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Psychometric Evaluation of Persian Version of Nurses' Intention to Care Scale (P-NICS) for Patients with COVID-19

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Background: Given the high incidence of coronavirus and the shortage of nurses in Iranian hospitals, nurses' intention to care for patients with COVID-19 is important. The aim of this study is to evaluate the reliability and validity of the Persian version of the nurses' intention to care scale (NICS) by Iranian nurses who care for patients with COVID-19 in hospitals.

Methods: A cross-sectional study was conducted on nurses (n= 400) at public and private Mazandaran hospitals. An online questionnaire was used that consisted of two parts: demographic variables and NICS. The scale was translated into Persian first and then validated using both construct and content validity.

Results: The findings from an exploratory factor analysis yielded six factors that explained 53.12% of the total variance of the NICS. The confirmatory factor analysis demonstrated that the model had a good fit and the inter-item correlation values of the factors indicated good internal consistency.

Conclusion: The Persian version of NICS in Iranian nurses had six factors. The results of our study add insight for nurse administrators and educators to further develop strategies to increase nurses' intention by improving positive attitudes and reducing their negative beliefs.

Keywords: COVID-19, intention, nursing care, reliability, theory of planned behavior, validity

Introduction

Most countries in the world are fighting a disease called COVID-19. It began in Wuhan city, located in the Hubei Province of China. COVID-19 has flu-like symptoms, including fever, dry cough, myalgia, and dyspnea[1] based on a WHO report, it infects people of all ages. However, older people and those with underlying medical conditions such as cardiovascular disease, diabetes, chronic respiratory disease, and cancer are at especially high risk of developing severe pulmonary conditions requiring prolonged treatment on ventilators.[2] The virus was identified as genus beta-coronavirus, placing it alongside other Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS), but compared with SARS and MERS, COVID-19 has spread more rapidly and the mortality rates are higher.[3]

Iran is one of the countries with a very high incidence of coronavirus so that according to the World Health Organization (WHO) to date 7 July 2020, 243,051 total confirmed cases and 11,731 total deaths were reported.[4] Under these stressful medical and social conditions, health care providers face many challenges: a sudden rise in workload, high risk of infection for themselves and their families, and especially

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because of inadequate protective equipment. Among health care providers, nurses have a great responsibility for patients with COVID-19 and are at the front lines in the fight to COVID-19 among other members of the healthcare system.[5] They are under extreme stress and experience psychological conflict between their duties as nurses and their concern for their own safety. Nurses have direct and prolonged contact with these patients, and any lack of personal protective equipment (PPE) and inefficient crisis management will affect them in providing care. During the SARS outbreak, health care workers were at highest risk of infection; however in Taiwan, 42.7% of nurses reported having positive intentions to provide care to patients with SARS.[6] Despite the shortage of facilities and difficulties in caring for these patients, uncomfortable conditions such as the use of face masks and protective clothes, they continued to care and did not quit their jobs.[7] Nursing patients with COVID-19 is affected by external factors (facilities, crisis management, incentives, and organizational support) as well as internal factors (motivation, spirituality, humanitarian actions).[8–10] Indeed, one way to retain existing nurses in the hospital is attention to their needs such as providing sufficient and adequate PPE, and providing up-to-date continuing education for nurses may help to reinforce nurses' self-efficacy in caring for such patients.[6]

The term intention is defined as purposeful and prompt action. In the nursing literature, "intention" implies providing holistic nursing care with love.[11] This concept also incorporates the Theory of Planned Behavior (TPB), where intention is defined in terms of trying to perform a given behavior rather than in relation to actual performance". Intentions are assumed to be motivational factors that influence the behavior and consist of attitudes toward the behavior, subjective norms, and perceived behavior control.[12] Many studies have used these theories to examine nurses' intentions with respect to specific practices, and several scales have been designed to measure this concept.

