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Compassion Fatigue Predicts Inadequate Pain Management: A Cross-Sectional Study of Iranian Nurses

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Abstract

Background: Compassion fatigue among nurses is a growing global concern that not only affects nurses' psychological well-being but may also compromise patient care quality, particularly pain management. However, the relationship between compassion fatigue and pain management practices remains underexplored. **Objective:** This study aimed to investigate the relationship between compassion fatigue and pain management practices among nurses, and identify predictors of inadequate pain management.

Methods: A cross-sectional study was conducted with 412 nurses recruited from 10 teaching hospitals in Tehran, Iran using stratified random sampling. Data were collected using the Professional Quality of Life Scale (ProQOL) measuring compassion satisfaction, burnout, and secondary traumatic stress; and the Pain Management Practices Scale (PMPS). Data were analyzed using descriptive statistics, Pearson correlations, hierarchical regression, and structural equation modeling.

Results: High compassion fatigue was reported by 48.3% of nurses. Pain management practices were suboptimal (mean=58.64/100). Significant negative correlations were found between burnout and pain management ($r=-0.512$, $p<0.001$), and between secondary traumatic stress and pain management ($r=-0.468$, $p<0.001$). Regression analysis revealed that burnout ($\beta=-0.324$), secondary traumatic stress ($\beta=-0.286$), compassion satisfaction ($\beta=0.298$), nurse-to-patient ratio ($\beta=-0.242$), and work unit ($\beta=-0.184$) were significant predictors, explaining 51.6% of variance.

Conclusion: Compassion fatigue significantly compromises nurses' ability to provide adequate pain management. Addressing this issue requires organizational interventions including psychological support, manageable workloads, and compassion-focused training to protect both nurse well-being and patient care quality.

Background

The Pain management is a fundamental component of ethical nursing practice and a basic human right of every patient. The International Association for the Study of Pain (IASP) defines pain as an unpleasant sensory and emotional experience associated with actual or

potential tissue damage, emphasizing that effective pain relief is essential for patient dignity, recovery, and quality of life (Raja et al., 2020). Nurses, as the healthcare professionals with the most continuous patient contact, bear primary responsibility for pain assessment, intervention, and evaluation. However, despite advances in pain management protocols and pharmacological options, inadequate pain relief remains a persistent problem in healthcare settings worldwide (Samarkandi, 2018).

The prevalence of unrelieved pain in hospitalized patients is alarmingly high. International studies indicate that 40-75% of patients experience moderate to severe pain during hospitalization, with significant proportions reporting inadequate pain management (Gregory et al., 2020). In Iran, similar patterns have been documented, with research showing that post-operative pain is often undertreated, and cancer patients frequently report insufficient pain relief (Rahimi-Madiseh et al., 2020). This persistent gap between available pain management strategies and actual patient experiences suggests that factors beyond pharmacological knowledge influence pain care delivery.

Compassion fatigue has emerged as a critical factor potentially compromising nurses' capacity to deliver compassionate, sensitive care including pain management. Compassion fatigue, conceptualized by Figley (1995) and subsequently refined by Stamm (2010), encompasses two components: burnout, characterized by exhaustion, frustration, and reduced professional efficacy; and secondary traumatic stress, involving vicarious traumatization from helping others who suffer. The Professional Quality of Life model posits that healthcare workers experience both positive (compassion satisfaction) and negative (compassion fatigue) aspects of caring (Stamm, 2010).

The prevalence of compassion fatigue among nurses is concerning. Recent systematic reviews indicate that 40-62% of nurses in acute and critical care settings experience moderate to severe compassion fatigue (Cavanagh et al., 2020). A large multicenter study of 1,910 hospital nurses found that those with high compassion fatigue scores were significantly less likely to adequately address patients' pain reports (Xie et al., 2021). In Iran, emerging evidence suggests similar patterns, with studies reporting moderate to high levels of compassion fatigue among hospital nurses (Bagheri et al., 2023).

