Evaluation and selection of the highest personal factor of nurses' job satisfaction by applying analytical network process methods

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Abstract

Background Nurses constitute the majority of the healthcare workforce, and it is imperative to develop a comprehensive understanding of the factors that influence their job satisfaction. While considerable knowledge exists regarding the organizational factors that elicit job satisfaction, limited research has been conducted on personal factors. This study aimed to determine and prioritize the impact of personal factors (motivation, professional identity, and job engagement) on nurses' job satisfaction.

Design This study is a form of applied research conducted in a descriptive-correlational manner, with an emphasis on structural equations.

Method The statistical population of the present study encompassed all nurses of the public hospitals of Tehran, from which 398 were selected as a sample utilizing multi-stage stratified sampling. The data collection instruments were validated Persian forms of Job Descriptive Index questionnaires, nurses' professional identity, work engagement, and London job motivation. Cronbach's alpha was used to verify the reliability of the instruments, all of which were above 0.7. Descriptive statistics, structural equation modeling, and prioritization and weighting were employed to analyze the data using the Analytical Network Process (ANP) method, utilizing SPSS-23, AMOS-26, and Super Decisions-3.0.

Results The findings confirmed the research model and the relationship between personal factors and nurses' job satisfaction. Furthermore, the findings pertaining to the prioritization of personal factors affecting nurses' job satisfaction revealed that professional identity, with a weight of 0.459, had the highest weight and occupied the first position, followed by motivation with a weight of 0.392. Job engagement, with a weight of 0.147, was ranked third.

Conclusion These findings suggest that personal factors can influence job satisfaction, with professional identity being of greater significance. Enhanced job satisfaction may be achieved through the creation of a respectful and equitable work environment, the strengthening of professional identity development programs, and the establishment of a favorable image of the profession.

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Introduction

Nurses provide at least half of all health services, and in some nations, they deliver up to 80% of healthcare [1]. Maintaining a high level of job satisfaction among nurses is crucial for achieving high-quality services [2], and recent research indicates that job satisfaction is vital for ensuring patient care quality and nurses' willingness to provide care [3]. Understanding job satisfaction levels is significant for various reasons, and the outcomes of job satisfaction studies impact both employees and organizations [4]. Low job satisfaction has been identified as the primary cause of burnout among healthcare professionals [5], and negatively affects service quality delivery and organizational commitment of healthcare workers [6].

The multitude of questions surrounding employee job satisfaction underscores the importance of studying this construct [7]. Thus, identifying factors that influence job satisfaction can significantly impact organizational outcomes, productivity, and individual lives [8].

Numerous studies have explored organizational antecedents and job satisfaction correlates. However, a recent systematic review of this literature revealed that personal factors are significantly linked to nurses' job satisfaction in long-term care facilities, with no organizational factors deemed important for job satisfaction [9]. Given that the essence of nursing practice is the "person" [10], understanding the personal factors that impact job satisfaction can be more critical [11].

Job engagement, representing individual aspects of nurses' work, has recently emerged as a crucial factor in altering nursing service quality [12]. Employee engagement refers to individuals' participation or attachment to an organization [13]. Increased job engagement among nurses leads to fewer errors, better patient safety, and greater patient satisfaction, leading to higher-quality nursing services [14]. Employee job engagement has a positive and significant relationship with key organizational performance. Studies have indicated that job engagement enhances nurses' job satisfaction [15, 16]. Furthermore, research has shown that a positive professional identity can lead to better work engagement, thereby helping to improve job satisfaction among nurses working in nursing homes [17].

Professional identity is the self-concept of a nursing professional that reflects how nurses or nursing students perceive the nursing profession [18]. The formation of professional identity results from professional socialization, a process where individuals learn and internalize knowledge, skills, norms, and values related to the profession [19]. The Covid- 19 pandemic has significantly affected the professional identity of nurses [20]. This pandemic has increased the professional identity among nurses [17, 21]. Professional identity has been proposed as a key factor in nurses' ability to provide high-quality care services to improve patients, and in a qualitative study, it has been indicated that creating a positive professional identity among nurses will lead to their job satisfaction [1]. Research indicates that a positive professional identity, coupled with self-confidence, a sense of professional belonging, and effective interpersonal communication among nurses, constitutes not only the most significant factor in generating job satisfaction [22, 23], but also the primary reason nurses remain in their profession [24]. A qualitative study found that the development of identity was associated with motivation and job satisfaction [25].