To the best of our knowledge, there are no studies about nurses' intention to care for patients with COVID-19 and the literature regarding nursing intention to care focuses on intention to care for patients with SARS,[6] H1N1 influenza,[13] a high-risk pathogen that infected patients.[14] Most of them use similar scale to measure nurses' intention that was developed by Yoo et al (2005) in the prediction of nurses intention for caring patients with SARS, where the authors identified the following six factors; positive behavioral beliefs, negative behavioral beliefs, positive social norms, negative social norms, positive control beliefs and negative control beliefs.[15]

A reliable and valid scale would help to explore how these factors influence the nurses' intention to care for patients with a COVID-19 diagnosis. Given, that most Iranian hospitals are facing a shortage of nurses;[16] in this situation nurses' intention to care for patients with COVID-19 is critically important to the healthcare system. Because of the similarity of SARS to COVID-19 disease, the questionnaire by Yoo et al (2005) was used in this study. The aim of this study is to evaluate the reliability and validity of a Persian version of the Nurses' Intention to Care Scale (P-NICS) in Iranian nurses who care for patients with COVID-19 in hospitals.

Materials and Methods

This is a cross-sectional study was conducted among Iranian nurses in hospitals affiliated by Mazandaran University of Medical Sciences in March 2020.

Sample Size

The minimum sample size for factor analysis was estimated using "a rule of thumb approach" in which 400 subjects were considered adequate.[17] Given the scale has 40 items this would provide 10 subjects per item.

Setting and Procedure

Mazandaran province is an Iranian province located along the southern coast of the Caspian Sea. According to the high prevalence of coronavirus in Mazandaran Province, all public and private hospitals admitted patients with symptoms of COVID-19. Given the infectiousness of this virus, to avoid nosocomial transmission of COVID-19, an online data collection with convenience sampling method was performed for this study. The questionnaire itself took approximately 10 min to complete. The P-NICS created via Google Forms and its URL link was sent to nurses through a social networking application such as Telegram channel or WhatsApp. Thus, all nurses who work in hospitals could be included in this sample. Data were extracted in the Excel file from Google Forms and prepared for analysis.

Measurements

The questionnaire consists of two parts. First, the demographic information included: age, gender, marital status, years of work experience, and education (bachelor or master degree). Also, one question asks nurses about their attitude toward caring for patients with COVID-19;

the response options consist of a seven-point Likert scale, ranging from 1 (Strongly did not want to) to 7 (strongly will). The second part was Yoo et al nurses' intention scale based on Ajzen's TPB.[12] The questionnaire was developed in four phases, the beliefs of 43 nurses, content validity, face validity and construct validity.[15] In this study, the nurses' beliefs of Yoo et al study was used; it consisted of three domains: (1) behavioral beliefs (14 items), (2) subjective norms beliefs (8 items) and (3) control beliefs (18 items) using a seven-point Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agree).

Analysis Methods
Content Validity
Content Validity Ratio (CVR) and Content Validity Index (CVI) for the P-NICS items were calculated by ten faculty members with expertise in psychiatric nursing. When the number of experts is 10, the minimum acceptable CVR based on Lawshe is equal to 0.62.[18]

Construct Validity
Construct validity of P-NICS was evaluated through the Maximum Likelihood Exploratory Factor Analysis (EFA) with Promax rotation on the first set of 200 responses for EFA. The Kaiser–Meyer–Olkin test and Bartlett's test of sphericity were used to check the appropriateness of the study sample and the model. The number of factors was determined based on Horn's parallel analysis.[19]

The presence of an item in a latent factor was determined based on a factor loading of almost 0.33, which was estimated using the following formula: $CV = 5.152 \div \sqrt{(n-2)}$, where CV was the number of extractable factors and n was the sample size. Next, the items with communalities less than 0.2 were excluded from EFA.[20] Also according to the three indicator rule having factorability, at least three items must exist for each factor.[21] For assessment of the structural factors, confirmatory factor analysis (CFA) was conducted using the maximum-likelihood method and the most common goodness of fit indices. The model fitness indicators were accepted according to Root Mean Square of Error of Approximation (RMSEA< 0.08), Comparative Fit Index (CFI> 0.9), Parsimonious Comparative Fit Index (PCFI> 0.5), Parsimonious Normed Fit Index (PNFI > 0.5), Incremental Fit Index (IFI > 0.9) and CMIN/DF (< 3).[22]

