

Relationships of social capital with health status and mental health in people living with HIV: structural equation modeling

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Abstract

Introduction: Acquired immunodeficiency syndrome is a unique social phenomenon that affects nearly all dimensions of socio-economic life of patients. The present study presented structural equation modeling to determine relationships of social capital with psycho-social health in people living with human immunodeficiency virus (HIV).

Material and methods: This descriptive-analytical study recruited 321 people living with HIV presenting to the Center for Behavioral Diseases of West Tehran Health Center, Tehran, Iran between 2020 and 2021. Data were collected using social capital questionnaire, general health questionnaire (GHQ), socio-economic status questionnaire, and demographic checklist containing self-rated items on health status, and were analyzed in SPSS version 25 and Lisrel 8.8.

Results: According to the results obtained from path analysis, with variables related to health status, duration of HIV in years ($\beta = -0.20$) most significantly and negatively affected health status in direct path, economic status ($\beta = 0.08$) positively influenced health status in indirect path, and social capital ($\beta = 0.29$) most significantly and positively affected health status in both direct and indirect paths. Among variables related to mental health status, mental health problems were most significantly and negatively related with health status ($\beta = -0.26$) in direct path, and with social capital ($\beta = -0.54$) in both direct and indirect paths. Duration of HIV in years ($\beta = 0.05$) was also most significantly and positively related with mental health problems in patients in indirect path.

Conclusions: The present findings suggest both direct and indirect relationships of social capital with health status and mental health of the patients. It is therefore recommended that more attention should be paid to this dimension of health, especially among these vulnerable patients.

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Introduction

A long history of effects of different diseases on psycho-physical health of humans has caused numerous problems for communities. As a contemporary infectious disease, human immunodeficiency virus (HIV) is globally considered the fifth leading cause of death according to the World Health Organization (WHO) [1]. A report of the WHO in 2017 showed 37 million people living with HIV (PLWH), including over 35 million adults [2]. The number of PLWH in Iran was also estimated as 61,000 in 2018, which increased by 4,400, and 2,600 deaths were reported [3].

HIV is a unique social phenomenon that affects nearly all dimensions of the socio-economic status of HIV-infected patients. Social problems caused by this disease, such as negative attitudes and stigma, affect the psycho-physical health of PLWH [4, 5], who suffer severe psychological problems, including depression, anxiety, stress, and sleep disorders, owing to their physical problems and limitations [6].

Numerous studies suggested desirable effects of a supportive environment on physical and psycho-social dimensions and satisfaction with life in PLWH [7]. The lower the interpersonal conflicts of patients, and the more effective their social communication and support they receive, the higher their endurance in facing the pressures and problems of life [8, 9].

Today, a collection of beneficial social relationships to individuals is defined as social capital with three main features, including trust, interaction, and cooperation [10]. Social capital globally promotes human health [11]. Evidence suggests social capital can play a key role in promoting HIV treatment by helping change risk-related behaviors, reduce infections with HIV, and more effectively use prevention, care, and medical services through social groups and networks [12]. Moreover, social capital can improve mental health and reduce the risk of prevalent psychological disorders in communities, such as depression and anxiety, by simultaneously affecting individuals and community [13]. A conceptual model developed by Nieminen *et al.* showed

a causal relationships of social capital with demographic variables, chronic diseases, and functional capacity as well as its' direct and indirect relationships with health status and mental health [14] (Figure 1). As the most essential component of social welfare and central concept of sustainable development, health more depends on socio-economic factors than on medical interventions [15]. Numerous studies have investigated the relationship between social capital and mental health [16]. However, to the best of the authors' knowledge, causal relationships of social capital with health-related factors have not been yet addressed in PLWH. Given the importance of health, especially in these patients, the present research employed SEM to determine the relationships of social capital with health status and mental health in PLWH. Path analysis provided a causal model for descriptive-analytical studies [17].

