

Medication Adherence in Stroke Patients: The Role of Social Support, Social Health, Self-Esteem, and Leisure Time

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Abstract

Background: Medication adherence in stroke patients remains a significant challenge, impacting treatment efficacy and patient outcomes. This study aimed to model the structural relationships predicting medication adherence based on social support and social health in stroke patients, focusing on the mediating roles of self-esteem and leisure time in Tehran.

Methods: This correlational study used structural equation modeling. The statistical population included all stroke patients referred to the Neurology Clinic of Firoozgar Hospital in Tehran in 2021. A sample of 255 participants was selected through a convenience sampling method. Participants completed questionnaires on medication adherence (Lin & et al, 2018), social support (Wax and Reader, 1986), self-esteem (Rosenberg, 1965), social health (Keyes, C. L., & Shapiro, A. D, 2004), and leisure time (Wang, 2019). Data were analyzed using Pearson correlation and structural equation modeling methods.

Results: The results indicate that SEM analysis demonstrated excellent model fit ($\chi^2/df=2.91$, CFI=0.97, RMSEA=0.062). Significant direct effects were found: social support \rightarrow self-esteem ($\beta=0.34$, $*P<0.001$), social health \rightarrow medication adherence ($\beta=0.45$, $*P<0.001$). Key indirect effects via mediators: social health \rightarrow leisure time \rightarrow adherence ($\beta=0.15$, $*P=0.001$) and social support \rightarrow self-esteem \rightarrow adherence ($\beta=0.15$, $*P=0.001$). All standardized coefficients ($*P<0.05$) confirmed the hypothesized pathways.

Conclusion: The findings demonstrate that psychological factors significantly influence medication adherence and, ultimately, patient recovery. Strengthening social support, self-esteem, social health, and leisure time can enhance treatment outcomes and facilitate better management of stroke patients.

Keywords: Medication Adherence, Social Support, Social Health, Stroke, Self-Esteem, Leisure Time

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Introduction

Stroke is a CNS injury causing neurological deficits and is a leading cause of death (3rd after heart disease and cancer) and disability (1, 2). Global stroke deaths have declined, but cases are rising in low- and middle-income countries (3). The incidence of stroke varies significantly with the age structure of the population under study. Medication use in primary care is likely one of the main factors in controlling stroke (4, 5). In this regard, treatment adherence is a key factor in improving patient health, as it

depends on how many medications are taken as prescribed by the doctor. Non-adherence to medication instructions can reduce efficacy, leading to poor treatment outcomes and higher healthcare costs (6, 7). Treatment adherence relies on doctor-patient agreement, ensuring the patient isn't forced into treatment and isn't solely blamed for non-adherence (8, 9). WHO defines treatment adherence as how well a patient follows medical advice—including medications, diet, and lifestyle—as prescribed

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↑What is “already known” in this topic:

Psychosocial factors such as social support and self-esteem have been shown to influence patients' adherence to medical treatment, particularly in chronic conditions.

→What this article adds:

This study provides a structural model demonstrating how social support and social health, mediated by self-esteem and leisure time, can predict medication adherence in stroke patients—highlighting the value of psychological and social interventions alongside medical care.

by healthcare providers (10). Reports indicate that the patients with <80% medication adherence have significantly higher treatment/hospitalization costs than those with >80% adherence (11).

The topic of medication use is interconnected with all cultural, social, and economic aspects of people (12). The etiology of patients' adherence to medical advice is complex. Studies show treatment adherence depends on medical (13), demographic, communication, treatment-related, and psychological factors, including side effects, perceived benefits, and patient satisfaction (14).

Research indicates that the Caring system in society is a key benefit of relationships and social networks, has been shown to positively impact treatment adherence (15). Social support is a subjective judgment where an individual believes that family and friends will help and assist them when facing stress or stressful factors (16). Studies have shown that patients with high levels of social support have greater satisfaction with prescribed medications, and take their medications at appropriate times and with proper food (14). Sherwood (17) and Doherty et al. (18) demonstrated that receiving social support from family and friends is related to better adherence to medical advice.