Motivation has been identified as a crucial predictor of job satisfaction, with numerous studies demonstrating a significant correlation between the two [26–28]. One study revealed that motivational incentives have a substantial positive impact on nurses' job satisfaction [29]. Research examining the relationship between nurses' motivation and job satisfaction has consistently shown motivation to be a key predictor of their job satisfaction [30].

The conservation of resources theory suggests that professional employees can recognize their value within an organization. They tend to seek out, acquire, maintain, and protect what they deem valuable, ultimately leading to increased job satisfaction and engagement. Furthermore, professional identity enables employees to effectively obtain desired work resources and shape their work environment, facilitating their tasks and enhancing job satisfaction. This implies that developing a professional identity at work may enhance employees' motivation and organizational involvement, ultimately resulting in job satisfaction [31]. However, the combined effects of these variables on nurses' job satisfaction remain unclear.

In conclusion, the literature review elucidates numerous personal factors influencing nurses' job satisfaction, with the majority of studies examining only one or two personal factors related to job satisfaction. No comprehensive study has investigated these factors collectively, nor has it been determined which of them exerts the greatest impact on job satisfaction. However, it is important to note that many of these factors possess subtle complexities that may be associated with different settings, geographical regions, and cultural values [32]. Furthermore, studies have indicated a decline in nurses' job satisfaction during the Covid- 19 pandemic [33]. If managers are to implement measures to improve job satisfaction, it is prudent to first address priorities, given the constraints of financial resources, nursing staff, and

limited time. Managers should recognize that strategies to enhance job satisfaction should be specific to culture and context. It is imperative to focus on human resource management factors, and the optimal source for determining priorities is the staff. Therefore, in this study, the impact of some of the most significant individual factors on job satisfaction will first be examined; subsequently, based on the nurses' own perspectives, the priority of these factors will also be determined to ensure that managerial efforts are directed towards reducing nurse turnover and creating an empowering environment that fosters job satisfaction within the contemporary healthcare conditions characterized by a shortage of human and financial resources. Consequently, this study aimed to elucidate the impact of personal factors (e.g., job engagement, professional identity, and motivation) on nurses' job satisfaction and prioritize the role of these variables using an analytic network process (ANP). ANP is a multi-criteria decision-making approach that is widely employed to address various real-world issues because it considers complex and interrelated relationships between variables [34]. Thus, this study can provide recommendations for the development of strategies that nursing managers and policymakers should comprehend and implement regarding factors that may influence job satisfaction and ultimately promote nursing care quality and nurse retention.

To achieve the aforementioned goals, this study seeks to address the following research questions:

1. Do nurses' personal factors influence job satisfaction?
2. What are the priorities of existing and effective factors affecting nurses' job satisfaction?

Methods
Design
This study employed applied research with a descriptive-correlational approach, emphasizing structural equations. Utilizing a formula that accounted for an anticipated attrition rate of 10%, 422 participants were selected from public hospitals in Tehran. A stratified random sampling method was employed to determine the proportion of nurses in each hospital. A stratified random sampling method was employed to determine the proportion of nurses in each hospital. Using this sampling method, the proportion of each hospital was determined based on the calculated sample size. The share of each clinical ward in each hospital was determined. In each ward, a random selection was conducted from the list of nurses, and self-administered instruments were distributed to the selected nurses. Data collection occurred between October and December 2023.

$$n \geq \left[\frac{\left(Z1 - \frac{\alpha}{2} + Z1 - \beta\right)}{0.5 \times \ln\left[\frac{1+r}{1-r}\right]} \right]^2 = 384 + 10\%\text{dropout} = 422$$

Correlation coefficient of 0.2, error factor of 0.05, beta coefficient of 0.1

Inclusion criteria stipulated a minimum of six months of work experience and full-time hospital employment. Participants with incomplete questionnaires were excluded from the study. The first and second authors distributed printed research instruments to participants at the commencement of each shift (morning, evening, and night) and collected them at the end of the shift. To mitigate potential bias, head nurses were absent during data collection, and responses were gathered in a single envelope to ensure confidentiality. Nurses were informed of anonymity, data confidentiality, questionnaire completion instructions, and the option to receive research results. An incentive package was offered to encourage participation.

