

Original Article

Investigating effective factors in the development model of faculty members at Babol university of medical sciences

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Abstract

Background & Objective: The development of faculty members contributes greatly to maintaining the quality of services and products of Medical Universities and improving the health of society. Therefore, the design of development programs should be based on a comprehensive model to attract the participation of faculty members. The present study aimed to determine the effective factors on the development model of faculty members.

Materials & Methods: This analytical cross-sectional study was carried out using the census method on 363 faculty members of Babol University of Medical Sciences in 2021. The data were collected by a valid and reliable online questionnaire based on the Development Model. Statistical analysis was performed in SPSS (version 21) and AMOS (version 26) software packages.

Results: Faculty members with a mean age of 47.42 ± 7.13 participated in this study, 221 of whom (60.9%) were clinical. The total mean of the development questionnaire was 343.20 ± 45.86 (out of 396), falling in the "good" category. The Development Model had a good fit. All path coefficients between model constructs were significant ($P < 0.01$). The causal, intervening, and contextual conditions, central phenomenon, and development strategies were the predictors of development consequences. The development model predicted 97%, 97%, and 100% of the variance of central phenomenon, strategies, and development consequences, respectively.

Conclusion: In this study, causal, intervening, and contextual conditions, core phenomenon, and strategies were reported as effective factors in the development of faculty members of Babol University of Medical Sciences. It is necessary to consider these factors and the structural relationships between them in the design, implementation, and evaluation of related programs according to the Development Model of faculty members.

Keywords: Development, Faculty Members, Path Analysis

Introduction

Higher education in medical sciences greatly affects other economic, social, cultural, and political sectors of society. In such conditions, universities and higher education centers have adopted different strategies and decisions in order to increase the quality and respond to the mentioned issues. The development of human resources, especially faculty members, is one of the adopted strategies and important factors contributing to the maintenance of the quality of university services and products. This issue assumes more critical importance if

university products play a significant role in improving the health of society (1).

In medical science education, in addition to general managers and policymakers, faculty members and lecturers come into special focus of human resource training. Efforts made to develop these key figures in any educational institution can improve the quantity and quality of education and more empowerment of graduates, finally leading to the provision of better services in the field of health (2). Development refers to all planned activities that provide individual knowledge



and basic and necessary skills for better performance of faculty members (3).

Therefore, paying attention to the development of faculty members can play a major role in universities and higher education institutions through the recognition of their needs (1). The quality of universities and higher education centers also depends more than anything on the dynamics of their faculty members. Meanwhile, professors in universities of medical sciences play a key role since they are responsible for the teaching and education of future doctors and paramedics, contributing greatly to improving the health level of society (2).

Due to substantial expansion in medical universities and higher health education institutions in Iran, appropriate infrastructures have been defined for the quantitative and qualitative improvement of higher education in medical education, one of which is the Health Sector Reform Program. In this regard and based on the country's macro-health policies, The Ministry of Health and Medical Education designed reform and innovation packages in medical science education to improve the higher health education system.

These packages include " Foresight and scientific authority in medical education," "Moving towards third generation universities," " Accountable and justice-oriented learning," " Strategic, targeted, and mission-oriented development of health education programs," " Spatial planning, mission-orientation, decentralization, and capacity enhancement in universities," " Promoting Professional Ethics," " Internationalization of medical education," " Development of virtual education in medical sciences," " Promotion of medical sciences assessment and testing system," "Accreditation of educational institutions and hospitals," as well as "Development and improvement of medical education infrastructure " (4).

The faculty members in medical universities, as the most important components of these packages, play a key role, and their development makes the mission and broad goals of universities and the Ministry of Health to be realized. In order to achieve the intended goals, medical universities are required to use models for the development of their faculty members. Suppose these models are coherent, integrated, and based on the documents of the reform of the higher education health system. In that case, they will help greatly to advance the goals of the major development plan of the country (2, 4, 5). Therefore, the design of development programs should be targeted based on a written pattern, and

necessary grounds for the participation of faculty members in the programs should be provided (6).

During the past years, various models have been presented for the development of faculty members (7-13). Some of these models clearly emphasize the individual capabilities of faculty members, and others emphasize the written programs designed by universities, in which the responsibilities of faculty members are specified and planned for. None of these models comprehensively and thoroughly include all dimensions of development so that it can be used as the basis of a conceptual framework to explain the factors affecting the development of faculty members.

