internet addiction is relatively higher in the Iranian society. Therefore, the increasing rate of Iranian users of the Internet may be attributed to the lack of easy access to physical activities, lack of family support and a proper role model in the families for their children's sports activities, which cause reduced physical activity.<sup>40</sup> Therefore, teenagers turn to cyber space to spend their leisure time to release their energy during adolescence.

In addition, studies have shown that shy, depressed, bored and lonely individuals are more at the risk of the Internet addiction compared to other individuals.<sup>41</sup> Moreover, according to the present study, there was a significant relationship between depression and anxiety and the Internet addiction. This finding indicates that these variables along with other demographic variables including age, sex, school grade, and parental separation, and parents' death and job could predict the Internet addiction by 36%. Several studies, including a study by Jafari and Fatehizadeh<sup>20</sup> have found a similar significant

correlation between the Internet addiction and their predictive effects. Moreover in this study, it was acknowledged that these variables could predict the Internet addiction by 39%. Moreover, Beranuy *et al.*<sup>16</sup> showed a significant correlation between the amount of the Internet use and depression. Furthermore, Bahrainian and Khazaee<sup>24</sup> indicated that depression was associated with the Internet addiction, and could partly predict its rate and could be used for its diagnosis and treatment. To sum up the findings of other studies, it can be argued that the Internet addiction and depression<sup>42-46</sup> and anxiety<sup>42,46-48</sup> are significantly correlated.

Furthermore, the results obtained in this study showed a significant relationship between the Internet addiction and school grade, indicating the higher rate of the Internet addiction among the second and third grade students. In addition, studies have shown a significant relationship between behavioral disorders and the school grade.<sup>49,50</sup> Considering the educational conditions in Iran, this may be attributed to further research load, further restrictions imposed on the fourth grade students by parents to prepare the students for university entrance examination, and the low knowledge and less access of first grade students to the Internet.

Based on the findings of the present study, there was no significant relationship between the Internet addiction and parents' separation

and death. Shayegan and Jebelli reported a significant relationship between the parents' separation and death and drug addiction, which was caused due to the loss of parental affection among the children.<sup>51</sup> Tsitsika et al. found that the rate of the Internet use was significantly higher among the adolescents whose parents had been separated.<sup>52</sup> Moreover, studies have shown that single parenthood can influence the Internet dependency.<sup>53</sup> Inconsistencies between the results of the present study and the abovementioned studies can be due to difference in the type and conditions causing the addiction.

Furthermore, there was no relationship between sex and the Internet addiction in this study, which was in line with the results of the studies by Kajbaf et al.<sup>25</sup> However, many studies are in contrast with this result, claiming that sex is correlated with the Internet addiction among different societies. Some studies have reported a significantly higher level of the Internet use among men compared to women.<sup>38,54-56</sup> Other studies have shown that the excessive use of the Internet.<sup>57,58</sup> This may be indicative of the cultural differences in different societies and different ways of upbringing of the children. A study showed that Korean students who were at the risk of the Internet addiction needed consultation.<sup>59</sup> Therefore, counselors were trained and the subsequent preventive measures were taken in the schools.<sup>14</sup>

**Limitations:** The present study faced several limitations. One of the limitations was the small sample size. The study population consisted of the high school students of two regions of the Sanandaj city, hence the results could not be generalized to other populations since the study subjects were selected from a limited community. Finally, data were collected by questionnaires and interviews and the students might not have answered accurately. Clinical interview by psychiatrists and mental health experts should be conducted in order to obtain the correct and

certain results.

### Conclusion

The increasing Internet addiction in the Iranian society is associated with depression and anxiety. Therefore, providing educational programs on the proper use of the Internet for students and parents and diagnosis and treatment of the Internet addiction among students are recommended.

### Conflict of Interests

Authors have no conflict of interests.

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## The effect of training on the self-efficacy rate among patients with diabetes mellitus

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### Original Article

#### Abstract

**BACKGROUND:** Self-efficacy is referred to as a person's belief in his/her ability to succeed in a particular situation. Training can be effective to enhance self-efficacy among the patients with diabetes mellitus (DM). Therefore, the present study was carried out with the aim to determine the effect of training on the self-efficacy rate among the patients with DM.

**METHODS:** The present study is a quasi-experimental study of interventional-control type. The data collection tool was a demographic questionnaire (demographic characteristics, educational needs assessment, and self-efficacy). 60 patients were selected by objective sampling method and were divided into the intervention and control groups (n = 30 in each group). Then, the replication-based study was performed on the subjects. Data were analyzed using independent t-test, chi-square, and Mann-Whitney tests in SPSS software.

**RESULTS:** The difference in mean of educational needs assessment in self-efficacy in the pre-test stage was not significant (P = 0.950), however, there was a significant difference between the two groups in the post-test stage in terms of the educational needs assessment (P = 0.030). From the viewpoint of self-efficacy level, there was a difference between the two groups in the post-test phase. However, this difference was not statistically significant (P = 519).

**CONCLUSION:** Considering the dependence of patients with DM on receiving care services, recognition of patient and self-care needs based on nursing theories and care planning will help the patient to adapt and increase self-efficacy.

**KEYWORDS:** Self-Efficacy, Diabetes Mellitus, Education

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### Introduction

Diabetes mellitus (DM) is a crucial health problem in 21<sup>st</sup> century. DM is a chronic, metabolic, and progressive disease that is commonly defined by increased blood glucose due to impaired secretion of insulin or insulin function.<sup>1</sup>

DM is diagnosed when glucose is equal to or greater than 126 mg/dl in two separate

sequences or the concentration of glucose two hours after meal is equal to or greater than 200 mg/dl.<sup>2</sup> DM is a critical chronic illnesses which affects young or middle-aged individuals. This disease may even be due to pregnancy.<sup>3</sup> According to the World Health Organization (WHO) in 2000, DM affected one per 300-500 individuals, in addition, the global incidence of this disease was reported to be 171 million individuals, reaching 438 million by the year 2030.<sup>4</sup> Most of this increase occurs in developing countries, and it is estimated that 75% of DM cases will be living in these

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countries by the year 2025.<sup>5</sup>

The highest incidence of DM is in the Middle East.<sup>6</sup> According to WHO, the incidence of this disease in Iran is more than 8%. Moreover, more than 20% of deaths in Iran occurs due to DM.<sup>7</sup>

Complications of the DM disease causing many deaths include short-term complications like hypoglycemia, hypocalcemia, and diabetic ketoacidosis (DKA), and long-term complications like cardiovascular, renal and ocular diseases; overall self-care and self-efficacy can be the causes of high mortality rates.<sup>8</sup>

Due to long-term treatment, the patients with DM need a change in their lifestyle in order to suitably manage their illness. The treatment of DM without the patient's self-contribution in some self-care activities cannot be sufficiently effective enough and the desired results will not be obtained.<sup>9</sup> Therefore, self-efficacy is one of the basic concepts among these patients. Self-efficacy is a concept with a wider scope of self-care among patients with DM. Self-efficacy means an individual's confidence and ability to perform self-care behaviors in a particular condition,<sup>10</sup> and emphasizes his/her ability to perform works properly and successfully.<sup>11</sup>

Individuals with a strong ability to work efficiently, believe that they can effectively manage their lives' events. This perception and belief give them a different view of one with poor self-efficacy since it has a direct effect on their behavior. Self-efficacy can be a critical factor in success and failure throughout life.<sup>12</sup> Individuals with higher levels of self-efficacy are better in controlling their disease.<sup>13</sup>

Self-care has a close link with the concept of self-efficacy, which is a process that requires the individual to progress independence and his ability to perform daily life activities as much as possible.<sup>14</sup>

Individuals with chronic illnesses, like DM, may not be able to take their own regimens according to the instructions, in addition, they

may forget the appointment with their doctor and not be able to carry out daily activities of their lives.<sup>15</sup> However, patients with DM should understand their own self-care requirements.<sup>16</sup>

According to the important role of rehabilitation of patients who suffer from the physical and mental disabilities, nurses can help patients improve their ability in performing their daily activities and reduce their social, psychological and economic problems.<sup>17</sup>

Diseases are major factors increasing the need for self-care among individuals. Meanwhile, nurses play a compensatory role in meeting these requirements.<sup>18</sup> Orem's model of nursing is one of the most inclusive self-care theories which can be beneficial for care providers to help patients evaluate their self-care ability.<sup>19</sup> The purpose of this model is to encourage patients to take care of themselves, in addition, the model specifies the role of nurses in assessing the need for self-care and the presence or lack of self-care deficiency among patients with chronic diseases.<sup>11</sup>

Self-care programs facilitate adaptation to conditions of chronic complications like DM.<sup>10</sup> Many health organizations and health care providers have also considered promoting self-care as a way to reduce the high cost of medical services.<sup>15</sup> Nurses contribute to the implementation of a care plan through serving, guiding, providing physical and mental support, and training the patients.<sup>14</sup>

Patient education and support are needed to increase self-efficacy, improve outcomes and reduce hospitalization.<sup>15</sup> Improving self-efficacy among the patients with DM and planning based on this potential is of particular importance. Due to numerous concerns of patients with DM regarding how to care for themselves and doubts about the ability to perform their daily routine and normal life, the researcher decided to conduct a study to determine the effect of training on the rate of self-efficacy among these patients.

## Materials and Methods

The present quasi-experimental study of control-intervention type was carried out with the aim of determining the effect of training on self-efficacy level among patients with DM in Tohid Hospital of Sanandaj, Iran, in 2017.

In this study, 60 patients were selected based on the inclusion criteria with non-randomized method; 30 of these samples were assigned to the control group ( $n = 30$ ). 15 individuals were estimated for each group according to previous studies. In this study, taking into account the intervention and the possibility of operating time for each group, 30 samples were sufficient, which were selected from 60 samples.

A 3-part questionnaire was used to collect data. The first part included demographic information including age, sex, marital status, duration of DM, and history of DM among the family members. The second part contained 20 questions about educational needs; this part of the questionnaire included the researcher problems with patients with DM. In this part, the subjects were asked to answer "I have" or "I do not have" any of the problems in the questionnaire in case of the presence or lack of a problem with a patient, respectively. Then, in case of a problem, they were supposed to answer the next question. There was a difficult question regarding how much patients needed to be trained and supported to control the situation. The scoring was based on the Likert scale and the answers to questions included high, moderate, low, and at all choices, with scores ranging from 4 to 1, respectively.

The third part included 15 questions for assessing the level of self-efficacy of the subjects, including personal health, nutrition, diet control, fluid intake control, compliance with drug regimen, sleep and rest, adaptation to problems, anxiety and worries control, communication with medical and nursing staff, family communication and social activities. The questions in this section of the

questionnaire were prepared by the researcher using the articles and scientific resources. The answer to each question was based on the Likert scale, with scores ranging from 4 to 1. On this basis, the self-efficacy levels were divided into 3 classes of self-efficacy, half affiliation, and independence with a score range of 15-30, 31-45, and 46-60, respectively.

In order to obtain scientific validity and reliability of this questionnaire, content validity method and Cronbach's alpha coefficient were used respectively. The informed consent were obtained from the subjects. In the next step, the researcher completed the questionnaires through in-person interview with the patients. Then, the patients' educational requirements in self-care and the related problems and their self-efficacy level were determined in the next step.

After the pre-test, a self-care program designed based on the Orem's nursing model, was performed for the intervention group in three stages, including evaluation of self-care needs among the study subjects, intervention in physical, psychological and social areas of self-care needs, and the post-test follow-up of patients during the 40 days after intervention. Data analysis was performed using descriptive and inferential statistics in SPSS software (version 16, SPSS Inc., Chicago, IL, USA).

