Original Article

Evaluating and Ranking the Factors Affecting the Acute Pain Management in Older Adults with Dementia after Hip Fracture Surgery: Second-Order Confirmatory Factor Analysis

Abstract

Background: Even though nurses take various measures to decrease acute pain after surgery in older adults with dementia, it is unclear why most of them suffer from severe pain. This study aimed to evaluate the factors affecting acute pain management in older adults with dementia after hip fracture surgery. **Materials and Methods:** This cross-sectional study used single-stage cluster and convenience sampling to select 330 nurses working in hospitals located in Western Mazandaran, Iran, in 2020. The demographic characteristic questionnaire and the Obstacles to Postoperative Pain Management in Dementia Scale (OPOPMDS) were used to collect data. **Results:** The study results confirmed the modified model. The second-order Confirmatory Factor Analysis (CFA) indicated that the Critical Ratio (CR) for all three factors was more than 1.96, and the significance level was considered 0.05. Based on the values of standard coefficients, older people-related (β = 0.86, p < 0.001), system-related (β = 0.70, p < 0.001), and healthcare provider-related (β = 0.61, p < 0.001) factors had the highest impacts on the OPOPMD. **Conclusions:** The study results suggested that older adult-related factors had the most significant impact on the OPOPMD.

Keywords: *Acute pain, aged, critical care nursing, dementia, disease management, hip fracture nurse, pain, perspective, postoperative*

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Introduction

Dementia and hip fractures are two common problems among older adults.[1] Studies suggest a significant relationship between dementia, hip fracture, and age.[2] Patients with hip fractures experience severe pain and are at greater risk of delirium, immobilization, prolonged hospitalization, and poor health-related quality of life,[3] so pharmacological and non-pharmacological techniques are available to increase their performance: spinal anesthesia, systemic analgesia, multimodal pain management, acupressure, relaxation therapy, Transcutaneous Electrical nerve Stimulation (TENS), physical therapy regimens and Total Hip Arthroplasty (THR), or Dynamic Hip Screw (DHS). However, their effectiveness and safety in managing pain (acute hip fracture) are different.[4] In Iran, surgery in the first 24 hours after the fracture is the most common treatment to reduce pain in this group of patients,[5,6] and Acute Postoperative Pain (APOP) is

a common problem among them.[7-9] The International Association for the Study of Pain refers to pain as an unpleasant sensory and emotional experience associated with actual or potential tissue damage.[10,11]

Despite the widespread consequences of postoperative pain in old people, healthcare providers try their best to control its severity in older patients.[12] Some studies reported that postoperative pain management was not successful in more than 50% of all cases undergoing THR[13,14] due to individual, systemic, and personnel-related factors in APOP management.[15]

Nurses can successfully assess pain based on patients' needs,[16] and they have to assess the severity of pain when providing postoperative care for older adults with dementia, implement medical instructions to reduce pain, and reevaluate the effectiveness of measures.[17] "The nurses' attitudes toward care" is an important factor in fulfilling their professional responsibilities.

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Nurses' attitudes toward Obstacles to Postoperative Pain Management in Dementia (OPOPMD) depend on their cultural and educational background; therefore, studies in different cultural contexts are necessary.[16] Only Rantala *et al.* (2014)[18] studied the OPOPMD from the perspective of nurses. Understanding nurses' perspectives toward OPOPMD could clarify the needs of older adults and help develop pain management strategies. This study aimed to evaluate the factors affecting the acute pain management in older adults with dementia after hip fracture surgery.

Materials and Methods

This cross-sectional study was conducted from January 29 to July 27, 2020. The study setting included public hospitals affiliated with Mazandaran University of Medical Sciences located in Ramsar, Tonekabon, Abbasabad, Chalus, Nowshahr, and Noor in Western Mazandaran, Iran. The selection of these hospitals was based on characteristics such as being public and university hospital, as well as providing the researchers access to the study's samples. The study population included all nurses working in hospitals in Western Mazandaran. Inclusion criteria included nurses' willingness to cooperate in the study who spoke Persian, had a bachelor's or higher degree in nursing, and had a positive history of caring for older adults with dementia after hip fracture surgery, and exclusion criteria included unwillingness to continue the participation or partly ignoring the research tools. Single-stage cluster and convenience sampling were used.