The development model of faculty members of medical universities in the north of the country (2016) takes into account both individual capabilities and organizational programs and is compiled based on packages for reform and innovation in medical education. This model includes six constructs of causal, contextual, and intervening conditions, core phenomenon, strategies, and development consequences (13), which can be used to explain the factors affecting the development of faculty members for future planning in this field.

In the investigations carried out so far, this comprehensive model of development has not been used to explain the predictors of the development of faculty members in medical universities in the country. Mohebzadegan et al. validated the desired development model in faculty members of Tehran universities (1). Therefore, considering the effective role of the development of faculty members of medical universities in realizing the mission and goals of universities and the Ministry of Health, and the need to use a conceptual framework and a comprehensive model to explain the effective factors in this field for future planning, as well as the lack of relevant research in universities of medical sciences, we designed this study. The current research aimed to assess the factors affecting the development of faculty members at Babol University of Medical Sciences based on the development model.

Materials & Methods

Design and setting(s)

This analytical cross-sectional study was conducted at Babol University of Medical Sciences using path analysis in 2021.

Participants and sampling

A total of 363 faculty members working at Babol University of Medical Sciences participated in this study

using the census method. In the path analysis using Structural Equation Modeling, the sample size is at least 5 cases for each questionnaire item (14). In the present study, considering the presence of 66 items ($330=5 \times 66$) and taking into account 10% sample attrition, the sample size was estimated at 363 cases. All faculty members of the university were included in the study by census method. The inclusion criteria entailed working in the university as a faculty member. Unwillingness to participate in the study was regarded as the exclusion criterion.

Tools/Instruments

The data collection tool was an online demographic-occupational questionnaire and a model-driven questionnaire on the development of faculty members based on packages for reform and innovation in medical education. The demographic-occupational questionnaire included age, gender, faculty, work experience, rank, grade, and educational group. Model-driven questionnaire on the development of faculty members based on packages for reform and innovation in medical education was prepared by Ghaemi et al. (2016), and its validity and reliability have been evaluated (2).

This 66-item questionnaire includes six constructs of causal, intervening, and contextual conditions, core phenomenon, as well as development strategies and consequences. The items are rated on a six-point Likert scale from completely disagree (1) to completely agree (6). The score range of this questionnaire is between 66 and 396. The scores of 66-132, 133-265, and 266-396 are interpreted as weak, medium, and good, respectively.

According to the opinion of a 7-member expert panel consisting of medical education and psychometric instrument specialists, this questionnaire had good qualitative content validity according to the criteria of grammar, wording, item allocation, and scaling. The quantitative content validity of the questionnaire was evaluated according to the indices of content validity ratio (CVR=0.78) and content validity index (CVI=0.85) (2). The construct validity of this questionnaire has been confirmed by exploratory and confirmatory factor analysis (2, 15). The results of the reliability of this questionnaire (Cronbach's alpha = 0.90) were satisfactory (2, 15). In the present study, the internal consistency (Cronbach's alpha=0.90) and the stability of the questionnaire were evaluated by the test-retest method with an interval of two weeks (intra-class correlation coefficient = 0.78) among 30 faculty members.

Data collection methods

The data of the current study were collected through online demographic-occupational questionnaires and model-driven questionnaires on the development of faculty members based on packages for reform and innovation in medical education. These questionnaires were designed on a valform.com (16). The link to the questionnaires was provided to faculty members via e-mail and SMS.

Data analysis

Data were analyzed in SPSS (version 21) and AMOS (version 26) software packages by structural equation modeling (SEM) with a maximum likelihood estimation method at a significance level of 5%.

Results

A total of 363 faculty members with a mean age of 47.42 ± 7.13 and work experience of 13.27 ± 9.46 years participated in this study in 1400. Moreover, 57.9% of subjects were male, 39.4% were specialists, and 65.8% were "assistant professors." Moreover, 61.4% of cases were working in medical school, and 60.9% were working in clinical groups (Table 1).