Measures
This research employed 72-item Smith's Job Descriptive Index (JDI) to evaluate job satisfaction across five dimensions: supervision (18 items), pay (nine items), promotional opportunities (nine items), coworkers (18 items), and work itself (18 items). Each dimension includes a checklist of adjectives or adjective phrases, and respondents are asked to fill the blank beside each item as follows: "Y" (agreement), "N" (disagreement), and "?" (cannot decide). The scoring system was as follows: positive items received a score of 3, negative items received a score of 0, and the ? response was given a score of 1. Higher scores indicate greater job satisfaction [35].

For example, the "Pay" dimension in the index looks like this:

Think of the pay you get now. How well does each of the following words or phrases describe your present pay?

- --- Income adequate for normal expenses
- --- Fair
- --- Barely live on income
- --- Bad
- --- Comfortable
- --- Less than I deserve
- --- Well paid
- --- Enough to live on
- --- Underpaid.

Career motivation was assessed using the London Career Motivation Questionnaire, which consists of 21 items rated on a similar 5-point Likert scale [36]. Three examples of items in this questionnaire are: "I have realistic career goals," "I spend my free time on activities

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that enhance my job performance," and "I can resolve my work-related problems."

To measure professional identity, this study utilized a questionnaire developed by Hao et al., which comprised 17 items across five aspects: social modeling, independence of career choice, social comparison and self-reflection, benefits of retention and risk of turnover, and self-image on a similar 5-point Likert scale. Scores range from 17 to 85, with higher scores indicating stronger professional identity [37]. Three examples of the items in this questionnaire are: "I have a strong desire to pursue a nursing career," "I frequently plan my future professional development based on my interests, personality, abilities, and values," and "I have selected my preferred occupation regardless of external opinions."

The Utrecht Work Engagement Scale (UWES) was used to gauge job engagement, featuring 17 items across three subscales: vigor, dedication, and absorption. Scores range from 17 to 85, with higher scores indicating increased work engagement [38]. Three examples of the items in this questionnaire are: "At my job, I feel strong and vigorous", "I find the work that I do full of meaning and purpose", and "When I am working, I forget everything else around me."

The Persian version of the JDI was validated by Bastani et al., who confirmed its content and structural validity. Reliability was assessed using Cronbach's alpha, which ranged from 0.75 to 0.89 for various subscales [39]. Foroutani et al. translated the London Career Motivation Questionnaire into Persian and verified its construct validity using responses from 949 nurses, reporting a Cronbach's alpha of 0.76 [40]. Ehsani-Farid et al. translated and evaluated the psychometric properties of the nurses' professional identity questionnaire and confirmed its construct validity through confirmatory factor analysis among 310 nursing students. The questionnaire demonstrated acceptable reliability with a Cronbach's alpha of 0.81 and a composite reliability exceeding 0.85 [41]. Torabinia et al. translated the UWES- 9 S and validated it among 282 nurses using a confirmatory factor analysis. The internal consistency reliability for the total scale and subscales ranged from 0.76 to 0.89. The test-retest reliability was high ($r = 0.89$), and the intraclass correlation coefficient was 0.91. Engagement is negatively correlated with burnout [42]. In the present study, reliability was confirmed using Cronbach's alpha, yielding coefficients of 0.84 for job satisfaction, 0.87 for job motivation, 0.78 for job engagement, and 0.83 for nurses' professional identity.

Data analysis

To analyze the data in this research, descriptive statistics including mean and standard deviation, and inferential statistics, including structural equation modeling (SEM), prioritization, and weighting, were used with the Analytical Network Process (ANP) method.

