Identifying and Ranking the Factors Affecting the Choice of Nursing Discipline Among Nursing Students in Iran: A Fuzzy Hierarchical Analysis

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**ABSTRACT**

**Background:** Choosing a career in nursing is frequently a complicated decision that is influenced by multiple factors.

**Purpose:** This study was designed to identify and rank the main factors that influence individuals to choose to pursue a career in nursing.

**Methods:** This cross-sectional study was conducted at Mazandaran University of Medical Sciences, Iran. A comprehensive review of the literature was conducted to identify the factors that people consider when making a choice to pursue a career in nursing. The face and content validities of these factors were evaluated. A sample of 250 participants was invited to assess the factors using exploratory factor analysis. Finally, the analytical hierarchy process, in combination with fuzzy logic, was used to rank the criteria and related factors.

**Results:** Twenty factors were identified and extracted from 50 published studies. After confirming the face and content validity of each, these 20 factors were distinguished into four criteria, including (a) external motivation, (b) social dignity, (c) internal motivation, and (d) usefulness of discipline. Each criterion had an eigenvalue greater than 1. External motivation and usefulness of discipline were respectively identified as the most and least important criteria (38.60% vs. 16.11%) in terms of influencing individuals to pursue a nursing career.

**Conclusions/Implications for Practice:** The results of this study show that exposure to positive recommendations from family and friends, receiving positive information about studying nursing, positive perceptions regarding the general usefulness of nursing knowledge, and migration opportunities to other countries are the primary factors that influence individuals in Iran to pursue a career in nursing.

**Key Words:** fuzzy logic, nursing students, discipline, analytic hierarchical process.

**Introduction**

Nurses are at the forefront of healthcare in most health systems, and their contribution is vital to achieving societal health goals and providing safe and effective healthcare (Lim & Muhtar, 2016). Understanding why individuals choose to pursue a career in nursing is critical to the survival and success of this profession and especially important for related leaders and academics. Understanding the factors affecting choice of discipline may be used to help drive the curriculum to better meet student needs and expectations (Cho et al., 2010).

In Iran, withdrawal from nursing education is a common problem. Students experience steady lowering of educational standards, which imposes great economic costs on the educational system and psychologically impacts other students. One of the most important reasons for student withdrawal is the lack of awareness when choosing the nursing discipline (Farahani et al., 2017). Many factors, including career image, future personal plans, and prospects for success in life, are known to influence discipline-selection decision making (Elibol & Seren, 2017). A conscientious search for information about a particular academic field before choosing that field can influence an individual’s satisfaction and commitment (Wilkes et al., 2015). A review of the literature found choosing nursing as a career to be influenced by factors such as willingness to help and care for others, job opportunities,
social status, income, personal environmental factors, experience caring for a loved one, having a close relative who is a nurse, and experiencing the hospitalization of relatives or friends (Ergün & Güzel, 2016; Liaw et al., 2016; Önder et al., 2014).

When the criteria affecting a particular goal are numerous, the analytic hierarchy process (AHP), which is one of the methods of multiple-criteria decision making, may be used in combination with Fuzzy Analytical Hierarchy Process (FAHP) to determine the weight and ranking of each criterion (Önder et al., 2014). Fuzzy logic allows decisions and judgments to be made that are closer to rigid numbers than human logic (Ahmed & Kilic, 2019). Because no study has been conducted in Iran to determine and rank the specific factors that affect choosing to pursue a career in nursing, this study was performed using the FAHP method.

Methods

This cross-sectional and analytic study was conducted in 2019 in four phases. The research population consisted of two groups: academic faculty and nursing students. The ethics committee of Mazandaran University of Medical Sciences approved the study (approval no.: IR.MAZUMS.REC.1398.064).

In Phase 1, the literature was reviewed to identify and extract the factors affecting the decision to pursue a career in nursing. To accomplish this, a search was conducted in international databases such as PubMed, Scopus, Science Direct, Google Scholar, Cochrane Library, CINAHL, and a local database (Scientific Information Database) for articles published between 2008 and 2018. The following keywords were used: “nursing profession,” “student choice,” “career decision,” “careers,” “career choice,” “chosen profession,” “career selection,” “discipline choice,” “nursing,” “nursing student,” and “criteria” and “factors.” Only articles published in Persian or English were selected. To search the Persian electronic databases, the Farsi equivalents of the English keywords were used. Finally, 20 factors that affect choosing a career in nursing were extracted from the 50 studies identified. Details on the identified studies are shown in Figure 1.

