



Relationship between Multimorbidity and Cognitive Decline Moderated by Social Health

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Received: 07 May, 2020
Accepted: 11 Oct. 2020
ePublished: 01 Aug. 2021



Abstract

Background and Objective: Multimorbidity is one of the important problems in health that can lead to cognitive decline. There is notable literature revealing that multimorbidity and cognitive ability are associated with social health and social-related activity. In this regard, this study aimed to investigate the role of social health in the relationship between multimorbidity and cognitive decline.

Materials and Methods: This descriptive-correlational study was conducted on all elderly people aged 70 years and above referring to the outpatient clinics of hospitals in Tehran, Iran, within July-September 2019. The volunteer samples (n=270) were selected from three randomly selected hospitals, namely Imam Khomeini, Sina, and Shariati, using the availability sampling method. The instruments of the study included questionnaires, namely a social-demographic form, the Chronic Diseases Checklist, Montreal Cognitive Assessment (MoCA) Test, and Social Health Questionnaire. The collected data were analyzed in SPSS software (version 22) using linear regression.

Results: The results showed that MoCA (cognitive decline) had a significant relationship with multimorbidity ($\beta=0.58$, 95% CI: 0.62-0.54, $P<0.001$) and social health ($\beta=-0.21$, 95% CI: -0.26. -0.16, $P<0.001$). Moreover, the findings indicated that social health was a mediator variable between multimorbidity and cognitive decline ($\beta=0.12$, 95% CI: 0.09-0.14, $P<0.001$), in which the amplification of social health would modulate the negative effect of multimorbidity on cognition ability.

Conclusions: According to the results of the present study, social health was a moderating variable in the relationship between multimorbidity and cognitive decline. In the other words, social health was a protective factor against a particular risk factor, such as multimorbidity, in protecting cognitive abilities.

Keywords: Cognitive decline, Multimorbidity, Social health

Background

Today, one of the challenges facing the health system is the growing number of patients who are suffering from several diseases at the same time, who are involved with the treatment and healthcare of all their diseases. A condition that is known as multimorbidity was commonly defined as the presence of multiple chronic diseases or conditions, often with a cut-off of two or more [1].

A considerable amount of research has been conducted, with the results indicating that multimorbidity is age-related. The findings of some research have shown that multimorbidity affects age-related cognitive processes [2]. One of the most frequently considered disorders is mild cognitive impairment (MCI). Vassilaki et al. (2015) indicated that having multiple chronic conditions was associated with a greater risk of MCI [3]. Moreover, Koyanagi et al. (2019) showed the existence of a relationship between chronic conditions and MCI, in which the prevention or treatment of chronic conditions or multimorbidity could reduce the onset of cognitive decline and subsequent dementia,

especially in low- and middle-income countries [4]. Mild cognitive impairment is a neurological disorder in older adults, in which cognitive abilities are mildly impaired and minimal impairment in instrumental activities of daily living occurs. Mild cognitive impairment is a condition, in which a person experiences a slight, however noticeable, decline in mental abilities (e.g., language or visual/spatial perception, memory, judgment, and thinking skills), compared to others at the same age. The minor decline in abilities is noticeable by the person experiencing them or by others who interact with that person; nonetheless, the changes are not severe enough to interfere with normal daily life and activities [5]. Some longitudinal studies determined that increasing multimorbidity was associated with the risk of mild cognitive impairment [6, 7]. By definition, health has five dimensions, namely physical, mental, emotional, spiritual, and social health. This research aimed to emphasize one important aspect, which was social health. Social exclusion causes decreased quality of life,

depression, and increased risk of chronic diseases [8]. Evidence suggests that social health may affect both multimorbidity and cognitive decline.

The results of various studies have indicated that there is a relationship between social factors and multimorbidity. Based on the findings of several epidemiological studies, social support can protect against premature mortality, prevent illness, and facilitate recovery [9, 10]. These researchers emphasized that these diseases are social-based and have a social basis in more general review. Social health plays a major role in health [11], and social interventions are essential to prevent illnesses [12, 13].

Numerous pieces of research have been performed on the relationship between social factors and cognitive abilities with a focus on social activities [14], social networks [15], and social supports [16]. The results of a systematic review conducted by Kelley et al. (2017) showed that there was an association between all of these social factors and cognitive function [17].

Objectives

Even recently, the findings of some studies indicated that social connections may increase cognitive reserve and protect against declining cognitive ability [18, 19].

