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Development and validation of a socioeconomic status short-form questionnaire (SES-SQ)

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Original Article

Abstract

BACKGROUND: Evaluation of socioeconomic status (SES) is an important aspect in community-based health studies and it is a major predictor of health and nutritional status as well as mortality and morbidity from many diseases. This study aimed to construct and validate socioeconomic status short-from questionnaire (SES-SQ) in Iranian population.

METHODS: This cross-sectional methodological study was conducted among 1437 Iranian general population. Face and content validity of the developed questionnaire was evaluated qualitatively. Internal consistency, construct validity using exploratory factor analysis (EFA) and latent class analysis (LCA), and convergent and known-group validity were also evaluated.

RESULTS: The SES-SQ consisted of 6 items. The overall Cronbach's alpha was 0.64, showing acceptable internal consistency. EFA resulted in two factors explaining 47.78% of total variance. Three SES classes (low/middle/high) were extracted by LCA. The score of SES-SQ ranged from 0 to 17; two cutoff scores of 4.5 and 8.5 were determined by receiver operating characteristic (ROC) analysis for differentiating low from middle and middle from high SES classes, respectively.

CONCLUSION: An efficient, reliable, and valid short-form questionnaire was developed for evaluating SES in Iranian general population. The relevancy of questionnaire items is not lost over time.

Keywords: Socioeconomic Status; Validity; Reliability; Population

Introduction

Socioeconomic status (SES) is a term that refers to an individual's social position relative to other members of a society which can have either a positive or negative impact on a person's life. According to previous researches, the main factors that made SES were income, occupation, and education.[1]

There is some evidence based on many studies on different diseases which have found deep implications of SES for disease,[2-4] and there is a close relationship between SES and health that is assumed to begin early in life, perhaps even in the prenatal environment, and continue to accumulate throughout life.[5,6] The conditions in which people are born, live, grow, and age influence how people become sick, what risk factors they faced to, how they access to the services, and how they use those services. Thus, there is a need to address the wider socioeconomic and structural factors to reduce health inequities.

Despite the importance of SES in health and health inequities, measures of SES can be difficult to achieve. However, many SES questionnaires or

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checklists have been provided and it is necessary to find the best indicators to measure SES properly.

Different SES factors could affect health at different points in the lifespan (e.g., infancy, childhood, adolescence, and adulthood) and at different levels (e.g., individual, household, neighborhood).[7] Indicators of SES in the individual level include the number of years of formal education, highest educational qualification, current or longest held occupation, housing tenure, household agreeableness, and household overcrowding.[1] Household-based indices of SES such as head of household's education, household income, household assets, household equipment, housing materials, and so on are reflection of SES through their association with the distribution of wealth and income, control over life circumstances, and access to human and social resources.[8-10] Population-based or neighborhood-based measurements can be based on in which individuals are living.[1,11]

Furthermore, SES is embedded in social patterns that vary with time, place, and culture; an indicator of SES that is valid in one country might not be so relevant in another. For this reason, every society needs specialized SES questionnaire according to its circumstances.

Whereas most health studies consider SES as a potential confounder of relationships between other variables and health[6,7,12] and due to such diversities and the important role of SES in health, there is a need for a unified tool to collect SES data for each community based on its specific situations and its level of technology development. Moreover, the SES measurement tools are dynamic, i.e., an item that can be a household SES indicator for a population at a period of time may not be relevant later on.[10]

SES is an important component of any community health-related research and influences both health behaviors in community and patients' specific behavior regarding their own disease. For instance, evidence about the socioeconomic determinants of cardiovascular disease (CVD), particularly in developing countries, shows an indirect association between SES and the occurrence of mortality and morbidity by CVD.

It also has an important role in planning and conduction of development programs in health behaviors and disease control areas. There have been many scales for different settings with their own limitations. Hence, there is a need for development of particularly short, efficient, valid, and reliable instrument for measuring SES. This study aimed to develop an efficient questionnaire through collecting a set of most appropriate items that could well represent the SES of Iranian society and evaluate its validity and reliability. SES is an important component of any clinical and community health-related studies; accordingly, this questionnaire and its scores can be used in different areas of research.