Table 1. Demographic and occupational characteristics of faculty members at Babol University of Medical Sciences (n=363)

	Variable	N(%)
Gender	Female	153 (42.1)
	Male	210 (57.9)
Faculty	Medicine	223 (61.4)
	Dentistry	66 (18.2)
	Paramedicine	12 (3.3)
	Nursing and Midwifery	12 (3.3)
	Nursing	11 (3.0)
	Health	18 (5)
	Rehabilitation	14 (3.9)
Academic rank	International Branch	7 (1.9)
	Instructor	17 (4.7)
	Assistant Professor	239 (65.8)
	Associate Professor	68 (18.7)
Education degree	Full professor	39 (10.7)
	Ph.D	124 (34.2)
	Specialist	143 (39.4)
	Sub-specialist	53 (14.6)
	Fellowship	22 (6.1)
Educational department	Ph.D by Research	5 (1.4)
	Master	16 (4.4)
	Clinical medicine and dentistry	221 (60.9)
	Basic science and health	142 (39.1)

All constructs and components of the development model got a good score compared to the expected score

in the development questionnaire. The total mean of the development questionnaire was 343.20±45.86 (out of 396 points) and fell in the "good" category (Table 2).

Table 2. Mean and standard deviation of the constructs and components of the faculty development model

Variable	Component	Code	M (SD)	Highest Expected Score
Causal conditions	Empowerment programs based on the reform and innovation program	C1	15.2±42.38	18
	Approved regulations based on reform and innovation program	C2	15.2±52.28	18
	welfare issues (compensation and reward system)	C3	15.2±82.25	18
Causal			46.6±77.55	54
Intervening conditions	Prevailing view on Medical Sciences University	C4	15.2±54.23	18
	Education management at Medical Sciences University	C5	15.2±68.24	18
Intervening			31.4±22.6	36
Contextual conditions	Intra-university operational program	C6	15.2±30.28	18
	Regional reform and innovation program	C7	15.2±36.23	18
	Reform and innovation program of the country	C8	15.2±20.32	18
Contextual			45.6±87.61	54
Core phenomenon	Individual characteristics of faculty members	C9	31.4±73.68	36
	Professional characteristics of faculty members	C10	46.6±99.44	54
	Educational characteristics of faculty members	C11	47.6±14.46	54
Core phenomenon			125.17±87.19	144
Development strategies	Institutionalizing of accountable and justice-oriented education approach	C12	36.5±01.00	42
	Interaction of faculty members with education development centers	C13	15.2±38.45	18
Strategies			51.7±40.15	60
Development consequences	Internal	C14	21.2±00.97	24
	External	C15	21.2±04.85	24
Consequences			42.5±04.66	48
Total questionnaire			343.45±20.86	396

According to the indicators in Table 3, the development model of faculty members (Figure 1) has a good fit. Considering that the chi-square test is sensitive to sample size, the probability of obtaining a significant result increases in the studies with more than 200 participants (17).

Therefore, we can refer to other indicators to evaluate the model. When the values of at least three fit indices are favorable, it can be claimed that the fit of the model is good and acceptable (18). As illustrated in Table 4, all coefficients of direct, indirect, and total paths (relationships) between the constructs of the development model are significant (P<0.01). Constructs of causal, intervening, and contextual conditions predict core phenomenon. Intervening conditions (β=0.55) is the strongest predictor of core phenomenon.

Table 3. Fit indices of the development model of faculty members

index	Observed values	Expected values
χ^2	729.967	-
P-value	<0.001	>0.05
RMSEA	0.1	Good<0.08 Medium 0.08-0.1 Weak >0.1
CFI	0.93	>0.90
PNFI	0.72	>0.50
IFI	0.93	>0.90
NFI	0.92	>0.90
RFI	0.90	>0.90
TLI	0.91	>0.90
PCFI	0.72	>0.90

