ORIGINAL PAPER

Mediating role of resilience in a relationship between social support and CD4 count of patients living with HIV in Behavioral Diseases Counseling Center of Imam Khomeini Hospital, Tehran

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Abstract

Introduction: Human immunodeficiency virus (HIV) is an infectious virus that can have devastating effects on physical and mental conditions of patients. This study aimed to investigate the mediating role of resilience in the relationship between social support and CD4 count of patients living with HIV in Behavioral Diseases Counseling Center of Imam Khomeini Hospital, Tehran, Iran.

Material and methods: The present research was a descriptive-analytical study, and included 200 HIV-positive patients from Behavioral Diseases Counseling Center of Imam Khomeini Hospital using available sampling method. Participants responded to social support and resilience scale, and CD4 count was extracted from their files. Structural equation modeling and PLS modeling were applied to analyze data.

Results: The results showed that social support confirmed 47% of the variance of resilience. Furthermore, social support variables predicted 47.1% of CD4 count changes by calculating this dependent variable, and the rest of explanation related to other factors.

Conclusions: Based on this study findings, it can be concluded that the structure of resilience can strengthen the effect of social support on CD4 of HIV-positive patients in Behavioral Diseases Counseling Center of Imam Khomeini Hospital, as a mediating variable.

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Introduction

Many events and diseases in life affect a person's health and well-being. One of them is human immunodeficiency virus (HIV) [1, 2]. More than 30 million people are living with HIV, and more than 10 million with acquired immunodeficiency syndrome (AIDS), receiving antiretroviral therapy (ART) [3]. AIDS is a syndrome because it has different symptoms that are not the same in all patients, and as a viral disease is transmitted from person to person in different ways [4]. People living with HIV experience a great amount of distress, anxiety, and depression, which affect their mental and physical health [5]. Since non-adherence to medication regimens leads to drugs resistance, people living with HIV should adhere to medications, and low adherence is one of the main reasons that decrease CD4 count [6].

Immune response is the response of immune system [7]. Immunity is the body's biological defense to fight against infections, diseases, and other unwanted biological stimuli. In fact, immunity is the body's ability to fight harmful microbes. The primary idea is that any improvement in immune function should be reflected in the number of CD4 lymphocytes; therefore, evaluation of CD4 lymphocytes is a method to measure the immunological response in HIV patients [8]. Furthermore, ART results in a considerable improvement in lymphocyte function in HIV patients [9]. In other words, safety functions are generally assessed by CD4 counting [10]. CD4 count is considered an important index of HIV status because HIV destroys CD4 cells [11]. HIV infection can cause AIDS by infecting a large group of immune system cells called CD4+ T lymphocytes. These cells are a sub-set of white blood cells, which naturally regulate immune response to infection. HIV uses T cells to multiply and spread throughout the body, and at the same time, the number of these cells are reduced. T cells are required for body's defense. When a person's CD4+ T cell count falls below a specific threshold, the person becomes susceptible to various diseases that the body is unable to treat [12]. The higher number of viruses, the higher rate of CD4 decline; thus, by increasing the likelihood of disease onset, the patient's involvement and adherence to antiretroviral therapy is the main way to reduce the number of viruses in the body [13].

CD4 levels are affected by psychological variables [14]. Recent studies show that social support is recognized as a form of defense used by many people living with HIV [15]. Social support refers to different types of support that a person perceives or receives from others, and can be classified as emotional, informational, physical, and companion support [16, 17]. In terms of public assistance and healthcare, such patients are discriminated; they are isolated and deprived of education due to inappropriate and humiliating behaviors experienced. They conceal their condition out of fear of notoriety and rejection from family and friends who may spread the disease across the society [18]. When people receive HIV diagnosis, it may cause psychological distress. Because of HIV specification, it is very socially undesirable. On the other hand, friends and relatives avoid the infected person, who remains isolated [19].