On the other hand, the Caring system in society as a key factor can help enhance individuals' self-esteem, as having positive supportive relationships leads to a sense of self-worth, confidence, and better mental health (16). Abraham Maslow considers self-esteem as one of the basic human needs, ranking it after physiological needs, safety needs, and the need for love and belonging in the hierarchy of human needs (19). Low self-esteem disrupts human balance and dynamics, negatively affecting productivity, efficiency, learning, and creativity, accompanied by fear and anxiety (20).

Higher self-esteem enhances patient motivation for self-care, leading to reduced symptoms and a more positive outlook on their condition (21). Previous research has shown that enhancing self-esteem is associated with psychological well-being, emotional adjustment, and significantly increased treatment adherence (22, 23). Therefore, increasing self-esteem can be an essential component in treatment adherence for patients.

Additionally, social health, alongside physical and mental health, is one of the pillars of overall public health for society and families. A person is considered socially healthy when they can engage in social activities and roles within the family and society according to existing social norms; this aspect of health encourages individuals to have motivation and a cheerful spirit in society (24, 25). Social health can be examined from two perspectives: the individual's healthy interaction with society, family, and work environment, and the overall health of society, measured by health indices. Social health results from an individual's interaction with people and objects in the environment, typically aligning with the content of their natural growth process (24). Structural and social determinants of health, which predispose individuals to illness and unhealthy behaviors, can be potential barriers to long-term medication adherence (26). However, the relationships between non-adherence and structural and social

determinants of health measured at the community level have not been well explored (27). Research has shown that some of these factors are potential predictors of medication non-adherence (28). Thus, examining social health determinants in patients can provide insights into factors that may affect their ability to properly take medications and can be useful in providing individual support for medication use (29).

Another variable related to treatment adherence is how leisure time is spent. Research has shown that engaging in recreational and social leisure activities can lead to better health (30). Leisure activities are activities that community members engage in freely, apart from work and life obligations, to develop their talents and expand their personality. How leisure time is spent reflects the social, economic, and cultural conditions of each society, and making optimal use of this time can significantly improve the quality of social and economic life for individuals (31).

For example, a study by McQuaid et al. (2017) showed that participating in leisure activities such as sports, music, art, and social recreation can turn the recovery process into a more positive motivation for treatment (32). These activities are also associated with reduced stress levels, improved mental health, and enhanced feelings of control and independence, contributing to better adherence to treatment instructions. Another study by Di Matteo (2004) found that suitable recreational programs can reduce the fatigue and boredom associated with the treatment process and increase social interactions, which in turn play a supportive role in treatment adherence (33). Considering these factors, leisure activities can be seen as part of the treatment program that not only improves physical health but also enhances mental and social well-being.

In light of the above, the issue of treatment adherence has become a significant challenge for medical professionals and social scientists. The challenge for these professionals to ensure that their patients follow medical advice and adhere to treatment regimens is often ineffective (34, 35). While interventions to promote treatment adherence have had some successes (36, 37), it appears that half of them face failure (38). Despite significant advances in adherence interventions over the past decade, adherence rates seem to remain unchanged.

Many patients do not maximize the benefits of medical interventions, leading to poor treatment outcomes, low quality of life, and increased healthcare costs (39). Given that non-adherence to medical advice contributes to higher mortality rates among patients annually, understanding the causes of non-adherence to medical advice and treatment is crucial. Although various psychological and social factors play a significant role in patients' adherence to treatment regimens, limited studies, particularly in Iran, have been conducted in this area. Therefore, the present study aims to model the structural relationships predicting medication adherence based on Community protection and social health in stroke patients, considering the mediating role of self-esteem and leisure time at Firouzgar Hospital from January to December 2021.

Methods

This cross-sectional study used structural equation modeling (SEM) to analyze data from 255 literate and consenting stroke patients selected via convenience sampling from Firouzgar Hospital in Tehran, following ethical protocols including informed consent. The sample size was determined based on comparable SEM studies in stroke research and accounted for practical clinical constraints while meeting minimum statistical requirements.

Research Instruments Medication

Medication Adherence Questionnaire: Medication adherence (Lin & et al, 2018) was evaluated using the 5-item Medication Adherence Rating Scale (MARS). This scale includes items such as "I forget to take my medicines" or "I alter the dose of my medicines as I see fit", which are rated on a 5-point Likert scale ranging from "always" (score of 5) to "never" (score of 1). The total score on this scale ranges from 5 to 25, with higher scores indicating better adherence (40). This questionnaire has been previously used in studies, and Internal reliability (Cronbach's α) ranged from 0.67 to 0.89 across all patient groups (41). In the study by Baljani et al. (42), after translation, content validity was obtained by incorporating corrective suggestions from 5 nursing faculty members. The reliability of this questionnaire in the present study was determined to be 94% based on Cronbach's alpha.