Considering the type I error of 5%, d = 0.05, s = 0.44, and $Z_{1\pm/2}$= 1.96, the sample size was estimated to be 297 individuals, but 330 people were considered for more certainty. The data collection tools included demographic characteristics and the OPOPMD Scale (OPOPMDS). The demographic questionnaire included age, sex, workplace, marital status, level of education, work experience, type of employment, position, history of acute pain after surgery, and history of surgery of nurses. Didvar *et al.*[19] (2022) designed and psychometrically measured a 39-item OPOPMDS that included three dimensions (factors related to older adults, factors related to healthcare providers, and factors related to the system). Items were rated on a 5-point Likert scale ranging from 5 (strongly agree) to 1 (strongly disagree). The minimum score on the scale was 39, while its maximum score was 195. Cronbach's alpha coefficient of the whole scale was 0.956. The test–retest results showed a significant agreement between the scores of the first and second tests ($p < 0.001$). The Exploratory Factor Analysis (EFA) indicated older adult-related, healthcare provider-related, and system-related factors as the OPOPMDS, which explained 57.58% of the overall variance. The Confirmatory Factor Analysis (CFA) indicated that the three-factor model of the OPOPMDS was the best fit for the data (Parsimonious Comparative Fit Index (PCFI) = 0.836; Parsimonious Normed Fit Index. Fit indices (PNFI) = 0.78; Chi-square/degree-of-freedom

ratio (CMIN/DF) = 1.959; Root-Mean-Square Error of Approximation (RMSEA) = 0.064; Incremental Fit Index (IFI) = 0.923; Comparative Fit Index (CFI) = 0.901). The convergent and divergent validity results suggested that the Composite Reliability (CR) and Average Variance Extracted (AVE) values of each factor were higher than 0.7 and 0.5, respectively (CR > AVE). The internal consistency of the first, second, and third factors was 0.89, 0.92, and 0.89, respectively. Cronbach's alpha coefficient of the scale was 0.95. In addition, the test–retest results demonstrated high agreement between the first and second test scores ($p < 0.001$).[19] In this study, Statistical Package for the Social Sciences (SPSS) version 20.0 (Armonk, NY: IBM Corp) was used to analyze descriptive statistics and parametric tests, while Amos 24 was used to investigate research hypotheses on the relationship between variables and factors through second-order CFA and structural equation modeling technique.

Ethical considerations

The researcher received permission from the ethics committee of Babol University of Medical Sciences (R. MUBABOL.HRI.REC.1398.097), explained the study objectives to the samples, observed the principle of confidentiality and anonymity, and obtained informed consent from the samples.

Results

The results showed that most of the participants were female (87.90%) and married (74.20%), with a mean(SD) age of 36.42 (7.76) years, and they had bachelor's degrees (89.40%). The results indicated that the total mean OPOPMD score was 3.34 (0.33), and 41% of the nurses agreed with the existence of the OPOPMD, with older adult-related factors receiving the highest mean score of 3.86 (0.48). The Pearson correlation matrix indicated a positive and significant relationship between the factors related to OPOPMD ($p < 0.001$) [Table 1]. The results suggested the effects of all factors on the OPOPMD, with older adult-related factor being the most critical barrier to pain management. Three main factors (latent variable) and 39 questions (manifest variable) were available to assess the effectiveness of factors related to the OPOPMD. Each of these variables had indices of q1 to q39. The factor load between the variables [Figure 1] was greater than 0.3, indicating the correlation between latent and manifest variables.

This study addressed univariate and multivariate data distributions separately to investigate the natural distribution and outlier data. We investigated multivariate outlier data using the Mahalanobis D-square ($p < 0.001$) and multivariate normality using Mardia's coefficient (above 8). We used multiple imputations to check the percentage of missed data and then replaced them with the mean response of the participants.

We investigated the fitness of the primary model before examining the structural coefficients that were acceptable because the CMIN/DF value was less than 3 and the RMSEA value was less than 0.08. We then modified the model by drawing a correlation between the errors to improve the fit of the proposed model as shown in Table 2.