The theoretical link between compassion fatigue and pain management is multifaceted. Compassion fatigue may impair nurses' ability to recognize pain cues due to emotional numbing and detachment (Pérez-García et al., 2021). Emotionally exhausted nurses may lack the psychological resources to engage in the complex cognitive and emotional work of accurate pain assessment. Furthermore, nurses experiencing compassion fatigue may develop cynical attitudes toward patients' pain reports, leading to underestimation of pain severity and inadequate intervention (Sinclair et al., 2021).

Beyond individual nurse outcomes, compassion fatigue has significant organizational and professional implications. A 2021 meta-analysis of 18 studies involving 12,459 nurses found that compassion fatigue was associated with 2.5-fold higher odds of turnover intention and substantially reduced job satisfaction (Zhang et al., 2021). These workforce consequences exacerbate nursing shortages, creating a vicious cycle wherein understaffing increases workload, which in turn elevates compassion fatigue risk. The economic impact is substantial,

with nurse turnover costing healthcare organizations significant resources in recruitment and training (Muir et al., 2022).

Qualitative research provides rich insights into the mechanisms linking compassion fatigue to compromised pain care. Nurses experiencing compassion fatigue describe emotional numbing that leads to unconscious minimization of pain cues, reduced empathy for suffering patients, and a sense of helplessness when unable to provide adequate relief (Bagheri et al., 2023). Some nurses report becoming "robotic" in their pain management approach, following protocols mechanically without genuine engagement with patient experiences (Pérez-García et al., 2021). These qualitative findings illuminate the human processes underlying quantitative associations.

Despite growing recognition of compassion fatigue as a occupational hazard in nursing, limited quantitative research has specifically examined its relationship with pain management practices. Most existing studies have focused on compassion fatigue prevalence or its association with general care quality, without detailed examination of pain-specific outcomes. Furthermore, few studies have employed comprehensive measurement of both compassion fatigue dimensions and multiple aspects of pain management including assessment, pharmacological and non-pharmacological interventions, and documentation practices.

The Iranian healthcare context presents unique considerations for studying compassion fatigue and pain management. Iranian nurses work under challenging conditions including high patient-to-nurse ratios, economic pressures from international sanctions, and limited resources for pain management (Najafi et al., 2023). Cultural factors may also influence both the experience of compassion fatigue and pain expression and management. Understanding these context-specific factors is essential for developing targeted interventions.

Therefore, this study aimed to: (1) determine the prevalence of compassion fatigue (burnout and secondary traumatic stress) and levels of compassion satisfaction among nurses in teaching hospitals in Tehran, Iran; (2) assess the quality of pain management practices including pain assessment, pharmacological interventions, non-pharmacological interventions, and documentation; (3) examine bivariate correlations between compassion fatigue dimensions and pain management practices; (4) identify significant predictors of pain management practices using hierarchical regression analysis; and (5) test a structural equation model elucidating the direct and indirect relationships between compassion fatigue, compassion satisfaction, and pain management practices. The findings are intended to inform organizational interventions and educational programs to protect both nurse well-being and patient care quality.

Method

Study Design and Setting

A cross-sectional correlational study was conducted between September and December 2023 in 10 teaching hospitals affiliated with Tehran University of Medical Sciences, Tehran, Iran. These hospitals represent major tertiary care centers with diverse clinical specialties including medical, surgical, intensive care, emergency, and oncology units.

Sample Size and Sampling

The sample size was calculated based on the formula for cross-sectional studies: $n = (Z^2 \times P \times (1-P))/d^2$, where Z=1.96 for 95% confidence interval, P=0.50 (maximum variability), and

d=0.05, yielding an initial sample of 384 participants. To account for potential non-response and incomplete questionnaires, 450 questionnaires were distributed. Stratified random sampling was employed, with stratification by hospital type and clinical units (medical wards, surgical wards, intensive care units, emergency departments, and oncology units). Within each stratum, proportional allocation was used followed by simple random sampling from nursing staff lists.

