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The relationship between job stress and the perception of patient safety culture among Palestinian hospital nurses



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Abstract

Background Patient safety is a global concern, with high rates of medical errors reported annually. Understanding the relationship between nurses' job stress and patient safety culture (PSC) is crucial. Despite their pivotal role in healthcare, nurses face stress due to demanding job roles and the challenging healthcare system in Palestine. This study aims to explore the relationship between nurses' job stress and PSC in Palestinian hospitals, identifying predictors that impact PSC to enhance healthcare outcomes and support healthcare professionals.

Methods This study employed a quantitative cross-sectional approach. Data collection took place from June to September 2023. The study utilized self-report surveys, including the Hospital Survey of Patient Safety Culture (HSOPSC) and the Nursing Stress Scale (NSS), administered to 355 nurses working in 16 North West Bank hospitals in Palestine. The data collected were analyzed via descriptive and inferential analysis.

Results Overall, 47% of the nurses reported having positive PSC. The areas with the most positive perception were "teamwork" and "organizational learning-continuous improvement", with mean percentages of positive responses of 63.1% and 55.8%, respectively. Conversely, the composites with the lowest positive response scores included "Response to Error" and "Staffing and Work Pace", with mean percentages of positive responses of 30.9% and 34.8%, respectively. Furthermore, the most common sources of job stress perceived by nurses were "workload" and "death and dying", with mean scores of 1.42 and 1.20, respectively. However, the lowest-scoring sources of stress were in the subscales "Uncertainty concerning treatment" and "Inadequate preparation", with mean scores of 1.02 and 1.06, respectively. Statistical tests revealed that six factors were significantly associated with the perception of PSC. Among these factors, income, hospital type, activities to improve PSC, patient safety ratings of work areas, and weekly night shifts emerged as predictors of PSC. Additional tests revealed nine factors significantly associated with job stress. Among these factors, gender, educational level, engagement in stress relief activities, participation in PSC improvement activities, and patient safety ratings emerged as predictors of job stress. Moreover, the study revealed negative correlations between job stress and PSC.

Conclusion This study identified the need for tailored policies and interventions that address nurses' specific stressors to enhance PSC within hospital settings. Moreover, the study shed light on the unique challenges faced by nurses in Palestine, such as limited resources, unemployment concerns, staffing, and transportation issues, which further

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exacerbated job stress levels and potentially compromised patient safety. Understanding these contextual factors is crucial for developing targeted interventions and support systems that prioritize the holistic well-being of nurses and the quality of patient care delivery.

Keywords Job stress, Patient safety culture, Patient safety, Palestine, Nurses

Background

Patient safety is a critical global public health concern. The World Health Organization (WHO) defines it as "the absence of preventable harm to a patient and reduction of risk of unnecessary harm associated with health care to an acceptable minimum" [1]. Reports indicate high incidences of harm. Specifically, the WHO's Global Patient Safety Action Plan 2021–2030 estimates that millions of patients are harmed each year due to unsafe care, with a significant portion of these harms being preventable [2]. Furthermore, the WHO's factsheet on patient safety states that globally, as many as one in ten patients is injured annually, while receiving hospital care [1]. The Institute of Medicine (IOM) emphasizes the need for safer healthcare systems rather than focusing solely on individual accountability [3].

In Palestine, the unstable and fragile political and socioeconomic climate [4] may lead to prioritizing resources and quantity over the safety and quality of healthcare services. However, the need to improve the standards and safety of these services has gained increasing attention. The Ministry of Health (MOH) has included patient safety in its national health strategic goals [5]. The MOH has taken steps to improve patient safety by joining the WHO Patient Safety Friendly Hospital Initiative (PSFHI) and achieving Joint Commission International Accreditation (JCIA) in two hospitals. The Joint Commission is a global leader in quality improvement and patient safety in healthcare. Limited research has been published on assessing patient safety culture (PSC) in Palestinian hospitals [6-10]. More research is needed to fully understand PSC in Palestinian hospitals and to further enhance current efforts.

The National Center for Complementary and Integrative Health (NCCIH) defines stress as "a physical and emotional reaction that people experience as they encounter challenges in life" [11]. In Palestine, the challenging political situation creates constraints and insecurities that hinder the development of a health infrastructure capable of meeting the population's public health needs [12]. Healthcare staff face stressors due to limited resources, difficult working conditions, complex movements between checkpoints, and insecurity in their homes due to occupation [12].

In the modern world, the health–work interface must be explored, especially concerning patient safety. Patient safety may be placed at risk due to stress-related health problems among healthcare workers. To foster thriving PSC in healthcare organizations, it is essential to address the norms, values, and beliefs related to patient safety [13]. The exhaustion and job stress of healthcare workers may negatively affect PSC [14]. Stress can lead to workplace incidents such as absenteeism and turnover [15], as well as decreased job satisfaction, productivity, accurate decisions, and reduced quality of patient care [16–18]. Numerous studies have shown that job stress directly or indirectly impacts health service delivery [19, 20].

Nurses, who constitute a significant portion of the healthcare workforce, are responsible for delivering high-quality and safe care [21]. In Palestine, nurses face increased stress due to political and economic challenges. High stress levels can increase the likelihood of errors that affect patient outcomes [16, 22]. Given their crucial role, understanding job stress among nurses and its effects on patient safety is vital [23]. Addressing these stressors can help improve productivity and patient care quality [18]. Studies have shown that excessive job stress can negatively affect staff performance [24, 25]. Healthcare organizations must assess stress levels and stressors among healthcare staff, particularly nurses, to develop effective stress management strategies [16]. This is essential for maintaining a positive organizational climate and improving staff performance [26].