Materials and Methods

Study design and participants: The current cross-sectional methodological study was conducted in Isfahan City, the biggest city located in central region of Iran, in 2019. The main study sample for validation of proposed instrument in this study consisted of 1437 people selected from participants in Isfahan Cohort Study (ICS). These people had complete data about wide range of SES used for our study instrument development. More details about ICS have been presented elsewhere.[13] Sampling framework and sample selection process in ICS are in brief as: the ICS is a population-based longitudinal ongoing study of 6504 adults aged equal or greater than 35 years at baseline, living in urban and rural areas from three counties in central Iran who had participated in the baseline survey of a community trial for CVD prevention and control, entitled Isfahan Healthy Heart Program (IHHP).[14]

Instrument development: The development process of the final questionnaire was conducted at various stages. It was initiated by a focus on developing countries particularly Eastern Mediterranean Regional Office (EMRO) countries. The developed questionnaires in this region and other developing countries contain domains including education, culture, occupation, family possessions, family members, home sanitation, economic situation, and health care. In the current study, we intended to develop and validate a summarized SES questionnaire through the following steps. This provides researchers and policy makers with a consistent standardized measurement and collection approach to SES across groups by a brief and efficient tool. We attempted to select more relevant and reliable items from available items in SES questionnaires based on literature search among developed SES questionnaires in Iran and other less developed and developing countries and adopted the National Committee on Vital and Health Statistics (NCVHS) recommendations for considering the most practical and reliable domains and items. The initial form of questionnaire covers many domains of SES based on sound and reliable sources. The domains include education, income,

employment, and family size.

We distributed a 41-item questionnaire among a panel of experts containing methodologist, sociologist, psychiatrist, psychologist, health administrator, biostatistician, epidemiologist, and experts in public health. We provided them with the validated SES questionnaires in Iran and developing and less developed countries such as Egypt, Saudi Arabia, India, Nigeria, etc., and asked them to select more prevalent and relevant items based on their insight about the current socioeconomic space of Iran by considering their relevant literature. The experts discussed the applicability of the items from literature review and available items in previous validated SES questionnaires. During this step, they selected 13 items from 41 original items provided in initial form. Accordingly, a primary scale was developed while selecting some items form the initially-developed 41-item questionnaire and modifying some of items. Then it was assessed in a qualitative pilot study in which, a purposive sampling was used for selecting two groups of people including people with high economic status and people with low economic status from those who participated in ICS and interviews were done individually for examining the relevance of the questions to the aim of this study to refine the questions. After obtaining the feedback from this pilot sample and conducting some modifications on 13 items, a qualitative face and content validity was done through distributing the new questionnaire among new panel of experts. Finally, 6 items were selected that have been approved by both independent panel of experts and these items were subjected to psychometric evaluations through statistical methods.

Statistical analysis (psychometrics analyses)

Reliability: A general accepted rule for internal consistency based on Cronbach's alpha is that an α of 0.6-0.7 indicates an acceptable level of reliability, and 0.8 or greater a very good level.[15]

Validity

Construct validity: The factor structure of the short form was explored using the exploratory factor analysis (EFA). A factor loading greater than 0.40 was considered as satisfactory for considering an item to be associated with a specific factor. The data viability for factorability was guided through Kaiser-Meyer-Olkin (KMO) measure of sample size (value > 0.7) and Bartlett's test of sphericity ($P < 0.050$).[16]

The latent structure of the socioeconomic status short-from questionnaire (SES-SQ) was also investigated using latent class analysis (LCA). In

other words, the level of SES was considered as a latent construct and it was evaluated using LCA based on finalized SES items during previous stages. LCA is a parallel approach or counterpart with factor analysis, but it is applicable for categorical variables. LCA, like factor analysis, addresses the complex patterns of associations that appear among observations; however, unlike factor analysis, in LCA, the underlying unobserved variables are not continuous (dimensions) but are classes or discrete. This model examines the pattern of relations among a set of observed categorical variables (here SES items) and classifies similar individuals in terms of SES levels into homogeneous latent classes. Therefore, participants within each latent class are highly similar to each other and uniquely different from the other classes across the set of evaluated items. Accordingly, comparisons can be made across latent classes with regard to items evaluated (here SES items). We fitted various LCA models with different latent classes. The adequacy of fitted models was guided through comparing the Bayesian Information Criterion (BIC), the Akaike Information Criterion (AIC), and entropy indices across models. A model with lower "BIC" and "AIC" and higher "entropy" values indicates better fitting and class separation, respectively. Then, we performed a cross-validation, splitting the sample into two subsamples randomly. LCA models with different latent classes were performed on the first half of sample (training sample). The adequacy of fitted models was guided through comparing BIC, AIC, and entropy indices across the fitted models.[17]

