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# Psychometric Proprieties of the Arabic Version of the Perceived Preoperative Nursing Care Competence Scale for Nursing Students (PPreCC-NS)

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ABSTRACT

***Background:*** Enhancing the quality of patient treatment and safety relies heavily on nursing students' preoperative competence, making it an essential component of their education. The Perceived Preoperative Nursing Care Competence Scale for Nursing Students (PPreCC-NS) has been created in English to assess the preoperative competence of nursing students. Hence, translation and evaluation of the psychometric proprieties of the PPreCC-NS scale in the Arabic context are pivotal. ***Purpose*:** To examine the psychometric proprieties of the Arabic version of the Perceived Preoperative Nursing Care Competence Scale for Nursing Students (PPreCC-NS). ***Methods*:** A descriptive, cross-sectional study was carried out on 202 nursing students using an online questionnaire. The students' selection was based on the probability simple random sampling technique. The international guidelines were followed in the translation of the PPreCC-NS. The psychometric proprieties and internal consistency were assessed using exploratory factor analysis and reliability tests. ***Results*:** Five factors were extracted by the exploratory factor analysis, with 22 final items. The obtained factor structure explained 62.71% of the variance. The Cronbach's alpha coefficients for the five domains ranged between 0.70 and 0.85, whereas the overall Cronbach's alpha coefficient for the scale was greater than 0.7. ***Conclusion*:** The translated questionnaire demonstrated valid and reliable psychometric properties when administered to nursing students. The translated preoperative nursing care competence measure for nursing students is thought to be used to assess perceived preoperative nursing students' competence in the Arab region. ***Implications for Nursing*:** The findings could be valuable for nursing educators, nursing managers, and decision-makers in devising efficient strategies to improve preoperative nursing care. Further research studies are essential to understand factors influencing the level of understanding among nursing students in relation to preoperative nursing care.

***Keywords:*** Preoperative care, Competence, Nursing students, Exploratory factor analysis, Psychometric proprieties.

**What does this paper add?**

1. This study serves as a guide in assessing the perceived level of preoperative nursing care competence among nursing students.
2. This study will help nursing educators in determining which areas of preoperative nursing care need greater focus in designing better educational programs for nursing students.

## Introduction

Preoperative care refers to care provided physically and psychologically to prepare a patient for safe surgery (Johnstone, 2020). It begins with the decision to undergo surgery and ends with the start of surgery (Chintale,

2021). Preoperative care aims to identify potential risk factors that may result in postoperative complications for patients (Durmaz Edeer et al., 2019). Prior to surgery, patients should be adequately prepared physically, physiologically, and emotionally, in order to facilitate an effective recovery after the surgery (Iqbal et al., 2019). Surgery outcomes are more positive for patients who are physically and mentally prepared for the procedure (Elkalashy & Masry, 2018). The competency of nurses in the preoperative area immediately affects their capacity to perform their tasks and duties in the preoperative care process (Nestler, 2019; Suganandam, 2019). However, for accurate diagnosis of patient conditions and for predicting and dealing with problems that may arise within the course of nursing care, students require highly specialized competencies (Nehrir et al., 2016).

Nursing competency refers to an individual's consistent utilization of the necessary information, skills, and judgment to ensure safe, ethical, and effective nursing practice (Moghabghab et al., 2018). Various theoretical frameworks have led to the development of universal instruments for assessing perceived competence in nursing (Yu et al., 2022).

Examples are: The Competency Inventory for Registered Nurses Scale (Liu et al., 2009); the Nurse Competence Scale (Meretoja et al., 2004); the Perceived Perioperative Competence Scale-Revised (Gillespie et al., 2012, 2023); the Holistic Nursing Competence Scale (Takase & Teraoka, 2011). However, the competence assessment with these common tools was limited, given the inability to accurately assess clinical practices specialized to the distinctive areas of nursing (Şimşek et al., 2023). In addition, there is no valid and reliable Arabic instrument to measure the nursing students' competence regarding preoperative patient care available. Therefore, translation and psychometric testing for perceived preoperative nursing care competence scale are actually needed.