The data were screened for respondent misconduct (e.g., multiple or extreme responses). These issues were not observed, and all responses were included in the analysis. Initially, the data were controlled for participant demographics (such as age and sex) and occupational characteristics (such as ward and years of experience) due to their potential relationship with dependent variables. The analysis revealed a nonsignificant association; thus, the model was estimated using the main study variables.

Structural Equation Modeling (SEM) is a widely recognized research technique that integrates Confirmatory Factor Analysis and Linear Regression to establish the relationship between the measurement and the structural model based on assumptions of a theoretical framework. The initial step involves assessing normality, with the measurement model's "Skewness and Kurtosis" values required to fall within the range of − 2 to + 2. Subsequently, it is essential to examine missing data, measurement and sampling errors, and model fit measures [43–45].

Analytic Network Process (ANP) is a decision-making approach for multiple criteria that utilizes pairwise comparisons to establish criteria weights and identify the optimal option. This technique also considers the internal relationships among decision-making components. The ANP method employs a supermatrix to illustrate the interactions and dependencies between decision-making levels, ascertain the relative importance of criteria, and rank options for the decision problem. A supermatrix is a partitioned matrix, where each element represents the relationship between two decision level elements in the overall decision issue. An unbalanced supermatrix depicts pairwise comparisons of criteria with potentially nonprobabilistic columns. The unbalanced supermatrix blocks are multiplied by the associated cluster priority to create a stochastic matrix (balanced matrix), with column sums equal to unity. This supermatrix is then raised to a power until there is no difference between the k and k + 1 exponent supermatrices [34]. To determine the final priorities, all the elements in each block of the resulting matrix were normalized, and the highest priorities were selected. SPSS- 23, AMOS- 26, and Super Decisions- 3.0, were used for data analysis.

Results

A total of 398 valid questionnaires were used in the final analysis. According to the descriptive indicators (Table 1), most of the participants were female, married, had 11 to 20 years of work experience, a bachelor's degree, and were permanent employees.

Table 1 Demographic and work characteristics of the study participants

Variable	Category	n (%)
Age	20–30	179(44.97)
	31–40	194(48.75)
	> 40	25(6.28)
Gender	Male	171(43.00)
	Female	227(57.00)
Years of work experience	1–10	132(33.17)
	11–20	173(43.47)
	21–30	93 (23.36)
Type of employment	Formal	245(62.00)
	Contract basis	153(58.00)
Education	B.SC.	247(62.10)
	MSc	140(35.20)
	Ph.D.	11(2.70)

Table 2 Variables characteristics of the study participants

Variable	Mean ± SD	Skewness	Kurtosis
Job Satisfaction	278.64 ± 8.26	0.43	0.47
Professional identity	62.90 ± 6.11	0.44	− 0.15
Job engagement	29.43 ± 3.23	− 0.25	0.20
Job motivation	70.14 ± 4.16	0.36	0.39

In addition, to check the descriptive information of the variables, the means and standard deviations of the studied variables were used, which are listed in Table 2.

The concept of model fit refers to the degree to which a model aligns with and adequately represents the relevant data. In this section, the suitability of the assumed model is evaluated to ensure its congruence with the research data. Subsequently, conclusions addressing the research question were derived. The assessment of the conceptual model's fit was conducted in two stages. The initial stage involved evaluating the fit of the measurement component of the model, followed by an assessment of the structural component's fit, which is elaborated upon below.

Figures 1 and 2 illustrate the non-standard and standard regression coefficient models of the research model, respectively. The standardized model is independent of the measurement scale, allowing for variable comparison; however, to assess their significance, it is necessary to revisit the regression weights model [43].