Social Support Questionnaire: The General Social Support Questionnaire by Norbeck was first administered by Norbeck and colleagues in 1981 on 135 nursing students in California. Responses are given on a 4-point Likert scale, ranging from "a lot" to "none." For data analysis, "none" was scored as 1, "a little" as 2, "moderate" as 3, and "a lot" as 4. The highest possible score for social support is 116, and the lowest is 29, with a median score of 72.5. Therefore, a score below 72.5 is considered poor social support, and a score above 72.5 is considered good Community protection (43). The reliability and validity of this tool in Iran were evaluated by Jalilian and colleagues, where the reliability coefficient (Cronbach's $\alpha = 0.88$) was obtained using the internal consistency method, and the validity of this tool was confirmed using concurrent criterion validity ($r = 0.72$, $p < 0.001$) (44).

Rosenberg Self-Esteem Scale: To assess self-esteem, the Rosenberg Self-Esteem Scale was used. This scale is one of the most widely used tools for measuring self-esteem and consists of 10 items designed as positive and negative statements. The items are presented on a 4-point Likert scale (strongly agree to strongly disagree). Scoring is such that positive items are rated from 4 (strongly agree) to 1 (strongly disagree), and negative items are reverse-scored from 1 to 4. The total scores range from 10 to 40, with higher scores indicating higher self-esteem (45). Various studies have demonstrated that this scale has high validity and reliability (46-48). The original Rosenberg scale shows good reliability ($\alpha=0.85-0.88$) and validity ($r=0.43-0.54$), while its Persian version demonstrates acceptable reliability ($\alpha=0.69-0.71$, test-retest= $0.73-0.78$) in Iranian populations (49). In this study, the reliability of the tool

was calculated using Cronbach's alpha, which was found to be 0.71. This scale was chosen for its simplicity, high validity, and widespread use in psychological and social studies. Furthermore, it has been previously used and localized within the Iranian population.

Leisure Time Questionnaire: Tandnevis designed this questionnaire in 2002 (47). It is a self-report instrument consisting of 27 leisure activities with Likert-type scoring from never to regularly, the total score of which expresses the frequency of an individual's leisure time. Cronbach's alpha was obtained by Safania in 2000 as 95 and by Fatahi Masroor in 2012 as 85 (48). The original leisure activities questionnaire (Tond Nevis, 1996) showed excellent reliability ($\alpha=0.95$), while its Persian version in the current study demonstrated good reliability ($\alpha=0.85$) and established content validity (50). He has stated the content validity in his research.

The Social Well-Being Questionnaire: The Social Well-Being Questionnaire, developed by Keyes (2004) at the MacArthur Foundation, is a psychometrically robust instrument featuring 20 items across five subscales: social integration, social acceptance, social contribution, social actualization, and social coherence. Utilizing a 5-point Likert scale (ranging from "strongly disagree" to "strongly agree"), it yields total scores between 20 and 100, with demonstrated reliability (Cronbach's $\alpha = 0.85$ in the original study) and validity (51). Subsequent Iranian validation by Babapour et al. (2008) confirmed strong internal consistency ($\alpha = 0.78$ overall, $0.70-0.77$ for subscales), establishing its cross-cultural applicability for assessing social health dimensions in diverse populations (52).

Results

The results indicated that 160 participants (62.7%) were men, and 95 participants (37.3%) were women. In terms of marital status, 16 participants (6.3%) were single; 89 participants (34.9%) were married; 60 participants (23.5%) were divorced; and 90 participants (35.3%) were alone. Additionally, 29 participants (11.4%) were illiterate; 35 participants (13.7%) had primary education; 31 participants (12.2%) had secondary education; 52 participants (20.8%) held an associate degree; and 21 participants (8.2%) had a bachelor's degree. The average age of the participants in the study was 63.08 years, with a standard deviation of 8.25 years. Table 1 presents Descriptive Analysis and Correlations Between Constructs.