Despite acknowledging these results, one point has remained. Although the relationship of cognitive abilities and multimorbidity with social factors has been investigated, little is known about their relationship. Therefore, considering this point, two hypotheses were proposed in this study: 1) the cognitive decline would be correlated with multimorbidity and social health, and 2) social health could mediate cognitive decline in patients with multimorbidity.

Materials and Methods

This research was conducted based on a correlational research design. The statistical population consisted of all elderly people aged 70 years and above referring to the outpatient clinics of hospitals in Tehran, Iran. The samples were chosen from three randomly selected hospitals, namely Imam Khomeini, Sina, and Shariati, within July-September 2019. In these hospitals, patients with multimorbidity accounted for 835 cases, among which at least 265 samples were required according to the Krejcie and Morgan Table. Accordingly, 270 voluntary subjects were selected using the availability sampling method. The inclusion criteria were being 70 years and above, literate, and content to participate in the research.

Initially, the eligible patients were identified in each

hospital. Subsequently, the research objectives were explained to them verbally, and if they agreed to participate in the research, the questionnaires were distributed among them to be completed with the supervision of the researcher. The collected data were analyzed in SPSS software (version 22) using linear regression.

Standard Chronic Disease Checklist

This list, developed by Barnett et al. (2012), identifies multiple comorbidities and helps improve healthcare systems [20]. Multimorbidity included hypertension, heart disease or circulation problems (e.g., heart attack, ischemic heart disease, angina or myocardial infarction, congestive heart failure, and heart arrhythmia), diabetes, stroke, asthma, arthritis (any type), pulmonary disease, cancer (any type), and headaches (any type). Neurological disorders, such as Alzheimer's and Parkinson's, were not listed since they are not suitable to be considered in studying cognitive ability changes.

Montreal Cognitive Assessment Test

This instrument, designed by Nasreddin et al. (2005), determines MCI and measures 8 cognitive domains through different skills. The cut-off points for MCI are less than 26 [21]. For people with less than 12 years of education, 1 score is added to their total score. The results showed that the Montreal Cognitive Assessment (MoCA) was highly sensitive to the diagnosis of MCI (90%) [22]. The reliability of this test was evaluated using Cronbach's alpha coefficient method. In 2015, a meta-analysis found 21 studies with a sensitivity estimate of 0.62 (95% CI=0.52-0.71) and specificity of 0.87 (95% CI=0.80-0.92) for MCI [23].

Social Health Scale

This scale, developed by Keyes and Shapiro (2004), determines psychological social well-being [24] and measures 5 related constructs of human functioning, namely social integration, social contribution, social coherence, social actualization, and social acceptance. This 33-item version is measured by a 5-point Likert rating scale. Keyes validated the scale using Cronbach's alpha coefficient, rendering for the range of 0.83-0.91, and evaluated strong test-retest reliability with coefficient ranges of 0.81-0.85 for each of the 5 factors [25]. This scale is validated in Iran and there is a Cronbach's alpha coefficient of 0.85 and reported high validity and reliability for the questionnaire [25].

Results

The mean age of patients was estimated at

Table 1. Frequency of multimorbidity

	Number of chronic diseases	n
Non-multimorbidity	0-1	56 (20.74%)
Multimorbidity	≥2	214 (79.25%)

76.6±5.3, and it was revealed that 128 (47.40%) and 142 (52.59%) subjects were male and female, respectively. Moreover, based on the standard checklist, the number of patients with and without multimorbidity was determined, which are presented in Table 1.

According to Table 1, more than half of the participants were involved with multimorbidity conditions. The results of the research variables are tabulated in Table 2.

Table 2. Mean and standard deviation of research variables

MoCA		Mean	SD
Non-MM	Non-MM	27.1	2.08
	MM	25.8	1.13
Social health	Non-MM	98.16	5.22
	MM	93.09	6.46

MM: Multimorbidity; MoCA: Montreal Cognitive Assessment

As shown in Table 2, the values of the two variables, namely MoCA and social health, are more in the multimorbidity group than in the non-multimorbidity group. To analyze the relationship among variables, the linear regression method was used (Table 3).

According to Table 2, the unadjusted analysis demonstrated that multimorbidity was related to MoCA. When accounting for other social-demographic confounders, multimorbidity remained related to MoCA ($\beta=0.58$, 95% CI: 0.62-0.54, $P<0.001$). In turn, in the unadjusted and adjusted model, social health was negatively related to MoCA ($\beta=-0.21$, 95% CI: -0.26, -0.16, $P<0.001$). There was a significant interaction effect between multimorbidity and social health with regard to MoCA ($\beta=0.12$, 95% CI: 0.09-0.14, $P<0.001$), that portraying social health as a moderator of the relationship between multimorbidity and MoCA (cognitive decline).