This study aims to examine the relationship between job stress and the perception of PSC among nurses working in Palestinian hospitals on the North West Bank. By investigating both job stress and PSC perceptions, this research aims to understand how stress influences nurses' well-being and patient care delivery. The findings can help healthcare institutions improve work environments, enhance PSC, and inform policy changes for a more supportive work culture. Additionally, the study seeks to explore these specific objectives:

- 1. To examine nurses' perception of PSC and job stress among nurses in North West Bank hospitals.
- 2. To investigate the relationships between nurses' demographics (gender, age, income, academic qualifications) and workplace characteristics (tenure in the hospital, tenure in the work area, type of hospital, primary working unit, hours worked per week, activities performed by the hospital to relieve job stress and improve PSC, the rating of unit/work area on patient safety, and night shifts) and their perceptions of job stress and PSC in North West Bank hospitals.

 To identify the predictors of job stress and PSC perceptions among nurses in North West Bank hospitals.

Methods

Study design

This study used a quantitative cross-sectional design, and the STROBE guidelines [27] were followed to ensure clear and accurate reporting of the study's findings.

Setting and population

This study was conducted across all hospitals in the Northern West Bank of Palestine, covering five major cities and 16 hospitals. The largest city, Nablus, has seven hospitals. The second city, Tulkarm, has two hospitals. Jenin has five hospitals, Qalqilya has one hospital, and the fifth city, Tubas, includes one hospital. Seven of the total hospitals are private, six are governmental, and three are NGOs. These hospitals deliver various health services, including secondary and tertiary treatment. The study population consisted of 2,021 nurses working in these hospitals. These nurses come from diverse backgrounds and hold various academic qualifications.

Sample size calculation

The study sample was chosen using proportionate and convenience sampling. The total number of nurses across different hospitals was obtained from hospital administrations and the MOH. Each hospital's representation was based on a specific percentage of the overall participant pool. To avoid duplication, nurses working in multiple hospitals were asked not to complete another questionnaire if they had already done so elsewhere.

The researcher used the Raosoft Inc. sample size calculator [28] to calculate the sample size. When calculating the sample size for studies, a commonly used approach assumes a 5% margin of error, 95% confidence level, and 50% response distribution, and the resulting sample size was 323 nurses. This study sampling frequently uses these intervals because they balance precision and confidence. A total of 10% was added as an attrition rate, and the final sample size was 355 nurses. These nurses were distributed proportionately.

Inclusion and exclusion criteria

The study targeted 355 licensed nurses from various departments in the selected hospitals. The inclusion criteria were that all licensed nurses, whether fully employed or part-time, who worked in one of the 16 hospitals and graduated from a recognized college or university were eligible. Additionally, only nurses who were available during the study period and agreed to participate were included. Conversely, the exclusion criteria ruled out nurses who were not licensed, who were neither fully employed nor part-time, who did not graduate from a recognized college or university, who were unavailable during the study period, or who did not agree to participate. These same criteria were applied during the pilot test.

Instruments

The study utilized a self-administered questionnaire comprising three sections. The first section of the questionnaire collected demographic data from the participants. The second section included the Arabic version of the Hospital Survey of Patient Safety Culture (HSOPSC) Version 2.0, originally developed by the Agency for Healthcare Research and Quality (AHRQ), to assess the perception of PSC [29]. This version was translated by the Saudi Patient Safety Center (SPSC) [30]. This tool has been widely utilized in various languages globally [31, 32]. For this study, PSC is defined as the shared values, beliefs, and norms about patient safety within a healthcare organization [33]. The HSOPSC tool assesses various dimensions of PSC, including communication openness, teamwork, and management support for patient safety. This tool is used to assess hospital PSC and has been reported to have very good internal consistency. The Cronbach's alpha for the composites ranged from 0.67 to 0.89 [34]. The Cronbach's alpha of the present study was 0.80, indicating very good reliability.

The tool consists of 40 items. In the first eight items, one survey question asked participants how many patient safety incidents they had reported. Another question asked participants to rate their overall perception of patient safety in their unit, and six survey items were based on participants' demographics. The remaining 32 items are grouped into ten composite measures, each comprising two or more items that assess areas of PSC. This tool utilized 5-point agreement scales (ranging from 'Strongly disagree' to 'Strongly agree') or frequency scales (from 'Never' to 'Always'). Additionally, it offered the option of "Does not apply or Do not know". To calculate composite scores, negative responses (strongly disagree/disagree and never/rarely) were combined, as were positive responses (strongly agree/agree and mostly agree/always). The lowest combined percentages represented the negative score, whereas the highest combined percentages represented the positive score. The perception of nurses is considered positive when the overall frequency score is high, and it is considered weak or negative when it is low. Some items are negatively worded; the positive score for these items was the lowest, and the highest score was positive. The overall score for each composite was determined by averaging the percentage of positive responses across its elements. The overall PSC score is represented by averaging the 10 composite scores. While there is no universally defined cutoff point,

the researcher identified an area as 'weak' when the positive score fell below 50%. The HSOPSC tool aligns with the study's objectives by providing a comprehensive assessment of PSC, which is crucial for understanding nurses' perception of PSC in the context of North West Bank hospitals. It enables the identification of areas for improvement and the evaluation of hospital initiatives aimed at enhancing PSC.

The third section of the questionnaire included the Arabic version of the Nursing Stress Scale (NSS), translated by B Alhajjar [35] from the original scale developed by P Gray-Toft and JG Anderson [36]. The NSS is widely used by nurse researchers to assess nursing stress. It has demonstrated excellent internal consistency in Arabic countries, with reported Cronbach's alpha values ranging from 0.89 to 0.94 in some studies [37–41]. The translated Arabic version had excellent internal consistency, with a Cronbach's alpha coefficient of 0.87 [35]. The Cronbach's alpha of the present study was 0.92, indicating the tool's excellent reliability. In this study, job stress was defined as the physical and emotional reactions experienced by nurses due to challenging conditions in their work environment [42]. The NSS tool is the most common tool used to measure nurses' job stress. It measures the frequency and sources of stress among nurses.