Based on the information in Table 1, the mean score for the medication adherence variable was 19.78, the leisure time variable was 50.56, the social health variable was 76.94, the social support variable was 73.19, and the mean score for the self-esteem variable was 15.43.

Before analyzing the research data, the statistical assumptions for path analysis were first examined. Three assumptions were considered: missing data, normality, and multicollinearity. For the first assumption, there were no missing data in this study. Regarding the assumption of normality, skewness and kurtosis indices were used. Based on the data in Table 1, the skewness and kurtosis indices for all variables were within the range of +2 to -2, indicating that the distribution of the variables was nor-

Table 1. Descriptive Analysis and Correlations Between Constructs

Variable No	Mean	Standard deviation	Skewness	Kurtosis	Tolerance statistics	Variance inflation	1	2	3	4
1. Medication adherence	19.78	2.94	0.53	0.13	-	-	1			
2. Leisure time	50.56	8.14	0.52	0.44	0.693	1.44	**0.63	1		
3. Social health	76.94	8.71	-0.11	0.35	0.703	1.42	0.72	0.45	1	
4. Social support	73.19	6.15	0.16	-0.67	0.696	1.43	0.57	0.42	0.42	1
5. Self-esteem	15.43	2.14	-0.49	0.31	0.699	1.43	0.61	0.43	0.41	0.45

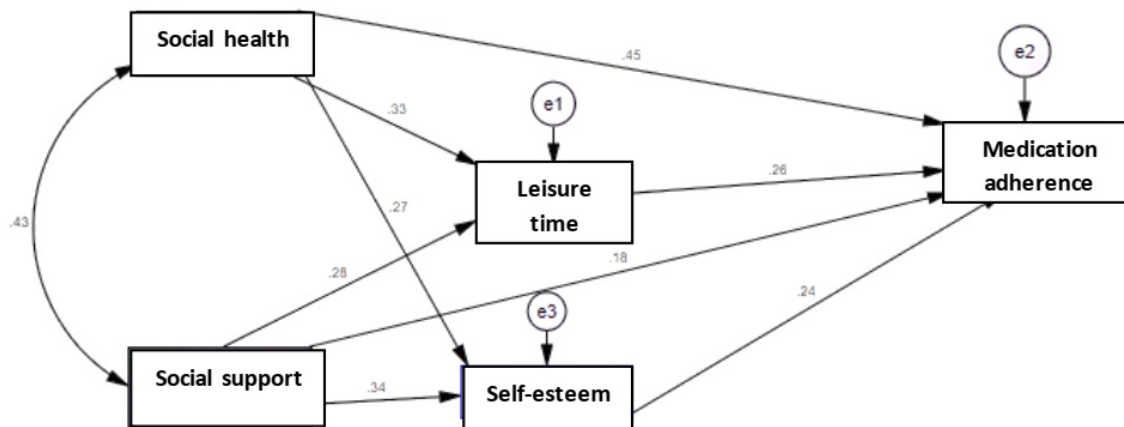


Figure 1. Structural Equation Model of Medication Adherence in Stroke Patients: Pathways Linking Social Support, Social Health, Self-Esteem, and Leisure Time. In this model, social support and social health are considered exogenous variables. Self-esteem and leisure time variables are considered mediators, and medication adherence is the dependent variable. The direct effects of social support and social health on the dependent variable have been examined. Additionally, the indirect effects of social support and social health, considering the mediating role of self-esteem and leisure time, have been analyzed for each dependent variable. The direct and indirect standardized path coefficients and the significance of the relationships between the research variables are presented (see Tables 2 and 3).

mal. To examine the third assumption, multicollinearity, the tolerance index and the variance inflation factor (VIF) were used. A tolerance value less than 0.1 and a VIF value greater than 10 indicate multicollinearity. The results in Table 1 show that the obtained values were within the acceptable range, and there was no multicollinearity among the study variables. Additionally, the results from the Pearson correlation test indicated that there were significant relationships between all study variables, indicating a linear relationship among them. The highest correlation was between the social health variable and medication adherence ($r = 0.72$). After confirming the study assumptions, the hypotheses were tested using the path analysis model and AMOS software 24. Figure 1 shows the model of relationships between the variables.