## Results

The 60 patients under study were equally divided into the intervention control groups ( $n = 30$  in each group). The mean age of individuals in the intervention and control groups was 36.56 and 37.85, respectively. 15 (50.0%) of the subjects in both groups were women. In both intervention and control groups, 7 (23.3%) and 23 (76.7%) of the individuals were married and single, respectively. The mean duration of the illness among the intervention and control groups was 6.76 and 58.6 years, respectively. In both groups, the majority of individuals did not have a family history of DM.

**Table 1. Distribution of absolute and relative frequencies of characteristics of individuals in the two intervention and control groups**

Variable	Intervention group		Control group		Independent t-test results	
	Mean	SD	Mean	SD		
Age	36.56	8.67	37.85	0.01	P = 0.514	
Duration of DM	6.76	5.59	6.58	5.28	P = 0.700	
Average monthly treatment cost	15.81	53.37	9.40	38.49	P = 0.581	
Variable	Rate	%	Rate	%	Chi-square test results	
Gender	Man	15	50.00	15	50.00	P > 0.999
	Woman	15	50.00	15	50.00	
Marital status	Married	7	23.33	7	23.33	P > 0.999
	Single	23	76.67	23	76.67	
Family history of kidney failure	Yes	8	26.67	6	20.00	P = 0.411
	No	22	73.33	24	80.00	
Education level	Illiterate	7	23.33	9	33.33	P = 0.880
	Elementary or diploma	15	50.00	15	50.00	
	Higher than diploma	8	26.67	6	20.00	

SD: Standard deviation; DM: Diabetes mellitus

Besides, most of the subjects among both the intervention and control groups had elementary education or diploma degrees (Table 1).

The average monthly income among the intervention and control groups was 9'950'000 and 9'200'000 IRR, respectively, with no significant difference between the two groups in terms of the abovementioned variables.

Findings on the educational requirements of patients with DM before intervention in the two groups are demonstrated in table 2. As it can be

seen, the two groups are identical in terms of educational needs before intervention (P = 0.880).

Results on the educational needs of patients with DM after intervention in the two groups are shown in table 3.

The findings regarding the level of self-efficacy among patients with DM before and after intervention and their difference in the two groups are shown in table 4. The results presented in this table indicate that the two groups were statistically the same in terms of

**Table 2. Distribution of absolute and relative abnormalities of the study subjects on educational needs in the two intervention and control groups before intervention**

Training needs assessment before intervention	Group	Intervention group		Control group	
		Rate	%	Rate	%
Independent		24	0.75	26	74.30
Semi-dependent		9	0.03	8	26.60
Overall		30	100	30	100

**Table 3. Distribution of absolute and relative abnormalities of the study subjects on educational needs in the two intervention and control groups after intervention**

Training needs assessment after intervention	Group	Intervention group		Control group	
		Rate	%	Rate	%
Independent		27	90.30	23	74.00
Semi-dependent		1	3.30	6	0.02
Overall		27	100	27	100

the self-efficacy score before the intervention ( $P = 0.734$ ). There was a difference between the two groups after the intervention in the self-efficacy score, however, this difference was not statistically significant ( $P = 519$ ).

### Discussion

Today, chronic illnesses are the greatest challenge to the public health, which are cause of more than 75% of deaths.<sup>1</sup> DM is one of these chronic diseases. Due to multiple and complex drug treatments, various problems and essential changes in life of patterns of patients with DM have an impact on their social and psychological functioning. Since DM is a chronic complication, patients suffering from this illness are required to use a set of instructions to better cope with and manage this illness. The treatment of the patients with DM does not involve any self-care activities to be effective enough and the desired results to be obtained.<sup>15</sup> Taking into account the critical role in improving the self-efficacy among patients who suffer from the physical and mental disabilities, nurses can help patients improve their ability to carry out daily activities and reduce their social, psychological and economic problems.

The present study was accomplished aiming to determine the effect of training on the self-

efficacy rate among patients with DM. In this study, 75.0% and 74.3% of the subjects respectively in the intervention and control groups were independent in terms of self-care before the intervention. After intervention, this rate was obtained as 90.3% and 74% were for the intervention and control groups, respectively.

In a study by Jaser et al. on the self-care ability and self-efficacy of patients with DM, the mean self-care score of subjects was obtained as  $89.76 \pm 14.20$ . Moreover, the mean self-efficacy score was  $34.66 \pm 5.65$  in this study. Furthermore, the difference between the self-care and self-efficacy scores of patients with DM was statistically significant.<sup>9</sup>

In the present study, the self-efficacy score of patients in both groups was similar before intervention ( $P = 0.950$ ). In a study by Kough on determining the effect of training and support on self-care ability of patients with chronic diseases, the results indicated the lack of a significant difference in the self-care ability of patients at the onset of the study ( $P = 0.300$ ).<sup>10</sup>

In an investigation by Kilcup on the self-care assessment and determination of the factors affecting self-care among patients with DM, the mean self-care score of patients was obtained as  $114.33 \pm 16.25$  and there was no statistically significant difference between the study groups.<sup>12</sup>

**Table 4. Mean and standard deviation (SD) of self-efficacy scores of the study subjects before and after intervention in the two intervention and control groups**

Self-efficacy	Group	Intervention group		Control group		P Mann-Whitney test results
		Mean	SD	Mean	SD	
Self-efficacy before intervention		50.73	7.80	52.80	4.10	0.590
Self-efficacy after intervention		53.70	4.70	53.30	3.30	0.519
Self-efficacy difference		3.00	8.10	0.46	3.60	0.460

SD: Standard deviation

In the present study, the results of Mann-Whitney test indicated a significant difference between self-care scores of individuals after training ( $P = 0.030$ ). This difference in post-intervention scores can be the implementation of Orem's self-care model for patients with DM. Therefore, it can be concluded that self-care model improves the self-care status of patients, in addition, the training level is also effective among patients. In a study by Marcdante et al., after intervention, patients in both intervention and control groups had a higher degree of self-care behaviors compared with the beginning of the study ( $P < 0.020$ ).<sup>14</sup>

Training is a suitable tool for increasing the level of awareness of patients. Studies have shown that the lack or insufficiency of knowledge on self-care in the areas of proper diet, fluid intake, and care cause various problems among the patients with DM and eventually lead to various complications and increased mortality rate.<sup>19</sup> There are different models for training the patients. According to the problems among these patients, training can inform patients regarding the active and informed participation to take care of themselves, hence face-to-face education and family education can bring patients into independence; which this is closely linked to their ability to take continuous care of themselves.

The finding in the study by Rezasefat et al. on the correlation between self-care and self-efficacy in the adolescents with type 1 diabetes using Orem's nursing model on patients' recovery indicated a significant difference between the self-care ability among patients in the intervention group compared to the control group after the intervention ( $P < 0.001$ ). In addition, the recovery of patients in the intervention group was better in comparison to the control group ( $P < 0.001$ ).<sup>13</sup>

In the present study, after self-care program training, the mean self-efficacy level increased, however, this increase was not statistically

significant ( $P = 0.519$ ). Hence, a multi-faceted educational program is required for a higher effect, since increasing self-efficacy is more effective when combined with general changes in lifestyle, physical activity and social support.<sup>16</sup> It is suggested that the patient be supervised by a team of nurses, psychologists, social workers, and nutritionists since the entry of the patient into the department.

Moreover, in this study, other variables directly and indirectly affecting the level of self-efficacy of patients with DM were not evaluated. Fasting blood glucose (FBS) and non-fasting blood glucose tests are of these variables which are important indices to observe the principles of self-care among patients due to factors affecting the level of self-efficacy.

The findings obtained in this study indicated a significant difference between the self-efficacy scores of the subjects after training, however, this difference was not statistically significant.

The results obtained from the study by Vora et al.<sup>16</sup> on determining the relationship between self-efficacy and self-care of patients with DM showed that the mean score of self-efficacy and self-care among patients with DM was 4.124 and 23.240, respectively; there was a positive correlation between self-efficacy and self-care ( $P < 0.001$ ).

In the present study, according to the independent t-test and chi-square test, there was no statistically significant difference between the intervention and control groups in terms of age, gender, education, and self-care education. In other words, the group was homogeneous. The scores of age, gender, and the education level require self-care education. In terms of gender, different social status, decision-making role in the family, and leadership can affect the self-care education scores. Self-care capacity decreases with age. By increasing the education level, the individuals obtain information in an easy way

and their interest in maintaining and improving their health is enhanced.

The results of the study by LEO on determining the level of knowledge, attitude and practice of patients with DM regarding self-care showed that there was a significant correlation between knowledge and attitude of subjects towards self-care ( $P < 0.001$ ). In addition, the results indicated a significant relationship between age, number of children, educational level and monthly income of patients with their knowledge on self-care and there was a statistically significant relationship between the degree of education of patients and their performance about self-care.<sup>17,18</sup>

Unfortunately, no similar study on the examination of the effect of the self-care program on the self-efficacy rate among patients with DM was found, however, there was a study on the impact of self-care training on the quality of life (QOL) among these patients.

The results of a study by King and DeCicco to determine the impact of self-care education on the QOL and physical problems of patients with DM indicated a significant decrease ( $P = 0.030$ ) in problems like overweight, hypertension, edema, itching skin, vascular problems, and increased QOL.<sup>20</sup>

The study by Zohar and Marshal on determining the effect of self-care training on the QOL of patients with DM indicated that self-care training significantly improved at general levels ( $P = 0.300$ ), physical function ( $P < 0.001$ ), and mental health ( $P = 0.001$ ).<sup>19</sup>

The findings of a study by Cheraghi *et al.* on the assessment of the effect of self-efficacy training on adherence to fluid regimens among the patients with DM, indicated that 33-50% of patients did not follow the fluid limitation diet. After intervention and training, increasing self-efficacy was associated with increasing treatment compliance, improved health behaviors and reduced psychological and physical symptoms.<sup>5</sup>

The personal and physiological responses of individuals to the questionnaire and reduced accuracy of answering questions due to the high number of questions in the questionnaire were of the uncontrollable limits of the present study.

Based on the results of this study, it is suggested the self-care programs to be designed for other chronic diseases including dialysis, cardiovascular and respiratory failure, and their impact on self-efficacy.

### Conclusion

Understanding the need for self-efficacy among patients with DM and the implementation of educational programs, due to the dependence of these patients on treatment to preserve life until the end of life, helps the patients to adapt with the conditions and increase self-care activities.

### Conflict of Interests

Authors have no conflict of interests.

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## Life expectancy in the families of patients with cancer: A qualitative study

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### Original Article

#### Abstract

**BACKGROUND:** The family of patient with cancer encounters stresses that are sometimes uncontrollable. One of the strategies to gain control is to deal with such a situation hopefully. Hope plays a key role in coping with the stress associated with cancer. The purpose of this study was to evaluate the experience of hope in the families of patients with cancer.

**METHODS:** This qualitative study was a kind of content analysis. Data was collected via semi-structured interviews from 12 family members of patients with cancer living in Sanandaj City, Iran. All data were recorded, and qualitative content analysis method was used to extract the contents.

**RESULTS:** It was revealed that hope leads to the self-belief, comfort, convenience, and power of individuals. Besides, the families of patients with cancer used several strategies including hope and spirituality that help developing the morale of the patients' families, especially their beliefs. In addition, the results of the qualitative section indicated that the families of patients with cancer participating in the study were adapted to the conditions of these patients.