Inclusion criteria were: (1) registered nurses with at least Associate Degree in Nursing; (2) minimum of six months clinical work experience in current hospital; (3) direct patient care responsibilities including pain management; and (4) willingness to provide informed consent. Exclusion criteria were: (1) nurses in administrative positions without direct patient care; (2) those on extended leave (>1 month); and (3) incomplete questionnaires (>20% missing data).

Instruments

Data were collected using a self-administered questionnaire comprising four sections:

Demographic and Professional Characteristics: A researcher-developed questionnaire collected data on age, gender, marital status, educational level, years of nursing experience, work unit, employment status, shift pattern, weekly working hours, and nurse-to-patient ratio in their unit.

Professional Quality of Life Scale (ProQOL): The ProQOL version 5, developed by Stamm (2010), is a 30-item instrument measuring three subscales: compassion satisfaction (10 items), burnout (10 items), and secondary traumatic stress (10 items). Items are rated on a 5-point Likert scale from 1 (never) to 5 (very often). Higher scores on compassion satisfaction indicate greater pleasure derived from helping others. Higher scores on burnout and secondary traumatic stress indicate greater compassion fatigue. The Persian version of ProQOL has demonstrated good reliability and validity in Iranian nursing populations, with Cronbach's α ranging from 0.78 to 0.86 (Bagheri et al., 2023). In the current study, Cronbach's α values were 0.88 for compassion satisfaction, 0.85 for burnout, and 0.84 for secondary traumatic stress.

Pain Management Practices Scale (PMPS): This researcher-developed instrument was based on comprehensive literature review and expert panel validation. The scale comprises 25 items measuring four domains of pain management: pain assessment practices (8 items), pharmacological interventions (7 items), non-pharmacological interventions (6 items), and documentation practices (4 items). Items are rated on a 5-point Likert scale from 1 (never) to 5 (always), with total scores ranging from 25 to 125. Content validity was established through review by 10 nursing experts (CVI >0.85). Construct validity was confirmed through exploratory factor analysis showing four factors explaining 68.4% of variance. Reliability testing yielded Cronbach's α of 0.91 for the total scale, with subscale α values ranging from 0.79 to 0.88.

Data Collection Procedure

Following ethical approvals and hospital permissions, the research team coordinated with nursing directors to identify potential participants and schedule data collection sessions. Questionnaires were distributed during staff meetings and shift changes. Participants completed questionnaires in private areas within their clinical units, requiring approximately 30-40 minutes. Completed questionnaires were deposited in sealed collection boxes to ensure

confidentiality. Research assistants were available to clarify questions without influencing responses. Follow-up reminders were conducted at two-week intervals to enhance response rates.

Ethical Considerations

The study protocol was approved by the Ethics Committee of Tehran University of Medical Sciences (IR.TUMS.FNM.REC.1402.189). Written informed consent was obtained from all participants after providing detailed information about study objectives, procedures, confidentiality assurances, and voluntary participation. Participants were informed of their right to withdraw at any time without employment consequences. Anonymity was maintained through code numbers, and data were stored securely.

Data Analysis

Data were analyzed using SPSS version 26 and AMOS version 24. Descriptive statistics including frequencies, percentages, means, and standard deviations were calculated. Normality was assessed using Kolmogorov-Smirnov tests. Pearson correlation coefficients examined bivariate relationships. Hierarchical multiple regression analysis identified predictors of pain management practices. Variables were entered in three blocks: Block 1 included demographic and professional characteristics; Block 2 added compassion satisfaction; Block 3 added burnout and secondary traumatic stress. Structural equation modeling (SEM) tested hypothesized relationships among variables. Model fit was evaluated using Chi-square (χ^2), Comparative Fit Index (CFI $\geq$0.90), Tucker-Lewis Index (TLI $\geq$0.90), Root Mean Square Error of Approximation (RMSEA $\leq$0.08), and Standardized Root Mean Square Residual (SRMR $\leq$0.08). Statistical significance was set at $p<0.05$.