Social support can play an important role in life expectancy of people living with HIV, by increasing hope that may help people at risk to consider treatment and prevention services more seriously [20]. There is evidence that social support can mediate the impact of stressors on psychological health in people living with HIV [21]. Previous studies showed a significant positive relationship in the levels of social support and CD4 count in HIV patients [22].

Although the diagnosis of HIV is stressful, some psychological characteristics are reported to be important [23]. There are different definitions of resilience, but some authors believe that the best definition of resilience is a positive adaptation to adversity [24]. Psychological resilience is defined as flexibility in response to changeable situations with negative emotional experiences [25]. Psychologists believe that resilience is a structure that acts as a resource to protect patients from the consequences of diagnosing a disease and labeling [26]. In a situation where a person faces a difficult and exhausting emotional situation, having good feelings, optimism, and stubbornness and resilience, are not enough to control emotions; there is a need for the best cognitive function to control emotions. Therefore, resilience strategies help to appropriately respond when a threatening and unpleasant events are faced [27]. Studies among people living with HIV showed that a combination of positive coping responses, such as active behavioral coping patterns, sense of dominance, and fighting spirit, increase people's resilience by reducing psycho-social disturbances [28]. Also, various studies indicated that by increasing resilience, treatment adherence of HIV patients increases and viral load of these patients decreases [29].

Social support and resilience play an important role in the immune system of patients, and can improve mental health and psychological well-being of HIV-positive patients, so eventually, patients with lower social support and resilience are at higher risk of death [14]. In a study, Mo *et al.* [30] reported a significant positive relationship between social support and resilience among HIV patients. A study by Earnshaw *et al.* [26], entitled "Stigma and racial/ethnic HIV disparities: Moving toward resilience" showed that instrumental social support and community-based social support play a significant mediating role between HIV and labeling. In a one-year longitudinal study on social support, coping strategies, resilience, and post-traumatic stress in a sample of Polish HIV-positive patients, Rzeszutek and Oniszczenko [31] reported that social support and resuscitation positively correlated with post-traumatic growth strategy.

Earlier studies, according to the offered research and models, investigated only particular aspects of research. Although resilience influences the association between social support and CD4 count, prior researches have been limited by the absence of resilience as a mediating factor; in other words, one of the innovative aspects of this study is the ex-

amination of other variables associated with resilience. Moreover, the weakness of previous studies is the lack of examining these variables in a form of coherent study; thus, some variables in previous studies were studied separately, and without relation with other variables that prevents valid findings and coherent information. These weaknesses can be the strength of the current study, which examined the relationship among these components by presenting an integrated model. This research provided a desirable model in the socio-cultural dimension. Furthermore, in the social context of Iranian society, patients' concerns about informing family members and relatives about the disease indicate the cultural importance of the present study. Therefore, this study aimed to evaluate the mediating role of resilience in the relationship between social support and CD4 count of patients living with HIV in Behavioral Diseases Counseling Center of Imam Khomeini Hospital. According to the study's purpose, the question was whether resilience plays a mediating role in the relationship between social support and CD4 count of HIV-positive patients in Behavioral Diseases Counseling Center of Imam Khomeini Hospital.

Material and methods

Study design and participants

The current research was a descriptive-analytical study that used structural equation analysis to investigate correlations among the variables of resilience, social support, and CD4 count, both directly and indirectly. Statistical population of this study included male and female patients over 18 years of age, referred to the Behavioral Diseases Counseling Center of Imam Khomeini Hospital in Tehran, Iran.