**CONCLUSION:** In addition to identifying some factors related to hope and coping with the stress caused by having a patient with cancer, this study showed that the families of these patients have achieved an understanding of hope. The survival of hope in these families was revealed by three components including compatibility, self-belief, and moving forward.

**KEYWORDS:** Hope, Life Expectancy, Caregivers, Qualitative Research, Cancer

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### Introduction

Cancer affects different aspects of a person's life and has physical and psychosocial outcomes.<sup>1</sup> Despite important medical advances, the disease is the second leading cause of death in some countries after cardiovascular disease.<sup>2</sup> In Iran, cancer is the third cause of death after cardiovascular disease and accidents.<sup>3</sup> According to the research center of Iran's health ministry, by the

end of the twentieth century, 15% of all deaths were occurred due to cancer.<sup>4</sup>

Some studies also indicate an increasing incidence of cancer in the late 20<sup>th</sup> and early 21<sup>st</sup> centuries; in addition, the role of psychosocial factors in this disease has been studied in many literatures.<sup>5</sup> In the study of psychological factors affecting the quality of life in patients with cancer, the meaning of life has been considered as one of the psychological factors in a number of important studies in this area. Researchers believe that a patient with cancer needs to cope with psychological and mental problems; inability

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to deal with any of these barriers can lead to mental illness.<sup>6</sup>

Researchers have argued that hope has a decisive role in the treatment and recovery of patients with cancer; so nurses, as the main caregivers, play a prominent role in facilitating hope for patients and their family members.<sup>7</sup> Hope is a word. We often use it, but we do not think about it with any specific purpose. Hope is hardly defined, but certainly if being grasped, we feel its effects.<sup>8</sup>

The phenomenon of hope has been seen frequently in relation to patients with cancer. When patients lose their hope, they often feel that they are not in power, and the negative aspects of their experiences become worse.<sup>9</sup> Loss of hope may affect the patient's response to the stress caused by this condition; while having hope will be useful for being strong and flexible.<sup>10</sup> Researchers believe that hope is a human phenomenon that needs more research; and since nurses deal with a wide range of human responses, they need to develop nursing knowledge in relation to the phenomenon of hope for comprehensive care.<sup>11</sup>

In reviewing the studies, a research that specifically investigated the meaning of life in patients with cancer was not found. Hence, addressing this issue and studying this structure in Iranian patients with cancer can open new horizons for researchers and therapists. Based on the results of this study, a special intervention program can be developed to ultimately improve the quality of life in these patients.

## Materials and Methods

Regarding the purpose of this study, which was investigating life-expectancy in patients with cancer, a qualitative research method was used to provide tools for the study of this concept and also obtaining valuable and profound knowledge about the samples.<sup>12</sup> Qualitative research was a comprehensive approach that embraced philosophical,

sociological, and psychological views,<sup>13</sup> and essentially referred to a philosophical movement in our era with the purpose of study, research, and direct recognition of phenomena including actions, thoughts, desires, beliefs, topics, etc. In this method, any phenomenon was investigated without explicitly relying on previous assumptions. In other words, these studies were based on the conscious and direct experience of phenomena; therefore, we must understand the nature of phenomena and deal with them purely and firsthand, abandon previous thoughts and arguments, and try to know and express them as they are.<sup>14</sup>

From the perspective of qualitative research, humans experience social realities with their own minds and interpretations in a particular way. These thoughts, opinions, and perceptions shape their behaviors or create a different nature. From this perspective, the purpose of this type of research is to deepen understanding and conquer the essence of a phenomenon to acquire comprehensive knowledge about that particular event. Understanding is a historical process that has evolved over time and must be understood in the same way.<sup>15</sup> The present study was a qualitative research including content analysis as a suitable tool for qualitative research among researchers.

In analyzing the content, the researcher avoided the use of predetermined classes and instead allowed the classes and their names to come out of the data. The benefits of this approach were that the results were directly derived from data contributors to research without entrenching the belief.<sup>16</sup> In this way, first, the work of analysis should be begin and then, each stage of the work, should have effective flexibility to guide the procedure.<sup>17,18</sup>

Generally, information management included classification and ranking of primary data, class change and moderation, integration of both initial and mean content, extraction of

the main themes (general), re-presentation to the bachelor group, and ultimately, the clear and unambiguous expression of the fundamental structure of the phenomenon concerned with health in the studied samples. To make a general understanding of interviews and information, they should be read several times. In this method, comprehensive comprehension of the text was more important than understanding sentences, paragraphs, and metaphors. A regular and continuous movement from component to entire text, and vice versa, in order to create an overwhelming emphasis on the text was required.

The main method for collecting data in this study was deep and semi-structured interview with target-based samples, which began with a general question about the subject, and gradually more specific questions were asked based on the research objectives. At the end of the session, participants were asked to provide other items that they thought were not asked during interview. The interview was conducted in 60 minutes and was recorded on tape; then, the content of the interview was immediately analyzed. In this study, 12 participants were interviewed. The interviews were conducted individually with family members of patients with cancer and in the natural environment such as home, workplace, etc.

To increase the validity and reliability of the data, it was necessary to allocate adequate space and time for data collection, communicate with the participants favorably, use complementary comments of colleagues, review handwritten notes of participants, and review data with other researchers.

Ethical considerations in this study included the informed consent of the participants for participating in the research, recording their interviews, using their names in the tapes and texts, as well as the observance of the principle of secrecy and confidentiality of information, and the right to resign for all participants.

## Results

12 members of patients' families aged 18 to 34 years, whose education comprised a range of illiterate to postdoctoral, were included in this study. The results of the interviews showed that three main themes including compatibility-hopefulness, self-belief (the peak of hope), and moving forward (the enthusiasm of hope) were of great importance.

**Compatibility-hopefulness:** One of the issues frequently raised by families was the need to take care of their patients. This case played an important role in admitting a patient with cancer and adapting to it. The families of patients believed that they could feel their illness, and wanted to take care of their patients and understand them, as one family member stated: "Previously, it was not so good, I was feeling guilty and upset, then I cared for my patient well, and now I am better off and my mood is better. I thank God. I feel good and think it will be fine. I think the whole world is mine."

Spirituality and faith in God were central to healthy behaviors and families' attitudes. In this regard, participant 1 said: "Hope means to be alive, that is, to rebirth, but first you have God, and then everything else."

The participants in the study helped each other and complemented the information. As one family member said, "We communicate with other families better. We became friends and learnt things from each other. We have the same address and location, and we want to be friends for a long time, because we have a common problem and it is cancer. We are going to help newcomers."

**Self-belief (the peak of hope):** Family-based care was used to increase self-esteem and reduce the anxiety of family members. In this case, one of the participants said: "I have a good feeling. I think my patient gets better, and I have a closer and better sense to my patient. I can say I love him more than ever."

**Table 1. The definition of hope from the viewpoint of family members of patients with cancer according to the results of the qualitative study**

Inside theme	Subtheme	Some statements from family members regarding hope
Compatibility-Hopefulness Nurses' assistance in facilitating family and patient communication	Trust in care	"I got this environment and conditionality"
	The need for patient care	"I want to take care of my patient"
	The spirituality, faith, optimism, and responsibility,	"I feel responsible"
	Better compatibility	"I communicated with other family members"
Self-belief, peak of hope Sense of responsibility, self-confidence	Communication based on trust	"Hope for me, well, I take care of my patient"
	Family-centered care, hopefulness, and responsibility	"I have a good feeling. I feel good. "
	Care, sense of pleasure, opening, and self-belief	"I love him more than ever"
	Increasing knowledge and awareness, encouraging hope	
Move forward (the craze of hope)	Search for information	"I hope he will be good soon."
	A sense of joy means hope	"I never cry in my head"
	Satisfaction with the health system	
	Technology advancement	
	Looking to the future: fear and hope	
	Personal support	
	Caring for a patient in a state of fear and hope	

Participant 3 stated: "I think I'm hoping to myself, and with the recent advancements in technology and increasing progresses in medicine, I hope my patient will be well."

Participant 6 said: "I'm feeling happy, glad, opening, warming, growing, deserving, and delighted. It is joyful for me. I hope, and if it is not, there is no crazy. God helps him to be well, and surely give him the power to be well."

**Move forward (the craze of hope):** Family members of patients concerned about the future of their patients; this concern was mostly due to the inability to take care of the patient and possible complications.

Another family member said: "I never cry on my head. I have a good feeling, but doctors do not have such feelings. I am hoping for days and years to come, and my patient will be fine, I tell them all."

Participant 3 also believed: "I hope that my patient will be fine, and I hope he will live. I have been persuaded to pursue my patient; and with the technology advancements nowadays, I can overcome problems with a heart full of pleasure, and a mind full of peace. I want to be hopeful, it is the solution."

The results of this study indicated that most participants achieved a comprehensive and adequate understanding of hope. They stated that hope had emerged in this environment, and the process of communication between the patient and the family was well established; although there still were signs of anxiety and concern, some of them felt guilty, lacking adequacy and awareness in the care of their patient (Table 1).

## Discussion

The purpose of this phenomenological research was to study and explain hope in the families of patients with cancer. Hope in the families has been examined in the light of their actual experiences. Findings indicated that most participants have achieved a comprehensive and adequate understanding of hope.

Researchers believe that if family members be involved in caring for their patients at the hospital and at home, they can better serve their patients, and the family-patient relationship will improve; therefore, family members can gain more self-esteem and self-confidence.<sup>19</sup> This partnership will increase the

knowledge and awareness, and reduce the stress of the families.<sup>20</sup>

Some family members of these patients said that they had positive emotions in their family.<sup>21</sup> On the other hand, some members stated that they had uncontrollably cared for their patients, so that they were somehow in a challenge.

Moreover, some family members expressed that they became closer to God; by reading the Qur'an and saying prayer, felt better spiritually, had less stress and more strong feeling, resisted the problems, and adapted themselves well. Researchers said that people use adaptive strategies such as hope to cope with their tensions, associated with their psychosocial development.<sup>22,23</sup> In addition, some scholars believe that the concept of hope is related to concepts that are consistent with faith and ability, and can be considered as an effective response to stressors through tolerance of existing conditions.

In this study, the first theme from the families' experiences was compatibility. In this regard, patients' family members said that they had pleasant and satisfying moments along with their patients. Spirituality and faith in God are central to healthy behaviors as well as the attitudes of the patients, which indirectly affects the outcomes and also has protective effects on the family.

The second theme was self-belief. The family members of the patients were instrumental in increasing self-esteem and reducing family anxiety.

Finally, the third theme was moving forward which was the craze of hope. Some members of the families expressed concerned about the future of their patients regarding possible complications including how to care for their patients; this concern was most likely due to possible side effects of the disease.

### Conclusion

This study, in addition to explaining the experiences of family members of patients

with cancer, and determining some of the factors related to hope and coping with the stress caused by having a cancer, showed that patients with cancer had some kind of hope. This study was a small step to explain the concept of hope in the families of these patients. Besides, the findings showed that an important factor in the families' hopefulness was spirituality as well as their beliefs. Hope can be a connecting bridge between families and patients, which can also increase the ability to cope with the stresses caused by having a patient with cancer, and can be a key factor in promoting the health programs for these patients.

When a person is faced with stressful factors, he uses strategies that can be countered by the amount of control he has on the situation. Beyond controlling the situation, the natural response to tensions is to avoid, accept, or try to overcome such a situation. Having the ability to assess the situation and use the coping strategies based on the position, one actually understands the effects of the management plans. Since many tensions experienced by families of patients with cancer are out of control, the use of emotion-focused strategies, such as hope, can be very useful in resolving the emotional effects of stress.

### Conflict of Interests

Authors have no conflict of interests.