As depicted in Fig. 2, all standard regression coefficients exceed 0.4, indicating that all components and factors in this model are deemed acceptable. Furthermore,
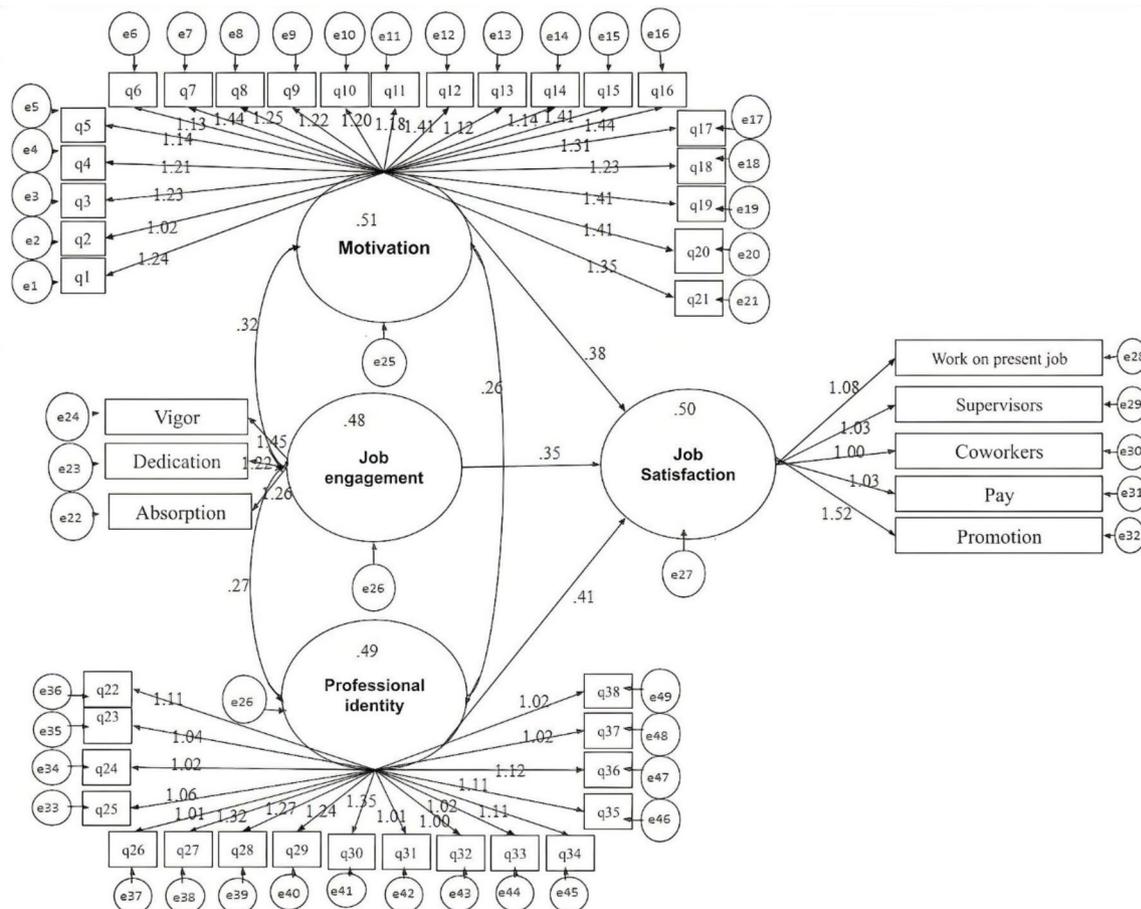
Fig. 1 Non-standard coefficients of job satisfaction, motivation, personal identity, and job engagement
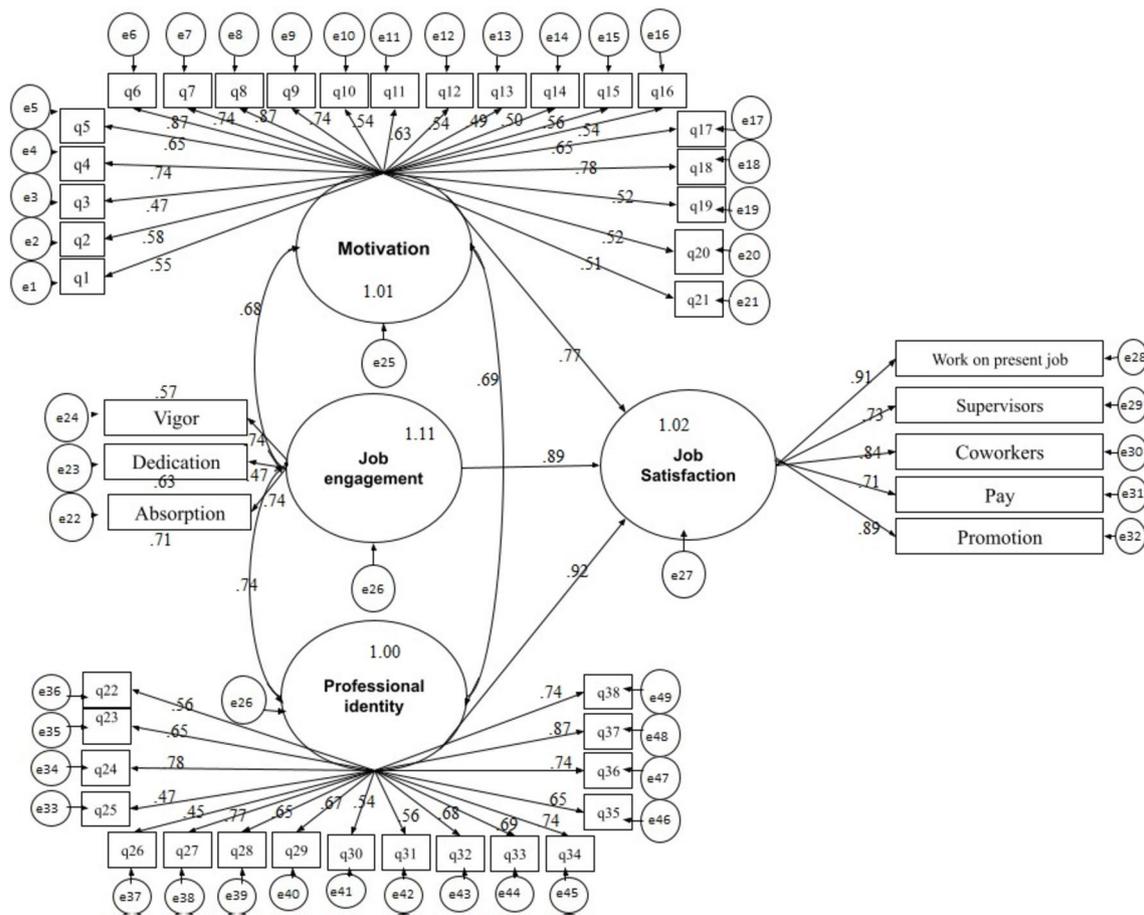
Fig. 2 Standard coefficients of job satisfaction, motivation, personal identity, and job engagement