Sample size determination and sampling techniques

Statistical samples were chosen using accessible techniques from the statistical population. To determine the sample size, Tabachnik and Fidell estimates were applied to analyze structural equation modeling. According to Tabachnik and Fidell, in structural equations modeling, the ratio of sample number (observations) to independent variables should vary from 5 to 15 [32]:

$5Q < n < 15Q$

In this formula, Q is the number of observed variables or the number of items (questions) of the questionnaire, and n is the sample size. Considering that the present study included 13 independent variables, the sample size should be from 65 to 195, and 200 patients were included to determine the sample size [32]. Participants were selected based on criteria, such as age over 18 years, minimum literacy level, satisfaction with inclusion, and HIV diagnosis made by an infectious diseases specialist. Furthermore, age under 18, incomplete research tools, and psychiatric disorders based on an interview with a psychologist were considered exclusion criteria.

Instruments

Sherbourne and Stewart social support questionnaire

Social support scale was developed by Sherbourne and Stewart to measure the amount of social support a person receives. This tool that measures the amount of social support has 19 terms and 5 sub-scales. These sub-scales include emotional, informational, tangible, and kindness sub-scales. The lowest score in this questionnaire is 19, and the highest score is 95; the higher the scores, the higher social support of the participants [33]. Mohammadzadeh [34] reported the reliability of this tool used in the present study by Cronbach's α method for the whole tool of 0.97, and for each emotional, informational, tangible, and kindness sub-scales, the values were 0.96, 0.92, 0.94, and 0.94, respectively.

Connor and Davidson resilience questionnaire

This scale was designed to measure the resilience of adults, and contain 25 questions that measure different dimensions of resilience, including individual ability, resistance to negative influences, positive acceptance of change, trust in individual instincts, support and social security, spiritual faith, and pragmatic approach. This scale provides five answers options (from 'completely false' to 'always true') for each item in a rating range. The minimum score of the resilience of the subject on this scale is 0, and the maximum score is 100. Internal consistency of this scale using calculation of Cronbach's α coefficient is 0.89 [35]. Kayhani *et al.* [36] reported Cronbach's α coefficient of 0.66, which indicates the desired internal consistency of the instrument.

CD4 index

This index was obtained by reviewing patients' records, and observing and recording the latest patients' CD4 counts.

Ethical considerations

The study was approved by the Ethics Committee of Tehran University of Medical Sciences, Tehran, Iran (approval number: IR.TUMS.VCR.REC.1398.517). Permission to enter the Behavioral Diseases Counseling Center was obtained to conduct research; then, patients were selected according to inclusion and exclusion criteria. The researcher conducted a clinical interview to determine whether the patient had psychiatric disorders or not. All patients provided written consent to participate in the study, and were assured that participation was voluntary, with anonymity and confidentiality guaranteed. The interview was stopped or continued at patient's will at any point of the study. After obtaining written consent from participants, questionnaires were presented. In the process of filling out the questionnaires, patients were being monitored in order not to damage the validity and reliability of findings.

Table 1. Percentage distribution of demographic characteristics of the sample

Variables/Categories	*n* (%)
Gender	
Female	75 (37.5)
Male	125 (62.5)
Education level	
High school	114 (57.0)
Bachelor's degree	53 (26.5)
Higher degrees	33 (16.5)
Marital status	
Single	129 (64.5)
Married	71 (35.5)
Employment status	
Employed	124 (62.0)
Unemployed	76 (38.0)

Table 2. Measurement model

Construct/ indicator	Loading	Composite reliability	AVE
Social support			
Kindness			
Ss1	0.846		
Ss2	0.719		
Ss3	0.894		
Positive social relation (PSR)		0.751	**0.745**
Ss16	0.891		
Ss17	0.690		
Ss18	0.894		
Ss19	0.750		
Emotion		0.783	**0.707**
Ss12	0.707		
Ss13	0.711		
Ss14	0.609		
Ss15	0.799		
Information		0.767	**0.753**
Ss10	0.671		
Ss11	0.890		
Ss12	0.899		
Ss13	0.755		
Tangible		0.856	**0.732**
Ss4	0.826		
Ss5	0.675		
Ss6	0.819		
Ss7	0.991		
Total		0.888	**0.748**