This NSS comprises seven subscales based on 34 items designed to assess the frequency of stress caused by certain conditions among nurses while they perform their tasks [36]. The response is based on a 4-point Likert scale to rate the sources of stress and the frequency of these stressors: 0 for "Never," 1 for "Occasionally," 2 for "Frequently," and 3 for "Very Frequently". Individual item responses are summed to calculate subscale and overall scores. NSS scores allow the comparison of stress levels across nurse groups (e.g., by unit, specialty, or demographics) and the identification of common stressors. To make a meaningful comparison, this study utilized a method similar to that used in previous studies [43, 44]. The scoring for the NSS involves calculating each item's mean and standard deviation. The arithmetic mean (AM) was utilized to measure the most frequent stress subscale. The NSS tool aligns with the study's objectives by providing a detailed assessment of job stress among nurses, which is critical for understanding the sources and frequency of stress in the context of North West Bank hospitals. This information is essential for developing strategies to reduce stress and improve nurses' performance and well-being.

Pilot testing

A pilot study was conducted on a group of nurses, constituting 30% of the study sample, to assess the instruments' feasibility in the main study. Notably, no clarifications were needed during questionnaire completion, likely because the questions were presented in Arabic, the participant's native language. The pilot study confirmed the high reliability of the study instruments. Specifically, the HSOPSC demonstrated a Cronbach's alpha of 0.86, indicating good internal consistency. Similarly, the NSS had a Cronbach's alpha of 0.95, reflecting excellent reliability.

Data collection

The study was conducted between June and August 2023 in 16 North West Bank hospitals in Palestine. After obtaining the necessary approvals, the researcher and assistants distributed questionnaires to eligible nurses at their workplaces. The participants received explanations about the study's purpose, confidentiality, and anonymity. Nurses had the right to withhold responses if any questions felt too private. Empty questionnaires were left with head nurses for eligible nurses to complete during their shifts, and the completed questionnaires were collected after two weeks.

Data analysis

The collected survey data were cleaned and coded in Microsoft Excel 2021. IBM SPSS Statistics Version 27.0 was subsequently used for organized data analysis [45]. Descriptive statistics were used to present demographic and workplace characteristics. The AHRQ Hospital Survey on Patient Safety Culture Version 2.0 User's Guide [32] guided the measurement of PSC. Associations between participant demographics, workplace features, and the NSS total score were assessed via t-tests and one-way ANOVA since the data was normally distributed according to the Shapiro–Wilk test (p-value > 0.001). Similarly, the Mann-Whitney U and Kruskal-Wallis H tests were employed to measure associations with the HSOPSC total score since the data was not normally distributed according to the Shapiro-Wilk test (p-value < 0.001). The Pearson correlation coefficient (r) was used to explore the relationship between the NSS total score and the HSOPSC total score. Additionally, multiple linear regression was used to assess the prediction of the significant variables found in the univariate analysis. Statistical significance was set at a p-value < 0.05.

Results

Participant characteristics

The study was conducted on 355 nurses from 16 North-West Bank Hospitals, with a response rate of 89%. The study results revealed that male participants represented 55.2% (n = 196) of the sample, whereas females represented 44.8% (n = 159) of the sample. Almost half of the participants (53.8%, n = 191) were aged 20–29 years. More than half of the participants were married (62.2%, n = 221).

Table 1 Participants characteristics

Variable	Categories	(<i>N</i>)	(%)
Gender	Male	196	55.2
	Female	159	44.8
Age group	20 to 29 years	191	53.8
	30 to 39 years	143	40.3
	40 years and above	21	5.9
Marital Status	Single	132	37.2
	Married	221	62.2
	Divorced	2	0.6
Resident	Nablus	146	41.1
	Tulkarm	74	20.8
	Jenin	85	24
	Qalqilya	21	5.9
	Tubas	29	8.2
Income	From 1000 to 3000 NIS	78	22.0
	From 3100 to 5000 NIS	244	68.7
	Over 5000 NIS	33	9.3
Academic Level	Diploma	71	20.0
	Bachelor	258	72.7
	Master	26	7.3
Total Respondents		355	100%

N: Number of participants; %: the percentage of participants in each group of a category (each category represents 100% of total participants)

Moreover, most participants (68.7%, n = 244) had an average income ranging from 3100 to 5000 New Israeli Sheqel (NIS). The majority of the participants in this study (72.7%, n = 258) held a bachelor's degree in nursing. Table 1 provides details of the participants' demographics (Table 1).

Workplace characteristics

As shown in Table 2, most of the study participants worked in governmental hospitals (48.5%, n = 172). Most participants (55.4%, n = 194) in these hospitals worked in patient care units such as emergency rooms (ERs), cardiology units, intensive care units (ICUs), outpatients, dialysis units, obstetrics and gynecology units, and pediatrics. Moreover, most of the participants in this study were nurses (88.2%, n = 313), and only 7.0% (n = 25) were midwives.

Over half of the participants worked 30–40 h per week (59.4%, n = 211). Moreover, the average number of night shifts per week among the participants was 1.88 (SD = 1.074). Furthermore, approximately half of the participants in the study (51.5%, n = 183) had 1–5 years of experience in the current working unit. Additionally, most participants were positive when asked to rate their working area/unit on patient safety. A total of 20.6% (n = 73) rated their unit as excellent, and 33.5% (n = 119) gave a very good rating.