Material and methods

Study design and population

The present descriptive-analytical study was conducted in the Center for Behavioral Diseases of West Tehran Health Center between 2020 and 2021. Majority of PLWH living the West of Tehran present to the Behavioral Disease Clinic of this center. Sample size was calculated as 321 using the following equation and based on $\alpha = 0.05$, $\beta = 0.1$, and correlation coefficient of 0.18 between social determinant and mental health, as reported by Shokohi *et al.* [18].

$$c = \frac{\ln(1+r)}{\ln(1-r)}$$

Inclusion and exclusion criteria

Inclusion criteria comprised Iranian citizenship, literacy, having a record of infection with HIV at the center, self-reported or recorded absence of psychological disorders, and

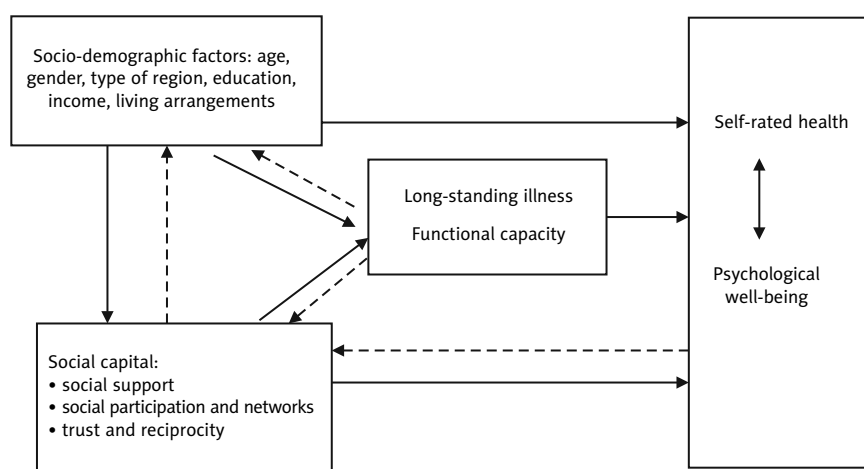


Figure 1. Conceptual model of the main associations between social capital, socio-demographic variables, long-standing illness, functional capacity, self-rated health, and psychological well-being [14]

not using psychotropic drugs. Exclusion criteria were inability to fulfill the questionnaires and failure to respond to questions.

Data collection and definition of terms

Data were collected using a social capital questionnaire, general health questionnaire (GHQ), socio-economic status questionnaire, and demographic checklist containing self-rated items on health status.

Social capital questionnaire

A 36-item social capital questionnaire developed by Onyx and Bullen in 2000 was used to evaluate social capital from individual's perspectives; it consisted of eight sub-scales, including community participation, feeling of trust, neighborhood connections, family connections, value of life, social pro-activity, tolerance of diversity, and work connections. Items were scored on a four-point Likert scale, and total score was ranging from 0 to 100, with higher scores suggesting a better health status [19]. Validity and reliability of this questionnaire were verified in Iran according to Eftekhari *et al.* by reporting intra-class correlation coefficient of over 0.7 for the sub-scales and Cronbach's α of 0.96 (internal consistency) for the entire questionnaire [20]. The present study evaluated reliability of this questionnaire by calculating Cronbach's α of 0.85.

General health questionnaire

GHQ was developed by Goldberg and Hiller in 1979, and comprised four 7-item sub-scales, including somatic symptoms (items, 1-7), anxiety and insomnia (items, 8-14), social dysfunction (items, 15-21), and depression (items, 22-28). Items were scored on a 0 to 3 scale, with a cut-off point of 23. Higher than 23 scores meant worse mental health and vice versa. Najarolaei *et al.* confirmed validity and reliability of this questionnaire in Iran by calculating a Cronbach's α of 0.85 [21].

Socio-economic status questionnaire

Socio-economic status questionnaire consisted of five main items and six demographic elements was developed by Ghodratnama in 2013, and it used to evaluate four dimensions of socio-economic status, including income level, economic class, education, and housing status. Items were scored on a five-point scale, ranging from 1 ('very low') to 5 ('very high'). Eslami *et al.* confirmed face and content validity of this questionnaire in Iran as well as its' reliability by calculating a Cronbach's α of 0.83 [22].

Self-rated health status

As a practical indicator with a key role in health studies, self-rated health status can be included in questionnaires

to cost-effectively predict health outcomes. As a measure of health perceived by individuals, self-rated health status [23] was evaluated with a question: "How do you currently evaluate your health status?". This item was scored on a five-point Likert scale, ranging from 'very bad' to 'very good'. Nejat confirmed validity and reliability of Persian version of self-rated health (WHO), and applied it to assess public health in Iran [24].