Table 3. Measurement model

Construct/ indicator	Loading	Composite reliability	AVE
Resilience			
Spiritual impact		0.806	**0.719**
S1	0.845		
S2	0.862		
Control		0.728	**0.664**
S4	0.687		
S5	0.995		
S6	0.798		
Change acceptance		0.881	**0.725**
S7	0.780		
S8	0.846		
S9	0.838		
S10	0.762		
S11	0.692		
Trust to negative affect		0.859	**0.752**
S12	0.622		
S13	0.810		
S14	0.724		
S15	0.809		
S16	0.758		
S17	0.811		
S18	0.984		
Competence image		0.834	**0.774**
S19	0.857		
S20	0.791		
S21	0.837		
S22	0.798		
S23	0.800		
S25	0.827		
Total		0.923	**0.893**
CD4		0.725	**0.713**

Table 4. Discriminant validity

	Social support	Resilience	CD4
Social support	0.847		
Resilience	0.764	0.944	
CD4	0.685	0.680	0.843

Table 5. Effect on endogenous variables

Effect on endogenous variables	Direct effect	*t*-value (bootstrap)	R^2	*p*-value
H1: Social support	0.667	24.35	0.468	< 0.01
H2: Social support	0.695	28.15	0.471	< 0.01
H3: Resilience	0.793	15.83		< 0.01

**|t| > 1.96 - significant at p < 0.005; |t| > 2.58 - significant at p < 0.001*

Statistical analyses

Structural equation modeling examined the pattern in two stages, and included measurement pattern and structural test in PLS modeling, in which external model was referred to as the measurement model, while internal model was referred to as the structural model. The measurement model verified the structural model of hypotheses and variable relationships as well as the validity and reliability of measurement methods and research constructs. To evaluate validity of the structures, Fornell and Larcker suggested three criteria: 1. Validity of each item; 2. Composite validity of each structure; and 3. Mean variance extracted for the validity of each. From the items, factor load of 0.6 and more for each item is defined in the confirmatory factor analysis as a good structural indicator. Moreover, the factor load of the items should be significant at least at a level of 0.01 [37]. Combined reliability is the ratio of the sum of the factor loads of latent variables plus the variance of error. The values are from 0 and 1; it is a substitute for Cronbach's α and the value of this index should not be less than 0.7. The third validity check is the mean of the extracted variance. Fresnel and Locker recommended the values of 0.50 and above for this item, which means that the structure in question explains about 50% or more of the variance of their markers [37].

Results

Demographic characteristics of the research sample are shown in Table 1.

Based on Tables 2 and 3, standardized factor loads, combined validity, and AVE index of all the items and variables were calculated, and the obtained values represented the convergent validity and correlation of structures.

Table 4 shows Pearson's correlation coefficients and divergent validity index. The principal diameter of this second root matrix was the mean of explained variance. Confirmation of divergent validity required that the value of AVE must be greater than all correlation coefficients of variables related to other variables. As can be seen, the values on the main diameter showed the highest value, which indicated the proper validity of the structures.

After examining the validity and reliability of measurement tools and research structures (external model), it was necessary to assess the hypotheses and relationships of the variables (internal model). For this purpose, the tested model of the research is presented in Figure 1.

The results of analyzing the research hypotheses based on the structural equation modeling using the partial least squares method are shown in Table 5. According to the value of *t*-statistic, the research hypotheses were confirmed at a 99% confidence level.

The validity of the model was determined using a coefficient of determination (R^2). This coefficient measured the explanatory variance of an endogenous variable by exogenous variables. The coefficients of determination in the dependent variables of resilience and CD4 were 0.468 and 0.471, respectively. It means that the social support variable could explain 46.8% of the variance. Furthermore, the coefficient of determination in CD4 was equal to 0.471, and showed that the effect of social support predicted 47.1% of CD4 changes of variables by predicting this dependent variable, and the rest of the explanation related to other factors.