this Figure shows a strong correlation (over 0.77) between motivation, job engagement, and professional identity with job satisfaction. To verify the model's validity, the indicators presented were examined.

The "Root Mean Square Error of Approximation" (RMSEA) represents the average of the residuals between the observed correlation/covariance of the sample and the expected model estimated from the population. According to Loehlin's recommendation, a value below 0.08 indicates a good fit. The "Comparative Fit Index" (CFI) and "Normed Fit Index" (NFI) are measures that assess the fit of the proposed model relative to the independent model (which assumes no relationship between the data). The "Goodness of Fit Index" (GFI) evaluates the relative amount of variances and covariances explained by the model. A notable characteristic of the GFI index is its independence from sample size. The range of these indices spans from zero to one, with values equal to or greater than 0.90 signifying a good fit. These indicators in the present model were as follows:

$$\chi^2 = 71.60, \text{ RMSEA} = 0.03, \text{ CFI} = 0.98,$$
$$\text{NFI} = 0.97, \text{ and GFI} = 0.92$$

Based on the values provided above, the model demonstrates validity, as all indicators fall within the desired range. Consequently, the presented model depicting the relationship between personal factors (motivation, professional identity, and job involvement) and nurses' job satisfaction exhibits the requisite validity.

The ANP method was implemented using Super Decisions software to weight and prioritize each factor. The general weight of each factor is expressed as follows. Figure 3 illustrates the general model of the ANP method for weighting factors, where B_1 to B_3 represent motivation, professional identity, and job engagement, respectively.

Results were generated for each cluster and the entire model. Due to the extensive nature of the operational results, only the final output of the model is presented. The final weights for the three factors are displayed in both normalized and graphical formats in Fig. 4.