The results showed that the coefficients of determination were 0.55, 0.42, and 0.37 for older adult-related, system-related, and healthcare provider-related factors, respectively [Figure 1].

The second-order CFA indicated a Critical Ratio (CR) above 1.96 for all three factors, which had a positive and significant effect on the OPOPMD at a 0.05 level. Based on the values of standard coefficients (factor load), older adult-related (0.86), system-related (0.70), and healthcare provider-related (0.61) factors had the highest impacts on the OPOPMD. We found that q3 (older adult-related factors), q26 and q27 (healthcare provider-related factors), and q38 (system-related factors) had the most significant effects on the OPOPMD [Table 3].
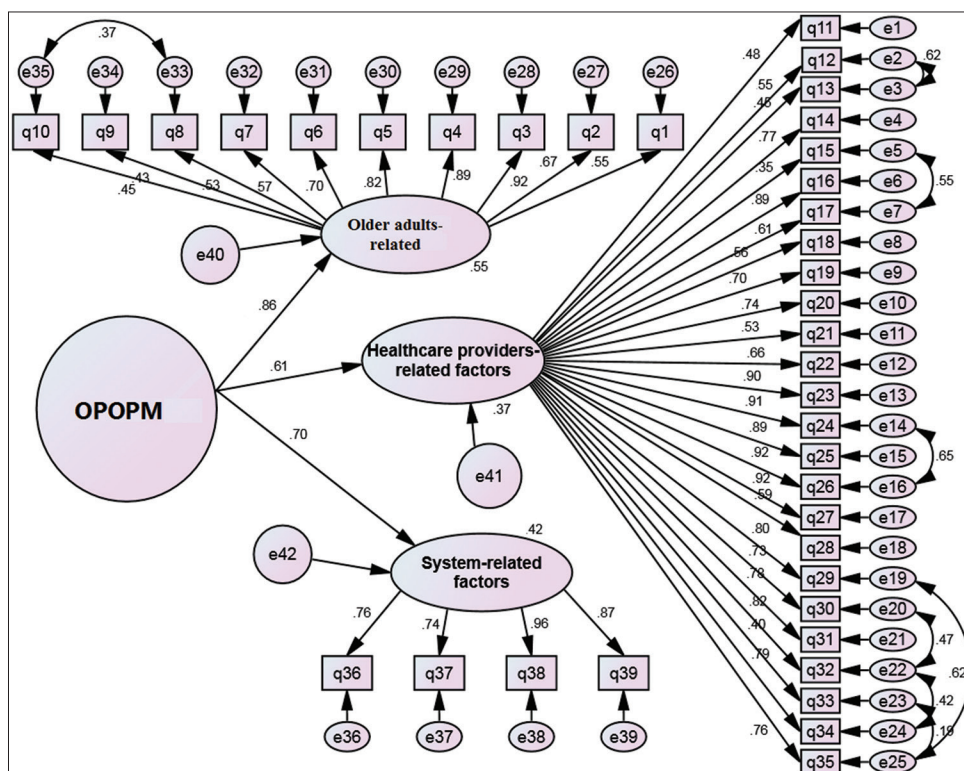

Figure 1: Modified model of standard coefficients (factor loading) of the factors affecting OPOPM in hip fracture old people with dementia

Table 1: Barriers to pain management and its dimensions (mean Pearson's correlation and reliability)

OPOPM	Mean (SD*)	% of agreement (mean sum variable ≥3.5)	Reliability	Elderly-related factors	Healthcare provider-related factors	System-related factors	Total
Older adult-related factors	3.86 (0.48)	80	0.89	1	0.15*	0.17*	0.32***
Healthcare provider-related factors	3.13 (0.33)	31	0.92		1	0.71***	0.97***
System-related factors	3.37 (0.49)	45	0.89			1	0.76***
Total	3.34 (0.33)	41	0.95				1

*Standard Deviation, *$p<0.05$,**$p<0.01$

Table 2: Fit indices of the primary and modified model

	GFI*	IFI**	PCFI8***	CFI****	PNFI*****	RMSEA$	CMIN/DF$$	p	df	χ^2
Primary model	0.88	0.81	0.63	0.88	0.67	0.07	2.91	0.001	700	2039.63
Modified model	0.96	0.95	0.69	0.95	0.69	0.06	2.60	0.001	692	1798.72