Discussion

It can be said that individuals who receive a higher level of social support benefit more from verbal encouragement and reassurance of people around while facing life crises, and thus feel more adequate and efficient in overcoming their problems. According to Bandura, one of the effective methods to cultivate self-efficacy is to receive verbal encouragement from people around [38]. Therefore, individuals facing life crisis can better cope with problems, allowing for healthy discharge of emotions along with support in stressful situations. Furthermore, receiving social support raises a person's self-esteem and sense of worth, thus improving resilience. Patients supported by those around them consider their existence to be valuable, important, and worthy. This attitude makes people not to abandon the problems, trying to overcome them with more perseverance and resilience. These individuals with strong support resources do not consider life empty and useless; rather, they try to cultivate meaning in their lives, consider specific concepts for difficulties of life, and interpret them in a specific context [38]. As a result, they experience more pleasant emotions and separate themselves from negative feeling, such as existential fear; they are better equipped to tolerate adversity, indicating that social support is useful through increasing resilience [38].

The present study results showed that social support is directly related to resilience, which is indirectly due to the resilience via self-efficacy and meaning in life variables; research has confirmed this relationship. In fact, social support can influence resilience by affecting some variables. For

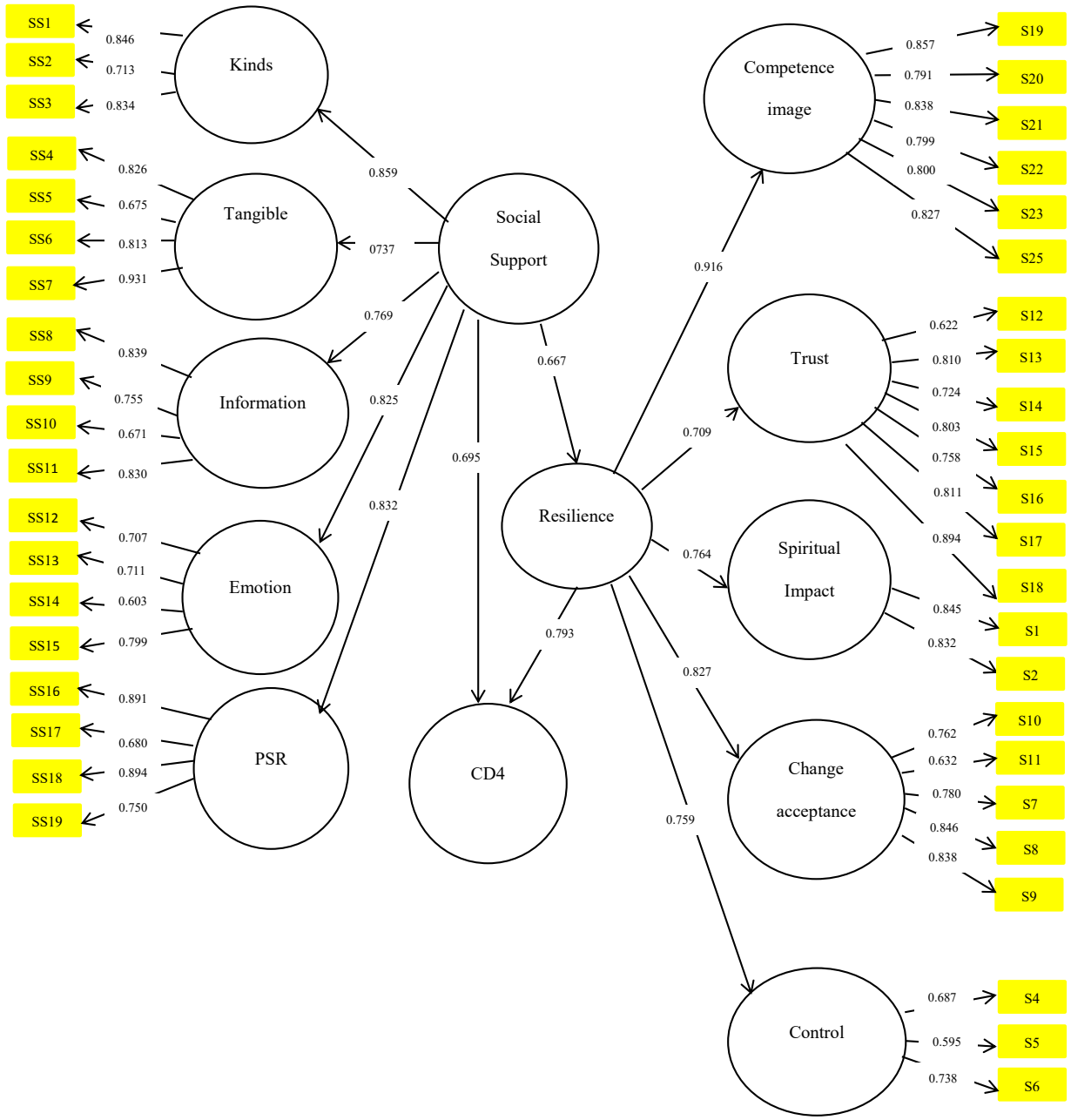

Figure 1. The tested model of the research

example, by affecting personal self-efficacy, social support allows people to rely on their abilities to overcome their problems in critical life situations. Social support will be able to promote resilience by meaningful personal suffering [39].

On the other hand, another explanation for the results is that higher resilience predicts higher adherence to antiretroviral drugs (95% or more), indicating that resilience promotes adherence to antiretroviral drugs. Patients who have a high score on resilience may consider HIV as another difficulty, and previous experiences giving them courage and mindset to believe that they can overcome this adversity [33].