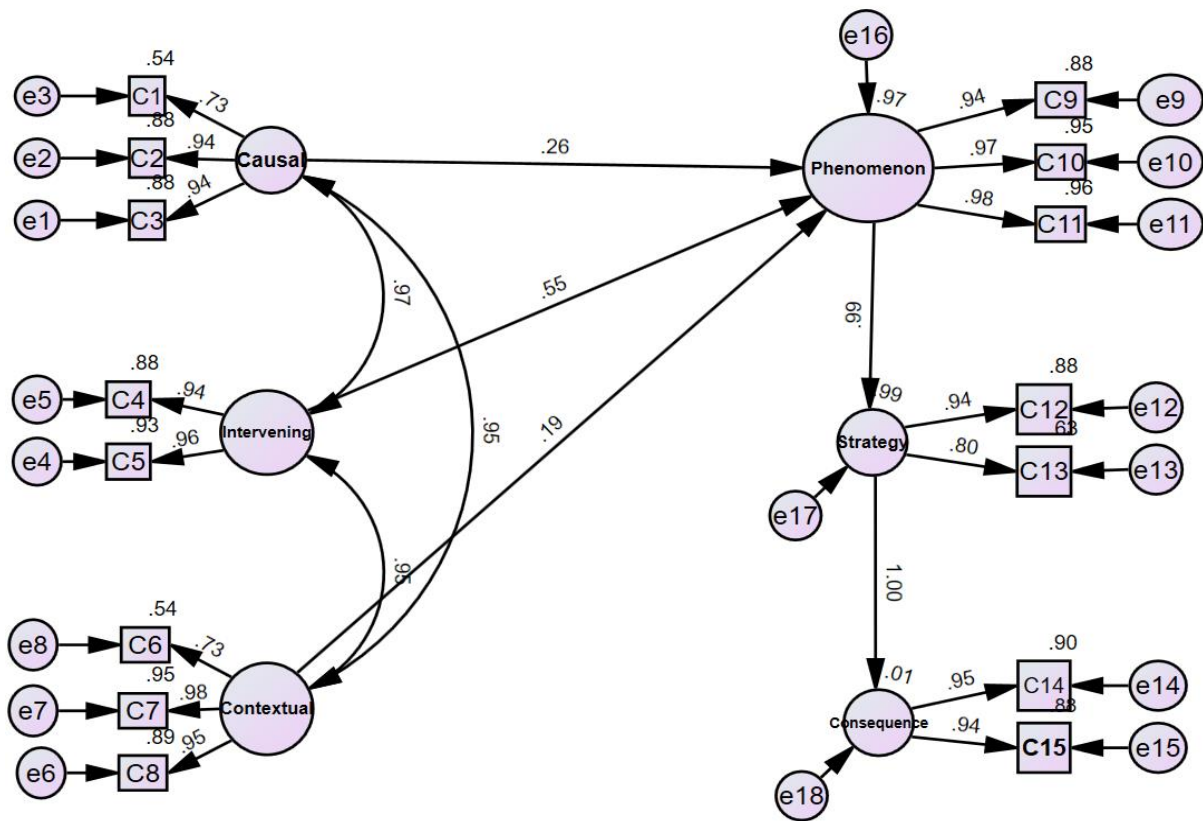


Figure 1. Path analysis of development model of faculty members (in standard estimation mode).

Constructs (Latent variables): causal, intervening, and contextual conditions, core phenomenon, as well as development strategies and consequences
 - C: components (observed variables) - e: error, one-way arrows: path coefficient between constructs and path coefficient between constructs and components, double side arrows: covariance between causal, intervening, and contextual constructs (external variables)

The constructs of causal, intervening, and contextual conditions, as well as core phenomenon, explain development strategies. Causal, intervening, and contextual conditions indirectly explain development strategies. Intervening conditions ($\beta=0.54$) is the strongest indirect indicator of development strategies. The core phenomenon ($\beta=0.99$) directly predicts development strategies.

Causal, intervening, and contextual conditions, core phenomenon, and development strategies are predictors of development consequences. Causal, intervening, and contextual conditions, as well as core phenomenon, indirectly explain development consequences. Core phenomenon ($\beta=0.99$) is the strongest indirect indicator

of development consequences. Development strategies ($\beta=1.00$) directly explain development consequences. The most explained variance among the dependent variables of the model (core phenomenon, development, strategies, and development consequences) pertained to consequences ($R^2=1.00$). The most explained variance in the components of the model was related to educational characteristics ($R^2=0.96$), which is one of core phenomenon components. In other words, the development model of faculty members predicts 97%, 97%, and 100% of the variances of core phenomenon, development strategies, and development consequences, respectively.