Socio-demographic checklist

This researcher-made demographic checklist included duration of marital life, number of children, duration of the disease in years, adherence to treatment, duration of medication in years, age, level of education, history of alcohol use, drug use, and drug injection in previous six months, and number of cigarettes smoked daily.

Procedures

Informed consent was obtained from all the participants entering the study. All methods were carried out in accordance with relevant guidelines and regulations. All experimental protocols were approved by ethics committee of the Alborz University of Medical Sciences (No., IR.ABZUMS.REC.1398.211).

Social distancing required by the COVID-19 pandemic at the time of the study limited presentation of the patients to the center. The researcher first attended the Center for Behavioral Diseases of West Tehran Health Center and identified eligible patients based on their records. Eligible patients willing to participate presented at the center and signed written consent forms after being briefed on study objectives. The objectives were also explained to absent candidates over the phone, and consent forms were sent through the center or the Internet to those willing to participate. After collecting consent forms, social capital questionnaire, GHQ, socio-economic status questionnaire, and socio-demographic checklist containing health items were distributed among the patients. The patients were invited to attend the center again in case they failed to respond to all the items. The questionnaires were provided for the absent participants on parsonline.com, and were supposed to be completed within two weeks. The researcher completed the questionnaires over the phone for the absent participants with no access to the Internet. The patients were assured of confidentiality of information provided, their right to withdraw from the study at their own discretion, and their preserved right to receive health services in case of withdrawal.

Statistical analysis

A conceptual model was first developed based on a review of literature and available theories to test a relationship model [25]. This study examined fitness of a conceptual model proposed by Nieminen *et al.* [14] for relationships of health status and mental health with social capital and demographic

variables and chronic diseases (Figure 1). Normality of the quantitative variables was examined using Kolmogorov-Smirnov test. As a developed version of regression, path analysis determines both direct and indirect effects of independent variables on a dependent variable, and provides a logical interpretation of the observed correlations. In other words, path analysis is a kind of multivariate statistical regression analysis that is used to investigate causal models by assessing the relationships of dependent variable with at least two independent variables [25]. This method can be used to determine significance of causal relationships between variables. Data collected were analyzed with SPSS version 25 [26] and Lisrel 8.8 [27]. Correlation and path analysis results were respectively expressed as Pearson correlation coefficient and beta (β), with a significance level of $p > 1.96$.

Results

This study analyzed the data of 321 PLWH who had records in the selected center. The mean age of the participants was 37.5 ± 7.1 years, years of education 10.28 ± 3.55 years, mean scores of social capital 76.32 ± 14.94 , health status 3.86 ± 0.79 , and mental health 38.21 ± 14.83 (Table 1).

According to Pearson's correlation test, years of education, duration of the disease, socio-economic status, and health status were positively correlated with social capital; duration of the disease and duration of medication were negatively correlated with health status, and the score of mental health was significantly and negatively correlated with social capital and health status. Health status was also negatively correlated with the total score of mental health. In other words, more favorable health status is related with lower scores of mental health problems and consequently fewer mental health problems ($r = -0.206$).

The significant and positive correlation of social capital with health status suggested the more favorable the social capital, the better the health status ($r = 0.30$). The negative correlation of social capital with mental health also suggested the less favorable the social capital, the more frequent the mental health problem ($r = -0.13$) (Table 2).

According to the results of path analysis (Figure 2), and among the variables related with health status, duration

of the disease negatively and directly affected health status ($\beta = -0.20$), socio-economic status indirectly influenced most significant effect on health status ($\beta = 0.08$), and education negatively affected health status through duration of the disease ($\beta = -0.03$). Moreover, social capital both directly and indirectly exerted most significant effect on health status ($\beta = 0.29$). In other words, the more favorable the social capital, the better the self-rated health status.