Several Arab countries have initiated the establishment of new nursing education programs, encompassing both advanced and specialty nursing schools, in order to meet the increasing need for skilled nurses and midwives. The growing number of nursing programs in Arab nations has been driven by the need to meet the demand for nurses (Sweileh et al., 2019). However, the number of Arabic speakers worldwide is more than 400 millions (UNESCO, 2022). Also, approximately 27 million men and women work as nurses and midwives worldwide (WHO, 2022). In addition, within the World Health Organization's (WHO) Eastern Mediterranean Region, nurses and midwives make up more than a half of the health workforce (WHO EMRO, 2022). Furthermore, approximately 5318 nursing students attend 14 nursing schools and 33 governmental hospitals in Jordan (Jebreel et al., 2017). These factors confirm the importance of translation and psychometric testing of the measurement tool. Therefore, this study aims to examine the psychometric proprieties of the Arabic version of the Perceived Preoperative Nursing Care Competence Scale for Nursing Students (PPreCC-NS).

## Methods

### Design and Settings

This methodological study used a descriptive cross-sectional online survey approach to examine the psychometric properties of the Arabic version of (PPreCC-NS). Three phases were used to translate and psychometrically assess the instrument in this study, including translation, exploratory factor analysis, and reliability.

The study was conducted in Al-Balqa Applied University (Irbid University College), within the nursing school, on students studying nursing and midwifery.

### Participants

The sample was recruited using the probability simple random sampling technique. The inclusion criteria were ability and willingness to participate in the study, being students 18 years old or older, males and females, receiving education on preoperative nursing care, and possessing the ability to read and understand Arabic.

The estimated sample size was determined based on the theory that suggests a factor analysis sample size should be from 5 to 10 times the number of scale items (Wu, 2010). Therefore, a sample size of at least 110-220 participants would be considered ideal, because the scale used in this study consists of 22 items.

### Ethical Considerations

Data collection was authorized by Al-Balqa Applied University's Institution Review Board (IRB) under the reference number (1067/2/3/26). The participants' consent was gained through an online platform. The

researchers explained the objectives of this study and provided a clear explanation of the anticipated outcomes. Participants were informed that their involvement was voluntary, and that they had the ability to withdraw from it at any time without providing a reason and without facing any consequences. Also, the participants were provided with guarantees that their answers would remain confidential.

**Perceived Preoperative Nursing Care Competence Scale for Nursing Students (PPreCC-NS)**

The first section of the instrument consisted of demographic information, including (age, gender, academic year, cumulative GPA, housing method, and location of residence). The second session is the Perceived Preoperative Nursing Care Competence Scale for Nursing Students (PPreCC-NS), which was developed by Simsek et al. (2023). It consists of 22 items that encompass five distinct domains:(5) items in the subdimension of ability to fulfill legal responsibilities and adherence to ethical principles, (5) items in the subdimension of evaluation and follow-up of the patient, (4) items in the subdimension of preoperative patient preparation, (4) items in the subdimension of communication, and (4) items in the subdimension of research and professional development (Şimşek et al., 2023).

The response is assessed using a 5-point Likert scale ranging from "1" representing strong disagreement to "5" representing strong agreement. The total score is computed by summing the responses for each item. The minimum and maximum attainable scores are 22 and 110, respectively. The score obtained from this scale directly correlates with the perceived competence level of nursing students in providing preoperative care. A higher score implies a higher degree of perceived competence (Şimşek et al., 2023).

This scale serves as a valid and reliable evaluation tool for assessing the perceived competency of nursing students in preoperative nursing care (Şimşek et al., 2023). Confirmative factor analysis revealed that the PPreCC-NS fit index values have been found to be higher than the acceptable limits. The internal consistency Cronbach's alpha scores ranged from 0.79 to 0.96 for the scale's subdimensions and amounted to 0.94 for the whole scale (Şimşek et al., 2023).

**Translation of the PPreCC-NS Questionnaire**

The translation process for the instrument includes forward and back-translation to ensure content and semantic validity (Brislin, 1970). The 22 items in the original English PPreCC-NS questionnaire are divided into five domains. Two qualified translators translated the PPreCC-NS into Arabic, and two further qualified translators back-translated it, and approved the content and format.