*GFI: goodness of fit index **IFI: incremental fit index ***PCFI: parsimonious comparative fit index****; CFI: comparative fit index; CFA: confirmatory factor analysis; *****PNFI: parsimonious normed fit index. Fit indices: PNFI, PCFI (>.5), $RMSEA: root-mean-square error of approximation; $$ CMIN/DF: Chi-square/degree-of-freedom ratio. CFI, IFI, GFI (>.9), RMSEA (<0.05: good, 0.05–0.08: accept, 0.08–0.1: marginal), CMIN/DF (< 3: good, <5: acceptable)

Table 3: Ranking of items affecting the OPOPM* in terms of factor load

Factor	Item	Factor load	Rank in the factor	Total ranking
Older adult-related factors	Q3—Verbal and contacting disorders (e.g., wording or pronouncing problems)	0.92	1	2
	Q4—Physical problems (e.g., hearing and vision problems)	0.89	2	5
	Q5—Unwillingness for taking painkillers due to fear from side effects like drug dependency or constipation	0.82	3	7
	Q6—Unwillingness for expressing the pain, so that the nurse doesn't get distracted	0.70	4	15
	Q2—Not reporting the pain to nurses	0.67	5	16
	Q7—Mood changes like depression or anxiety	0.57	6	20
	Q1—Cognitive problems (e.g., delirium, restlessness, and judgment disorders)	0.55	7	22
	Q8—Cultural differences like dialect, beliefs, and religious beliefs	0.53	8	23
	Q10—Resisting against taking oral medicines	0.45	9	25
	Q9—Contrast between the pain severity report of elderly and his family members	0.43	10	26
Healthcare provider-related factors	Q27—Nurses disregard for patient's requests for painkillers	0.92	1	2
	Q26—Ignoring the assessment of physical factors affecting the pain (e.g., full bladder, urinary tract infection, or constipation)	0.92	1	2
	Q24—Ignoring the pain continuity symptoms (e.g., blood pressure increase, surgery site bleeding, increase of heart rate, arrhythmia, or blood glucose increase)	0.91	2	3
	Q23—Ignoring the older patients' pain assessment in special conditions (e.g., sudden movements of patient repositioning during night or physiotherapy sessions)	0.90	3	4
	Q16—Improper interaction between nurses and patients	0.89	4	5
	Q25—Not following the outcomes of pharmacological interventions	0.89	4	5
	Q32—Ignoring the behavioral changes resulted by pain relief (e.g., anger, ignoring the treatment team's requests, or movement disorders)	0.82	5	7
	Q29—Physicians' unwillingness for prescribing new painkillers	0.80	6	8
	Q34—Ignoring the usage of pain assessment common questions for older patients (e.g., asking do you feel comfortable/uncomfortable instead of have you pain?)	0.79	7	9
	Q31—Not asking the family caregivers about the behavioral changes resulted by elderly's pain (e.g., ignoring requests, turmoil, or facial expressions change)	0.78	8	10
	Q14—Lack of access to physicians for reporting pain assessment and treatment results	0.77	9	11
	Q35—Unclear physicians' instructions for the consumption of requested painkillers	0.76	10	12
	Q20—Physicians disregard for nursing staff reports and recommendations about the pain severity or the effect of prescribed painkillers	0.74	11	13
	Q30—Not using several pain management solutions (e.g., educating the patient/family members or using pharmacological/non-pharmacological interventions)	0.73	12	14
	Q19—Nurses' fear from painkillers' side effects	0.70	13	15
	Q22—Ignoring the documentation of pharmacological and non-pharmacological intervals in a written format accessible for other nurses or caregivers	0.66	14	17
	Q17—Nurses' distrust of the effectiveness of prescribed painkillers	0.61	15	18
	Q28—Ignoring the application of dose-equivalent table (e.g., for converting mEq to mL or estimating the new consumption doses in case new narcotics are prescribed)	0.59	16	19
	Q18—Nurses' unawareness of older adults' pain tolerance threshold	0.56	17	21
	Q12—Contrast between the knowledge of nurses about providing PRN medicines	0.55	18	22
	Q21—Unawareness about painkillers' instructions and needed consumption cautions	0.53	19	23
	Q11—Lack of time for applying non-pharmacological pain revealing treatments (e.g., cold compress or patient repositioning by the nurse)	0.48	20	24
	Q13—Unawareness about the real pain severity due to lack of time for using pain assessment instruments	0.45	21	25
	Q33—Delayed pain examination	0.40	22	27
	Q15—Ignoring the physicians' orders of providing Pro Re Nata (PRN) painkillers for older patients	0.35	23	28