One of the reasons for the favorable effect of resilience on patients' CD4 count is the role of this variable to create and increase some psychological variables, such as finding meaning in challenging conditions and optimism, and both of these variables can reduce patient's CD4 count and death rate [40]. On the other hand, resilient people are less affected by stress and its physiological processes, such as increased cortisol. Research shows that increasing cortisol level significantly affects the body, and increases the likelihood of developing psycho-somatic symptoms [41].

On the other hand, people who receive a higher score in resilience show more health-promoting behaviors, such

as healthy eating, exercise, and optimal treatment and drug adherence. Furthermore, those with high resilience scores can better understand the long-term purposes of successful HIV management, and may strive to achieve these goals by adhering to their medications [41].

Resilient people have a strong understanding of stress, and can classify and react to it based on its intensity [42]. Resilient people can retain their resilience in difficult times and use problem-oriented coping methods to manage their disease concerns. These individuals are typically less impacted by damaging social connections, and utilize social communication to enhance their life due to their personality features [43, 44].

There are some limitations of the present study. First, the study was carried out with the participation of patients living with HIV in Behavioral Diseases Counseling Center of Imam Khomeini Hospital, Tehran. Therefore, the generalization of the results to other communities should be cautious. Second, the structural equation modeling limits the deduction of causal relationships from these structural relations. In order to use the finding, the authors recommend prioritizing attention given to social support, resilience, and CD4 count by formulating treatment programs. Also, it is recommended that future studied focus on clinical trials to assess the effectiveness of tailored interventions in resilience for the promotion of ART efficacy.

Conclusions

Resilient people can identify stress levels; they undertake various actions to reduce the impact of stress on their lives and benefit from the social support around them. Resilience can have a relationship with stress hormone levels as well as immune function, where there are reciprocal relationships between psychological factors and neurological function and safety. It can be concluded that the resilience can strengthen the effect of social support on the CD4 count rate of HIV-positive patients in Behavioral Diseases Counseling Center of Imam Khomeini Hospital, as a mediating variable.

Disclosures

1. Institutional review board statement: The study was approved by the Ethical Committee of Tehran University of Medical Sciences, with the approval number of IR.TUMS.VCR.REC.1398.517.
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