**Data-collection Methods**

The probability simple random sampling technique was used to select the study participants. The study tool consisted of a self-administered questionnaire. Demographic data, and the primary questionnaire were obtained. Google Forms were used to collect the data, which was then extracted as an Excel file. Google Form link contains study questionnaires and was shared by the researchers to the study participants who met the inclusion criteria through Microsoft Teams class. The data collection extended from July 3, 2023, until August 7, 2023. All responses received through the online Google Forms were totally anonymous, with no collection of any identifying information. Also, to ensure the anonymity of the participants, the data from the completed questionnaires was coded, and only the researchers had access to it. Finally, all the data was kept in a password-protected computer.

**Data Analysis**

Data analysis was conducted using the Statistical Package for Social Sciences (SPSS, version 26). The demographic data was analyzed using descriptive statistics, including measures such as mean, standard deviation, frequency and percentage to provide a comprehensive overview of the data based on the level of measurement.

Exploratory factor analysis, which examined factor loading and correlations between factors as well as individual items, was used to determine the construct validity, using the Varimax rotation technique to the principal component method, while considering eigenvalues greater than 1.0. The suitability of the data for factor analysis was assessed by the Kaiser-Mayer-Olkin (KMO) sample sufficiency measure and the Bartlett's sphericity test.

**Results**

The questionnaire was distributed to 206 nursing students. A total of 202 students completed the

questionnaire for the study, resulting in a response rate of 98%. The mean age for participating students was (*M* = 20.83, *SD* = 2.32). More than two-thirds of the participants (n = 154, 76.2%) were females. Also, most of the participants were second-year nursing students (n=103, 51%). In addition, the mean cumulative GPA for participating students was (*M* = 70.3, *SD* = 6.65). Furthermore, there were 106 students (52.5%) who lived in villages. Moreover, the majority of participants 193 (95.5%) lived with their families. Table 1 illustrates the participants' demographic characteristics.

**Table 1. Participants' demographic characteristics**

| Variable | Categories | *F* | *%* | *M* | *SD* |
|---|---|---|---|---|---|
| **Age** | | | | 20.83 | 2.32 |
| **Gender** | Male | 48 | 23.8 | | |
| | Female | 154 | 76.2 | | |
| **Academic year** | First Year | 88 | 43.6 | | |
| | Second Year | 103 | 51 | | |
| | Third Year | 11 | 5.4 | | |
| **Cumulative GPA** | | | | 70.3 | 6.65 |
| **Location of residence** | Town | 96 | 47.5 | | |
| | Village | 106 | 52.5 | | |
| **Housing method** | With Family | 193 | 95.5 | | |
| | With Friends | 2 | 1 | | |
| | With Students | 2 | 1 | | |
| | Alone | 5 | 2.5 | | |

*N = 202.*

**Reliability for the PPreCC-NS Arabic Version Before EFA**

The sub-dimensions of the scale's Cronbach's alpha values were determined to be between 0.75 and 0.81, and the overall scale's Cronbach's alpha value was 0.91 (Table 2).

**Table 2. Cronbach's alpha for perceived preoperative nursing care competence scale for nursing students (PPreCC-NS) before EFA**

| Subscales | Number of Items | Items | Score range | Cronbach's alpha |
|---|---|---|---|---|
| **Ability to fulfil legal responsibilities and adherence to ethical principles** | 5 | 1,2,3,4,5 | 1–5 | 0.78 |
| **Evaluation and follow-up of the patient** | 5 | 6,7,8,9,10 | 1–5 | 0.81 |
| **Preoperative patient preparation** | 4 | 11,12,13,14 | 1–5 | 0.78 |
| **Communication** | 4 | 15,16,17,18 | 1–5 | 0.79 |
| **Research and professional development** | 4 | 19,20,21,22 | 1–5 | 0.75 |
| **Overall** | | | | 0.91 |

*N = 202.*

**Exploratory Factor Analysis**

To determine sample sufficiency, data was first evaluated using Bartlett's test of sphericity ($p < 0.001$, $\chi 2 = 2100.662$, and [KMO] = 0.874). The best possible model was then determined by a series of EFA analyses using the principal components' approach and Varimax rotation. Finally, the identified model consists of five factors. This model is the best modified model accounting for 62.71% of the total variance. There are 22 items on a Likert scale in the model. The scores for each item range from 1 to 5. The five factors include factor 1, which accounted for 36.94% of the variance, factor 2 for 8.45%, factor 3 for 7.01%, factor 4 for 5.29%, and factor 5 for 5.01% of the variance (Table 3).