Discriminant and known-group validity: Known-group validity was assessed based on the SES-SQ ability to discriminate between two groups of people with high- and low-level income in terms of SES scores. We selected a sample of 100 people who participated in other conducted research in our research institute based on a question about their income and had expressed their income status as high and low. We contacted them for completing our SES-SQ questions. Finally, 22 low- and 46 high-income people filled SES-SQ completely. We tested difference in the distribution of each item and mean total score of SES for all items between two groups using chi-square test or independent samples t-test. In addition, receiver operating characteristic (ROC) curve along with the sensitivity and specificity values as well as area under the curve (AUC) was used to gauge the ability of the total SES score to discriminate between two known groups.

The Spearman rank-order correlation coefficient was used to examine item-scale correlations, corrected for overlap. Item convergent validity should be at least 0.40 We also evaluated the convergent validity by examining the correlation between total score of SES-SQ and its own domains. Data were analyzed using SPSS software (version 16.0, SPSS Inc, Chicago, IL, USA). P-value < 0.050 was considered as statistically significant.

Results

A total of 1437 people participated in this validation study, including 707 (49.2%) women and the remaining men. The mean and standard deviation (SD) of age was 56.70 ± 10.89 years. The majority of the participants were married [n = 1241 (87.5%)] and the remaining were single, widowed, or divorced. Approximately, 85% of participants had attained academic level equal or less than diploma (12-year formal education); majority of study participants were governmental employees, self-employed, or retired. Car ownership was reported by 64.2%, while only 19.3% and 10.5% of the current study participants used digital equipment such as laptop, personal computer (PC), or notebook in their house and had fun trip abroad during last year, respectively. Table 1 also presents the assigned scores to each category of final selected items by our study panel experts. These scores reflect the view of experts about the importance of each selected item. These scores also have been

approved by the related factor loadings of each of six items during the EFA.

Internal consistency: The reliability of the SES-SQ was evaluated for internal consistency (Cronbach's alpha). The alpha value of 0.64 indicates relatively high internal consistency reliability.

Known-group approach validity: Table 2 provides the distribution of chosen answers for each item by participants in two studied groups (people with low and high income). As can be seen, there were significant differences between two groups in terms of all SES-SQ items. As expected, those categories indicating higher SES levels have been chosen by rich people significantly higher than low-income group; also the mean value of SES score was significantly higher in high-income group (P = 0.030) (Table 2 and Figure 1).
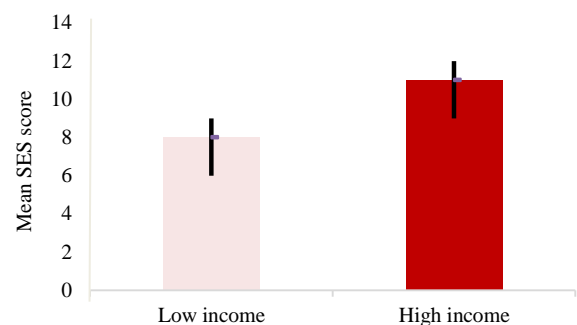

Figure 1. Mean value of socioeconomic status short-form questionnaire (SES-SQ) score in people with low and high income

Table 1. The distribution of socioeconomic status short form questionnaire (SES-SQ) items in main study sample

Questionnaire items		Total sample (n = 1437) [n (%)]	Assigned score
Head of households' education level	Illiterate	244 (17.2)	0
	Elementary school	434 (30.6)	0
	Middle school	234 (16.5)	0
	Diploma	279 (19.7)	1
	Bachelor or Associate degree	178 (12.6)	2
	Master of Sciences or PhD degree	42 (3.0)	4
	Religious education	5 (0.4)	3
Head of households' employment status	Governmental	134 (9.5)	4
	Self-employed	658 (46.7)	4
	Housewife (for women)	96 (6.8)	0
	Retired	431 (30.6)	1
	Unemployed	89 (6.3)	0
	Student	1 (0.1)	0
House room number	Without room	3 (0.2)	0
	One	226 (15.9)	1
	Two	683 (48.0)	2
	Three and more	510 (35.9)	3
Car ownership	No	500 (35.8)	0
	Yes	894 (64.2)	1
Using notebook, laptop, or tablet in the house	No	1158 (80.7)	2
	Yes	277 (19.3)	0
Fun, pleasure, travel abroad	No	735 (89.5)	0
	Yes	86 (10.5)	3