As observed, B_2 (professional identity with a weight of 0.459) exhibits the highest weight and occupies the
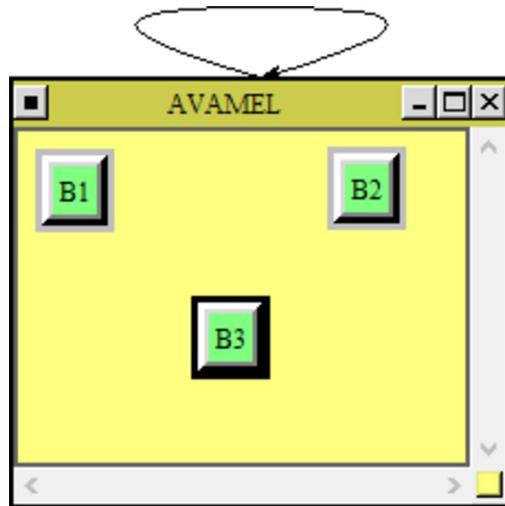
Fig. 3 ANP Method model for factors affecting job satisfaction of nurses: B_1 motivation, B_2 professional identity, and B_3 job involvement, respectively

primary position, followed by B_1 (motivation with a weight of 0.392) in the second position, and B_3 (occupational conflict with a weight of 0.147) in the third position.

Discussion

This research was conducted with the aims of determining and prioritizing the impact of personal factors (motivation, professional identity and job engagement) on the job satisfaction of nurses.

Professional identity has emerged as the predominant factor in job satisfaction. The study's model confirmed professional identity as a significant contributor to nurses' job satisfaction, aligning with findings from Mousazadeh et al. [1], Mainous et al. [46], and McCrae et al. [22], which demonstrated a substantial correlation between nursing professional identity and job satisfaction.

The formation of professional identity occurs when the values, beliefs, and convictions of a profession are internalized and assimilated by its members [47]. Nurses who recognize the significance of their profession, integrate their work identity into their personal and social

identities. They strive for excellence in their duties [48]. This may elucidate why nurses prioritize professional identity over other personal factors influencing job satisfaction. Previous research has also indicated that nurses' professional identity is the most crucial element in their performance [41, 49].

Khantimirov and Karande observed disparities in professional identity between developing and developed nations. In developed countries, employees typically benefit from superior compensation, higher social status, and better client relationships, fostering a stronger professional identity. Conversely, developing countries often offer low-skilled, poorly compensated positions with limited social status and career advancement opportunities [50]. The emphasis on professional identity in this study aligns with these observations. However, as this is the first study to examine priorities in nurses' job satisfaction, further research comparing nurses' professional identity and its importance in job satisfaction between developed and developing countries is warranted.

In ranking personal factors affecting nurses' job satisfaction, motivation secured the second position, with nurses perceiving it as more crucial than job engagement for enhancing their job satisfaction. The structural model also revealed a significant relationship between nurses' job motivation and satisfaction, consistent with findings from Schüler et al. [51].

Motivation is frequently considered the primary impetus behind human behavior [52]. Both theoretical and empirical research literature demonstrates a significant relationship between job motivation and satisfaction [25, 51]. It is noteworthy that the relationship between motivation and job satisfaction can be bidirectional, indicating that job satisfaction can increase motivation, and vice versa [53]. Job satisfaction can be enhanced through various motivational theories and techniques. Healthcare system leaders can implement strategies such as organizational support, assistance, and attentiveness to increase job motivation [28, 54]. While organizations play a significant role [55], for nurses, intrinsic affinity for their profession is crucial. For this reason, they may have given second priority to motivation. This internal drive propels nurses to perform efficiently, mitigating fatigue and

Icon	Name		Normalized by Cluster	Limiting
No Icon	B1		0.39267	0.392668
No Icon	B2		0.45954	0.459535
No Icon	B3		0.14780	0.147797

Fig. 4 The weight of each factor affecting nurses' job satisfaction

increasing dedication to their work [56]. Such motivation encourages nurses to strive for excellence, pursue education, and engage in continuous self-improvement [4].