Factor 1, Evaluation and follow-up of the patient, includes seven items (Items 6, 7, 8, 9, 10, 15, and 16); Factor 2, Preoperative patient teaching, and communication includes six items (Items 11, 12, 13, 17, 18, and 19); Factor 3, Research and professional development includes three items (Items 20, 21, and 22);

Factor 4, Ability to fulfill legal responsibilities and adherence to ethical principles includes three items (Items 1, 4, and 5); and Factor 5, Preoperative patient preparation includes three items (Items 2, 3, and 14) (Table 3). In cases where the item loading factors were less than 0.40, the findings were excluded.

**Table 3. Exploratory factor analysis of (PPreCC-NS) questionnaire**

| Item Number | Item Description | Component | | | | |
|---|---|---|---|---|---|---|
| | | F1 | F2 | F3 | F4 | F5 |
| 6 | يمكنني تقييم المريض فيما يتعلق بالمضاعفات والآثار الجانبية للأدوية التى تم إعطاؤها قبل الجراحة | 0.629 | | | | |
| 7 | يمكنني استخدام الأجهزة الطبية (جهاز المراقبة بجانب السرير، تخطيط كهربة القلب،... إلخ) لرعاية المرضى قبل الجراحة حسب التعليمات المطلوبة | 0.705 | | | | |
| 8 | يمكنني التعرف على حالات الطوارئ التي قد تتطور في فترة ما قبل الجراحة | 0.703 | | | | |
| 9 | يمكنني التحقق مما إذا كانت هناك كمية كافية من المستلزمات والأدوية الضرورية لحالات الطوارئ | 0.702 | | | | |
| 10 | يمكنني تحديد المضاعفات التي قد تحدث في أثناء العملية من خلال تقييم بيانات المريض قبل الجراحة | 0.658 | | | | |
| 15 | *** قبل العملية يمكنني إبلاغ المريض وعائلته عن آلية وطريقة العملية الجراحية** | 0.654 | | | | |
| 16 | *** يمكنني ضمان بيئة اتصال مناسبة للمريض للتعبير عن مخاوفه بشأن الإجراء الجراحي باستخدام تقنيات الاتصال الفعالة** | 0.444 | | | | |
| 11 | قبل العملية يمكنني تعليم المريض التمارين الأساسية (التنفس العميق والسعال، تمارين نطاق الحركة ، التقليب في السرير،... إلخ) التي يجب القيام بها بعد العملية | | 0.633 | | | |
| 12 | يمكنني مساعدة المريض فيما يتعلق بأمور الحركة | | 0.777 | | | |
| 13 | يمكنني مساعدة المريض فيما يتعلق بالحصول على ما يكفي من السوائل والعناصر الغذائية | | 0.756 | | | |
| 17 | *** يمكنني تعزيز استراتيجيات المريض للتعامل مع الخوف من الجراحة باستخدام مهارات التواصل بين الأشخاص** | | 0.412 | | | |
| 18 | *** يمكنني ضمان التواصل والتعاون الإيجابي مع المرضى وأقاربهم من أجل زيادة المشاركة في رعاية المرضى** | | 0.434 | | | |
| 19 | *** يمكنني تبادل الخبرات وتبادل المعلومات حول الرعاية التمريضية قبل الجراحة مع زملائي الطلبة والممرضات** | | 0.651 | | | |
| 20 | يمكنني استخدام المصادر العلمية ذات القيمة الإثباتية العالية التى يمكن استخدامها للتطوير المهنى | | | 0.617 | | |
| 21 | يمكنني متابعة الأبحاث الحالية والحديثة حول الرعاية التمريضية قبل إجراء العملية الجراحية | | | 0.749 | | |
| 22 | أحاول المساهمة في البحث العلمي من أجل تحسين الرعاية التمريضية قبل إجراء العملية الجراحية | | | 0.750 | | |
| 1 | يمكنني الامتثال للمبادئ الأخلاقية الأساسية في ممارسات التمريض التي يجب إجراؤها قبل العملية الجراحية للمريض | | | | 0.655 | |
| 4 | يمكنني ضمان سرية وأمن معلومات المريض المكتوبة والشفوية والإلكترونية بما يتماشى مع المبادئ الأخلاقية | | | | 0.805 | |