Table 2 shows the standardized coefficients for direct and indirect effects in the relationships between the research variables. The results of the structural equation modeling analysis revealed several significant direct effects between the study variables. Social support showed a significant positive effect on self-esteem ($\beta = 0.34$, $b = 0.11$, $P < 0.001$) and leisure time ($\beta = 0.28$, $b = 0.37$, $P < 0.001$). Similarly, social health had significant positive effects on both leisure time ($\beta = 0.33$, $b = 0.30$, $P < 0.001$) and self-esteem ($\beta = 0.27$, $b = 0.07$, $P = 0.003$). Regarding medication adherence, significant positive effects were found from social health ($\beta = 0.45$, $b = 0.14$, $P < 0.001$), self-esteem ($\beta = 0.24$, $b = 0.32$, $p < .001$), leisure time ($\beta = 0.26$, $b = 0.10$, $p < .001$), and social support ($\beta = 0.18$, $b = 0.09$, $P = 0.003$). All reported effects were statistically

significant at the $P < 0.05$ level.

To further investigate the significance of the indirect effects, a bootstrap test was used. The results are presented in Table 3.

The bootstrap method with a 95% confidence interval and 200 resamples was considered. If the obtained values (confidence interval) do not include zero, the mediating role of the variable is significant. According to Table 3, leisure time plays a mediating role in the relationship between social health and medication adherence, with an indirect path coefficient of 0.15. Given that the lower limit of the confidence interval is 0.082, the upper limit is 0.208, and zero is outside this range, this mediating relationship is significant at $P < 0.01$. Similarly, self-esteem plays a mediating role in the relationship between social support and medication adherence, with an indirect path coefficient of 0.15. Considering that the lower limit of the confidence interval is 0.088, the upper limit is 0.2, and zero is outside this range, this mediating relationship is significant at $P < 0.01$. For model fitting, the fit indices are reported (Table 4).

Table 4 shows the model fit indices. Based on the results, the root mean square error of approximation (RMSEA) index is 0.062, which is smaller than the criterion of 0.08. The AGFI, CFI, GFI, and NFI indices have also increased compared to the initial model and are higher than the criterion of 0.9. Considering the obtained fit indices, it can be concluded that the model of the relationship between social support and social health with medication adherence, mediated by leisure time and self-

Table 2. Standardized Direct and Indirect Effects

Research variable		Standard direct effect	Direct non-standard effect	t	P-value
Dependent	Independent				
Social support	Self-esteem	0.34	0.11	3.74	<0.001
Social support	Leisure time	0.28	0.37	3.18	<0.001
Social health	Leisure time	0.33	0.30	3.72	<0.001
Social health	Self-esteem	0.27	0.07	3	<0.003
Social health	Medication adherence	0.45	0.14	7.46	<0.001
Self-esteem	Medication adherence	0.24	0.32	4.21	<0.001
Leisure time	Medication adherence	0.26	0.10	4.47	<0.001
Social support	Medication adherence	0.18	0.09	2.95	<0.003

Table 3. Standardized Indirect Effects

Indirect path	Standard Indirect Coefficient	P value	Lower bound	Upper bound
Social health on medication adherence through leisure time	0.15	0.001	0.082	0.208
Social support influences medication adherence through self-esteem	0.15	0.001	0.088	0.22

Table 4. Goodness of fit index

Goodness of fit index	Observed value
CMIN	2.91
df	1
CMIN/df	2.91
Root mean square approximation (RMSEA)	0.062
Goodness of fit index (GFI)	0.97
Adjusted goodness of fit index (AGFI)	0.92
Comparative index of fitness (CFI)	0.97
Softened index of fit (NFI)	0.97

esteem, is a good fit.

Discussion

The present study aimed to model the structural relationships predicting medication adherence based on Community benefits and social health in stroke patients, with the mediating roles of self-esteem and leisure time. The results illustrated that social support, both directly and indirectly through the mediation of self-esteem and leisure time, impacts medication union and can predict medication attachment. This finding is consistent with studies (46-48) which have shown that social support and social health, as key factors, play a significant role in enhancing patients' motivation and commitment to the treatment process. They facilitate adherence to medication regimens by improving self-esteem, strengthening the sense of self-worth, and increasing perceived control over life. Furthermore, the mediating role of self-esteem and quality of leisure time in reinforcing this relationship has been particularly highlighted in recent research. It can be explained that Community protection affects both attitudes towards treatment and the initiation of help-seeking, as well as the treatment outcomes for patients (48). Studies by Luttik et al. (2005) showed that a higher Caring system in society among patients leads to better adherence to medical recommendations (53). Another explanation for the mechanism of the Community benefits system's impact on bond to medical recommendations is the optimal matching hypothesis. This hypothesis posits that when there is a match between the needs created by a stressful event (e.g., illness) and the type of support available, Community welfare can play a protective role against experiencing stress (55).