Approximately half of the participants (49.6%, n = 176) said that they did not report any events related to patient safety. However, only 2.5% (n = 9) reported 11 or more

Table 2 Participants' workplace characteristics

Variable	Categories	(N)	(%)
Hospital type	Governmental	172	48.5
	Non-Governmental	136	38.3
	Academic	47	13.2
Experience in	1 to 5 years	153	43.1
Profession	6 to 10 years	123	34.6
	11 or more years	79	22.3
Experience in the	Less than one year	43	12.1
current hospital	1 to 5 years	159	44.8
	6 to 10 years	103	29.0
	11 or more years	50	14.1
Experience in the	Less than one year	70	19.7
current unit	1 to 5 years	183	51.5
	6 to 10 years	67	18.9
	11 or more years	35	9.9
Working hours per	Less than 30 h per week	41	11.5
week	30 to 40 h per week	211	59.4
	Over 40 h per week	103	29.0
Primary unit or work area in this hospital	Multiple Units, No specific unit	17	4.9
	Medical/Surgical Units	101	28.9
	Patient Care Units	194	55.4
	Surgical Services	38	10.9
Position in this	Nurse	313	89.2
hospital	Midwife	25	7.1
	Administrative Positions	13	3.7
Does the hospital	Yes	63	17.7
perform activities for nurses to relieve job stress?	No	292	82.3
Does the hospital	Yes	183	51.5
perform activities to improve the PSC?	No	172	48.5
In the past 12	None	176	49.6
months, how many	From 1 to 2	110	31.0
patient safety events	From 3 to 5	41	11.5
have you reported?	From 6 to 10	19	5.4
	11 or more	9	2.5
How would you rate	Poor	12	3.4
patient safety in your	Fair	51	14.4
unit/work area?	Good	100	28.2
	Very Good	119	33.5
	Excellent	73	20.6
Night Shift	Median [Q1-Q3] = 2.00 [1.00-	-2.00]	
Total Respondents	-	355	100%

SD: standard deviation; some numbers do not total 355 due to missing data; N: Number of participants; %: the percentage of participants in each group of a category

Patient care units include cardiology, ER, gastroenterology, ICU (all adult types), labor & delivery, obstetrics & gynecology, oncology, hematology, and pediatrics (including the NICU and PICU)

Surgical services include endoscopy, colonoscopy, preopening, operating room/site, PACU/post-op, and pre-op

Administrative positions include supervisor, manager, clinical leader, department manager, administrator, and director



Fig. 1 Composite average positive response

Arithmetic Mean Score of NSS Sub-Scales



Fig. 2 The arithmetic means scores of the NSS-7 subscale

events related to patient safety. Moreover, 82.3% (n = 292) of the participants mentioned that their hospitals had not performed activities for nurses to relieve job stress. Additionally, 51.5% (n = 183) of them mentioned that their hospitals had performed activities to improve their PSC.

Perception of PSC

The composite score in this study ranged from 30.9 to 63.1%, and the overall composite score was 47.0%. Figure 1 shows the average positive scores of the ten composites. The highest composite score was "teamwork", with a 63.1% positive score. This is followed by the "organizational learning—continuous improvement" composite, with a positive score of 55.8%. However, the lowest composite score was "response to error", with a positive score of 30.9%, followed by the "staffing and work pace" composite, with a positive score of 34.8%. The composite scores and their item scores are presented in detail in Additional File 1.

The average percentage of positive responses for all composites represents an overall PSC score of 47.0%.

Nursing job stress

The overall mean score for the NSS was 39.76 ± 15.16 , ranging between 1 and 85 points. The highest perceived sources of job stress were in subscale VI, "workload", with a mean score of 8.55 ± 3.54 (AM = 1.42), followed by subscale I, "death and dying", with a mean score of 8.41 ± 3.52 (AM = 1.20). The lowest perceived sources of job stress were in subscale VII, "uncertainty concerning treatment", with a mean score of 5.14 ± 3.03 (AM = 1.02), followed by subscale III, "inadequate preparation", with a mean score of 3.19 ± 1.72 (AM = 1.06) (see Fig. 2).

For subscale I, "death and dying", the most stressful sources were "watching a patient suffer" (M = 1.52 ± 0.82) and "performing procedures that patients experience as painful" (M = 1.42 ± 0.79). Similarly, in subscale VI, "workload", the most stressful source of stress was "not enough staff to adequately cover the unit" (M = 1.55 ± 0.94), followed by the "breakdown of computers" (M = 1.55 ± 0.91). The score for each subscale and their items can be found in Additional File 2.

Participants' characteristics and PSC

Table 3 shows a statistically significant association between the perception of PSC and income (p-value < 0.05). Participants with incomes over 5000 NISs had more positive perceptions than those with lower income rates (mean rank 244.76, p-value < 0.001). The remaining demographics were not significantly associated with the perception of PSC (p-value > 0.05).

Variable	Ν	PSC and Part	icipant Characteristics	NSS and participant characteristics				
			Mean rank	Median [Q1–Q3] ^a	p-value	Mean±SD ^b	F	p-value
Gender	Male	196	174.63	101.00 [92.00–111.75]	0.492	42.2±15.6	1.559	< 0.001*
	Female	159	182.16	100.00 [94.00-113.00]		36.7 ± 14		
Age group	20 to 29 years	191	178.98	100.00 [93.00-113.00]	0.365	38.7 ± 14.6	1.453	0.235
	30 to 39 years	143	172.54	100.00 [93.00-111.00]		41.3 ± 16		
	40 years and above	21	206.24	102.00 [96.50–118.00]		37.5 ± 13.4		
Marital Status	Single	132	172.43	100.00 [93.00-112.00]	0.172	39.6±1.6	0.503	0.605
	Married	221	180.15	101.00 [94.00-112.50]		39.7±15.5		
	Divorced	2	44.50	75.00 [57.00–.]		50.5 ± 9.2		
Income	From 1000 to 3000	78	161.24	97.50 [92.00–108.75]	< 0.001*	36.3 ± 14.6	5.841	0.003*
	From 3100 to 5000	244	174.33	100.00 [93.00-111.00]		41.5 ± 15.1		
	Over 5000 NIS	33	244.76	112.00 [102.00–124.50]		34.4 ± 14.1		
Academic Level	Diploma	71	165.05	97.00 [94.00-111.00]	0.419	34.6 ± 15.5	5.184	0.006*
	Bachelor	258	180.14	101.00 [93.00-112.25]		40.9 ± 14.9		
	Master	26	192.15	101.50 [93.00–118.50]		42.1±13.5		
Total Respondents		355						