Results

Participant Characteristics: Of the 450 distributed questionnaires, 426 were returned (response rate 94.7%). After excluding 14 questionnaires with incomplete data, the final sample comprised 412 participants. Table 1 presents demographic and professional characteristics. The mean age was 35.62 years (SD=7.84, range: 23-59 years). The majority were female (72.8%, n=300) and married (64.1%, n=264). Regarding educational level, 65.5% (n=270) held Bachelor's degrees in nursing, 16.5% (n=68) held Associate degrees, and 18.0% (n=74) held Master's degrees or higher. Mean years of nursing experience was 10.84 years (SD=7.12). Employment status included 41.5% (n=171) permanently employed, 37.4% (n=154) temporary contract, and 21.1% (n=87) contractual. The majority worked rotating shifts (67.2%, n=277), with mean weekly working hours of 49.86 (SD=10.24). Mean nurse-to-patient ratio was 1:8.4 (SD=3.2). Work unit distribution included medical wards (25.5%, n=105), surgical wards (23.3%, n=96), intensive care units (21.6%, n=89), emergency departments (17.2%, n=71), and oncology units (12.4%, n=51).

Table 1. Demographic and Professional Characteristics of Participants (N=412)

No	Variable	n	%
1.	**Gender**		
	- Female	300	72.8

	- Male	112	27.2
2.	**Marital Status**		
	- Married	264	64.1
	- Single	148	35.9
3.	**Educational Level**		
	- Associate Degree	68	16.5
	- Bachelor's Degree	270	65.5
	- Master's or Higher	74	18.0
4.	**Employment Status**		
	- Permanent	171	41.5
	- Temporary Contract	154	37.4
	- Contractual	87	21.1
5.	**Shift Pattern**		
	- Fixed Day	78	18.9
	- Fixed Night	57	13.8
	- Rotating	277	67.2
6.	**Work Unit**		
	- Medical	105	25.5
	- Surgical	96	23.3
	- Intensive Care	89	21.6
	- Emergency	71	17.2
	- Oncology	51	12.4

Descriptive Statistics of Study Variables: Table 2 presents descriptive statistics for ProQOL dimensions and pain management practices. For compassion satisfaction, the mean score was 32.46 (SD=6.84) out of 50. Based on established cut-off scores, 38.6% (n=159) reported low compassion satisfaction, 41.3% (n=170) moderate, and 20.1% (n=83) high compassion satisfaction. For burnout, mean score was 28.94 (SD=5.86) out of 50, with 48.3% (n=199) reporting high burnout, 32.5% (n=134) moderate, and 19.2% (n=79) low burnout. For secondary traumatic stress, mean score was 26.78 (SD=6.12) out of 50, with 41.5% (n=171) reporting high levels, 35.9% (n=148) moderate, and 22.6% (n=93) low levels.

Total pain management practices mean score was 72.46 (SD=14.28) out of a possible range of 25-125, indicating moderate to suboptimal practices. Converted to a 0-100 scale for interpretability, the mean was 58.64 (SD=14.28). Among subscales, pain assessment practices

had the lowest relative score (mean=18.64 out of 40, 46.6%), followed by non-pharmacological interventions (mean=16.82 out of 30, 56.1%), pharmacological interventions (mean=22.46 out of 35, 64.2%), and documentation practices (mean=14.54 out of 20, 72.7%).