Table 4. Direct, indirect, and total effects of the development model of faculty members

Independent variables	Dependent variables	Direct effects	Indirect effects	Total effects
Causal conditions		0.26*	-	0.26*
Intervening conditions	central phenomenon	0.55*	-	0.55*
Contextual conditions		0.19*	-	0.19*
Causal conditions		-	0.26*	0.26*
Intervening conditions	Development strategies	-	0.55*	0.55*
Contextual conditions		-	0.19*	0.19*
Core phenomenon		0.99*	-	0.99*
Causal conditions		-	0.26*	0.26*
Intervening conditions		-	0.55*	0.55*
Contextual conditions	Development consequences	-	0.19*	0.19*
Core phenomenon		-	0.99*	0.99*
Development strategies		1.00*	-	1.00*

Discussion

The present study explained the factors affecting the development of faculty members according to the development model at Babol University of Medical Sciences. These factors included causal, intervening, and contextual conditions, core phenomenon, and strategies. The mean development of faculty members of Babol University of Medical Sciences fell in the "good" category. The results of the study by Mohajeran et al. at Farhangian University also pointed out that educational development in terms of classroom management components, knowledge acquisition, and evaluation skills is at a relatively favorable level. Moreover, in terms of role model and teaching skill components, it is in a favorable condition (19).

The findings of the research by Shabani Bahar et al. also indicated that the dimensions of professional, organizational, and individual development of faculty members of physical education faculties at state universities of the country are at the optimal level (13). In an experience from the western region of Saudi Arabia, Algahtani et al. reported that faculty members had a positive perception of all aspects of development programs (20). Nevertheless, Abdelkreem et al., in their study in a medical school in Egypt, pointed to a moderate to severe need for all aspects of development (21). This discrepancy in results can be attributed to differences in the characteristics of the target group and the university under study, development programs, the conceptual framework of the model, and the evaluation tools.

The development model in Babol University of Medical Sciences faculty members had a good fit according to the relevant indicators. In fact, the information obtained about development in the university was consistent with the theoretical framework of the study and the structural relationships between its constructs. In their study,

Darvishi et al. also confirmed the fit of the model of moral development of faculty members and lecturers of Farhangian University (22).

The fit of the conceptual framework of the study by Hejazi, including educational, research, service, and individual development components, was also confirmed by structural equation modeling analysis (23). Abdelkreem et al. presented a transferable model to perform a development needs assessment (21). The results pinpointed that all direct, indirect, and total paths between the constructs of development model are significant. In this model, the causal, intervening, and contextual conditions predict core phenomenon. Intervening conditions, including the components of the perspective governing medical universities and education management in medical universities, are the strongest predictors of core phenomenon.

Causal conditions, consisting of three components of empowerment programs, circular letters, and regulations approved based on the reform plan and welfare issues, have an effect on core phenomenon or participation of faculty members in the design and implementation of packages. Core phenomenon also includes individual, educational, and professional characteristics of faculty members. The study by Mohebzadegan et al. also revealed that the causal conditions of development have an effect on the participation of faculty members in decision-making; nonetheless, the effect of two other factors, namely development programs and financial factors, was not significant (1).

Intervening conditions were the strongest construct affecting core phenomenon. In fact, the intervening conditions can have a significant impact on the participation of faculty members in the design and implementation of packages according to their personal, educational, and professional characteristics. In the study

by Mohebzadegan et al., social status as a component of intervening conditions was effective in the participation of faculty members in decision-making. Of course, individual characteristics did not affect participation (1). The contextual conditions (operational programs within the university, regional and national macro reform program) had an effect on core phenomenon or participation. In the study by Mohebzadegan et al., the contextual conditions of development were effective in the participation of faculty members. Of course, the support factor did not have a significant effect on participation (1). The findings showed that the causal, intervening conditions, contextual conditions, and core phenomenon explain development strategies.

Causal, intervening, and contextual conditions indirectly explain development strategies, including institutionalizing responsive and justice-oriented education and active interaction between education development centers and faculty members. Intervening conditions are the strongest indirect predictors of development strategies. Core phenomenon directly predicts development strategies. Mohebzadegan et al. also reported that the participation of faculty members in decision-making has an effect on development strategies (software and hardware) (1).

Causal, intervening, and contextual conditions, core phenomenon, and development strategies are the predictors of internal and external development consequences. In addition, causal, intervening, and contextual conditions, as well as core phenomenon, indirectly explain development consequences. Core phenomenon is the strongest indirect indicator of development consequences. Development strategies also directly explain development consequences, which include improving the quality of medical science education and community health.

Along the same lines, Mohebzadegan et al. reported that development strategies have an effect on development consequences. The hardware and software strategies of faculty development (academic freedom and independence and the creation of a development center) affect its consequences (i.e., improving the teaching-learning process and responding to the needs of society) (1). Other studies have also been carried out using different development models of faculty members. This research differed from the present study in the framework or conceptual model of development, the statistical population, and the study sample (faculty members of universities affiliated with the Ministry of Health and Medical Education), information collection

tools (various development questionnaires), and development components (educational, professional, moral, and organization).