In the second phase, an expert panel consisting of 10 nursing professors was formed. Their role was to evaluate the qualitative and quantitative face and content validities of the factors identified in Phase 1. The inclusion criterion for panelists was having at least 5 years of work experience as a nurse faculty member.

In the qualitative face validity phase, the grammatical and semantic problems of the factors were corrected. Both content validity index (CVI) and content validity ratio (CVR) were used to confirm quantitative content validity. CVI was used to assess the simplicity, relevance, and transparency of the factors. The experts categorized the factors into four significant criteria and scored each on a scale of 1 (strongly disagree) to 4 (strongly agree; Lin et al., 2014). To obtain the CVI for each factor, the number of panelists who scored 3 and 4 was divided by the total number of panelist respondents, and factors earning a CVI greater than .79 were retained (Maasoumi et al., 2013). CVR was used to assess the necessity of each factor. The CVR for the 10-member panel of experts was at least .62, as determined using the Lawshe table (Lawshe, 1975).

In Phase 3, a sample of students was invited to use the exploratory factor analysis (EFA) approach to assess the factors that were extracted and validated in Phases 1 and 2. We presented the factors to a study sample of 250 nursing students in a questionnaire scored using a 5-point Likert scale with 5 = very high importance, 4 = high importance, 3 = medium importance, 2 = low importance, and 1 = very low importance. Because the minimum sample size required for EFA is 10 per criterion, 250 students were invited to participate in this study (MacCallum et al., 1999). Principal component analysis and promax rotation were used to extract the factors. The cutoff level for the eigenvalue was ≥ 1.

The final phase was set to label and rank the factors. The experts reviewed the results obtained using the EFA and assigned each factor to an associated criterion. A hierarchical structure was then created that included the criteria and factors. Chang’s triangular FAHP method was used to rank the criteria and factors affecting the choice of a nursing career. The AHP is one of the approaches in multivariate decision support systems that was introduced by Thomas Saati in 1983. The purpose of the AHP is to rank the criteria and related factors by pairwise comparison and then weigh each (Shafii et al., 2016). The formation scheme of the AHP questionnaire in this study is presented in Figure 2. The purpose of multicriteria decision-making techniques is not to prove a hypothesis or statistical study but rather to rank the related criteria. In this phase of the study, 20 nursing students were selected randomly from the primary study sample of 250 to complete the paired comparisons matrix. In the first phase of this study, participants were asked to compare the

Figure 1
Flowchart of the Analytic Hierarchy Process: Questionnaire Design Process

| International Database | (n = 817) |
|------------------------|----------|
| PubMed (n = 152)       |          |
| Scopus (n = 218)       |          |
| Science Direct (n = 219) |        |
| Google Scholar (n = 217) |       |
| Cochrane Library (n = 0) |        |
| CINAHL (n = 0)         |          |
| SID (n = 11)           |          |

Articles Excluded
(n = 767)
Screened titles and abstracts:
• Irrelevant (n = 654)
• Duplication (n = 113)

Articles Reviewed
(n = 50)

Note. SID = Scientific Information Database.
importance of each criterion in terms of its effect on choosing to pursue a career in nursing and to compare the relevance of each criterion to the other using linguistic variables. The researchers then converted the linguistic variables to their corresponding triangular fuzzy numbers. The linguistic variables and their corresponding triangular fuzzy numbers included absolute importance (7, 9, 9), very strong importance (5, 7, 9), strong importance (3, 5, 7), weak importance (1, 3, 5), and equal importance (1, 1, 3). Participants were then asked to determine the significance of the factors in each criterion separately and comparatively. Finally, the weight of the criteria and factors were determined using the Chang’s FAHP and were ranked accordingly.