Contd...

Table 3: Contd...

Factor	Item	Factor load	Rank in the factor	Total ranking
System-related factors	Q38—Lack of certain instructions for the use of the most appropriate pain management techniques	0.96	1	1
	Q39—Lack of valid instruments for assessing pain among the older patients with dementia after a HF surgery	0.87	2	6
	Q36—Lack of organized caring system for searching through main painkillers and providing the medicines	0.76	3	12
	Q37—Shortage of comforting equipment (e.g., warm/cold packs, mattresses, and chairs as the alternatives to pain killing medicines)	0.74	4	13

*Obstacles to Postoperative Pain Management in Dementia Scale

Discussion

We decided to investigate the OPOPMD and divided it into three categories: older adult-related, system-related, and healthcare provider-related factors. First, we investigated the construct validity of the research model using CFA and indicated that the model was suitable for the OPOPMD because its fit indices were proper. Then, we confirmed all three main hypotheses based on the structural equation model at a 95% confidence level. Older adult-related, system-related, and healthcare provider-related factors had negative effects on the OPOPMD and led to poor pain management. Rantala *et al*. (2014)[20] also reported that three factors affected the OPOPMD: barriers to hired caregivers, barriers to the system, and barriers to patients. They believed that physical, psychological, social, cultural, and environmental factors affected pain perception, management, and evaluation. Xiao *et al*. (2020)[21] indicated that caregiver-related, patient-related, and system-related factors affected pain management in hip fractures. Brennan *et al*. (2019)[22] studied the concept of access to pain management as a human right and believed in the establishment of pain committees in hospitals to respect patients' rights and identify the factors affecting pain management. Other studies and our study agree with the existence of the OPOPMD, so healthcare providers, particularly nurses, should take measures to remove pain management barriers such as the physical and psychological effects of pain on these people, their dependence on others to perform daily activities, and surgical and nosocomial infections.

The present study showed that older adult-related factor was the most important barrier to pain management. The healthcare team, particularly nurses, have difficulty assessing pain in old patients with dementia because they often do not understand the severity and location of the pain[23,24] Sometimes, healthcare providers pay no attention to the underlying diseases of the older patients undergoing surgery (such as dementia), which increase the pain assessment in this group of patients.[25]

The study results indicated that in elderly-related factors, the item "difficulty in assessing pain due to speech impairment (e.g., wording or pronouncing problems)" had the most significant impact on the OPOPMD. Other studies also emphasized the inability of patients with dementia to express their severity and location of pain.[18] According to many researchers, one of the main problems in pain management in patients with advanced dementia is their inability to report their pain. Moschinski *et al*. (2000)[23] demonstrated that the inability of older patients with dementia to communicate effectively with the healthcare team was one of the problems in assessing the type and severity of pain because they could not trust the healthcare team or felt insecure in the postoperative wards. Observing behaviors related to acute pain in older adults such as screaming, groaning, resistance to movement, and rigid body posture can be ways to assess acute pain in older adults.