Among the variables related to mental health status, health status directly exerted most significant and negative effect on mental health. In other words, the less favorable the health status, the more the psychological problems

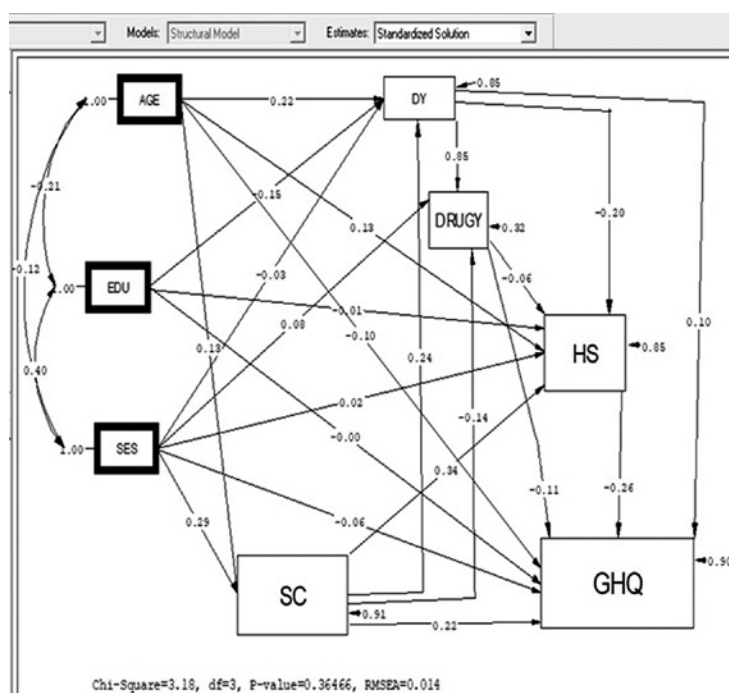
Table 1. Socio-demographic characteristics of the participants

Variables (quantitative)	Mean \pm SD
Age (years)	37.5 \pm 7.1
Education (years)	10.28 \pm 3.55
Socio-economic status	10.92 \pm 3.027
Duration of the disease (years)	7.02 \pm 5.63
Mental health	38.21 \pm 14.83
Social capital	76.32 \pm 14.94
Self-rated health status	3.86 \pm 0.79
Years of using drugs	5.39 \pm 4.18
Variables (qualitative)	F (%)
Insurance	
Yes	171 (53.3)
No	150 (46.7)
Number of children	
0	172 (53.6)
1	69 (21.5)
2	61 (19.0)
≥ 3	19 (8.6)
Occupation	
Employed	189 (58.9)
Unemployed	132 (41.1)

Table 2. Correlation matrix between social capital, mental health, and health status in people living with HIV

	1	2	3	4	5	6	7	8
1 Age (years)	1							
2 Education (years)	-0.209**	1						
3 Duration of the disease (years)	0.282**	-0.172**	1					
4 Years of using drugs	0.239**	-0.157**	0.812**	1				
5 Socio-economic status	-0.120*	0.396**	-0.053	-0.007	1			
6 Health status	0.096	0.066	-0.125*	-0.156**	0.108	1		
7 Social capital	0.097	0.161*	0.231**	0.073	0.278**	0.305**	1	
8 Mental health	-0.097	0.017	0.072	0.007	-0.015	-0.206**	-0.132*	1

**Correlation is significant at 0.01 level (2-tailed). *Correlation is significant at 0.05 level (2-tailed)



SC – social capital, GHQ – general health questionnaire, HS – health status, DY – duration of disease (years), DRUGY – years of using drugs, EDU – education (years), SES – socio-economic status

Figure 2. Testing of path analysis model of mediating role of social capital with mental health and health status in people living with HIV, according to B standard

Table 3. Direct and indirect effects of social capital on health status and mental health in people living with HIV

	Direct effects	Indirect effects	Total effects
Health status			
Age (years)	0.13*	-0.006*	0.124*
Education (years)	-0.01	-0.03*	-0.03*
Socio-economic status	0.02	0.085*	0.085*
Duration of the disease (years)	-0.20*	-	-0.2*
Years of using drugs	-0.06	-	0.06
Social capital	0.34*	-0.048*	0.292*
Mental health			
Age (years)	-0.10	-0.0301*	-0.0301*
Education (years)	-0.001	-0.0078*	-0.0078*
Socio-economic status	-0.06	0.0417*	0.0417*
Duration of the disease (years)	0.10	0.052*	0.052*
Duration of using medication (years)	-0.11	0.0156	-0.094
Social capital	0.22*	-0.76*	-0.54*
Health status	-0.26*	-	-0.26*

($\beta = -0.26$). Duration of the disease indirectly exerted most significant effect on mental health. In other words, the longer the disease duration, the more the psychological problems ($\beta = 0.05$). Furthermore, only social capital was both directly and indirectly related to mental health, i.e., the less

favorable the social capital, the more the psychological problems and vice versa ($\beta = -0.54$) (Table 3).