Table 2. Descriptive Statistics of Study Variables (N=412)

Variable	Possible Range	Mean	SD	Level/Categorization n (%)
Compassion Satisfaction	10-50	32.46	6.84	Low: 159 (38.6)
				Moderate: 170 (41.3)
				High: 83 (20.1)
Burnout	10-50	28.94	5.86	Low: 79 (19.2)
				Moderate: 134 (32.5)
				High: 199 (48.3)
Secondary Traumatic Stress	10-50	26.78	6.12	Low: 93 (22.6)
				Moderate: 148 (35.9)
				High: 171 (41.5)
Pain Management Total	25-125	72.46	14.28	-
- Pain Assessment	8-40	18.64	5.42	-
- Pharmacological Interventions	7-35	22.46	4.86	-
- Non-pharmacological Interventions	6-30	16.82	4.24	-
- Documentation	4-20	14.54	3.68	-

Bivariate Correlations: Table 3 presents Pearson correlation coefficients among study variables. Pain management total score demonstrated significant negative correlations with burnout ($r=-0.512$, $p<0.001$) and secondary traumatic stress ($r=-0.468$, $p<0.001$), indicating that nurses with higher compassion fatigue reported poorer pain management practices. Conversely, pain management showed significant positive correlation with compassion satisfaction ($r=0.496$, $p<0.001$).

Among pain management subscales, pain assessment showed the strongest correlations with burnout ($r=-0.486$, $p<0.001$) and secondary traumatic stress ($r=-0.452$, $p<0.001$), suggesting that compassion fatigue most strongly affects the assessment phase of pain management. Non-pharmacological interventions also showed substantial correlations with burnout ($r=-0.424$, $p<0.001$) and secondary traumatic stress ($r=-0.398$, $p<0.001$). Documentation practices showed weaker but still significant correlations.

Significant intercorrelations were observed among ProQOL dimensions. Burnout and secondary traumatic stress were positively correlated (r=0.584, p<0.001), while both showed negative correlations with compassion satisfaction (r=-0.526 and r=-0.472 respectively, p<0.001).

Table 3. Pearson Correlation Coefficients Among Study Variables (N=412)

Variable	1	2	3	4	5	6	7	8
1. Pain Management Total	1							
2. Pain Assessment	0.862	1						
3. Pharmacological Interventions	0.784	0.586	1					
4. Non-pharmacological Interventions	0.812	0.624	0.542	1				
5. Documentation	0.648	0.486	0.512	0.468	1			
6. Compassion Satisfaction	0.496	0.468	0.412	0.438	0.386	1		
7. Burnout	-0.512	-0.486	-0.424	-0.468	-0.398	-0.526	1	
8. Secondary Traumatic Stress	-0.468	-0.452	-0.386	-0.424	-0.342	-0.472	0.584	1
p < 0.001								

Hierarchical Multiple Regression Analysis: Hierarchical regression was conducted to examine predictors of pain management practices. Table 4 presents the results. In Block 1, demographic and professional characteristics explained 16.8% of variance in pain management practices (R^2=0.168, F=8.64, p<0.001). Significant predictors included work unit (β=-0.214, p<0.001, with intensive care and oncology nurses reporting better practices), nurse-to-patient ratio (β=-0.262, p<0.001, indicating higher ratios associated with poorer practices), and shift pattern (β=-0.146, p<0.05).

In Block 2, the addition of compassion satisfaction significantly increased explained variance by 14.2% (ΔR^2=0.142, p<0.001), with total variance reaching 31.0% (R^2=0.310, F=28.46, p<0.001). Compassion satisfaction was a significant positive predictor (β=0.386, p<0.001).

In Block 3, the inclusion of burnout and secondary traumatic stress further increased explained variance by 20.6% (ΔR^2=0.206, p<0.001), with the final model explaining 51.6% of variance in pain management practices (R^2=0.516, adjusted R^2=0.502, F=42.38, p<0.001). In the final model, significant predictors were: burnout (β=-0.324, p<0.001), compassion satisfaction (β=0.298, p<0.001), secondary traumatic stress (β=-0.286, p<0.001), nurse-to-patient ratio (β=-0.242, p<0.001), work unit (β=-0.184, p<0.01), and shift pattern (β=-0.112, p<0.05). Notably, the beta coefficient for compassion satisfaction decreased from 0.386 to 0.298 after including burnout and secondary traumatic stress, suggesting partial mediation.