Table 2. Comparison of socioeconomic status short-from questionnaire (SES-SQ) items between people with low and high income

SES-SQ items	Low income (n = 22)	High income (n = 46)	P*
Head of households' education level			0.001
0	31.8	8.7	
1	27.3	2.2	
2	13.6	30.4	
3	18.2	26.1	
4	9.1	32.6	
Head of households' employment status			0.040
0	9.1	4.3	
1	40.9	19.6	
4	50.0	76.1	
House room number			0.020
0	-	-	
1	40.9	17.4	
2	50.0	45.7	
3	9.1	37.0	
Car ownership			0.010
0	59.1	28.3	
1	40.9	71.7	
Fun, pleasure, travel abroad			0.080
0	93.3	72.1	
3	6.7	27.9	
Using notebook, laptop, or tablet in the house			0.050
0	81.8	58.7	
2	18.2	41.3	
SES score	8.57 ± 3.58	10.75 ± 4.22	0.030

Values are percentage for categorical and mean ± standard deviation (SD) for continuous data;
*Resulted from chi-square test and independent samples t-test for categorical and continuous data, respectively
SES: Socioeconomic status

Known-group validity of the SES-SQ was also evaluated to discriminate between low-income and high-income people. ROC curve was generated [AUC: 0.79, 95% confidence interval (CI): 0.68-0.90], indicating strong accuracy for discriminating two groups with optimal cutoff point of 9 (sensitivity: 74% and specificity: 71%). Figure 2 demonstrates the ability of SES-SQ to discriminate between people with low and high income.
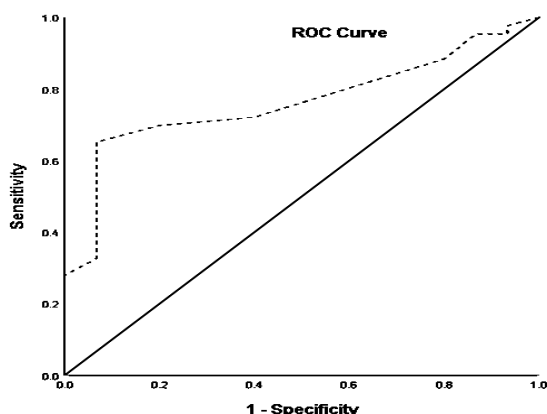

Figure 2. Receiver operating characteristic (ROC) curve of socioeconomic status short-from questionnaire (SES-SQ) score for discriminating low economic and high economic status groups

Construct validity: Construct validity was evaluated by using LCA. Results of LCA on the 6 items of the SES-SQ showed that a model with three classes had adequate fit to the data (BIC = 7889.38, AIC = 7735.62). The entropy was 0.68, suggesting that individuals were correctly classified by our fitted model. According to distribution of answers to items in constructed classes (Table 3 and Figure 3), the first class contained 60% of participants with medium SES level.
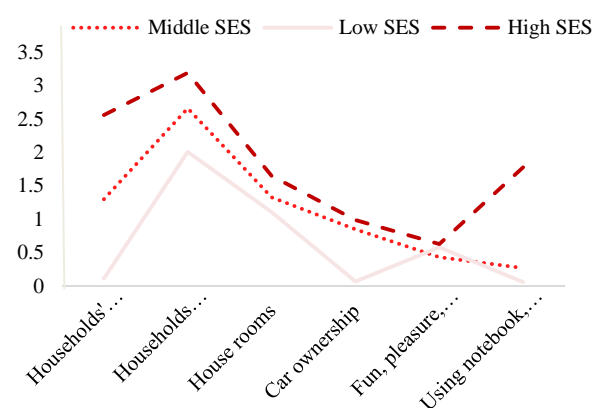

Figure 3. The extracted latent classes and distribution of answers to socioeconomic status short-from questionnaire (SES-SQ) items in each class

Table 3. Class-specific answer (percentage) to the socioeconomic status short-from questionnaire (SES-SQ) items and the size of classes