Among the personal factors influencing nurses' job satisfaction, job engagement was ranked third in importance. Structural model analysis revealed a correlation between job engagement and nurses' job satisfaction, consistent with the findings of Orgambídez & Extremera [57], De Los Santos; Labrague [15], and Lynn Barden [16].

Job engagement reflects an individual's psychological identification with their work and its significance in their self-perception [58]. It can be considered as an integral component of one's identity [47]. High job engagement implies that an individual associates themselves closely with their role and views it as representative of their character [47]. Therefore, the engagement of nurses in their jobs is important for job satisfaction, and nurses should be periodically evaluated from this perspective [57].

In general, according to the findings, among the three personal factors examined in this research, the professional identity of nurses was more important than the other two factors for increasing nurses' job satisfaction, and this variable should be given more attention. Therefore, it is suggested that they be strengthened and improved by identifying factors that affect the nurses' professional identities, preferably using structural equation modeling studies. To improve professional identity, it is suggested that educational, occupational, personal and counseling, and information courses should be considered as group or personal intervention to improve the image of professional identity among nurses. Also, creating an atmosphere full of respect in the work environment by nursing managers and encouraging nurses to join professional nursing organizations and associations adds to the strengthening of nurses' professional identity. In the next ranks, motivation-based interventions or combined interventions aimed at promoting professional identity and job engagement or promoting professional identity along with motivation and job engagement can include the following: Policymakers, managers, and employees should work together to create a good professional image for employees. Also, in order to increase job engagement and job satisfaction through professional identity, it is suggested that managers implement soft skills training such as interactive communication, role-playing to manage emotional exchange, active listening, and trust-building exercises to increase job engagement and job satisfaction in the hospital. Also, by designing a reward system for employee success, improve their job satisfaction and engagement.

Limitation
Among the limitations of this study, we can refer to the cross-sectional nature of the research, which restricts the generalizability of the findings. longitudinal and intervention studies are needed to further validate the proposed structural models. Moreover, sampling was done on nurses working in hospitals in the capital, who may be different from nurses working in other cities in terms of job satisfaction. Conducting studies with larger sample sizes at the national level and comparing the perspectives of different nurses are strongly recommended. In addition, self-reporting may be one of the limitations of the research. Although the best method for measuring individual factors is self-reporting, honest responses may not have been provided despite the research units being assured of confidentiality and presenting the results in general. It is suggested that performance observation or auditing be considered alongside self-reporting. It should be noted that other confounding variables may influence the variables discussed in this study; therefore, conducting meta-analyses on all factors affecting job satisfaction and examining the effects of these variables is recommended.

Conclusion
The results of the research model showed that professional identity, motivation, and job engagement are significantly related to nurses' job satisfaction. Additionally, the fact that nurses recognize themselves as nurses and are proud of them can have a significant impact on their job satisfaction, and ultimately, their performance. Therefore, managers should consider designing, implementing, and supporting interventions to promote professional identity as a factor in increasing job satisfaction. This study has several theoretical implications. For instance, the present framework can be considered for developing a middle-range theory of nurses' job satisfaction. Additionally, nursing educators, based on the findings of this study, can emphasize the priority of professional identity in both the explicit and implicit curriculum of this field, relying on empirical evidence.

Authors' contributions
Mahdi Sahraei Beiranvand: Conceptualization, Software, Investigation, Methodology, Data curation, Writing- Reviewing and Editing, Writing- Original draft preparation. Raheleh Piri-Nargeseh: Methodology, Formal analysis, Data curation, Writing- Original draft preparation, Fatemeh Mohammadipour: Supervision, Project administration, Conceptualization, Methodology, Data curation, Writing- Reviewing and Editing.

Data availability
The data sets used and analyzed during this study can be provided from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
This methodological study was conducted in line with the current guidelines of the Declaration of Helsinki. The Ethical Code (IR.LUMS.REC.1401.110) was received from the Ethics Committee of the Lorestan University of Medical Sciences. Informed consent was obtained from all subjects. They have been ensured the privacy of data, and anonymously, the questionnaires have been filled out.

Consent for publication
No applicable.

Competing interests
The authors declare no competing interests.

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