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## Evaluation of life expectancy in Kurdistan Province, Iran, during the years 2006 and 2016

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### Original Article

#### Abstract

**BACKGROUND:** Life expectancy index is used in assessing changes in the health status of Kurdistan Province community, Iran, especially among the elderly, the difference in the health levels of women and men, and also the economic levels and the desired changes. This study aimed to evaluate the life expectancy in the age groups in Kurdistan Province using demographic information and mortality based on age and sex during the years 2006 and 2016.

**METHODS:** In this study, life expectancy was used for calculating life table according to the World Health Organization (WHO). Death information was extracted based on age groups and using demographic data of the statistical centers; in addition, the raw mortality rate was extracted according to age groups and calculated using Chiang method in the stage of life expectancy by sex and location. To analyze the data, Stata 12 and Excel software packages were used for calculations.

**RESULTS:** Life expectancy at birth in Kurdistan Province in the whole population was equal to 74.56 and 78.31 years in 2006 and 2016, respectively, and this rate was higher among women compared to men.

**CONCLUSION:** Extensive factors including medical and health status, well-being, nutrition status and quality, etc., affect the life expectancy index in different societies, and promotion of each criterion increases the life expectancy. It is necessary to establish required fields for establishing these indicators at the provincial level by creating a complete and accurate record of mortality and illness.

**KEYWORDS:** Hope, Life Expectancy, Health Levels

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#### Introduction

The existence of accurate mortality data in every community is essential in order to evaluate health system plans to precisely determine and control various diseases and injuries, and this information can be useful for health changes and health transition to

other levels.<sup>1</sup>

One of the important tools in demography is the life table, which have been provided with many demographic indicators. Although the life table has been prepared for mortality rate and other criteria, it is currently used to describe and analyze many fields including demography, public health, economics, population geography, biology, and employment.<sup>2</sup>

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Raw and specific death rates alone cannot reflect the level of mortality of a community. Hence, an appropriate indicator for this purpose is the life expectancy defined in a population as the average of the remaining years of life of individuals at a certain age. This indicator is usually calculated for both men and women using the age table, in addition, income and literacy indicators are introduced along with this indicator as indices of development.<sup>3</sup> The life expectancy index is used to assess changes in the health status of the community, especially among the elderly and the difference in the health levels of women and men regarding the economic levels and the desired changes.<sup>4</sup>

Recently, the life expectancy among the Western societies has grown much higher compared to the past decades, and this dramatic increase over the past century has been one of the great achievements of societies.<sup>5</sup> Various studies have examined the life expectancy in different countries worldwide, which have shown different results from the hope of life in different parts of the world.<sup>1</sup> In the life expectancy calculations of the year 2010, the American population had a life expectancy of 78.80 years.<sup>6</sup> Between 1970 and 2009, the average lifespan in Europe ranged from 68.70 to 78.00 years and from 74.90 to 83.50 years among men and women, respectively.<sup>5</sup>

According to the World Health Organization (WHO), the lowest and highest life expectancy at birth in 1997 was 41 and 80.00 years for the African country of Guinea-Bissau and Japan, respectively; Iran ranked 80<sup>th</sup> in terms of life expectancy among 192 countries.<sup>1</sup> This important health and biological index is estimated to be between 80.00 and 85.00 years for developed countries. On a global scale, life expectancy among women is usually higher compared to men.<sup>3</sup>

An estimate of life expectancy for the Iranian population was carried out at the national and international levels. For example,

life expectancy at birth was directly measured among men and women as respectively 55.10 and 56.30 years for the year 1972 by Tehran University of Medical Sciences, Tehran, Iran;<sup>6,7</sup> moreover, health assessment for 2000 individuals was conducted by the Ministry of Health, Treatment and Medical Education in 1996. Life expectancy was 68.00 and 70.00 years for men and women, respectively.<sup>8,9</sup> Unfortunately, these estimates have not been available for Kurdistan Province, Iran, recently, however according to the latest estimates, Kurdistan Province was among the provinces with the lowest rates of life expectancy.

Considering that the life expectancy index is one of the population summary measures and the time trend of changes is the main result of the performance of the health system and the implementation of health policies, and since no study has been performed so far in Kurdistan Province, the present study was carried out aiming to estimate the life expectancy in Kurdistan Province, which was conducted in 2008 and 2013.

## Materials and Methods

This study was a cross-sectional descriptive study. The study subjects included Kurdistan Province population in 2006 and 2016. To investigate, all deaths were considered in these years and they were taken into account in the study. The reason for choosing these years was that there were almost 5-year intervals between the calculations.

In this study, life expectancy was used by the WHO using the recommended method for calculating life table. For each death according to the place of occurrence (hospital, home), a certificate of death in four forms should be completed at the place by the physician, one copy of which would be completed with the local registration office, a copy for burying permission, a copy for the patient's case, and the fourth copy had to be sent to the health center. In places where the unofficial disaster

exists and the death certificate is not completed, there are web forms that were ultimately completed for each death case and the information on this form and the death certificate was recorded monthly in the mortality registration system of the city. Then, this information was sent seasonally to the provincial health center and was reviewed at the health center of the province and, if necessary, the defects were modified. Finally, the province's data were integrated together. Accordingly, the mortality data of these years were released.

The data were refined by the student and the required information was converted to the desired format. Population demographic data were purchased from the Bureau of Statistics of Iran in different years and, if necessary, computational methods were used for the years when the census was not performed.

In this study, a more common summary table of life was used. First, death rates were calculated for age groups. The age groups in this table included 0 to 11 months, 1 to 4 years, and then age groups ranging from 5 to older than 85 years.

The columns in this table are as follows:

- First column (X): the first year of each age group
- Second column (n): the interval between each age group
- Third column (nPx): population of the age group in the middle of the year
- Fourth column (nDx): the number of deaths in the age group in the target year
- Fifth column (nMx): age-specific mortality rate in the target year as the fourth column divided by the third column.
- Sixth column (a): A fraction of the interval between the age group during which the individuals have died. This fraction was considered for all age groups except for 0.5 and the first group was considered. This means that individuals who have died in any age group have lived on average 2.5 years out

of a 5-year interval of that age group. In the first age group, due to the fact that the probability of death under one year in the first months of life is higher, its value is less than 0.5.

This value is 0.3 and 0.1 in societies with high and low mortality rates, respectively. A value of 0.4 was considered for the parameter a for the second age group, which is more likely to die at the lower ages.

- Seventh column (nqx): the probability of incidence of death at the age range of x and x + n. This probability was calculated from the following equation:

$$(1-3) \\ l_x = l_{x-n} \cdot n P_{x-n}$$

Then, the survival curve of the community was presented according to this information. The survival curve shows what part of a hypothetical group is in what age.

- Eighth column (ndx): The number of individuals who died between age x and x + n. This value was calculated from the following equation:

$$(2-3) \\ ndx = l_x \cdot nqx$$

Given that all individuals in the last age group have died,  $dx + = 1x$

- Ninth column (nLx): The total number of years the individuals lived between x and x + n. Individuals who have lived all this interval ( $l_x + n$ ) are all the interval to the living area ( $n + 1x + n$ ), and individuals who died at that interval (ndx) lived a fraction of this interval ( $n \cdot nax \cdot ndx$ ); Therefore, the value of this column was obtained from the following equation:

$$(3-3) \\ nL_x = n(l_x + n + nax \cdot ndx)$$

For the last age group, the value of this column was obtained from the following equation:

$$(4-3) \\ L_{85+} = d_{85+} / M_{85+}$$

The value of this column is used to calculate the general health indicators of the community.

- Tenth column (T x): Total number of years Individuals lived after age x. For the last age group

(5-3)

$$T_{85+} = L_{85+}$$

And for other age groups:

(6-3)

$$T_x = T_{x+n} + nL_x$$

- Eleventh column (e x): Life expectancy at age x was derived from the following:

(7-3)

$$e_x = T_x / l_x$$

Finally, the life expectancy for each age group was calculated.

Death information was extracted based on age groups and using demographic data of the statistical center, in addition, the raw mortality rate was extracted according to age groups and calculated by the Chiang method in the stage of life expectancy by sex and location.<sup>10</sup> The demographic data were obtained from the Statistics Bureau of Iran in different years.

### Results

According to the results, the number of deaths in 2006 and 2016 was 6728 and 6812, respectively. Of the deaths occurred in 2006, 3443 and 3285 individuals were urban and rural, respectively. In addition, of this rate, 2588 and 4140 were women and men, respectively. Moreover, of the deaths occurred in 2016, 4410 and 2240 were urban and rural, respectively, in addition, 2908 and 3904 were women and men, respectively. In 2006, the mean life expectancy of the age group of 1-4 years was 74.77 and 77.40 years for men (Figure 1) and women (Figure 2), respectively. The mean life expectancy of the age group of 1-4 years was 76.46 years in both sexes and

74.56 years in the age group less than 1 year old (at birth) (Figure 3).

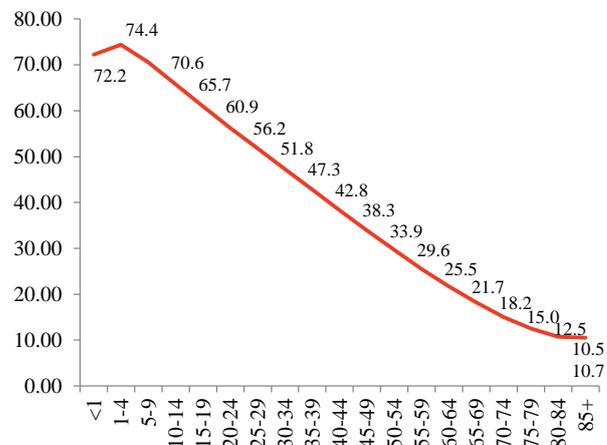


Figure 1. Life expectancy calculations among men by age group in Kurdistan Province, Iran, in 2006

In calculations related to 2016, the mean life expectancy at birth was 76.93 and 66.69 years among men and women, respectively (Figure 4).

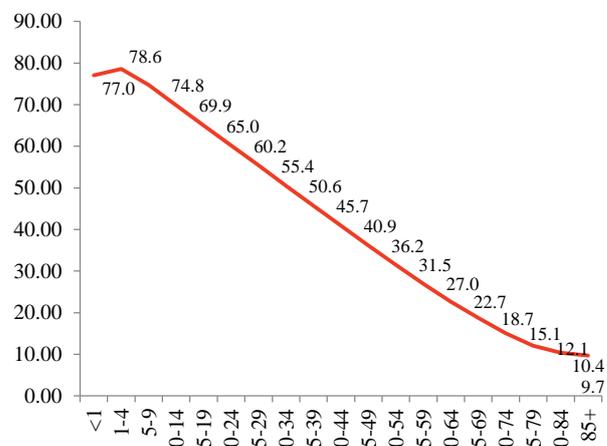


Figure 2. Life expectancy calculations among women by age group in Kurdistan Province, Iran, in 2006

The mean life expectancy of the age group of 1-4 years was 79.66 years among both sexes (Figure 5), in addition, the age group less than 1 year (at birth) was calculated as 78.31 years (Figure 6).