Table 3 Associations between PSC, NSS score, and participant characteristics

N: Number (frequency), Q1-Q3: first quartile-third quartile, SD: standard deviation

*Significance levelp < 0.05

^a: Mann–Whitney U and Kruskal–Wallis H tests were employed to measure associations with the HSOPSC total score since the data of the HSOPSC tool was not normally distributed

^b: T-tests and one-way ANOVA were employed to measure associations with the NSS total score since the data of the NSS tool was normally distributed



Fig. 3 A significant relationship exists between PSC and hospital type (academic hospitals have a greater positive perception of PSC)

Participants' workplace characteristics and PSC

The study results revealed a statistically significant association between the perception of PSC and "hospital type" (see Fig. 3), whether the hospital performs activities for nurses to relieve job stress, whether the hospital performs activities to improve PSC, and patient safety ratings in the unit/working area (p-value < 0.05) (see Table 4). The remaining workplace characteristics were not significantly associated with the perception of PSC (p-value > 0.05).

Participants' characteristics and job stress

The study revealed statistically significant associations between perceived job stress and gender, income, and academic level (*p-value* < 0.05) (see Table 3). Male participants experienced more job stress than female participants did (M=42.2 & 36.7, respectively, *p*<0.001).

The participants with incomes ranging from 3100 to 5000 NIS experienced more job stress (M = 41.5, p = 0.003). Moreover, participants with a master's degree perceived more job stress (M = 42.1, p = 0.006).

Participants' workplace characteristics and job stress

The study revealed that participants who work in governmental hospitals reported higher levels of job stress (M=44.9) than those working in academic or nongovernmental hospitals did (M=35.5 & 34.6, respectively) (see Fig. 4). Furthermore, participants with experience ranging from 6 to 10 years in their current unit perceived more job stress (M=41.8, p = 0.010) than their colleagues did.

Moreover, participants who worked in medical/surgical units experienced the highest level of job stress (M = 43.3, p < 0.001), followed by those who worked in patient care units (M = 40.6, p < 0.001). The study also revealed that participants whose hospitals were conducting activities to alleviate job stress for nurses experienced lower levels of job stress (M = 32.2, p < 0.001) than those whose hospitals were not doing such activities (M = 41.3, p < 0.001). Furthermore, the study revealed that participants whose hospitals were conducting activities to improve PSC experienced a lower level of job stress (M = 35, p < 0.001) than those whose hospitals were not doing such activities (M = 44.7, p < 0.001). Moreover, the study results revealed that participants who rated their working unit or area as poor in terms of patient safety experienced the highest level of job stress (M = 58.3, p < 0.001), whereas those who

Variable	Categories	N PSC and workplace characteristics				NSS and workp	olace chara	cteristics
			Mean Rank	Median [Q1–Q3] ^a	p-value	Mean±SD ^b	F	p-value
Hospital type	Governmental	172	153.88	98.00 [90.00–105.75]	< 0.001*	44.9±14.5	22.058	< 0.001*
	Non-Governmental	136	175.02	100.00 [94.00–110.75]		34.6±14		
	Academic	47	274.89	118.00 [109.00-128.00]		35.5 ± 14.2		
Experience in the cur-	< one year	43	184.14	99.00 [93.00–115.00]	0.622	37.3 ± 16.4	2.146	0.094
rent hospital	1 to 5 years	159	170.23	100.00 [92.00-112.00]		39.7 ± 14.1		
	6 to 10 years	103	182.37	101.00 [93.00-116.00]		42.3 ± 15.2		
	11 or more years	50	188.42	101.00 [94.75–111.50]		36.5 ± 16.2		
Experience in the cur-	< one year	70	182.50	99.50 [93.00–113.50]	0.976	36.8 ± 15.2	3.875	0.010*
rent unit	1 to 5 years	183	176.10	100.00 [93.00-112.00]		41.2 ± 14		
	6 to 10 years	67	178.99	101.00 [92.00-116.00]		41.8±17.9		
	11 or more years	35	177.04	99.00 [94.00–107.00]		33.6±13.1		
Working hours per	< 30 hours per week	41	161.20	98.00 [91.00–106.50]	0.490	43.6±17.8	1.635	0.196
week	30 to 40 hours per week	211	181.92	101.00 [93.00-113.00]		39 ± 14.4		
	Over 40 hours per week	103	176.65	100.00 [94.00-112.00]		39.7 ± 15.4		
Primary unit or work area in this hospital	Multiple Units, No specific unit	17	185.88	104.00 [88.00–115.50]	0.167	27.6±15.2	9.222	< 0.001*
	Medical/Surgical Units	101	156.82	98.00 [92.00-104.00]		43.3 ± 16.2		
	Patient Care Units	194	181.53	101.00 [93.75–113.00]		40.6±13.8		
	Surgical Services	38	189.72	101.50 [95.50–113.00]		32.6±13.3		
Does the hospital	Yes	63	207.48	103.00 [94.00–117.00]	0.012*	32.2 ± 14.1	0.024	< 0.001*
perform activities for nurses to relieve job stress?	No	292	171.64	100.00 [92.00–111.00]		41.3±14.9		
Does the hospital	Yes	183	208.4	104.00 [95.00-117.00]	< 0.001*	35 ± 13.5	1.749	< 0.001*
perform activities to improve the PSC?	No	172	145.59	96.50 [89.00–104.00]		44.7±15.1		
How would you rate	Poor	12	74.04	89.00 [79.75–94.75]	< 0.001*	58.3 ± 14.2	13.442	< 0.001*
patient safety in your	Fair	51	100.37	91.00 [87.00–99.00]		46.4±12		
unit/work area?	Good	100	151.29	96.50 [92.00–104.00]		41.9±13.2		
	Very Good	119	210.39	104.00 [97.00–117.00]		37.2±16		
	Excellent	73	233.12	112.00 [99.50–123.00]		33.1±13.6		
Total Respondents		355						