| | | |
|---|---|---|
| | لمهنة التمريض | |
| 5 | يمكنني اتخاذ الاحتياطات اللازمة لضمان أمان وسلامة المرضى في الرعاية قبل العملية الجراحية (السلامة البيئية، وسلامة العلاجات والأدوية وخدمات الرعاية الصحية،... إلخ.) | 0.798 |
| 2 | *** يمكنني التأكد من إبلاغ المريض / الوصي/ الوصي القانوني بالتدخل الجراحي، والتأكد من التوقيع على وثيقة الموافقة من قبل المريض/ الوصي/ الوصي القانوني** | 0.728 |
| 3 | *** يمكنني التأكد من أن المريض قد قام بتسليم جميع مستلزماته الخاصة و الثمينة إلى قريبه/ مسؤول الأمن/ رئيس الممرضين وفقًا للإجراء القانوني وسياسة العمل ذات الصلة** | 0.619 |
| 14 | يمكنني التأكد من إيقاف تناول الماء والغذاء عن طريق الفم قبل العملية وفقًا للتوصيات العلمية القائمة على الأدلة والبراهين | 0.620 |

The extraction methods were exploratory factor analysis, principal components' method and Varimax rotation with Kaiser normalization. F1, F2, F3, F4, and F5 are factor loadings for the rotated solution, eigenvalues ≥ 1.0, KMO =0.874. Bold font reveals that the item has been moved and put in a different domain.

**Reliability for Arabic Version for Each Domain After EFA**

The sub-dimensions of the scale's Cronbach's alpha values were determined to be between 0.70 and 0.85, and the overall scale's Cronbach's alpha value was 0.91 (Table 4).

**Table 4. Cronbach's alpha for perceived preoperative nursing care competence scale for nursing students (PPreCC-NS) after exploratory factor analysis**

| Subscales | Number of items | Items | Score range | Cronbach's alpha |
|---|---|---|---|---|
| **تقييم ومتابعة المريض** | 7 | 6,7,8,9,10,15,16 | 1–5 | 0.85 |
| **تعليم المريض والتواصل معه قبل الجراحة** | 6 | 11,12,13,17,18,19 | 1–5 | 0.83 |
| **البحث والتطوير المهني** | 3 | 20,21,22 | 1–5 | 0.72 |
| **القدرة على تحمل المسؤوليات القانونية والالتزام بالمبادئ الأخلاقية** | 3 | 1,4,5 | 1–5 | 0.74 |
| **إعداد المريض قبل الجراحة** | 3 | 2,3,14 | 1–5 | 0.70 |
| **Overall** | | | | 0.91 |

*N = 202.*

**Discussion**

The current study aims to examine the psychometric properties of the Arabic version of the Perceived Preoperative Nursing Care Competence Scale for Nursing Students (PPreCC-NS).

Initially, reliability analysis was examined using internal consistency. Generally, higher values imply greater reliability(Hair et al., 2019). An alpha level between 0.6 and 0.7 is considered acceptable, whereas an alpha level of 0.8 or more is considered excellent (Ursachi et al., 2015). The internal consistency of the Arabic version of PPreCC-NS was found to be above 0.7, confirming its reliability. This result is consistent with that of Şimşek et al. (2023), who found that the reliability of the original instrument was above 0.70. Despite that the internal consistency values for each subscale were at the cutoff point 0.80 for adequate consistency, they exceeded the results reported by the PPreCC-NS's original version. This finding implies that the PPreCC-NS items' effectiveness did not seem to be influenced by language differences.