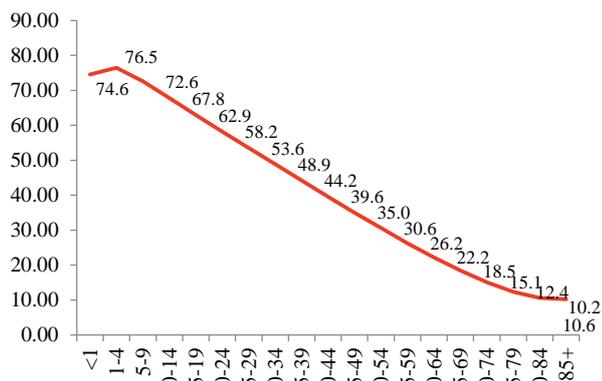


Figure 3. Life expectancy calculations among both sexes by age group in Kurdistan Province, Iran, in 2006

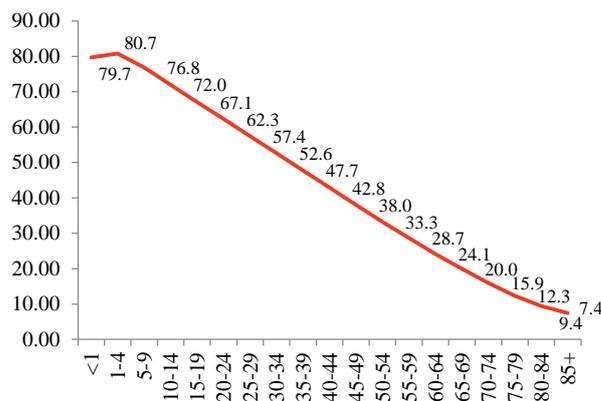


Figure 5. Life expectancy calculations among women by age group in Kurdistan Province, Iran, in 2016

### Discussion

In recent decades, the world has witnessed an increase in life expectancy. The increase in life expectancy is not limited to advanced countries, and has also been observed in developing countries in the second half of the twentieth century.

Recent studies on life expectancy and well-being have shown that increased life expectancy was not associated with the same trend in disability-adjusted life expectancy (DALE),<sup>12,13</sup> in contrast to life expectancy, the proportion of years with chronic diseases, disability and social and economic disadvantages.<sup>14-18</sup>

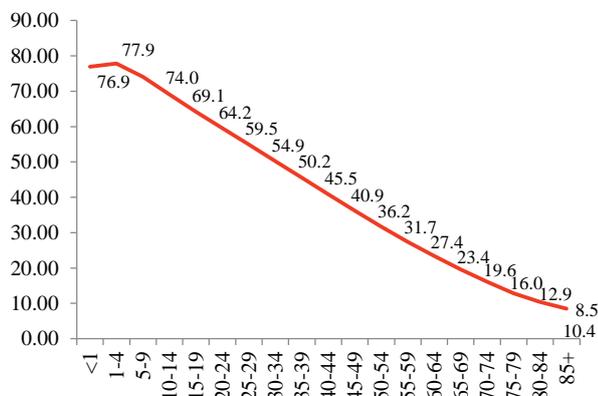


Figure 4. Life expectancy calculations among men by age group in Kurdistan Province, Iran, in 2016

According to the United Nations Organization (UN) estimates, Latin American countries showed an increase of 14 years between the years 1950 and 2000.<sup>9</sup> Reducing deaths at young ages, increasing longevity, reducing fertility, and increasing chronic illnesses with the demographic changes of society have emerged as new challenges.<sup>11</sup>

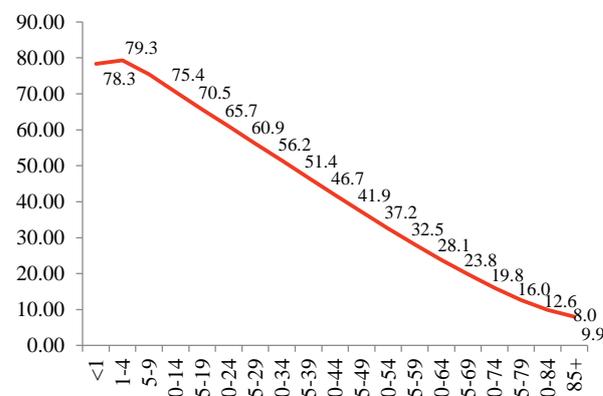


Figure 6. Life expectancy calculations among both sexes by age group in Kurdistan Province, Iran, in 2016

Progress in technology to save lives provides appropriate medical services and has contributed to a contradictory increase in the incidence of chronic diseases.<sup>15-21</sup>

The results of this study showed that the life expectancy in Kurdistan Province in the age group of 1-4 years had highest rate among the different age groups and also among the

two sexes. The age group of less than 1 year accounted for the second highest rate among the other age groups and for both sexes. An increase in the life expectancy rate from birth to 1 year is observed when the proportion of deaths under 1 year to 1 to four years was relatively high.<sup>1,22-26</sup>

Similar increase was observed for lifetime table that was estimated by School of Public Health and the Institute of Health Research of the University of Tehran, Iran in 1974,<sup>27</sup> WHO in 1999,<sup>28</sup> 2000 and 2001,<sup>29</sup> by USA life schedule in 1960,<sup>30</sup> and by India in 1996.<sup>31</sup> In addition, a greater life expectancy was also obtained for women compared to men.<sup>24,30,32,33</sup> In addition, the results of the study showed a significant increase of at least three years in the life expectancy of the year 2016 compared to 2006.

The life expectancy at birth in Kurdistan province among the whole population was 74.56 and 78.31 years in 2006 and 2016, respectively, and this rate was higher among women in comparison with men. One of the possible reasons for the increase in the life expectancy can be the improvement and development of health care services, the reduction of mortality among children under 1 year, the growth of literacy and higher education in the province, and especially among women, the establishment and development of infrastructures. Moreover, the probable reasons for higher levels of women's life expectancy than men can be attributed to men's physiological sensitivity to diseases, risky behaviors, increased exposure to environmental pollutants, unsafe conditions of work, stress and care seeking differentiation.<sup>34-36</sup>

Comparing the results of this study with the previous estimates on the region and the latest estimates of the country indicate an increase in life expectancy in the province. An estimate of life expectancy for the Iranian population was carried out at the national and international levels. For example, life expectancy at birth was directly measured as 55.10 and 56.30 years

in 1972 respectively among men and women by Tehran University of Medical Sciences.<sup>37</sup>

In addition, in the health assessment for the whole population in the country by 2000, which was conducted by the Ministry of Health, Treatment and Medical Education in 1996, the life expectancy was obtained as 68.00 and 70.00 years for men and women, respectively.<sup>38</sup> According to the WHO report in 2012, life expectancy at birth in Iran was 72.00 and 76.00 years for men and women, respectively. Therefore, according to the results of the present study, the life expectancy at birth in 2017 was 76.93 and 66.69 years among men and women, respectively. These two values were nearly 5 and 7.7 years higher than the total life expectancy in the whole country.

Compared to the international level, life expectancy is lower for both men and women, as a survey in 2012 revealed that the highest life expectancy for men in Iceland was observed in the age range of 81.2 years old and the highest life expectancy for women in Japan was observed in the age range 87 years old.<sup>37</sup>

Comparing the life expectancy of this study with the those in other provinces of the country, it was found that life expectancy in Kurdistan province in 2006 was higher than the life expectancy of Chaharmahal and Bakhtiari Province, Isfahan Province, and Khuzestan Province with 55.70 and 74.80 years, 73.70 and 75.70 years, and 74.30 and 72.70 years, for men and women, respectively. Life expectancy in Kurdistan province was also higher compared to Kohgiluyeh and Boyer-Ahmad and Lorestan provinces.<sup>26</sup>

## Conclusion

Extensive factors including medical and health status, well-being, nutrition status and quality, etc., affect the life expectancy index in different societies, and promotion of each criterion increases the life expectancy. In order to measure the impact of health programs in the community, it is necessary to calculate the life

expectancy and DALE and establish the required field for determining these indicators in Kurdistan province by establishing a complete and accurate registration system for mortality and illness rates.

### Conflict of Interests

Authors have no conflict of interests.

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## Effectiveness of training programs in Shohada hospital, Sarpol-e Zahab City, Iran, in 2017

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### Original Article

#### Abstract

**BACKGROUND:** Organizational efficiency depends on the proper performance of the workforce in the sphere of trade and staff. Since human resources form 70% of organizational resources and capital, supply of human capital requires a systematic instructional activities at all organizational levels. The main objective in this study was to evaluate the effectiveness of training programs and consultation for effective educational programs in a university hospital (Shohada hospital), Sarpol-e Zahab City, Iran, in 2017.

**METHODS:** This study was a descriptive-survey research. Since the present study was an ex-post facto, the causal-comparative method was used. The population in this study included all 90 individuals of Shohada hospital in Sarpol-e Zahab City among which, 35 individuals were selected through the random sampling method. In this study, a researcher-made questionnaire was used to collect data. In addition, the statistical methods of chi-square and t-test were used in this study.

**RESULTS:** Trainees positively responded to training programs, the null hypothesis is rejected. There was a significant difference in international training programs in learning and behavior before and after attending the training periods, then the contrary assumption is confirmed.

**CONCLUSION:** The trainees positively responded the training program. Therefore, the training programs had a (positive) effect in learning and behavior.

**KEYWORDS:** Program Effectiveness, Training, Educational Activities, Consultation

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### Introduction

Today, capital, human resources, technology and management form the cornerstones of the organizations, and according to many scholars, human resource is the most important element among these elements, since the efficiency of the organizations depends on the proper performance of the workforce in the sphere of trade and staff. Since 70% of the resources and capital of organizations are human resources, therefore, the provision of this human capital requires regular educational activities at all

organizational levels.<sup>1</sup> Therefore, in a changing society, training of the staff is not only desirable, but also an activity that any organization must take into account for these resources in order to have efficient human resources.<sup>2</sup> However, the type and amount of training of employees of organizations depends on the importance of the quality of products and services provided to customers or clients, and also the importance of the required skills among the workforce for organizations. The general classification of staff training is divided into two types of pre-service training and in-service training.<sup>3</sup> Each organization should provide a platform for the

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development of the knowledge of its employees and create appropriate groundwork in this regard. This will start by organizing classes and briefings to familiarize the newly recruited staff with the organization's tasks and processes. This process also continues throughout the service through updating the knowledge and information of staff by regularly organizing retraining courses and training classes so that they can enhance their knowledge and capabilities by combining their knowledge and experience.

In this regard, paying attention to training of the staff in order to increase their abilities is very important for organizations.

Today, the advances and developments of organizations depends on improving the level of knowledge, skills, behavior, and human resources. Accordingly, it can be observed that the leading institutions and organizations increasingly focus on the training and development of human resources, in such a way that explaining the true place of education is a great mission in the direction of development of organizations. Increasing knowledge and technological advances have led organizations to focus on human resource training as the focal point of development and use all facilities to increase the capabilities of their employees, as the extent of learning in today world directly depends on dynamic methodology. However, using this methodology requires a close relationship with superior tools to provide the best facilities for easy and dynamic learning. Throughout the centuries, education has exploited instruments and tools access to which has been along with spending the life of researchers on research, in such a way that many researches have been ceased due to the lack of tools and resources in this way. Today it has been accepted by everyone that this difficult path has been passed as quickly as possible and easy access to education through different methods can be achieved. Trainers have always been willing to

use the combination of writing and listening to achieve the highest efficiency in the field of teaching and training. The existence of multimedia equipment and the use of all teaching tools would result in the success of this method.<sup>4</sup> Regarding the fact that the analysis of effectiveness of training seems apparently problematic and controversial, it is a serious necessity, and in most today organizations, there is a serious need for assessing staff training abilities and capabilities. The existence of appropriate training programs as one of the important factors affecting the performance of employees is very important and lack of effective and appropriate programs will reduce the effectiveness of the organization, and will cause negative effects on the staff morale. Unfortunately, in most organizations and institutions in our country, when downsizing the workforce, the organization's training unit is one of the first target units; this is due to the fact that this unit is ignored and less important is given compared to other units. Accordingly, the necessity and importance of analyzing and evaluating the effectiveness of educational programs can be noticed. Therefore, the main reasons for choosing this issue can be stated as follows:

- Justifying the existence of the activities and training programs and indicating the role and importance of these activities in realizing the goals of the organization.