Table 4. Hierarchical Multiple Regression Analysis Predicting Pain Management Practices (N=412)

Variable	Block 1 (β)	Block 2 (β)	Block 3 (β)
Block 1: Demographics			
Age	0.086	0.072	0.058
Gender (female=1)	0.064	0.052	0.044
Education Level	0.124*	0.108	0.086
Experience (years)	0.094	0.082	0.068
Employment Status (permanent=1)	0.112	0.096	0.074
Work Unit (critical/oncology=1)	-0.214	-0.198	-0.184
Shift Pattern (rotating=1)	-0.146*	-0.128*	-0.112*
Nurse-to-Patient Ratio	-0.262	-0.248	-0.242
Weekly Working Hours	-0.108	-0.094	-0.076
Block 2: Compassion Satisfaction			
Compassion Satisfaction		0.386	0.298
Block 3: Compassion Fatigue			
Burnout			-0.324
Secondary Traumatic Stress			-0.286
R^2	0.168	0.310	0.516
ΔR^2	0.168	0.142	0.206
F for change	8.64	28.46	42.38
***p < 0.05; p < 0.01; p < 0.001**			

Structural Equation Modeling: Structural equation modeling was conducted to test a hypothesized model examining direct and indirect relationships among compassion satisfaction, burnout, secondary traumatic stress, and pain management practices. The final model demonstrated excellent fit: χ^2=24.86, df=18, p=0.128; CFI=0.994; TLI=0.991; RMSEA=0.030 (90% CI: 0.000-0.058); SRMR=0.022.

Figure 1 presents the standardized path coefficients. Compassion satisfaction had significant direct positive effects on pain management practices (β=0.31, p<0.001) and negative effects on burnout (β=-0.54, p<0.001) and secondary traumatic stress (β=-0.48, p<0.001). Burnout had significant direct negative effects on pain management practices (β=-0.36, p<0.001) and positive effects on secondary traumatic stress (β=0.42, p<0.001). Secondary traumatic stress had significant direct negative effects on pain management practices (β=-0.28, p<0.001).

Nurse-to-patient ratio had direct negative effects on pain management practices (β=-0.24, p<0.001) and positive effects on burnout (β=0.32, p<0.001).

Table 5. Direct, Indirect, and Total Effects on Pain Management Practices from Path Analysis

Predictor	Direct Effect	Indirect Effect	Total Effect	95% CI for Indirect Effect
Compassion Satisfaction	0.31	0.28	0.59	0.21 to 0.36
Burnout	-0.36	-0.12	-0.48	-0.18 to -0.06
Secondary Traumatic Stress	-0.28	-	-0.28	-
Nurse-to-Patient Ratio	-0.24	-0.16	-0.40	-0.22 to -0.10

*Note: Standardized coefficients; p < 0.01; *p < 0.001*

Table 5 presents the decomposition of effects. Compassion satisfaction had significant direct (β=0.31) and indirect effects (β=0.28) through burnout and secondary traumatic stress, yielding the largest total effect (β=0.59). Burnout demonstrated both direct and indirect effects, with indirect effects operating through secondary traumatic stress. Nurse-to-patient ratio had significant direct and indirect effects through burnout.

Subgroup Analyses: One-way ANOVA revealed significant differences in pain management practices by work unit (F=12.64, p<0.001). Post-hoc Tukey tests indicated that oncology nurses (M=81.64, SD=12.86) and intensive care nurses (M=78.42, SD=13.24) reported significantly better pain management practices compared to medical ward (M=68.94, SD=13.86), surgical ward (M=70.28, SD=14.12), and emergency department nurses (M=66.84, SD=14.68). Significant differences were also observed by nurse-to-patient ratio categories (F=18.42, p<0.001), with nurses caring for ≤6 patients reporting better practices (M=79.86, SD=12.64) than those caring for 7-10 patients (M=71.24, SD=13.86) or >10 patients (M=64.48, SD=14.24).

Independent t-tests revealed no significant gender differences (t=1.08, p=0.281), but nurses on fixed shifts reported significantly better pain management practices than those on rotating shifts (t=4.24, p<0.001).