Convergent and Discriminant Validity
The convergent and discriminant validity of P-NICS were estimated using Fornell and Larcker's approach and

through Average Variance Extracted (AVE), Maximum Shared Squared Variance (MSV) Composite reliability (CR). An AVE of more than 0.5 reflects suitable convergent validity and an AVE greater than MSV confirm discriminant validity.[23]

Reliability Assessment
Internal consistency of P-NICS was assessed by the Cronbach's alpha (α), McDonald's omega (Ω), Average Inter-Item Correlation (AIC) Coefficient's, CR (which replaces Cronbach's alpha coefficient in structural equation modeling)[24] and Maximal Reliability H (the value of > 0.7 was considered good).[22] Also, AIC 0.2 to 0.4 was considered as a good internal consistency.[25]

Multivariate Normality and Outliers
Univariate distributions were examined for outliers, skewness, and kurtosis. Multivariate distributions were evaluated for normality and multivariate outliers. Multivariate normality can be evaluated through the use of the Mardia's coefficient of multivariate kurtosis. One indication of deviation from normal distribution was a Mardia's coefficient > 5. Multivariate outliers were evaluated through the evaluation of a Mahalanobis distance. Items with a Mahalanobis distance of $p<0.001$ were considered to be multivariate outliers.[26,27]

All of the statistical procedures were analyzed by SPSS-AMOS$_{24}$, JASP $_{0.13.1.0}$, and the SPSS R-Menu $_{2.0}$.

Ethical Consideration
The following information was included in the informed consent: the introduction of the questionnaire; the study aims, number of items, The average completion time of the questionnaire, the researcher's affiliation and email address for queries, ethical code of study conduct, the voluntary nature of participation and using anonymous responses in research by the research team to protect confidentiality. The questionnaire items are not viewed by the participant until they agree to participate and click on the "next button." Also, the completion of the survey by the participants is considered informed consent. The questionnaire items are not viewed by participant until they agree to participate and click on "next button". The protocol of this study was approved by the Mazandaran University of Medical Sciences Research Ethics Committee (IR.MAZUMS.REC.1399.7298).

Results
The mean and standard deviation for the age of 400 nurses and years worked as a nurse were 33.6 (±7.9)

Table 1 Demographic Characteristics of Participants (n=400)

Variables	N (%)
Gender	
Female	283(70.8)
Male	117(29.3)
Marital status	
Single	170(42.5)
Married	230(57.5)
Education level	
Bachelor	343(85.8)
Master/PhD	57(14.2)

provide nursing care to patients with a COVID-19 diagnosis.

In MLEFA, KMO test value was 0.84 and Bartlett's test value was 3588.89 ($P < 0.001$). MLEFA revealed a six-factor structure for P-NICS. The eigenvalues and percent of variances of these six factors are shown in Table 2. These six factors explained 53.12% of the total variance of the P-NICS in Iranian nurses who cared for patients with COVID-19.

Given that CFA findings, all goodness of fit indices confirmed the model fit (χ^2 = 688.76; n = 250; df= 418, $P < 0.001$; CMIN/DF = 1.64, PCFI = 0.82; PNFI = 0.73; RMSEA = 0.06 (CI 90%: 0.05, 0.06); IFI = 0.92, and CFI = 0.91 (Figure 1).

The Cronbach's alpha, McDonald's omega, CR, and maximal reliability of six extracted factors of the P-NICS

and 10.12 (±8.2) years respectively. Other demographic characteristics of nurses are shown in Table 1. Also, 20.5% of nurses responded strongly that they would