The results showed that in healthcare provider-related factors, the item "nurses disregard patients; requests for painkillers" had the most significant impact on the OPOPMD. Nurses' indifference to the older patients' requests may be due to their negative view toward aging because older adults with dementia may exaggerate the severity of pain.[26] Nurses often have no enough time to deal with all patients, and taking care of another patient prevents them from responding to patients' requests promptly. In addition, many sociocultural factors affect pain management, one of which is the views and attitudes of healthcare providers toward aging and its problems[27]; they should raise their awareness and change their attitudes toward pain management, which reduces the prescription of painkillers. However, creating sensitivity in nurses is extremely important in controlling their patient's pain. Nurses may become accustomed to the patient's pain over time due to their constant presence in recovery or surgery wards. The impression may be that surgery pain is a natural phenomenon and no particular action is needed to control it. However, nurses need to understand that pain will never be expected of the patient, and they must make one of their care priorities to understand the patient's condition and manage his pain. Meissner *et al*. (2015)[28] found that nurses' inattention to patients' requests was due to their inadequate knowledge of acute pain management and underestimation of patients' pain. Other studies reported the following as factors related to healthcare providers:

no enough time to assess pain, caregiver's inattention to assess pain, inattention to acute pain reassessment in older adults, difficulty in contacting physicians regarding the changes in patients' pain status, lack of pain improvement in the revaluation of analgesic regimens, and physicians' and patients' fears of side effects of analgesics. Dehnoalian and Mohammadpour considered the following as healthcare provider-related factors affecting pain management: nurses' insufficient knowledge and reluctance to use non-pharmacological pain relief methods, and not reporting patient's pain to the physician due to inadequate response of physicians.[29] According to Rantala (2012),[24] lack of resources and time to use non-pharmacological pain relief methods were some of the problems healthcare workers faced in managing acute pain in older adults with dementia. The APOP management was influenced by the culture of the unit, the nurses' self-concept, and the perception of pain assessment. Therefore, clinical nurses and nurse managers should pay attention to these factors to maximize the effectiveness of measures taken to control APOP.

The results showed that in system-related factors, the item "lack of certain instructions for the use of the most appropriate pain management techniques" had the most significant impact on the OPOPMD. Developing geriatric pain management-specialized evidence-based guidelines, pathways, and compliance standards might increase nurses' responsibility and practice.[30] Mędrzycka-Dąbrowska *et al.* (2014)[31] did not support this finding and showed that the lack of rules and procedures related to pain management received the lowest frequency in APOP management, while the impossibility of consulting a clinical pharmacist received the highest frequency. This difference may be due to the different healthcare systems in Iran and Poland. Dehnoalian and Mohammadpour (2014) indicated that a lack of analgesics and nursing power was effective in performing interventions related to acute pain management.[29] Rantala *et al.* (2012)[24] agreed with the following strategies for pain management: explaining nursing procedures and what would happen to patients, informing them about the pain cause and how to relieve it, allowing companions to visit patients in the early hours after surgery, and increasing visiting hours.

One of the limitations of the present study is that we focused on nurses' view toward the OPOPMD, so further studies are necessary to better identify acute pain management barriers. We selected the study samples from public hospitals affiliated with Mazandaran University of Medical Sciences; therefore, their views on pain management barriers, particularly on system-related factors, might differ from those of nurses working in private hospitals. We recommend a study to compare the views of nurses working in private and public hospitals regarding the obstacles to postoperative pain management in dementia and an intervention based on our results. As the equipment used in healthcare systems is different in small and large cities (study setting), we recommend a similar study in large cities. We used the

convenience sampling method to select samples from the hospitals located in Western Mazandaran; therefore, we should generalize the study results with caution. We suggest similar studies in different parts of Iran to compare results and increase their generalizability.

Conclusion

The study results indicated that the older adult-related factor had the most significant impact on OPOPMD. To overcome these barriers, we must identify the needs and problems of older adults with dementia, such as their speech problems and conditions. Healthcare systems should improve patient-centered care based on their needs and underlying diseases and nurses must constantly measure and control pain in older adults with dementia. Therefore, increasing their knowledge and changing their attitudes toward the needs of older adults with cognitive impairments can reduce barriers to pain management and improve treatment outcomes. Nurses must use various methods of pain assessment such as observing patients' behavioral symptoms at multiple times.

Ranking the OPOPMD can help geriatric health policymakers and healthcare providers identify the most effective barriers to acute pain management. Recognizing the existing gap makes time, energy, and cost management more effective in reducing the current barriers and increasing the quality of care for this group of older adults.

Conflicts of interest

Nothing to declare.

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