- Introducing ways to improve the training activities of organizations in the future.

Today's organizations need to compete with leading organizations to survive. Therefore, considering the improvement of human resources and modern educational tools is necessary for the development of organizations in different aspects of economics, organizational culture and technology. The development charter of organizations which consists of four dimensions, including financial and economic development, technical and technological development, organization cultural

development, and educational development. The educational development of organizations is considered not only as the cornerstone of the organization's development, but also the development of all dimensions and sub-sets of organizational development.<sup>5</sup> In Iran, a huge amount of costs is expended on the in-service training, however, most of these methods are traditional and the effectiveness of their dimensions are unclear. Nevertheless, there are some organizations that use a variety of compact discs (CDs) and educational software and e-learning in general. It is worth noting that most of these training methods are conducted in an organization without analyzing different dimensions of their effectiveness. Investigating the formation and evolution of organizations shows that in the past, due to the simplicity of human life and limited technology, the structure and functions of organizations were simple and primitive, and individuals did not need much knowledge and professional skills to carry out their activities. The changes that were made in the form of social life later became widespread in various dimensions of the organization, making their goals, tasks and responsibilities more complicated and more difficult to manage. In such a situation, other individuals were not able to carry out the tasks and activities of the organizations without the necessary knowledge and skills. The consequence of such massive industrial, technological, economic, and other changes in the nineteenth and early twentieth centuries was the vital need for education in all the organizations.<sup>6</sup> Iran Health and Human Services Commission (HHSC) provides a broad definition of education and considers education as a process designed to refine thinking, knowledge, or behavioral skills through experiential learning, to achieve effective performance in an activity or in a range of activities and goals in the workshops to develop the capabilities of individuals and gain the current and future satisfaction of the human

resources of the organizations.<sup>7</sup> However, according to the United Nations Educational, Scientific, and Cultural Organization (UNESCO), education is all actions, effects, ways and means for developing and expanding mental and cognitive capabilities, and human skills, attitudes and behaviors, of course, in such a way to enhance the personality of human as much as possible to be one of the positive values of the society in which they lives.<sup>8</sup> Education is a learning experience designed to make relatively stable changes in the individuals so that they can improve their abilities to perform their tasks. In other words, teaching is a predetermined activity or strategy that aims to facilitate the process of learning for trainees. Education is defined as providing opportunities for students to learn. In fact, education is referred to activities designed to facilitate learning by a teacher or trainers and the interacting between the teacher and learners,<sup>9</sup> to ultimately achieve the development of the attitude, knowledge, skills, and behavioral patterns required by individuals to perform appropriate functions in a particular task. However, training is defined as a systematic and continuous improvement of the workforce in terms of knowledge, skills, abilities and behaviors which helps them improve their well-being and provides better conditions for their promotion.<sup>10</sup> In all these definitions, education is a key factor in human promotion and this promotion can also be effective in subtilizing the employee relationships and management. Individuals who are well familiar with their work, enjoy working and are satisfied with it, and subconsciously consider this satisfaction due to the satisfactory workplace; this goal can be well achieved through learning.<sup>11</sup> The role of learning in the organization has been highlighted in recent years. Knowledge on the learning process and how it affects the subsequent behavior are very useful. This is because many organizations expend a huge

amount of resources to train employees.

All complex behaviors of individuals are achieved through learning, and if managers desire to predict or control the behaviors of the individuals, they must know how they have learnt these behaviors.<sup>12</sup> The present study was conducted aiming to examine the effectiveness of educational activities of the organizations, in addition to studying the effectiveness of these activities and providing the necessary solutions for the development of educational activities.

## Materials and Methods

**Research objectives:** -Assessing the effectiveness of educational programs and providing the necessary strategies for the effectiveness of educational programs of Shohada hospital in Sarpol-e Zahab City, Iran.

-Examining learners satisfaction with organizational curriculum

-Investigating the effectiveness of training programs

-Investigating the impact of educational programs on behaviors

-Determining the strengths and weaknesses of educational programs in the organization

-Attempting to fill the research gap in the training programs

-Assisting the organization in enhancing training programs by providing solutions and suggestions

This study was a descriptive-survey research. Since the present study was an ex-post facto, the causal-comparative method was used. This method is commonly used for studies in which the researcher examines the possible causes of the occurrence of the research according to the dependent variables. In other words, the present study is a retrospective research which tries to ascertain the effect from the probable cause of the research.<sup>13,14</sup>

The population in this study included all 90 individuals of Shohada hospital in Sarpol-e Zahab City among which, 35 individuals were

selected through the random sampling method. In this study, a researcher-made questionnaire was used to collect data. In addition, the chi-square test and independent t-test were used for statistical analysis.

The data were collected through library studies, reviewing documents and files, and also the questionnaire, which was the main tool for collecting information in this study. The questionnaire consisted of three sections: the first part was related to demographic questions, which included descriptive findings. The second section contained 15 questions and was related to the first hypothesis. The third section contained 7 questions related to the second hypothesis.

The validity of this questionnaire has been verified by three management professors. The results of this test have been confirmed by 86% Cronbach's alpha coefficient, showing a good validity.

## Results

**Descriptive statistics:** According to the results, the educational programs of Shohada hospital in Sarpol-e Zahab City were effective as learners positively reacted to training programs and there was a significant difference between training programs in learning and behavior before and after the training courses.

As table 1 shows, 54% and 46% of the respondents were men and women, respectively.

**Table 1. Gender breakdown of respondents**

Gender	Rate	Percentage	Cumulative percentage	Percentage of confidence
Man	19	54.3	54.3	54.3
Woman	16	45.7	45.7	100.0
Total	35	100.0	100.0	

In addition, as shown in table 2, 42%, 23%, 11%, 17%, 3%, and 2% of the subjects were in the age range of 24-30, 30-36, 36-42, 42-48, 48-54, and 54-60 years, respectively.

**Table 2. Age breakdown of respondents**

Age range	Rate	Percentage	Cumulative percentage	Percentage of confidence
24-30	15	42.9	42.9	42.9
30-36	8	22.9	22.9	65.7
36-42	4	11.4	11.4	77.1
42-48	6	17.1	17.1	94.3
48-54	1	2.9	2.9	97.1
54-60	1	2.9	2.9	100.0
Total	35	100.0	100.0	

Moreover, as demonstrated in table 3, in terms of education status, 11%, 17%, 68%, and 3% of the respondents had a degree of diploma or below, associate degree, bachelor's degree, and master's degree, respectively. Furthermore, according to table 4, 34%, 31%, 22.9%, and 11% of the subjects had a working experience of less than 10, 5-10, 10-15, and above 15 years, respectively. As table 5 shows, in terms of service status, 85% and 14% of the respondents were either operational or in line and staff, respectively.

#### **Inferential Statistics**

**Hypothesis 1:** Learners' reaction was positive about the training curriculum.

Since the chi-square test results obtained for the questions 1 to 15 related to the hypothesis 1 with a degree of freedom of d.f = 4, were greater than the chi-square at the significance level of  $P = 0.05$  (9.49), the null hypothesis was rejected and Hypothesis 1 was approved, hence the learners positively responded the training program (Table 6).

**Hypothesis 2:** There was a significant difference between educational programs in terms of the learning level and behavior before and after attending the training courses.

Comparing the learning level and behavior before and after attending the course in terms

of the significance level ( $P = 0.030$ ) given in table 7, and based on the allowable error rate of 0.05, the hypothesis null is rejected and Hypothesis 2 is approved with a 95% confidence level. Therefore, according to the higher mean score after attending the training period as 26.62 compared to this value before the period as 24.77, it can be concluded that the training period had a positive effect on the learning level and behavior of subjects during the training period.

#### **Discussion**

**Hypothesis 1:** Since the chi-square test values obtained for questions 1 to 15 related to the Hypothesis 1 with a degree of freedom (df) = 4, were greater than the chi-square at the significance level of  $P = 0.050$  (9.49), the null hypothesis was rejected and Hypothesis 1 was approved, hence the learners positively responded the educational program.

**Hypothesis 2:** Comparing the learning level and behavior before and after attending the course in terms of the significance level given in table 7, and based on the allowable error rate of 0.05, the hypothesis null is rejected and Hypothesis 2 is approved with a 95% confidence level.

**Table 3. Education level of respondents**

Education	Rate	Percentage	Cumulative percentage	Percentage of confidence
Diploma or below	4	11.4	11.4	11.4
Associate degree	6	17.1	17.1	28.6
Bachelor degree	24	68.6	68.6	97.1
Master's degree	1	2.9	2.9	100.0
Total	35	100.0	100.0	

**Table 4. Working experience of respondents**

Working experience	Rate	Percentage	Cumulative percentage	Percentage of confidence
Bellow 10 years	12	34.3	34.3	34.3
5-10 years	11	31.4	31.4	65.7
10-15 years	8	22.9	22.9	88.6
Above 15 years	4	11.4	11.4	100.0
Total	35	100.0	100.0	

Therefore, according to the higher mean score after attending the training period compared to before the period, it can be concluded that the training period had a positive effect on the learning level and behavior of subjects during the training period.

The education of human resources in the organization has not been systematically studied until the emergence of a scientific management school in the late nineteenth and early twentieth centuries. With the rapid growth of cities, the growing number of governmental departments, and the complexity of the administration of public affairs in the early 20<sup>th</sup> century, employee training was considered.

The first signs of regular training of human resources can be found in the school of scientific management. Until World War II, there was no comprehensive training programs for governmental agencies in countries like United Kingdom (UK). However after this war, the United States (US) Treasury Department of Apprenticeship and Education was established and began its training programs to solve national development issues. A few years later in France, a new training center called the National School of Administration was established for the first time. The center was committed to implementing comprehensive

training programs to improve the quality and efficiency of human resources in governmental agencies. The United States (US) government also opened the way for human resources training in the public sector in 1958 with the adoption of first law in the government. Political and social developments in Iran also brought the government's attention to the training of human resources in the public sector. As the country employment act was approved in 1965, a separate chapter was devoted to staff training. This was considered a start-up point in the training of manpower on a broad and regular basis. The establishment of a public administration training center in 1968 and the beginning of its training activities for extensive and systematic training in short and long term courses, in addition to providing training for government employees, revealed the importance of the issue more than ever and opened the way for the renewal of manpower in government agencies.<sup>1,12</sup>

**Application of the study results:** This study can be a step to fill the research gap in the field of training program. In addition, it can provide solutions and suggestions for the effectiveness of educational programs.