Table 2 Exploratory Factors Extracted from 40 Items of P-NICS (n=200)

| Factors	Q_n. Item	Factor Loading	h^2	Eigenvalue	%Variance
Positive behavioral beliefs	6. I would increase my self-efficacy	0.915	0.815	3.679	11.871
	7. I would have new knowledge	0.877	0.721		
	8. I would be a god role model	0.821	0.721		
	5. I would have a new experience	0.810	0.665		
	4. People acknowledge my efforts	0.728	0.472		
	9. It would be a good career	0.337	0.471		
	1. Patient can be cure by my care	0.308	0.293		
Positive control beliefs	36. A professional responsibility	0.840	0.663	3.190	10.295
	38. Prevention from further infection	0.834	0.683		
	37. Empathy for COVID patients	0.828	0.718		
	34. Duty to care	0.711	0.494		
	39. Peer support	0.591	0.492		
	40. Patients right to being cared	0.495	0.305		
Negative control beliefs	28. Fear of infection	0.849	0.748	2.710	8.745
	26. Contagious disease	0.805	0.597		
	24. Fear of death	0.723	0.446		
	27. Job overload	0.687	0.593		
	29. Inconvenience with mouth mask/PPE	0.419	0.426		
	31. Isolation during caring	0.408	0.497		
Family subjective norms	21. Sisters & brothers	0.989	0.918	2.681	8.652
	20. Parents	0.968	0.889		
	22. Spouse	0.658	0.506		
	19. Friends	0.752	0.451		
Work subjective norms	16.Senior nurses	0.859	0.743	2.311	7.457
	18. Colleagues	0.773	0.725		
	17.Physician	0.757	0.542		
	15. Head nurses	0.625	0.417		
Negative behavioral beliefs	13. I would not have enough vacation	0.826	0.649	1.890	6.101
	14. I would not have extra bonus	0.758	0.527		
	11. I would transmit COVID to my family	0.595	0.464		
	12. I would be isolated	0.519	0.303		
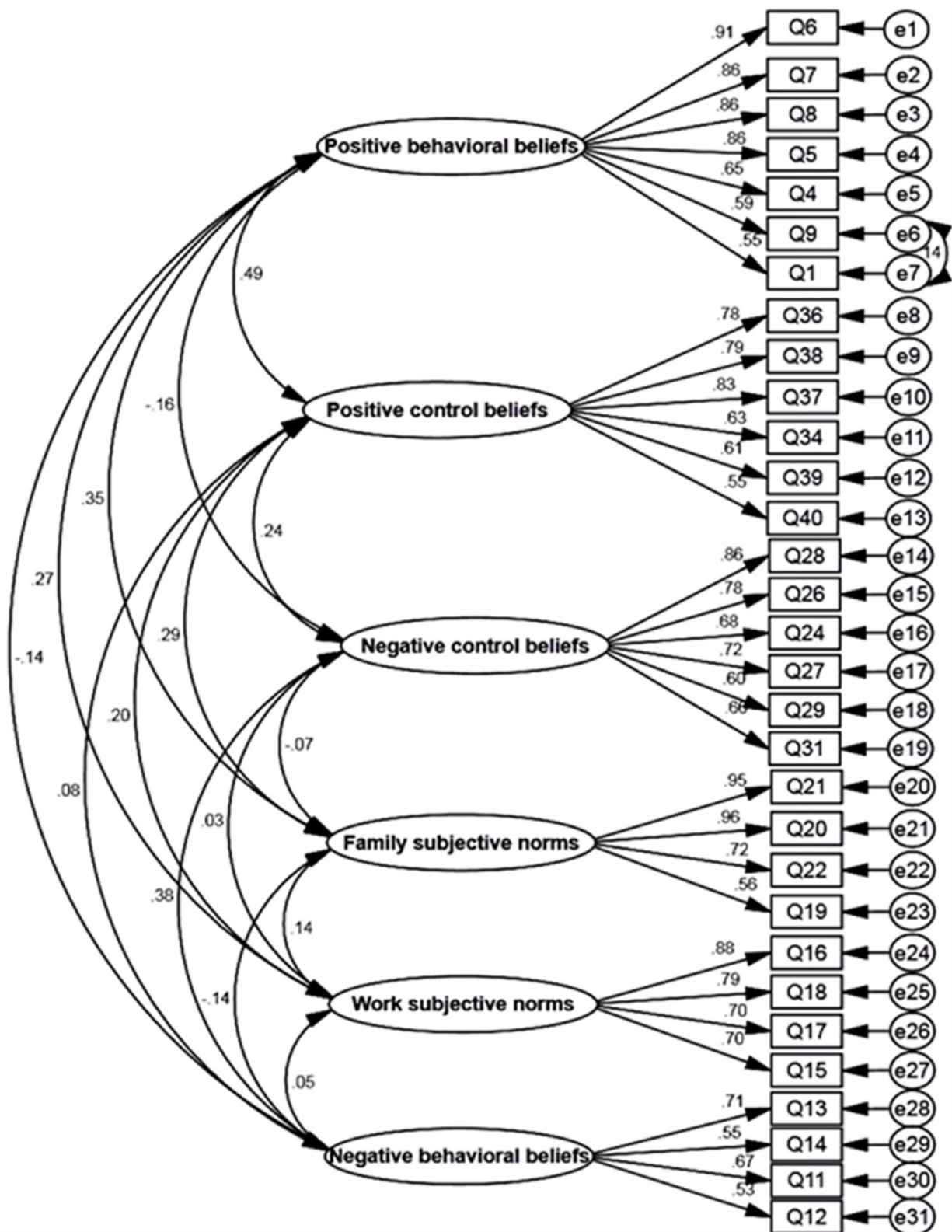
Figure 1 Model of confirmation factor analysis of P-NICS.