Table 4 Association between PSC, NSS and workplace characteristics

N: Number (frequency), Q1-Q3: first quartile-third quartile, SD: standard deviation; some numbers do not total 355 due to missing data

*Significance levelp < 0.05

Patient care units include cardiology, ER, gastroenterology, ICU (all adult types), labor & delivery, obstetrics & gynecology, oncology, hematology, and pediatrics (including the NICU and PICU)

Surgical services include endoscopy, colonoscopy, preopening, operating room/site, PACU/post Op, and Peri Op

^a: Mann–Whitney U and Kruskal–Wallis H tests were employed to measure associations with the HSOPSC total score since the data of the HSOPSC tool was not normally distributed

^b: T-tests and one-way ANOVA were employed to measure associations with the NSS total score since the data of the NSS tool was normally distributed

rated their working unit or area as excellent in terms of patient safety experienced the lowest level of job stress (M = 33.1, p < 0.001) (see Table 4).

Relationship between job stress and PSC

Pearson's correlation coefficients revealed that job stress was significantly negatively correlated with PSC (r = -0.352, p < 0.001) (see Table 6).

Pearson's correlation (r) coefficients revealed that the number of night shifts per week was significantly negatively correlated with PSC (r = -0.192, p < 0.001). However, no statistically significant correlation was found between night shifts and perceived job stress (r = -0.031, p = 0.559) (see Table 5).

Multiple linear regression *Predictors of PSC*

Multiple linear regression analysis (Table 7) revealed that several factors significantly predicted PSC ($R^2 = 0.336$, adjusted $R^2 = 0.324$, F (6, df) = 29.291, p < 0.001). Specifically, income ($\beta = 0.119$, p = 0.010), hospital type ($\beta = 0.132$, p = 0.009), whether the hospital performs



Fig. 4 A significant relationship between job stress and hospital type (government hospitals have higher levels of job stress)

Table 5Pearson's correlation coefficients of night shifts withPSC and NSS

	Number of night shifts	Sig.		
	per week	(2-tailed)		
The total score of the NSS	-0.031**	0.559		
Total score of PSC	-0.192**	< 0.001		

** Correlation is significant at the 0.01 level (2-tailed)

 Table 6
 Pearson's correlation coefficients of NSS and PSC

	Total score of PSC	Sig. (2-tailed)		
The total score of the NSS	-0.352**	< 0.001		
** Correlation is significant at the 0.01 level (2-tailed)				

activities to improve PSC ($\beta = -0.165$, p < 0.001), unit/ work area rating on patient safety ($\beta = 0.395$, p < 0.001), and number of night shifts per week ($\beta = -0.147$, p = 0.001) were significantly associated with PSC. In contrast, whether the hospital performs activities for nurses to relieve job stress was not a significant predictor ($\beta =$ -0.003, p = 0.947).

Predictors of job stress

Multiple linear regression analysis (Table 8) revealed that several factors significantly predicted job stress ($R^2 = 0.255$, adjusted $R^2 = 0.235$, F (9, df) = 12.923, p < 0.001). Specifically, gender ($\beta = -0.107$, p = 0.034), academic

level (β =0.149, *p*=0.005), whether the hospital performs activities for nurses to relieve job stress (β =0.137, *p*=0.010), whether the hospital performs activities to improve PSC (β =0.180, *p*<0.001), and unit/work area rating on patient safety (β = -0.265, *p*<0.001) were significantly associated with job stress. In contrast, income (β =0.015, *p*=0.780), hospital type (β = -0.097, *p*=0.072), experience in the current unit (β =0.004, *p*=0.929), and primary unit or work area in this hospital (β = -0.057, *p*=0.232) were not significant predictors.

Discussion

Nurses' perception of PSC

This study examined the relationship between job stress and perceived PSC among hospital nurses on the North West Bank of Palestine. The results indicate a relatively low average positive perception of PSC among these nurses compared with other regions. This may be due to several factors, including ongoing challenges within the Palestinian healthcare system, such as limited resources, political instability, and potential inconsistencies in training and best practice implementation. Limited engagement in patient safety initiatives and the lack of comprehensive national or international accreditations may also contribute. This finding highlights the need for greater efforts to improve PSC within Palestinian healthcare institutions. Our study's overall PSC perception was lower than that reported in the AHRQ database [46] and several other studies [6, 7, 9, 47-51]. Conversely, it was higher than that reported in other studies [52-55]. The current results are similar to those reported by F Mohammed, M Taddele and T Gualu [56], I Oweidat, GA Shosha, K Dmaidi and AJ Nashwan [57], and X Zhao, W Liu, Y Wang and L Zhang [58]. These variations in PSC scores, both within our study and compared to others, illustrate the complex interplay of organizational, cultural, and contextual factors that affect nurses' perception of safety culture. Our diverse sample, which included participants from public, nonpublic, and academically accredited hospitals, likely reflects some of this