Table 3. Main and interaction effect of multimorbidity and social health on the Montreal Cognitive Assessment (cognitive decline)

	MoCA	
	Model 1 β (95% CI)	Model 2 β (95% CI)
MM	0.63 (0.65, 0.61)*	0.58 (0.62, 0.54)*
Social health	-0.26 (-0.40, -0.32)*	-0.21 (-0.26, -0.16)*
MM ∇ Social health	0.17 (0.17, 0.19)*	0.12 (0.09, 0.014)*

** $P \leq 0.001$

CI: Confidence interval; Model 1: Unadjusted analysis; Model 2: Analyses adjusted for gender, age, education, and marital status; MM: Multimorbidity; MoCA: Montreal Cognitive Assessment

Discussion

This study investigated the relationship between multimorbidity and MCI, as well as the moderating effect of social health on this relationship. According to the results, multimorbidity was positively related to MCI (assessed through MoCA). On the other hand, social health had a negative relationship with cognitive impairment and MCI. These results are consistent with previous findings in the literature. The literature review showed that chronic diseases and multimorbidity were associated with impairment in cognitive ability [2]. Moreover, the results of previous studies indicated that social health negatively affected cognitive decline, which means social health could be considered a protective factor for cognition impairment [14-19]. Furthermore, the results of the present study indicated that social health moderated the effect of multimorbidity on MCI, and thereby, buffered the effect of multimorbidity on the decrease of cognitive ability. As previously mentioned, the combination of social determinants generated a range of more than one health condition. Health is not only the absence of illness [26]. Encountering with a disease (single or in multimorbidity form) is foremost associated with the increased decline in function [27]. The functional decline can in turn lead to the decreased rates of social engagement. The findings of some systematic reviews suggest that low levels of social engagement and poor social networks are significantly associated with poor cognitive functions [18]. Social health may be critical for cognitive function as individuals with multimorbidity experience less social contact with others; therefore, they receive less cognitive stimulation through social contact, which leads to cognitive decline [19]. Regarding this, it seems that social activity makes more cognitive ability, leading to more resistance against cognitive decline [19]. Multiple studies investigated the effect of social health on cognition ability and suggested that it may be useful for promoting brain health in older adults [17].

On the other hand, social health is related to concepts which are structural dimensions of social relationship [28]. One of the most important consequences of social health is social support that is more than a quantity of social activity and requires a functional dimension, which is a better relationship with cognitive abilities [29, 30].

Conclusions

Overall, based on the findings of our study, there was a significant correlation between multimorbidity and social health with MCI. Furthermore, the results of our study indicated that social health was

a moderating variable in the relationship between multimorbidity and cognitive decline, which the amplification of social health would modulate the negative effect of multimorbidity on cognition ability. In the other words, social health was a protective factor against a particular risk factor, such as multimorbidity, in protecting cognitive abilities.

One of the limitations of the present study was related to its population. In this research, the samples participated voluntarily and were chosen from some hospitals in Tehran; therefore, the samples might not be representative of the target population. In addition, the patients who accepted to participate had different types of socioeconomic status; consequently, the influence of social status type had to be considered. The third limitation of this study was related to its inability to discriminate between social health dimensions to determine which ones were more influenced in this relationship.

Considering these limitations, it is suggested that future research be performed to address these issues in other populations. It is also recommended to investigate the effects of multimorbidity on cognitive ability through performing a qualitative study or using mixed methods. The researchers also hope that the results of this study would lead to the development of interventions aimed at social health promotion to prevent and control the cognitive decline in people with multimorbidity.

Compliance with Ethical Considerations

All ethical considerations were considered in this study. In this regard, the subjects were informed of the volunteer participation in the research and the right to withdraw from the research at any stage. They were assured of anonymity and confidentiality in this study.

Acknowledgments

The authors would like to thank all the patients and managers of the hospitals who contributed to this study.

Conflicts of Interest

The authors declare that there is no conflict of interest.

Authors' Contributions

S. Alizadehfard designed and implemented the research and A. Alipour contributed with her to the analysis of the results and writing of the manuscript.

Funding/Support

This research did not receive any specific grant from funding agencies in the public, commercial, or non-profit sectors.

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