Table 3 Composite Reliability, Convergent and Discriminant Validity, and Internal Consistency Indices of the P-NICS (n=200)

Indices / Factor	CR	AVE	MSV	MaxR(H)	α (CI95%)	Ω	AIC
Positive behavioral beliefs	0.89	0.55	0.25	0.93	0.896 (0.881 to 0.909)	0.906	0.567
Positive control beliefs	0.87	0.53	0.25	0.89	0.845 (0.822 to 0.865)	0.853	0.483
Negative control beliefs	0.85	0.50	0.17	0.87	0.858 (0.838 to 0.876)	0.865	0.511
Family subjective norms	0.88	0.65	0.12	0.95	0.867 (0.847 to 0.875)	0.882	0.621
Work subjective norms	0.84	0.57	0.15	0.86	0.850 (0.827 to 0.870)	0.853	0.588
Negative behavioral beliefs	0.75	0.43	0.17	0.78	0.702 (0.657 to 0.743)	0.709	0.371

were excellent (0.8<). Also, the AIC values of factors were good. Regarding convergent and discriminant validity, the AVE of factors was more than MSV and shows that six factors have good convergent and discriminant validity. Composite reliability, convergent and discriminant validity and internal consistency indices of the P-NICS are given in Table 3.

Discussion

The results of the present study support a six-factor structure of P-NICS where 31 items explained 53.12% of the total variance of the nurses' intention to care in the Iranian context. This is the first valid and reliable scale about nurses' intention to care for patients with COVID-19. In the Yoo et al study, with PCA six factors explained 68.2% of the total variance.[15] Considering that scales with higher variance are more desirable in explaining the concept, it should be noted that EFA focuses on the shared variance of the variables; whereas PCA focuses on the total variation among the variables; thus, the percentage of extracted variance of PCA will be greater than EFA.[28]

The internal consistency of items of the P-NICS was good, and the high level of Cronbach's alpha signifies the internal consistency suitability of the scale and the correlation between the items. Also, the CR of the scale was evaluated with CFA and demonstrated acceptable reliability of the P-NICS. One of the advantages of measuring CR is that this estimate is not affected by the number of scale items and obtained structure and is dependent on the actual factor loading of each item of the latent variables.[29] The CR value of this scale was calculated in this study for the first time.

Based on EFA results the P-NICS consists of six factors namely positive behavioral beliefs (PBB), positive control beliefs (PCB), negative control beliefs (NCB), family subjective norms (FSN), work subjective norms (WSN) and negative behavioral beliefs (NBB).