B b	t	<i>p</i> -value	95.0% confidence interval		VIF	
				Lower	upper	
83.702		15.152	< 0.001	72.837	94.567	
3.243	0.119	2.599	0.010*	0.788	5.697	1.106
2.789	0.132	2.643	0.009*	0.713	4.864	1.314
-0.125	-0.003	-0.066	0.947	-3.840	3.590	1.247
-4.890	-0.165	-3.354	< 0.001*	-7.757	-2.023	1.271
5.447	0.395	8.373	< 0.001*	4.168	6.727	1.165
-2.025	-0.147	-3.274	0.001*	-3.241	-0.808	1.054
	B 83.702 3.243 2.789 -0.125 -4.890 5.447 -2.025	B b 83.702	B b t 83.702 15.152 3.243 0.119 2.599 2.789 0.132 2.643 -0.125 -0.003 -0.066 -4.890 -0.165 -3.354 5.447 0.395 8.373 -2.025 -0.147 -3.274	B b t p-value 83.702 15.152 <0.001	B b t p-value 95.0% contribution 1000000000000000000000000000000000000	B b t p-value 95.0% c-miterval interval 83.702 15.152 <0.001

B and b = unstandardized and standardized coefficients, respectively; R = 0.579; R Square = 0.336; Adjusted R Square = 0.324, F = 29.291, df = 6, p < 0.001 *Sianificance levelp < 0.05

Table 8Predictors of job stress

Predictor	B b	b	t	<i>p</i> -value	95.0% confidence interval		VIF
					Lower	upper	
Constant	37.091		5.139	< 0.001	22.894	51.288	
Gender	-3.227	-0.107	-2.123	0.034*	-6.217	-0.238	1.148
Income	0.427	0.015	0.280	0.780	-2.574	3.427	1.353
Academic Level	4.465	0.149	2.856	0.005*	1.390	7.540	1.250
Hospital type	-2.097	-0.097	-1.802	0.072	-4.386	0.192	1.314
Experience in the current unit	0.076	0.004	0.090	0.929	-1.587	1.739	1.080
Primary unit or work area in this hospital	-1.203	-0.057	-1.197	0.232	-3.179	0.773	1.042
Whether the hospital performs activities for nurses to relieve job stress	5.435	0.137	2.581	0.010*	1.293	9.578	1.280
Whether the hospital performs activities to improve the PSC	5.441	0.180	3.376	< 0.001*	2.271	8.612	1.302
Unit/work area rating on patient safety	-3.713	-0.265	-5.187	< 0.001*	-5.121	-2.305	1.191

B and b = unstandardized and standardized coefficients, respectively; R=0.505; R Square = 0.255; Adjusted R Square = 0.235, F = 12.923, df = 9, p < 0.001 *Sianificance levelp < 0.05

variability. However, further research is needed to understand the specific contributions of each factor.

Only one hospital in our study had JCI accreditation. This limited number highlights the need for wider adoption of accreditation standards to improve patient safety across the healthcare system. Patient safety initiatives have been implemented relatively recently in Palestine. Continued efforts to strengthen and expand these initiatives are essential for developing a robust PSC. More research is needed to fully understand the factors influencing PSC in the Palestinian context.

Key dimensions of PSC

The highest perceived positive composite in the present study was "teamwork" and "organizational learning— continuous improvement". These findings are consistent with many other studies [7, 59–63], suggesting that these are existing strengths in Palestinian healthcare that can be leveraged to enhance PSC. For example, fostering interprofessional collaboration and creating shared learning opportunities could build on positive teamwork perception and improve other areas, such as response to errors. Effective teamwork and continuous improvement processes are crucial for PSC. Improving team integration and promoting a culture of continuous learning can lead to better clinical outcomes and a stronger PSC.

The current results align with those of a review study by A Azyabi, W Karwowski and MR Davahli [64], which identified "teamwork" as the most positively reported composite, demonstrating the healthcare sector's reliance on multidisciplinary teams. This finding supports existing research showing the positive impact of effective teamwork, communication, and leadership on patient safety and quality of care [65]. The findings also echo those of a study of Jordanian nurses, which reported that "organizational learning—continuous improvement" was highly rated [57]. This aligns with other research [61–63, 66]. Organizational learning significantly affects patient safety, as developing staff abilities based on event analysis can improve PSC [64]. Regular workplace procedures and events, along with knowledge sharing between experienced and junior staff, can promote continuous improvement [67].

Conversely, the lowest average positive score in this study was in the "response to error" composite, followed by the "Staffing and Work Pace". This finding is similar to findings from studies in Qatar and Palestine, which reported low scores for "non-punitive responses to errors" and "staffing" [62, 63]. Low "response to error" scores may indicate a culture of fear or blame, which prevents nurses from reporting errors and learning from them. This has significant implications for patient safety, as unreported errors can lead to future harm. Addressing staffing issues by optimizing workforce allocation and reducing workloads can improve care quality and safety. Staffing was also identified as a concern in a review by A Azyabi, W Karwowski and MR Davahli [64], with studies indicating that staff feel overwhelmed and overworked, impacting their ability to provide highquality care [68]. Staff overload and inadequate staffing negatively affect PSC [64]. Palestinian hospitals often experience staff shortages and limited resources, which can increase workload and hinder the delivery of highquality, safe patient care. Therefore, hospitals should prioritize improving staffing, reducing workload, and enhancing the work environment. This requires a systemic approach, including advocating for increased funding for nursing positions, implementing strategies to improve nurse retention, and creating a supportive work environment.

Our findings are consistent with other studies that reported low scores for "non-punitive response to errors" and "reporting patient safety events" [7, 9, 66, 69]. A systematic review of PSC in Arab countries also identified "non-punitive response to errors" as a weak area needing improvement [70]. The absence of a well-organized incident reporting system and fear of punishment in Palestinian hospitals may explain these low scores. Staff may conceal problems due to such a culture, which ultimately affects patient safety [69]. Hospital managers should foster a culture of non-punitive responses to events [71]. A Azyabi, W Karwowski and MR Davahli [64] suggested implementing more efficient reporting methods. Reporting provides crucial data regarding the frequency of incidents that may compromise patient safety. Future research could explore the specific barriers to incident reporting in Palestinian hospitals and develop interventions to promote a more open and transparent reporting culture.