Variables	Middle SES	Low SES	High SES
Cluster size	0.60	0.22	0.18
Head of households' education level			
0	0.33	0.91	0.05
1	0.22	0.08	0.09
2	0.26	0.01	0.27
3	0.16	0.001	0.43
4	0.02	0.00	0.16
Mean score	1.32	0.11	2.56
Head of households' employment status			
0	0.10	0.17	0.05
1	0.31	0.43	0.20
4	0.59	0.40	0.75
Mean score	2.66	2.01	3.19
House room number			
0	0.13	0.20	0.06
1	0.48	0.53	0.38
2	0.30	0.23	0.39
3	0.08	0.04	0.16
Mean score	1.33	1.11	1.65
Car ownership			
0	0.15	0.93	0.001
1	0.85	0.07	0.99
Mean score	0.85	0.07	0.99
Fun, pleasure, travel abroad			
0	0.86	0.81	0.79
3	0.14	0.19	0.21
Mean score	0.43	0.58	0.63
Using notebook, laptop, or tablet in the house			
0	0.87	0.97	0.11
2	0.13	0.03	0.89
Mean score	0.27	0.06	1.78

SES: Socioeconomic status

Second class (22%) and third class (18%) consisted of participants with low and high levels of SES, respectively. The mean score of items for majority of SES-SQ items in high-SES class was higher than both middle- and low-SES classes and in middle-SES class was higher than low-SES class.

We used ROC analysis to identify the cutoff points with highest accuracy for SES total score in order to differentiate the extracted classes. Results showed that a cutoff value of 4.5 had the highest sensitivity (69%) and specificity (97%), simultaneously for differentiating the middle-SES class from low-SES class with AUC = 0.93 (95% CI: 0.90-0.96) (Figure 4).

In addition, the cutoff value of 8.5 was determined with highest sensitivity (84%), specificity (67%), and AUC = 0.82 (95% CI: 0.79-0.85) for differentiating high-SES class from middle-SES (Figure 5).

We also evaluated construct validity by using EFA. EFA with varimax rotation extracted two factors from the six SES-SQ items in which, the first and second factors accounted for 30.05% and 17.73% of total variance, respectively.
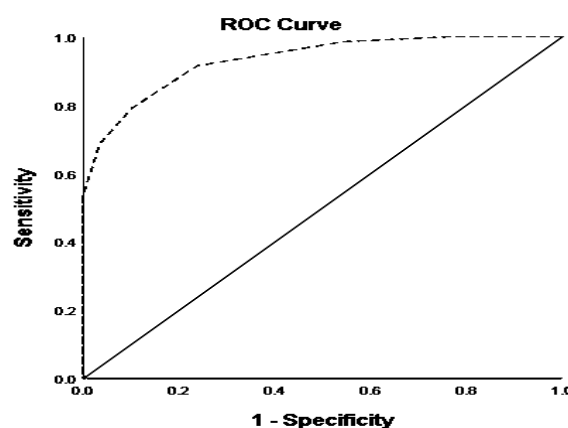

Figure 4. Receiver operating characteristic (ROC) curve of socioeconomic status short-from questionnaire (SES-SQ) score for discriminating middle-SES from low-SES class

A KMO value of 0.66 indicates sample size adequacy and $P < 0.001$ for the Bartlett's test confirmed the data viability for factorability. Table 4 provides the factor loadings of two extracted factors from 6 items.

Table 4. Factor loadings and item-scale correlation

SES-SQ items	Factor 1	Factor 2	Item-scale correlations
Head of households' education level	0.76		0.78
Head of households' employment status	0.33		0.31
House room number		0.43	0.68
Car ownership	0.75		0.74
Fun, pleasure, travel abroad		0.91	0.64
Using notebook, laptop, or tablet in the house	0.68		0.67

SES-SQ: Socioeconomic status short-from questionnaire
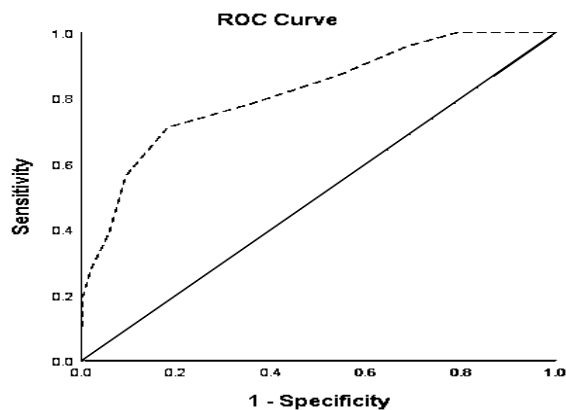

Figure 5. Receiver operating characteristic (ROC) curve of socioeconomic status short-from questionnaire (SES-SQ) score for discriminating middle-SES from high-SES class

Convergent validity: We used Spearman rank-order correlation coefficient corrected for overlap to assess the correlation between each item and its own total score of extracted subscales. The computed correlation coefficients all exceeded the value of 0.3, indicating satisfactory convergent validity. Item-scale correlations based on Spearman correlation coefficients, as presented in table 4, were between 0.31 and 0.78, indicating satisfactory item convergent validity.