**Suggestions:** -Creating and strengthening a positive attitude toward education by senior managers.

**Table 5. Service status of respondents**

Service	Rate	Percentage	Cumulative percentage	Percentage of confidence
Line or operational	30	85.7	85.7	85.7
Staff	5	14.3	14.3	100.0
Total	35	100.0	100.0	

**Table 6. Positive reaction of learners about the curriculum**

Question	Excellent	Very good	Good	Moderate	Weak	Chi-square	P
1	3	13	17	1	1	32.00	< 0.001
2	3	4	16	0	12	13.57	0.040
3	1	8	16	0	10	13.14	0.040
4	1	10	13	11	0	9.68	0.021
5	3	3	16	11	2	22.00	< 0.001
6	2	7	13	8	5	9.42	0.051
7	3	5	14	8	5	10.57	0.032
8	5	14	11	4	1	16.28	0.003
9	2	7	16	10	0	11.74	0.008
10	4	11	11	12	1	12.28	0.015
11	4	10	17	4	0	13.11	0.004
12	3	5	20	7	0	20.20	< 0.001
13	2	15	10	6	2	17.17	0.001
14	2	12	12	9	0	7.62	0.050
15	4	9	17	5	0	11.97	0.007

– Strengthening of experts and training personnel in terms of skills, expertise, knowledge, and experience as a tool for enhancing expertly assessment (reinforcement of professors in terms of transferring practical materials)

– Creating managerial stability and focusing on employee training programs

– Strengthening the position of the training unit in organizations

– Properly assessing the effectiveness of the courses and reflecting it to the top executives and retaining the organizational experiences

– It is suggested that the period of the courses to be in accordance with the subject matter of the courses or the needs determined by the organization and to be held in the form of a seminar, periodically, communicational, in person, or in the form of a scientific-recreational camp.

– Creating an effectiveness database of networked educational programs: establishing an integrated information center (on-line)

regarding the procedure of program implementation, place of holding, professors, duration, evaluation scores, effectiveness level, etc., and access of members to the results.

– The contents should correspond exactly to the determined objectives and should be related to the daily issues of the staff.

**Suggestion for future researches:** -Due to the high usage of the questionnaire in the process of measuring the effectiveness of educational programs, the routine and excessive use of questionnaire in organizations has reduced its credibility. Therefore, it is suggested that interviews, observation and examination of documents should also be taken into account in addition to the questionnaire.

– Using mathematical models including fuzzy logic and dynamic systems in the effectiveness measuring process

Familiarity with the effectiveness of psychology principles in interviewing the employees.

**Table 7. Independent t-test values**

Course	Rate	Mean	SD	DF	t	P
Before training period	35	24.77	3.72	68	2.11	< 0.030
After training period	35	26.62	3.63			

SD: Standard deviation; DF: Degree of freedom

### Conclusion

Proper training of human resources, while promoting the performance of staff and organization in the level of the governmental agencies, also provides the field for appropriate dealing of employees with clients.

### Conflict of Interests

Authors have no conflict of interests.

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## In vivo reprogramming: A new approach for tissue repair in chronic diseases

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### Review Article

#### Abstract

Medical researchers and biologists have long been fascinated by the possibility of changing the identity of cells, a phenomenon known as cellular plasticity. Now, we know that differentiated cells can be experimentally coaxed to become pluripotent (cellular reprogramming). Recent studies have demonstrated that changes in cell identity are not limited to the laboratory, but also the tissue cells in live organisms are subjected to this process, too (endogenous cellular reprogramming). Nowadays “reprogramming technology” has created new opportunities in understanding human chronic diseases, drug discovery, and regenerative medicine. This technology have enabled the generation of various specific cell types including cardiomyocytes, pancreatic beta cell, and neurons, from patient’s cells such as skin fibroblasts. Reprogramming technology provides a novel cell source for autologous cell transplantation. But, cell transplantation faces several difficult hurdles such as cell production and purification, long-term survival, and functional integration after transplantation. Recently, in vivo reprogramming, which uses endogenous cells for tissue repair, has emerged as a new approach to circumvent cell transplantation. Up till now, in vivo reprogramming has been practiced in the mouse pancreas, heart, brain, and spinal cord with various degrees of success. In this review, we summarize the progress made, therapeutic potentials, and the challenges ahead in this emerging research area.

**KEYWORDS:** Cellular Reprogramming, Chronic Disease, Guided Tissue Regeneration, Cellular Reprogramming Techniques

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#### Introduction

The ability to modify and return a cell to pre-differentiation conditions is a new concept in biology and medicine research. This concept was first taken into account in cloning studies conducted by Gurdon et al. on *Xenopus laevis*<sup>1</sup> and later by Campbell et al. conducted on sheep.<sup>2</sup>

In these studies, unknown factors found in the cytoplasm of the oocyte cell were used to convert somatic cells to near-embryonic ones; the cells formed eventually became viable

organisms. In 2006, Takahashi and Yamanaka realized that by applying a combination of several transcription factors to somatic cells, they could be returned to pluripotent state. These cells are structurally and functionally close to the fetal state. These cells were called induced pluripotent stem cells.<sup>3</sup>

Takahashi et al. revealed the molecular basis of cloning, and it became clear that when the nucleus of a cell is inserted into the oocyte cell, it actually puts the nucleus in an environment that contains transcription factors and, more generally, in the same intracellular conditions as the fetal state. In this condition, the genetic material inside the nucleus is

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reprogrammed and the resulting cell can create a complete organism.<sup>4</sup> Using this method, Yamanaka reprogrammed skin fibroblasts into inducible stem cells and provided a solid basis for the production of other body cells.<sup>5</sup>

Of course, it is worth noting that in other studies carried out in the following years, researchers observed that using just one transcription factor, cells evolutionary closely together, such as fibroblasts and muscle cells, as well as B-lymphocytes and macrophages, can be converted to each other.<sup>6,7</sup> But, the importance of the researches by Yamanaka, Takahashi, and their colleagues was to reprogram the cells to a more fundamental state that would allow researchers to produce a wide range of cells.<sup>3-5</sup> In the following years, studies showed it possible that cells such as neurons be produced from skin fibroblasts, directly and without passing through the stemness stage.<sup>8-10</sup> This approach of converting cells is called as "transdifferentiation". This conversion method was examined both in the culture medium and in animal models, and achieved acceptable results.<sup>11-19</sup> Altogether, a new research field named "cellular reprogramming" and "in vivo reprogramming", which is one of the most powerful branches of cell reprogramming, has been founded.

Recently, in vivo reprogramming has attracted the attention of many researchers worldwide.<sup>20</sup> The importance of this method lies in its high potentials for clinical application and medical use. In fact, this method of treatment was actually found in response to this question: "Can tissues or cells inside the body be converted directly to another ones?"

One of the first studies on this area was performed on pancreatic cells. Since these cells were flexible enough in transforming into developmentally close cells.<sup>12</sup> In the next step, the method was also tested on cardiac and neural tissues. These experiments showed that it was possible to transform the cardiac and neuronal cells by applying a cocktail of

transcription factors.<sup>13-16</sup> In the present review, we discuss the advantages of the traditional method of cell therapy and in vivo reprogramming method, as well as examples of researches done in the chronic diseases field of study. Finally, we discuss the therapeutic potentials of this method and also the challenges ahead.

### Traditional cell therapy techniques

Years ago, when reprogramming technology had not existed, cell therapy approach was carried out at university laboratories or even in the clinic. In these researches and clinical trials, pluripotent stem cells such as embryonic cells,<sup>21</sup> or multipotent ones such as bone marrow cells, were transplanted to patients suffering chronic diseases.<sup>22,23</sup> These studies have been well considered by Kim and de Vellis for neurological diseases,<sup>24</sup> Segers and Lee for heart tissue repair,<sup>25</sup> Fadini *et al.* for vascular diseases,<sup>26</sup> and Branski *et al.* for wound healing,<sup>27</sup> in their reviews. Despite all the valuable efforts of outstanding researchers in this field of study, traditional therapies with their limitations have illuminated the need for a new method to overcome these barriers.

### In vivo reprogramming as a novel therapeutic approach

So far, most of the works related to the replacement of deaths cell due to diseases have been concentrated on cell transplantation; but there are lots of limitations in cell transplantation. First of all that stem cells transplanted to the site of injury are not viable, and in most cases they die. Second, these cells stimulate the immune response, and are destroyed by the immune system before being able to differentiate to the required at the site of damage.<sup>28-30</sup>

To solve this problem, in vivo reprogramming method can be used; it means that instead of producing stem cells in the culture medium, and then transplanting them

into the area of injury, cells that are found at the site of the injury can be converted to the desired ones to repair the damaged tissue. In this method, using viral vectors, transcription factors could be targeted to special cells in the area and convert them to another type of cell that is needed. Another limitation of traditional cell transplantation method is the complexity of the process of differentiating cells into desired cells. As we know, the niche around the cells of a tissue, contains growth factors and chemical messengers that provide an exclusive environment to minimize the probability of unwanted cell production in the area.<sup>31</sup> Therefore, we can take advantage of this exclusive condition by performing a process of reprogramming inside the body and tissue. This article focuses on the history of in-vivo reprogramming in chronic diseases and its progress up to now. Since studies in this field have been conducted mostly on chronic diseases including pancreatic, heart and nervous tissue damages, in the present article, we review the articles on in vivo reprogramming with emphasis on in these three tissues.

### In vivo reprogramming in pancreatic cells

The first attempts to transform cells in vivo to produce beta cells from other cells in the pancreas was carried out in 2008 by Zhou *et al.*<sup>12</sup> In their study, the transcription factors that had specifically expressed in beta cells of the pancreas were injected into the pancreas, and the conversion of exocrine cells of this tissue into beta cells were examined. The researchers eventually introduced synchronous injection of three Ngn3, Pdx1, and Maf transcription factors as the most efficient way to make this conversion. In their research, reprogramming was carried out directly, meaning that the extracellular cells were transformed into beta cells without passing through the embryonic stages

(pluri/multipotent stages). These beta cells were active (insulin and growth factors were secreted). Interestingly, by applying the same factors in the culture medium, the cellular transformation observed in vivo, was not observed, probably due to the absence of in vivo agents in culture medium.<sup>12</sup>

Following the success of Zhou *et al.* project, further studies were done in this field. They showed that cells that do not secrete insulin can be reprogrammed into insulin secreting beta cells by using transcriptional factors and cytokines.<sup>32-34</sup> Despite the successful results, effectiveness of this method in mice was relatively low, which, according to a recent study, can be referred to hyperglycemia and its inhibitory effect on reprogramming of exocrine cells.<sup>35</sup> It has also been shown in several studies that pancreatic cells have an intrinsic ability and flexibility of converting to each other.<sup>36</sup> For example, in a study by Thorel *et al.*,<sup>37</sup> it was observed that even when diphtheria toxin was continuously injected into mice in toxic doses for beta cells, insulin production continued, and mice survived. By tracking the source of beta cells, they found that these cells derived from alpha cells of the same tissue. A remarkable point in this study was that they used any transcription factor, and concluded the intrinsic flexibility of pancreatic cells as the main reason for this phenomena.<sup>37</sup> The question that now arises is: "Are the cells of other tissues also able to do this, or it is an exclusive feature of pancreatic cells?"

On the way to answer this question, further steps were taken in the development of in-vivo reprogramming. So, the next step was to look at the conversion of cells that were developmentally close to pancreatic cells. The liver cells were selected to answer this question. They tried to convert these cells via the three above-mentioned transcription factors. Surprisingly, the conversion has occurred and some duct structures that expressed beta cell markers were developed in

the liver. This newly produced cells eliminated the symptoms in animal models diabetes.<sup>38</sup> Another study by Ariyachet *et al.* also found that intestinal cells could be converted to insulin-secreting cells.<sup>39</sup> These results led the researchers to conclude that the evolutionary close tissues had a potential for in-vivo reprogram to each other. All this together encouraged these scientists to continue their path.

The efforts of researchers in this field to date have focused on finding more efficient methods to convert different somatic cells into beta cells. For example, some researchers are focused on finding more efficient cocktail of transcription factors, while others have been working with creative methods to find other ways to reprogram these cells without expression of transcription factors.<sup>40,41</sup> It is worth noting that these researcher's efforts for reprogramming mesoderm cells continued, and recently Rezvani *et al.*<sup>42</sup> and also Song *et al.*<sup>43</sup> have shown that myofibroblasts can be converted into hepatocytes to treat hepatic fibrosis.