The results of the model fit indices showed a high favorability and fit of the model and logical relationships between the variables based on the conceptual model. The fitted

Table 4. Goodness of fit indices for the model

Fitting index	χ^2	df	χ^2/df	CFI	GFI	NFI	RMSEA
Model index	3.18	3.00	1.06	1.00	1.00	0.99	0.014
Acceptable range	$\chi^2/df < 5$			> 0.9	> 0.9	> 0.9	< 0.05

NFI – normed-fit index, GFI – goodness-of-fit statistic, RMSEA – root mean square error of approximation, $\times 2 \chi^2$

model was therefore insignificantly different from the conceptual model (Table 4).

Discussion

According to the results of the path analysis, duration of the disease directly exerted the most significant and negative effect on health status and socio-economic status indirectly, and social capital both directly and indirectly influenced the most significant and positive effect on health status. As a part of culture, health is defined in different communities depending on their beliefs and values [28, 29]. As the most essential component of social welfare and central concept of sustainable development, health more depends on socio-economic factors than on medical interventions [15]. A study conducted in Canada between 2013 and 15 showed direct relationships of social components, unfair social structures, and economic status with self-rated health status in two groups of women with and without HIV [30]. Reinius *et al.* and Mukoswa *et al.* found improvements in social capital to promote treatment outcomes, adherence to treatment regimen, and self-esteem in PLWH [11, 31]. The present study found socio-economic status to be related through social capital to self-rated health status in the patients. Subramanian *et al.* found unfair socio-economic distribution to affect health status through lowering social capital, which disintegrated the community and increased rejection and conflicts. Living in an unfavorable socio-economic status is associated with lack of control, frustration, loss of respect, and social inequality [32, 33]. The present study found duration of the disease to affect self-rated health status directly and negatively, which is consistent with the report by McGowan *et al.* who observed prolonged HIV to be significantly effective in health status and quality of life of PLWH. They also found self-rated health to be associated with health and social outcomes of the disease over time [34].

The present study discovered that among the variables negatively related to mental health status, health status was directly and negatively associated with mental health and social capital to both directly and indirectly exerted the most significant and negative effect on mental health. Meanwhile, duration of the disease indirectly exerted the most significant and positive effect on mental health problems.

HIV constitutes a serious crisis in patients' life. From the very early moments of diagnosis, patients become extremely anxious about their early death [35]. Research suggests higher levels of social connections and support, and lower levels of interpersonal conflicts help endure life pressures and problems [36]. Social support and social capital affect the structural and cognitive dimensions of human health, im-

prove mental health, and reduce the risk of common psychological disorders, including depression and anxiety, by simultaneously affecting individuals and community. In a recent study, Han *et al.* observed significant relationships between social capital and psychological problems in PLWH. They also reported social capital as a cognitive therapy for psychological disorders in these patients [16]. In physiological mechanism, social capital can play a role in improving mental health by strengthening immune system to face the disease and stress [37]. In the present study patients, self-rated health was negatively related with mental health. Machado *et al.* reported negative relationships between psychological problems, such as depression and stress, and self-rated health in PLWH. They found a relationship between poor self-rated health status and psychological problems to reflect limited access to resources, and provide information about health-promoting behaviors and inefficient support networks [38]. The present research found duration of the disease to indirectly influence the most significant and positive effect on mental health problems. Research suggests psycho-physical and social complications caused by prolongation of HIV to increase the prevalence of its' symptoms in patients over time. Inflammatory responses and HIV crossing the blood-brain barrier appear to reduce tryptophan and serotonin levels, and thus develop psychological disorders, such as depression, by causing oxidative stress and neural damage, e.g., elevated levels of cytokines [39].

Study limitations

The present study limitations comprised using self-reported questionnaires and the fact that the COVID-19 pandemic prevented some of the patients from participating in person.

Conclusions

The present findings showed direct and indirect relationships of social capital with health status and mental health in PLWH. Even though majority of studies suggested associations of social trust and social capital with reduced health deprivation, poor health status, and low quality of life investigated in industrial and developed countries, there are not enough data available in this regard in developing countries [33, 40]. Hence, it is important to design interventions, aiming mainly at vulnerable group of PLWH.

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Conflict of interest

The authors declare no conflict of interest.

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