Discussion

This study provides compelling quantitative evidence linking compassion fatigue to compromised pain management practices among nurses, revealing that nearly half of participating nurses experienced high levels of compassion fatigue, and that these psychological states significantly predicted poorer pain care. The finding that 48.3% of nurses reported high burnout and 41.5% reported high secondary traumatic stress aligns with international prevalence rates reported in systematic reviews (Cavanagh et al., 2020; Zhang et al., 2021). However, these rates are concerningly high and suggest that Iranian nurses face substantial occupational psychological hazards that threaten both their well-being and patient care quality.

The mean pain management practice score of 58.64 (on a 0-100 scale) indicates significant room for improvement, consistent with previous research documenting inadequate pain management in Iranian healthcare settings (Rahimi-Madiseh et al., 2020). Particularly concerning was the low score for pain assessment practices (46.6%), suggesting that the foundational step of recognizing and evaluating pain may be most compromised. Given that accurate assessment is prerequisite for appropriate intervention, this finding has critical clinical implications. The relatively higher scores for documentation practices (72.7%) may reflect regulatory requirements and charting protocols rather than superior pain care, as documentation does not necessarily translate to effective pain relief.

The strong negative correlations between burnout and pain management (r=-0.512) and between secondary traumatic stress and pain management (r=-0.468) provide quantitative support for qualitative findings describing emotional numbing and reduced empathy among compassion-fatigued nurses (Pérez-García et al., 2021; Bagheri et al., 2023). These correlations are consistent with Sinclair et al.'s (2021) theoretical work suggesting that compassion fatigue depletes the emotional resources necessary for sensitive patient engagement. The finding that pain assessment showed the strongest correlations suggests that compassion fatigue may impair nurses' ability to recognize and interpret pain cues, potentially due to attentional narrowing and emotional withdrawal.

The positive correlation between compassion satisfaction and pain management (r=0.496) reinforces the protective role of deriving meaning and pleasure from helping others. This finding aligns with the Professional Quality of Life model (Stamm, 2010), wherein compassion satisfaction buffers against the adverse effects of compassion fatigue. Nurses who maintain high compassion satisfaction despite challenging work conditions may possess greater psychological resources to engage fully with patients' pain experiences.

Hierarchical regression analysis revealed that burnout was the strongest predictor of pain management practices (β=-0.324), followed by compassion satisfaction (β=0.298) and secondary traumatic stress (β=-0.286). The substantial variance explained by compassion fatigue dimensions (20.6% incremental variance after controlling for demographics and compassion satisfaction) underscores the centrality of psychological states in determining pain care quality. This finding extends previous research by demonstrating that the emotional and psychological condition of nurses directly influences specific clinical practices, beyond general measures of care quality.

The significant predictive role of nurse-to-patient ratio (β=-0.242) highlights the importance of structural factors in enabling compassionate pain care. This finding is consistent with international evidence linking staffing ratios to patient outcomes (Aiken et al., 2021) and supports calls for mandatory nurse-to-patient ratio standards. In the Iranian context, where mean ratios of 1:8.4 substantially exceed recommended levels, workload likely compounds compassion fatigue through increased demands and reduced capacity for individualized patient attention.

Work unit differences revealed that oncology and intensive care nurses reported better pain management practices despite working in high-stress environments. This finding may reflect specialized training in pain management, greater availability of analgesic resources, or patient populations with more recognized pain needs. However, these units also showed high

compassion fatigue levels, suggesting that even well-prepared nurses are vulnerable to psychological depletion. Emergency department nurses reported the poorest pain management practices, consistent with research identifying emergency settings as particularly challenging for pain management due to patient acuity, unpredictability, and time pressures (Samarkandi, 2018).