In this study, the first factor is PBB which addressed positive beliefs in the outcomes of caring for patients with COVID-19. Iranian nurses reported that increasing self-efficacy, gaining new knowledge, and "to be a good role model" are positive beliefs that Lee et al identified as behavioral beliefs that bring about attitudes toward the behavior.[30] Indeed, nurses had a positive attitude towards caring for patients and an increased desire to care and be providing nursing care involved for these patients.

The second factor of PCB is control beliefs that are the beliefs that nurses have about how easy or difficult it will be to care for patients. Iranian nurses reported that professional responsibilities, prevention from further infection, and empathy for patients with COVID-19 are positive control beliefs that affect nurses' intentions. "Perceived control belief" was the most significant variable among predictor variables in nurses' intention to care for patients with emerging infectious diseases in Lee et al study.[30]

The third factor was the NCB. It related to the negative beliefs of nurses about caring for patients with COVID-19. Because of the dangerous nature of the COVID-19 disease, items such as fear of infection and death or contagious disease are negative beliefs that decrease nurses' intention to care. Ko et al stated that although nurses have a commitment to providing the best care for patients with this life-threatening illness; however, they have concerns about staying away from their homes, fearing that they might spread the disease to their families and friends during the SARS epidemic.[6]

In this study, two factors of FSN and WSN are about subjective norms of TPB that are reflective of a nurse's beliefs about the expectations of significant others regarding the performance of particular behaviors. In the FSN factor, the nurses demonstrated that their family and friends supported them in caring for patients with COVID-19. Nurses distinguished the two factors of FSN and WSN, and they reported the hospital colleague's role

in their caring intention as another factor (WSN). Sun Young et al (2015) assessed the nurses' intentions to care for patients with New Influenza-H1N1. Among the predictors, subjective norm had the greatest effect on the intention to care. The nurses with higher subjective norms and more positive perceived behavioral control reported higher intentions.[13] However, in the study by Lee et al (2020) that investigated factors that influence nurses' intention to care for patients with emerging infectious diseases, subjective norms did not explain nurses intentions.[30]

The last factor is NBB, and it referred to negative beliefs on the outcomes of caring for patients with COVID-19. Nurses demonstrated that some items like "not having enough vacation or extra bonus," and "being isolated" were negative attitudes toward caring for patients with COVID-19. Ko et al stated that nurses' intention to care was predicted by their attitudes and reinforcement of nurses' positive attitudes could be achieved through verbal expression of approval and support from nursing administrators, or substantial rewards such as special compensation payments could be used to encourage and acknowledge nurses for their efforts.[6]

In general, Iranian nurses like nurses in other countries, face difficulties such as infection control, patient acute illness, and increased nursing workload in caring for COVID-19 patients.[7] A valid and reliable scale helps to assess nurses' viewpoints and accurately measure their intention to identify the effective factors.

Limitation

The subjects were recruited from one province in Iran; therefore the generalizability of the study may be a limitation. Since P-NICS explores 53.12% of the total variance, further studies with qualitative methods may be needed to explore nurses' intention to care for patients with COVID-19. Although there were advantages to using an online questionnaire in the COVID-19 outbreak; we should point out that selection bias, lack of physical interaction, inability to verify an individual's status, or the veracity of their responses were limitation of this online survey.

Conclusions

The findings of this study highlight that the P-NICS in Iranian nurses have 31 items and six factors which explain more than half of the variance of the concept. The P-NICS has good reliability, internal consistency, and constructs validity to identify nurses' intention to care for patients

with COVID-19. Nurses have close contact with patients with COVID-19 and therefore the identification of predictors of nurses' intentions can be very useful to hospitals managers and policymakers. Improving self-efficacy, knowledge of nurses is helpful during the COVID-19 pandemic. During this COVID-19 pandemic, nurses need support. The results of our study add insight for nurse administrators and educators to further develop strategies to increase nurses' intention by encouraging positive attitudes, taking all necessary steps to ensure that nurses and their families have the necessary PPE to be safe. Also, the motivated nurses need to have their negative beliefs reduced, and providing sufficient PPE, managing job overload and financial aid are all beneficial.

Disclosure

The authors report no conflicts of interest in this work.

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