Furthermore, the study results depicted a significant

positive correlation between self-esteem and medication attachment in stroke patients. Self-esteem, as an internal asset, is important in establishing correct social functioning under stressful conditions and maintaining health (56). Damaged self-esteem makes it impossible to endure the difficult conditions individuals face in daily life, bringing about psychological and physical consequences (57). Given that low self-esteem in chronic diseases negatively affects interpersonal relationships, thought, feelings, and patients' performance (58) and plays a pivotal and effective role in the physical and mental health of individuals, it can act as a buffer against the effects of harmful factors (59). Additionally, the results of the present study indicated that the better the patients' leisure time is spent, the more they adhere to their medications (60). The concepts of treatment adherence and quality of life are recognized as important factors in the survival of these patients (61).

Since patient adherence to the treatment regimen and its positive effect on the patient's quality of life are also critical criteria for evaluating treatment success, many clinical trials have used health-related quality of life as a criterion for achieving results (62, 63). The study results also showed that social well-being, both directly and indirectly through the mediation of self-esteem and leisure time, touches medication bond and can predict medication attachment. This finding is consistent with previous studies (64, 65). It can be explained that well-being status in society influences the formation of effective beliefs, positive mental performance in understanding reality, self-acceptance, and personal growth of patients.

The results of this study can be explained by noting that social health influences the formation of effective beliefs, positive mental performance in understanding reality, self-acceptance, and personal growth in patients. According to

the results, the healthy feeling of connection in the society score increased, and medication attachment also increased. In the context of medication use, if individuals are raised in families with low social status that hold incorrect, superstitious, or traditional beliefs about illness and medication use, these attitudes are taught by parents to their children, causing both the parents and their children to exhibit these behaviors throughout their lives and during illness episodes, thereby creating a model for the next generation (66). In fact, structural and social determinants of health that predispose people to illness and unhealthy behaviors can be potential barriers to long-term medication adherence in patients (67).

Furthermore, training in skills that enhance self-esteem and self-efficacy, encouraging and motivating patients, and conveying the message that they are valuable individuals help empower them (64). Therefore, Higher self-esteem and treatment hope improve recovery outcomes by enhancing psychological stability, social adjustment, and treatment attachment through better self-regulation strategies (68). Thus, participating in educational programs seems to have a positive effect on self-esteem and medication bond, leading to improved quality of life and mental well-being.

Quality of life also has a direct and significant impact on the amount and type of leisure time patients have, and as a broad concept, it has recently become one of the most important therapeutic goals. Health-related quality of life refers to the physical, psychological, and social dimensions of health that are influenced by an individual's experiences, beliefs, expectations, and perceptions (69, 70).

Conclusion

Considering the importance of these SEM, the results of structural equation modeling in this study indicate that combining social well-being with self-esteem and leisure time has a positive impact on medication adherence, and these factors have a direct and significant relationship with the recovery of stroke patients. Therefore, it is suggested that intervention programs be designed to enhance social support and self-esteem in patients to increase bond to treatment. Expanding this research to other chronic diseases and incorporating education related to leisure-time management could provide better results. However, limitations such as using convenience sampling, focusing on patients from one hospital, and relying on self-report tools can reduce the generalizability of the results. Additionally, cultural and social differences may limit the applicability of the results to other communities.

Authors' Contributions

Conceptualization and Supervision: S.F.Sh; Data Curation: S.F.Sh; Methodology: A.G; Writing-original draft: Y.D; Writing-review and editing: S.F.Sh.

Ethical Considerations

This study was conducted in accordance with the principles of the Declaration of Helsinki, and the Iran University of Medical Sciences Ethics Committee approved this study's protocol (IR.IUMS.FMD.REC.1399.706). In-

formed consent was obtained from all participants to participate in the study.

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Conflict of Interests

The authors declare that they have no competing interests.

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