Discussion

This study was an effort for developing SES measurement to be used in related researches in different dimensions. The results of this study showed that this SES questionnaire was a reliable and valid questionnaire. Regarding reliability, acceptable internal consistency was observed.

This paper tried to identify measures of SES that were relevant in diverse settings which were more predictive and constant. Because, SES indictors are interchangeable and different in many sites. For example, those SES factors which were used in the United States (US) were different from those used in Europe. In Europe, the classification of an individual's occupation was a commonly-used and valid indicator of SES. Since the 1960s, factors such as housing tenure (rented versus owned) and overcrowding have been increasingly used in the United Kingdom (UK) to calculate SES at the individual and neighborhood levels,[1] while in the US, income or education is more commonly used.[7] A few studies on development and validation of SES questionnaire were performed in Iran. Abobakri et al. developed an SES questionnaire for urban households. Their questionnaire consisted of 22 items with five domains that more considered economic aspect of SES.[18] In another study, Hosseini-Shokouh et al. designed a 79-item questionnaire in eight sections.[19] This questionnaire is very long and it takes too much time to fill out.

According to the results of current study, this SES questionnaire consisted of six items including head of household's educational level and job position, number of rooms in the house, traveling abroad during last year, having private car (car ownership), and using notebook, laptop or tablet in the house.

Some components of SES, including education and occupation shape the physical environment in which one lives and works, the social environment, socialization, and experiences that influence psychological development and health behaviors. A review study on SES health studies in Iran from 2007 to 2017 showed head of household's education and occupation, number of rooms in the house, using notebook, laptop, or tablet in the house, and car ownership as the most comprehensive SES factors.[10]

Some researchers suggested that education was a stronger indicator of economic status than either income or occupation. Educational achievement of the head of household is as well strongly correlated with the SES of households. The World Bank (1998) stated that the level of education of the head of household was a good proxy of his/her income and the economic status.[20]

Household crowding was measured as rooms, bedrooms, or floor area, resulting in adverse

physical and mental health outcomes.[21] Several studies used number of rooms in the house as a SES factor.[1]

Wealth which is defined as accumulated financial resources is also considered a determinant of SES that provides the means to live comfortably. Some studies have observed wealth effects on health using simpler measures such as home or car ownership as another measure of SES.[7,22,23] Hence, car ownership and traveling abroad during last year were utilized to serve as representatives for wealth indicators for this SES questionnaire.

The study had some limitations which should be mentioned. Although we attempted to utilize robust and constant SES indicators, the resulting components of an ideal measure of SES are likely to vary across settings and study objectives. The sample was selected from participants of ongoing ICS study in Isfahan Cardiovascular Research Institute. Although this study is a population-based one, this instrument development process may not fully be generalizable to Iran general population. Other important limitations of our study are lacking data for evaluation of test-retest reliability and relatively low Cronbach's alpha value.

It is suggested that this new tool should be evaluated in different community and clinical settings in Iran. Besides, further studies are needed to assess the predictive validity of the scale in predicting both economic status and health care utilization in community level and morbidity of both communicable and non-communicable diseases (NCDs) and mortality among different patients' population. Application of this new SES-SQ in different parts of Iran and other developing countries with similar economic and cultural background is strongly recommended.

Conclusion

An efficient, reliable, and valid short form questionnaire was developed for evaluating SES in Iranian general population. The relevancy of questionnaire's items is not lost over time. SES is an important component of any clinical and community health-related studies; accordingly, this questionnaire and its scores can be used in different areas of research both in community and clinical and health-related settings.

Acknowledgments

Conflict of Interests

Authors have no conflict of interests.

Authors' Contribution

HR, MS, and NS: Study conception and design; AK: Writing/manuscript preparation; HR and AF: Methodology and critical revision; MG: Conducting the study; MD: data acquisition and analyzing. All authors approved the final version of manuscript and agreed with all aspects of the work.

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