The consistency ratio was calculated to check the validity of each pairwise comparison matrix (Wedley, 1993).

\[
Consistency\ ratio = \frac{Consistency\ Index}{Random\ Consistency\ Index}
\]

The Random Consistency Index is a constant value that varies according to the dimensions of the pairwise comparison matrices and is equal to 0.9, 1.12, and 1.24 for the \(4 \times 4\), \(5 \times 5\), and \(6 \times 6\) matrices, respectively. The following formula was used in this study to calculate the Consistency Index (CI):

\[
CI = \frac{\lambda_{max} - n}{n-1}
\]

In this formula, \(\lambda_{max}\) or principal eigenvalue is calculated by averaging the matrix eigenvector, and \(n\) also indicates the number of dimensions of the pairwise comparison matrix (Sun, 2010). If a matrix is consistent, the principal eigenvalue (\(\lambda_{max}\)) is equal to the matrix dimension (Alonso & Lamata, 2006). Descriptive factor analysis/EFA and FAHP analyses were performed using IBM SPSS Version 19 (IBM, Corp., Armonk, NY, USA) and MATLAB Version 9.7 (MathWorks, Natick, MA, USA) software, respectively.

**Results**

After reviewing the literature, 20 factors were identified that affect the choice of individuals to pursue a career in nursing. In the second phase of this study, experts edited the factors grammatically and semantically. All 20 factors were included in the subsequent assessment and analysis phase because of their appropriateness in terms of qualitative and quantitative face and content validities. In the third phase of this study, 250 nursing students with a mean age of 21.18 ± 1.99 years were invited to participate. All of the participants submitted complete and valid questionnaires. Most (148, 59.2%) were female and single (97.2%). The demographic characteristics of the participants are presented in Table 1.

In terms of demographic data, a significant and positive relationship was found with the educational level of parents (mothers and fathers; \(p < .001, r = .245\)), whereas significant and negative relationships were found between grade average and age (\(p = .011, r_s = -.160\)) and between grade average and semester (\(p < .001, r_s = -.233\)).

On the basis of the results of the EFA, all four criteria had an eigenvalue \(\geq 1\) and a variance of 64.16. The factor loading and commonalities of each criterion were \(\geq .5\), and the Kaiser-Meyer-Olkin index was .84, which is considered desirable (Table 2). In addition, the internal consistencies of

**Figure 2**

Flowchart of the Analytic Hierarchy Process—Questionnaire Design Process

- **Step 1**
  - Using a comprehensive review, identify and extract the factors affecting the choice of the nursing discipline

- **Step 2**
  - Form an expert panel
  - Evaluate the qualitative and quantitative face and content validity of the factors

- **Step 3**
  - Use Exploratory Factor Analysis to appraise the validated criteria (developing Likert questionnaire)

- **Step 4**
  - Use the Fuzzy Analytic Hierarchy Process method to label and rank the criteria (developing pairwise comparison questionnaire)
all items (.76) and each criterion (.83–.88) were acceptable. The results are presented in Table 2.

The experts reviewed and approved the criteria appraised using the EFA. The results were categorized and placed in a hierarchical structure (Figure 3).

The main criteria identified were as follows: (a) external motivation, (b) social dignity, (c) internal motivation, and (d) usefulness of discipline. The factors included in each criterion are also specified in the corresponding structure.

In the fourth phase of this study, some of the selected participants completed the pairwise comparisons matrix, which was used to conduct a pairwise comparison of each criterion and factor. Participants presented their preferences in the form of linguistic variables. The linguistic variables were converted to corresponding triangular fuzzy numbers, and the weights of the criteria and factors were calculated using the FAHP method (Table 3).

The “external motivation” and “usefulness of discipline” criteria were ranked, respectively, as the most (38.6%) and least (16.11%) important in terms of affecting the decision to pursue a career in nursing. The effect of the external motivation criterion in determining the discipline of nursing was found to be 1.56, 1.87, and 2.40 times stronger, respectively, than the social dignity, internal motivation, and usefulness of discipline criteria.