In the study by Darvishi et al., the components of moral development in order of importance were human interactions, seriousness at work, personality traits, knowledge of learners, and compliance with laws (22). Mohammadi et al. pointed to the effect of organizational culture components on the development of faculty members of Islamic Azad Universities (24). Mohammadi-Tabar et al. emphasized the system approach and reported that organizational structures and programs should be ready to support and facilitate development (25).

Giltin et al. reported the factors affecting the professional development of faculty members as encouraging them to participate in projects and providing opportunities for gaining experience in educational, research, and management programs (26). Schindler et al. came to the conclusion that a positive attitude towards the classroom, teaching skills, and classroom management are among the essential factors in faculty members' professional development (27). In fact, the review of literature pinpointed that the development of faculty members should be planned and evaluated with a systematic and comprehensive approach in the form of contextual and environmental factors and components, as well as consequences, and taking into account the diverse goals and needs of universities and faculty members (25).

Considering that the requirements and conditions of faculty members are different in various universities, disciplines, and conditions, development programs should be designed for specific target subgroups and cover a wide range of skills (not just education) (28). Addressing organizational factors, along with individual factors, can play a role in improving the participation of faculty members in development programs (29).

The results of the path analysis demonstrated that according to the development model of faculty members, 97%, 97%, and 100% of the variances of core phenomenon, development strategies, and development consequences were explained. The most explained variance in the dependent variables of the model, i.e., core phenomenon, strategies, and consequences, was related to the consequences of internal and external development. The most explained variance in the components of the model belonged to educational characteristics.

The educational characteristics of the faculty member, in brief, included mastery over the teaching subject, use of

up-to-date scientific resources, mastery over theoretical and practical issues, ability to teach and evaluate, as well as familiarity with virtual and electronic education and innovative teaching methods. The results of the study by Eshraqi on Islamic Azad University faculty members demonstrated that factors affecting professional development include structural service, organizational, personal, and personality maturity, and social network, which explains 50.89% of the variance (30).

Ghoroneh et al. reported that the educational development of Tehran University faculty members is the most important, with a relative weight of 0.342 (31). In a similar vein, Shabanibahar et al. reported that in the relationship between development and its dimensions, the professional, individual, and organizational dimensions with factor loads of 0.80, 0.74, and 0.71 had the most marked impact, respectively (13). In fact, the review of these studies illustrated that the development models of staff members explain different percentages of development variance depending on the target group under investigation, environmental, organizational, and individual conditions, and the context of that study.

This study suggested the path analysis based on the development model of faculty members at Babol University of Medical Sciences. Path analysis is able to test causal hypotheses; nonetheless, it cannot determine the direction of causality. Despite the fact that correlation methods are used in this research and correlation does not mean causation, the models are based on causal patterns; therefore, correlation does not mean the negation of causality.

Conclusion

The present study demonstrated the effective factors on the development of Babol University of Medical Sciences faculty members based on the model consisting of causal, contextual, and intervening conditions, as well as development strategies and consequences. In fact, the personal, educational, and professional characteristics of faculty members are developed under the influence of empowerment programs and approved circulars, regulations, and welfare issues. In the optimal implementation of the development process, intra-university operational programs, regional and national reform plans, as well as the prevailing view on medical universities and education management, are effective.

In advancing the development process and achieving the improved quality of medical science education and the health level of society, two strategies of institutionalizing accountable and justice-oriented education and the active

interaction of medical science education development centers with faculty members should be considered. It is necessary to consider the mentioned factors and their structural relationships according to the development model in the design, implementation and evaluation of related programs.

Ethical considerations

This article was extracted from a master's thesis of Virtual School of Medical Education and Management, Shahid Beheshti University of Medical Sciences with the code of ethics (IR.SBMU.SME.REC.1400.015). This research was carried out by obtaining informed consent and observing ethical principles, including the confidentiality of personal information and preserving the human dignity of the participants.

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Disclosure

The authors declare that they have no conflict of interest.

Author contributions

Z.Gh. conceptualized and designed the study, collected and analyzed the data, wrote the main manuscript text. S.A. conceptualized and designed the study. A.H. conceptualized and designed the study. The authors have met the criteria for authorship and had a role in preparing the manuscript. Also, the authors approved the final manuscript.

Data availability statement

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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