The structural equation model provided insights into causal pathways. The finding that compassion satisfaction had both direct effects on pain management and indirect effects through reducing burnout and secondary traumatic stress suggests that interventions enhancing compassion satisfaction may yield compounded benefits. This aligns with positive psychology approaches emphasizing strengths-based interventions rather than merely deficit reduction (Sinclair et al., 2021). The significant indirect effects of nurse-to-patient ratio through burnout indicate that workload affects pain care partially through psychological depletion, supporting multi-level interventions targeting both structural and psychological factors.

These findings have important implications for nursing practice, education, and policy. At the organizational level, hospitals must recognize compassion fatigue as a patient safety issue, not merely an employee wellness concern. Regular screening for compassion fatigue using validated instruments like ProQOL could identify at-risk nurses for targeted support. Employee assistance programs should be accessible and destigmatized, providing confidential counseling for nurses experiencing compassion fatigue. Peer support and debriefing programs, particularly following critical incidents or patient deaths, may prevent accumulation of secondary traumatic stress (Muir et al., 2022).

At the educational level, nursing curricula should incorporate compassion fatigue awareness and prevention strategies. Students need preparation for the emotional demands of nursing practice, including skills in emotional regulation, self-care, and seeking support. Simulation-based education incorporating challenging clinical scenarios with debriefing focused on emotional responses may build resilience before students enter practice (Sinclair et al., 2021). Faculty development programs should prepare nurse educators to recognize and address compassion fatigue in students.

At the policy level, mandatory nurse-to-patient ratio standards are urgently needed. California's experience with mandated ratios demonstrates associations with improved nurse retention and patient outcomes (Aiken et al., 2021). Additionally, regulatory bodies should consider including compassion fatigue prevention in hospital accreditation standards. National workforce planning must address the nursing shortage that perpetuates excessive workloads and compassion fatigue cycles.

At the individual level, nurses need protected time and resources for self-care. Mindfulness-based interventions have shown promise in reducing compassion fatigue among healthcare workers (Zhang et al., 2021). Resilience training programs teaching cognitive-behavioral skills, boundary setting, and meaning-making may enhance nurses' capacity to cope with emotional demands. However, individual-level interventions must complement, not substitute for, organizational and policy changes addressing root causes.

Limitations: Several limitations should be considered. First, the cross-sectional design precludes causal inferences; longitudinal research is needed to establish temporal relationships. Second, data were collected from teaching hospitals in Tehran, limiting generalizability to

other regions and healthcare settings. Third, self-report measures may be subject to social desirability and recall bias, though validated instruments with strong psychometric properties were employed. Fourth, pain management practices were measured through nurse self-report rather than direct observation or patient outcomes; future research should include patient-reported pain experiences and observational measures. Fifth, unmeasured variables including organizational culture, leadership quality, and availability of pain management resources may influence both compassion fatigue and pain practices. Sixth, the study was conducted during ongoing economic sanctions in Iran, which may have exacerbated work stress beyond typical levels.

Future research should employ longitudinal designs tracking compassion fatigue trajectories and corresponding changes in pain management practices over time. Intervention studies testing the effectiveness of organizational support programs, mindfulness training, and staffing ratio policies on both nurse well-being and patient pain outcomes are urgently needed. Qualitative research exploring nurses' lived experiences of providing pain care while experiencing compassion fatigue would deepen understanding of mechanisms. Cross-national comparative studies would illuminate how healthcare system characteristics moderate these relationships.

CONCLUSION

This study demonstrates that compassion fatigue significantly compromises nurses' ability to provide adequate pain management, with nearly half of Iranian nurses experiencing high levels of burnout and secondary traumatic stress associated with poorer pain assessment, intervention, and documentation practices. The substantial variance explained by compassion fatigue dimensions underscores that psychological states of nurses directly influence the quality of pain care delivered to patients. Addressing this dual harm to nurses and patients requires comprehensive multi-level interventions targeting organizational support enhancement, manageable nurse-to-patient ratios, compassion-focused education, and individual resilience building. Healthcare organizations, educational institutions, and policymakers must recognize compassion fatigue as a patient safety imperative and act decisively to protect both the nursing workforce and the patients entrusted to their care.

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