In terms of factors, the normalized weight of the “recommendations from others” factor (55.69) was 3.48–4.26 times higher than the other factors included under the external motivation criterion, “getting positive information about studying in the field” (30.19) weighed 1.23–2.86 times more than the other factors under the social dignity criterion, “the usefulness of nursing knowledge in personal life” (24.14) weighed 1.06–8.97 times higher than the other factors under the same criterion, and “immigration opportunities to other countries” (44.30) weighed 1.85–8.26 times more than other factors under the same criterion of usefulness of discipline.

The principal eigenvalues for the matrices were very close to the magnitude of each matrix dimension, which indicates that the results exhibited appropriate consistency (Table 3). On the other hand, the CI for each of the five matrices was lower than the Random Consistency Index, and the consistency ratio was lower than 0.1 for all of the matrices, indicating that all pairwise comparisons obtain reasonably good results and that the findings in this study were consistent.

Table 1
Demographic Characteristics of Participants (N = 250)

| Characteristic             | n  | %   |
|---------------------------|----|-----|
| Gender                    |    |     |
| Male                      | 102| 40.8|
| Female                    | 148| 59.2|
| Father’s education        |    |     |
| Illiterate                | 15 | 6.0 |
| Diploma                   | 129| 51.6|
| Academic education        | 106| 42.4|
| Mother’s education        |    |     |
| Illiterate                | 14 | 5.6 |
| Diploma                   | 150| 60.0|
| Academic education        | 86 | 34.4|
| Marital status            |    |     |
| Single                    | 243| 97.2|
| Married                   | 57 | 2.8 |
| Residence                 |    |     |
| A native of the province  | 193| 77.2|
| Nonnative                 | 57 | 22.8|
| Semester                  |    |     |
| 1                         | 31 | 12.4|
| 2                         | 97 | 38.8|
| 3                         | 69 | 27.6|
| 4                         | 53 | 21.1|
| University entrance exam. |    |     |
| 1                         | 163| 65.2|
| 2                         | 53 | 21.2|
| 3                         | 30 | 12.0|
| 4                         | 4  | 1.6 |

Discussion

In this study, a four-phase approach was used to identify and prioritize factors that influence students to choose a career in nursing.

The findings highlighted the primary importance of external motivation in selecting nursing as a career. This is in contrast to the results of a study by Manzour et al., which found that most participants considered personal interest as having the most significant impact on career choice (Manzoor et al., 2010). In this study, the two factors “recommendations from others (family, friends, and teachers)” and “media (television, Internet, and social networks)” earned the highest and lowest coefficients for importance, respectively, under the external motivation criterion. Similar external factors such as parental recommendations (Lim & Muhtar, 2016; Wu et al., 2015), employment of a family member in the profession (Manzoor et al., 2010), and the influence of others’ suggestions and encouragement (Crawford & Turvey, 2019; Mooney et al., 2008) have been identified in other related studies as considerations in choosing a career in nursing. Given that family, friends, and teachers are important influencers in a person’s life, their role in a future job search may be expected to be crucial and significant (Mphahlele, 2011).

A survey of the significant coefficients of each factor found the most significant coefficient under the social dignity criterion to be “getting positive information about studying in this field.” Mooney et al. (2008) also found “having professional knowledge” as an essential factor in choosing a nursing career. The high importance of this factor reflects the high impact of extrinsic motivation dimensions that can be received in various ways such as through family, friends, and the media. Further evaluation showed “having a positive impression of nursing in the society” to be of minimal
### Table 2