### In vivo reprogramming in cardiac tissue

As discussed in the previous section, one of the challenges facing in vivo reprogramming is the conversion of evolutionary distant cells. In contrast to the pancreas, in cardiac tissue, fibroblast cells and cardiomyocytes come from different progenitors, but the source of both of them is the mesodermal embryonic layer; the advantage of in-vivo reprogramming in the cardiac tissue is the presence of abundant sources of cardiac fibroblasts which migrate to the lesion area after heart damage. This feature led the researchers to test this hypothesis whether cardiac fibroblasts could be converted to cardiomyocytes at the site of the damage?

In 2009, Takeuchi and Bruneau designed an experiment to respond to this question. They reprogrammed embryonic mesoderm tissue into cardiac tissue using transcription factors GATA4, Tbx5, and Baf60c.<sup>44</sup> In 2012, Inagawa *et al.* observed that non-myocyte cells could be

converted to induce cardiomyocytes by applying a cocktail of transcription factors including Gata4, Mef2c, and Tbx5 (GMT).<sup>45</sup> Interestingly, when this process was done in vivo, it was more efficient than in vitro, and also the transcriptome of converted cells was very similar to cardiomyocytes. On the other hand, these cells were also active electrophysiologically similar to cardiomyocytes.<sup>13,46</sup>

After this study, other studies were also carried out to increase the efficiency of the GMT cocktail.<sup>47</sup> As an example, the addition of Hand2 transcription factor to GMT (GHMT) improved the efficiency of reprogramming, and improved cardiac activity. GHMT also produced various heart cells, including ventricle, atrium, and conductive tissue.<sup>48,49</sup> Then, other studies using the same method on rat's heart were performed with different sets of transcription factors.<sup>50-53</sup> By introducing miRNAs and their widespread use in cell reprogramming, after much effort, in 2015, Jayawardena *et al.* demonstrated that miRNAs also could play an important role in cardiac cells reprogramming.<sup>54</sup> In vivo reprogramming itself led to angiogenesis and increased blood flow to newly converted cells, but it was not enough. Therefore, the researchers used angiogenesis stimulator, and they were surprised to find that these stimuli significantly increased the efficiency of in-vivo reprogramming.<sup>13</sup> Mathison *et al.* showed that another factor that influenced angiogenesis, the vascular endothelial growth factor, also had a positive impact on the efficiency of GMT on in-vivo reprogramming.<sup>55</sup>

One of the major problems in heart stroke is fibrosis, which is caused by fibroblast secretions. In studies of cardiac in vivo reprogramming, cardiac fibrosis significantly reduces, which can be due to the release of anti-collagen agents by induced cardiomyocytes, or because of reduced secretions of fibroblast cells that had not completely reprogrammed, or perhaps both of them.

Cardiomyocytes are not the only cardiac cells that are needed, but also conductive cells that are damaged, or their amount and location is abnormal. Kapoor *et al.* showed that the Tbx18 transcription factor present in the cardiomyocytes cells culture media converted these cells into pulse producing cells. This experiment was done in vivo on guinea pig model of bradycardia, which returned heart rate to the normal state.<sup>56</sup> It should be noted that more knowledge is needed on the expression of genes in different cells of the cardiac tissue to be capable of converting existing intact cell to desired cell in vivo; but with increasing knowledge of this process, in vivo reprogramming is not very far from minds.

### In vivo reprogramming in neural tissue

Recently, in vivo tissue reprogramming of neural tissue has attracted the attention of scientific community. The first symposium on in vivo reprogramming was held in 2014 at the annual meeting of the Neuroscience Association in Washington, DC, which showed the attention of researchers in neuroscience to this research and therapeutic approach.<sup>57</sup>

Cardiac tissue has a poor restorative potential, but in some regions such as sub-ventricular zone and dentate gyrus, as well as certain areas of amygdala, there is an intrinsic potential to produce new cells.<sup>58,59</sup> These newly generated cells can repair minor damages to the tissue.<sup>60</sup> This reparative potential can be used to make it easier to convert neural cells with only one or two transcription factors. In the neural tissue, just like the cardiac tissue, there are cells that are some supportive cells, which they collectively called glia. These cells have some features of precursor cells.<sup>61</sup>

Researchers in the field of in-vivo reprogramming whom focused on neural tissue repair have focused on these cells for conversion purposes. The first attempts on in-vivo reprogramming of neural tissue were done to convert the evolutionary close cells. In

a study by De la Rossa *et al.*, in vivo reprogramming of cells from one layer of the cerebellum to the another layer cell was carried out by the Fezf2 transcription factor in the mouse embryo.<sup>62</sup> Similar studies have been carried out by other researchers to convert cells of other layers of the fetal brain.<sup>63</sup> It should be noted that the conversion of adult neurons to each other in the early stages of embryonic life is much simpler, and this is more complicated in adults. Another study was carried out to convert astrocytes to primary neurons by Niu *et al.*, whose aim was to transform glial cells to functional neurons in the brain using a transcription factor called Sox2.<sup>15</sup>

Researchers in this field,<sup>64-66</sup> including Dehghan *et al.*,<sup>64</sup> along with the factors of transcription, have paid attention on growth factors such as brain-derived neurotrophic factor (BDNF), fibroblast growth factor (FGF), and Noggin, as well as small molecules such as valproic acid. The newly generated cells from these studies integrate into brain circuits, and they are electrically active. In a study by Su *et al.*, they converted spinal cord astrocytes to interneurons on the injury site.<sup>19</sup> These interneurons also were capable of integrating into local circuits, and were functionally active. It was also found that only Sox2, and then Ascl1, were sufficient for this conversion.<sup>67,68</sup> Effects of Sox2 on cell reprogramming is not limited to the conversion of glia to the neurons, but can also be useful in pericyte to neuron conversion.<sup>69</sup> MicroRNAs (miRNAs) have also play a major role in the in-vivo reprogramming of glial cells to the neuron.<sup>70</sup> For example, Ghasemi-Kasman *et al.* showed that using miRNAs, astrocytes could be converted to neuroblasts, and then to neurons.<sup>71</sup>

Recently, many studies have been conducted to reprogram glial cells to the damaged neurons of various diseases such as Alzheimer's disease, multiple sclerosis (MS), etc. These studies suggest that it is possible to replace damaged cells with functional ones

which can integrate to the brain circuits using this approach.<sup>17,64,72</sup> It can be concluded from these studies that using various factors and environmental conditions, as well as body needs, it is possible to produce special types of cells in the body via in vivo reprogramming process.

### Therapeutic potentials of in-vivo reprogramming

Many researchers around the world have sought to use in vivo reprogramming strategy for diseases treatments. Efforts of Zhou *et al.*,<sup>12</sup> Niu *et al.*,<sup>15</sup> Rezvani *et al.*,<sup>42</sup> and Song *et al.*<sup>43</sup> to treat pancreatic and hepatic diseases, by in vivo reprogramming method, are highly appreciated. Besides, efforts of Ma *et al.*,<sup>47</sup> Song *et al.*,<sup>48</sup> Ieda *et al.*,<sup>50</sup> and Li *et al.*<sup>53</sup> have been focused on treating cardiac diseased with this method. Guo *et al.* also looked after the capability of this approach in brain injury models. They sought to convert the reactive astrocytes, which accumulated in the region after the onset of the damage or lesion, to the neurons in the adult mice brain.<sup>17</sup> Dehghan *et al.* also looked for a way to replace the damaged oligodendrocytes with new ones in the animal models of MS.<sup>64</sup> Applied efforts of neuroscience researchers in this area are discussed in detail in Li and Chen review article.<sup>61</sup>

### Challenges ahead for in-vivo reprogramming

In-vivo reprogramming is a novel way of treating diseases. This method can replace new cells in the damaged tissue without the need for cell transplantation. Obviously, cell transplantation is complex and relatively invasive. Although the ability of this method to produce new cells in the body has been well documented in the studies described above, but there are many challenges ahead of this method to prove its ability to treat human diseases.

However, human knowledge is growing, and new emerging technologies will be available to solve these problems and

challenges. Researchers now reprogram the cells by artificial increasing in the expression of a number of transcription factors, but their works are still blinded, and they have little knowledge. With the advancement of genomics and proteomics, and in general genomics knowledge, it was hoped to achieve more specific, higher-performing transforming factors. Now, we know that by altering the epigenetic state of the cells, we are able to remove possible obstacles of reprogramming.<sup>73</sup>

However, with the development of epigenetic knowledge, it is possible to find some drugs that will be capable of cell reprogramming, without the induction of gene expression. Of course, new technologies of gene editing such as clustered regularly interspaced short palindromic repeats (CRISPRs) are also powerful tools for cell reprogramming. Technologies of single cell manipulation that assess the genetic material and proteins of a cell individually, including single cell gene sequencing and single cell RNA sequencing, can also be effective in completing our knowledge. These new techniques introduce us the general conditions of the cells, so that we can come up with suitable strategies for converting cells. We know that the cells in the tissue are susceptible to conversion, but conditions such as cell death and the conversion to the unwanted types of cells are factors that decrease the efficacy of this method.<sup>74,75</sup> Therefore, we should look for ways to increase the efficiency of cell reprogramming.

According to the above, it is clear that with the advancement of stem cell science and technology we can gain a clearer understanding of these cells and the processes occurring during cell reprogramming, and develop the technology of internal re-programming with a brighter and more open view.

Another major obstacle to the development of in-vivo reprogramming is delivering pathways of compounds and factors. Reprogramming compounds must be delivered

safely, effectively, and optimized. Viral and plasmid vectors are the usual methods, but due to their disadvantages, they are not still ready for human treatment applications.<sup>76,77</sup> Although it is possible to deliver the reprogramming factors to the actual locations of damage, but their risk is still very high. On the other hand, transcription factors should be expressed to a large extent, whose effects and consequences are still unclear. Given the limitations of genetic reprogramming, today, chemical reprogramming using small molecule compounds has received attention. In this method, although the need for high expression of transcription factors has been almost eliminated, still some obstacles remained. Delivering the compounds to the site of lesion, and maintaining their therapeutic concentrations over a long period of time are the major problems. It's worth noting, however, that nanotechnology has opened up new door to overcome these problems. Another hope is also injecting high concentrations of mRNAs to the damaged tissue to transiently increase the expression of desired genes.

After all, the safety and effectiveness of this method should be tested in animal models evolutionary close to humans including monkeys. These tests help us to test the quality of this method in human-size animals.

With the advancements of in-vivo programming technology, gradually more efficient methods of reprogramming and targeting will be developed. These methods should all receive the necessary approvals from the relevant organizations, but nevertheless the need for this technology will make the verification processes move faster. Of course, for patients who are disappointed with other therapies, it is possible to use in vivo reprogramming more quickly.

### Conclusion

At the end, in short, in vivo reprogramming technology is a regenerative medicine

therapeutic method based on developmental biology and cell reprogramming. Recently, many studies have been published on chronic diseases associated with pancreatic, cardiac, and neural tissues of small laboratory animals that have reported promising results. Despite all the positive aspects of this method, there are still challenges facing this new technology, which we hope they would be solved gradually. With the gradual removal of obstacles and challenges, the use of this method for medical purposes is not far from mind. We hope that this technology will progress as quickly as possible, and we will soon see chronic and nonchronic diseases patients treated with this approach.

### Conflict of Interests

Authors have no conflict of interests.

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