Prior to EFA, the KMO and Bartlett's tests, which

are primary assumption tests, were conducted to determine the adequacy of the sample size and the correlations between variables (Shrestha, 2021). KMO values between 0.8 and 1.0 indicate a sufficient sample. A factor analysis may be effective for the dataset if the significance value of the Barlett's test is 0.05 (Shrestha, 2021). The KMO value of the Arabic version of PPreCC-NS was > 0.80, demonstrating that the study sample was sufficient in size. In addition, the correlations between the scale items after Bartlett's test were found to be statistically significant.

Then, the principal components' approach and Varimax rotation were used to test the scale. In this study, the cut-off values for the factor loading and the eigenvalues were set to 0.4 and 1, respectively. Five subdimensions with eigenvalues ≥ 1.0 that accounted for 62.71% of the scale's overall variance were found after analyses. Therefore, at least 50% of the overall variation should be explained by the factors (Shrestha, 2021). Thus, the scale is suitable, as shown in this context. This result is similar to the result of Şimşek et al. (2023), who found five subdimensions after the analysis that explained 62% of the total variance. However, a difference in the order of items is found between the two studies.

The Arabic version of PPreCC-NS approved as a five-factor model includes evaluation and follow-up of the patient comprising seven items, preoperative patient teaching and communication with six items, research, and professional development with three items, ability to fulfil legal responsibilities and adherence to ethical principles with three items and preoperative patient preparation comprising three items. By contrast, the original scale consisted of five subscales: five items in the subdimension of ability to fulfil legal responsibilities and adherence to ethical principles, five items in the evaluation and follow-up of the patient, four items in the preoperative patient preparation, four items in the subdimension of communication and four items in the research and professional development. These differences might be related to discrepancies in the students' level of knowledge, skills, language, and culture, as well as between the two target populations' curricular priorities.

Factor loadings exhibit the relationship between variables in clarifying a construct (Şimşek et al., 2023). Shrestha (2021) reported that the variables with high loading values of more than 0.40 indicate that they are representative of the factors. In addition, Kiliç et al. (2020) reported that the average factor loading was described as 0.4 for low values and as 0.7 for high values. From this instance, all scale items are related to the construct, as the factor loadings ranged from 0.41 to 0.80. This result is also similar to the result of Şimşek et al. (2023), who found that the items were moderately to highly adequate, as indicated by factor loadings that ranged from 0.51 to 0.76.

The reliability analysis was examined again using internal consistency to assess the consistency of the tool after the conduction of EFA and the new arrangement of items. The internal consistency of the Arabic version of PPreCC-NS after EFA was found to be above 0.7, confirming its reliability. However, further study is still required to precisely evaluate these assessment elements through additional psychometric analyses focused on the performance at individual criteria forming each individual skill.

**Implications for Nursing**

This study emphasizes the importance of assessing the perceived level of preoperative competence among nursing students. Assessing the perceived level of preoperative competence is an essential process, to ensure that they possess the necessary skills and knowledge to deliver services of high quality and safe patient care.

Using this scale can help identify the weaknesses among nursing students in the preoperative topic, and work to improve them. In addition, using this scale could increase the nursing educators' awareness of the requirements to improve the level of preoperative care among nursing students, and determine which areas of preoperative care need greater focus in designing better educational programmes.

**Conclusion**

The findings indicated that the Arabic version of PPreCC-NS is a valid and reliable tool for evaluating nursing students' perceived competence in preoperative nursing care. Implementing the new scale in research and practice simplifies the process of determining the competencies and requirements of nursing students for providing holistic care in the preoperative area. Thus, professionalism in nursing practice and education is encouraged.

**Limitations and Recommendations**

The research limitation is that only Jordanian students were recruited. Future research should involve a larger sample of nursing and midwifery students from various geographic regions to improve the generalizability of these findings and generate normative data for the scale in Arabic-speaking nations. In addition, utilizing a self-administered online survey to investigate the PPreCC-NS's Arabic psychometric properties could affect the study results.

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**Conflict of Interests**

No conflict of interests is to be declared by the authors.

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