**Exploratory Factor Analysis**

| Factor (Criteria)                                                                 | Communality | Factor Loading | Explained Variance | Cronbach's Alpha |
|----------------------------------------------------------------------------------|-------------|----------------|---------------------|------------------|
| **External motivation**                                                          |             |                |                     |                  |
| Recommendations from others (family, friends, and teachers)                      | .725        | .85            | 15.07               | .88              |
| Having patterns in this field among friends and relatives                        | .740        | .86            |                     |                  |
| Religious issues                                                                 | .737        | .86            |                     |                  |
| Media (television, Internet, and press)                                          | .796        | .88            |                     |                  |
| **Social dignity**                                                               |             |                |                     |                  |
| Getting positive information about studying in this field                        | .669        | .81            | 15.19               | .83              |
| Suitable social position of the profession                                       | .580        | .75            |                     |                  |
| Ability to communicate with medical team members                                 | .580        | .75            |                     |                  |
| Existence of excellent human relations in the field                              | .636        | .79            |                     |                  |
| Having a positive impression of nursing in society                               | .556        | .73            |                     |                  |
| **Internal motivation**                                                          |             |                |                     |                  |
| Usefulness of nursing knowledge for personal life                                | .716        | .84            | 17.92               | .86              |
| Being interested in the nursing profession                                       | .510        | .70            |                     |                  |
| Distance to the faculty                                                          | .543        | .73            |                     |                  |
| Having a caring experience (e.g., taking care of a patient at home)              | .537        | .73            |                     |                  |
| Field proximity to medicine                                                      | .630        | .79            |                     |                  |
| Willingness to help others                                                       | .676        | .82            |                     |                  |
| **Usefulness of discipline**                                                     |             |                |                     |                  |
| Immigration opportunity (to other countries)                                     | .686        | .81            | 15.98               | .86              |
| Having postgraduate job opportunities                                            | .743        | .86            |                     |                  |
| Opportunity for further education and academic progress                           | .660        | .79            |                     |                  |
| Having a good income while studying                                              | .591        | .76            |                     |                  |
| Opportunity to access welfare facilities while studying                          | .521        | .72            |                     |                  |

### Figure 3

**Flowchart of the Article Selection Process**
significant. Contrary to the results of this study, the results of a qualitative study in the United Kingdom showed that nurses expressed pride in their profession and in being nurses (McCabe & Sambrook, 2013). The results of a previous study conducted in Iran indicate that nursing students believe that the nursing profession in Iran lacks necessary value (Joolaee et al., 2016). Although public perception of the nursing profession in Iran has improved in recent years, it seems that this profession in Iran has yet to achieve sufficient value and dignity.

Under the internal motivation criterion, “the usefulness of nursing knowledge for personal life” and “willingness to help others” were respectively scored as the most and least important factors. However, contrary to this finding, internal factors presented in other studies such as “tendency to care and help others” (Lindberg et al., 2020; McCabe & Sambrook, 2013; Patidar et al., 2011; Wu et al., 2015), “being able to communicate with people,” and “having the opportunity to work with people” (Eley et al., 2010) were identified as crucial factors in choosing the nursing profession. It is evident that, different from other studies, the participants in this study did not place high priorities on willingness to help others and working with people. However, the usefulness for personal life was identified as important to the participants in the present research. Although this difference may be rooted in the gaps between cultures and research population, it may be inferred that, in this study, the participants were focused primarily on their personal improvement and growth. Under the usefulness of discipline criterion, “existence of migration opportunities (to other countries)” and “opportunity to access welfare facilities during study” were respectively ranked as the most and least important factors. In Lim and Muhtar (2016), “providing accommodations during education,” “simultaneity of education and work,” “travel opportunities,” and “rapid support in entering the field” were identified as the main factors that motivated respondents to choose a career in nursing.

Because many countries face a shortage of nursing graduates and offer attractive salaries for practitioners, studying nursing provides an opportunity for graduates to experience better working conditions in other countries.
Limitations
Decision making is a systematic approach. Thus, the components of each problem could not be considered separately in this study. In other words, the different elements of decision making are correlated in real-world situations. Moreover, because human ideas are subject to dynamic change, the results of this study may be different from other samples of participants. Finally, the findings are not representative of all nursing students in Iran and are intended only to capture the situation among a subgroup of students in one particular school in Iran.

Conclusions
Recommendations from others (family, friends, and teachers), receiving positive information about studying in the field, the usefulness of nursing knowledge for personal life, and the existence of migration opportunities (to other countries) were the most significant factors found to affect choosing to pursue a career in nursing. The first two factors refer more to the external and social aspects of the discipline, whereas the other factors emphasize the internal elements and usefulness of the discipline. Therefore, the results support strengthening these aspects of the nursing profession and giving these aspects sufficient attention from stakeholders.

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Author Contributions
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Data collection: ZHM
Data analysis and interpretation: SB
Drafting of the article: ZHM, KK, WJS
Critical revision of the article: ZHM, FH, WJS

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