Participants' demographics and PSC

The study revealed that higher income levels correlate with better PSC perception, possibly due to improved job motivation and performance. Addressing financial stability and fair compensation for healthcare staff could enhance their perception of PSC, leading to better patient outcomes. A study in Jordanian-accredited hospitals also revealed a positive relationship between income and PSC [51]. Hospitals with better financial status generally have better quality and safer care [72]. Staff income reportedly affects job motivation and performance [73, 74]. In Palestine, resource and salary instability in hospitals may explain the associations between income and staff attitudes toward PSC. This highlights the need for advocacy to improve nurses' compensation and ensure timely, consistent payment. Exploring other ways to enhance job motivation and performance, such as professional development and recognition programs, could also be beneficial.

Participants' workplace characteristics and PSC

The study revealed that accredited hospitals and those engaging in PSC improvement activities had greater positive perception of PSC. Encouraging more hospitals to become accredited and implement safety initiatives can significantly improve PSC. Hospital accreditation promotes patient safety and performance improvements [75]. Studies in Indonesia [76] and Saudi Arabia [77] have shown that hospital accreditation positively impacts PSC. Our findings, which indicate a generally low overall PSC perception, may be related to hospital type. This relationship is clearer given that only one hospital in our study was accredited, and this hospital demonstrated the most positive perception of PSC. This suggests that accreditation may serve as a proxy for a range of organizational factors that contribute to a positive safety culture, such as standardized protocols, robust communication systems, and a culture of continuous improvement.

Furthermore, hospitals that perform activities to improve PSC had a greater positive perception of PSC.

This highlights the importance of actively engaging staff in patient safety initiatives. When nurses are involved in these activities, they are more likely to feel a sense of ownership and empowerment, which can translate into a stronger perception of safety culture. A study in Palestine reported a positive effect of safety initiatives in public hospitals on PSC [10]. Implementing targeted interventions to enhance PSC, foster error reporting, and create robust learning environments are essential steps [78]. Strategies to improve teamwork and communication between healthcare staff can improve service quality, reduce errors, and promote a positive PSC [79]. The accredited hospital in this study, which performs such activities, had a higher positive PSC perception.

Night shifts were a negative predictor of PSC perception in this study. This is not surprising, as night shifts are often associated with increased fatigue, sleep disruption, and reduced staff availability, all of which can negatively impact the perception of PSC [80]. This finding is consistent with a study in Japan, which linked extended work hours, night shifts, and limited vacation days to lower PSC perception [81]. Another study highlighted the physiological effects and patient safety issues experienced by nurses working night shifts, emphasizing the need for support services [82]. In Palestinian hospitals, the political situation and transportation difficulties may exacerbate the impact of night shifts on PSC perception. Therefore, healthcare organizations should prioritize mitigating the negative effects of night shifts by providing support services and ensuring adequate rest periods.

While performing activities to relieve job stress was not a predictor of PSC, the univariate analysis revealed a significant correlation. This discrepancy may be due to the relatively small sample size or the specific types of stress relief activities offered. It is possible that current activities do not effectively address the root causes of job stress or that they are not widely utilized by nurses. Most participants reported that their hospitals did not perform activities to relieve job stress. Staff shortages and limited resources in Palestinian hospitals could explain this. S Asefzadeh, R Kalhor and M Tir [18] noted that PSC is significantly associated with job stress. Therefore, hospital managers must consider implementing activities and initiatives to reduce job stress to improve the working environment and increase the quality of care delivered, thus improving staff attitudes toward PSC [83].

Unit rating on patient safety

The results revealed a strong correlation between a higher unit rating of patient safety and better PSC perception. Healthcare leaders should prioritize improving overall PSC by enhancing communication, managerial support, and resource allocation. Studies have revealed a relationship between unit ratings of patient safety and PSC perception [61, 84–86]. Despite positive patient safety ratings in our study, the underlying perception of PSC may be poor because of factors such as inadequate communication and managerial support. These results suggest that while patient safety outcomes may seem favorable, the foundational aspects of PSC need significant improvement to ensure sustainability. It is important to assess not only outcome measures but also the underlying culture and perception that drive those outcomes.

Nursing job stress

The present study revealed that "workload", "insufficient staffing", and "emotional stressors" as significant sources of job stress among nurses. These findings are consistent with extensive research highlighting these factors as key contributors to stress in this profession. Addressing these issues through increased staffing, clearer roles, and better support systems can reduce stress and improve nurses' well-being and PSC.

"Workload" was the most prominent source of perceived job stress. The three most stressful aspects of workload were "not enough staff to adequately cover the unit", "breakdown of the computer", and "too many nonnursing tasks required, such as clerical work". This finding is consistent with other studies [44, 87-89]. Staffing is a common source of job stress [89, 90]. Inadequate staffing can lead to an inappropriate skill mix and individuals managing shifts before they feel competent [90]. The demanding environment in Palestinian hospitals, where nurses work with limited resources and increasing demands, likely contributes to their job stress. Given its impact on physical and psychological health, it is not surprising that workload predicts nurses' work-related stress. Since nurses with heavy workloads are prone to high job stress [23], increasing the number of nursing staff can help alleviate this burden. Furthermore, providing nurses with clear roles, autonomy, and supervisory support can help them manage their workload effectively **[91**].

Computer and communication system breakdowns, along with excessive non-nursing tasks, were also significant stressors [89]. S Al-Yaqoubi and J Arulappan [44] reported similar findings. Research has shown that high levels of job stress among nurses are associated with many non-nursing responsibilities [92, 93]. This can negatively affect the quality of nursing care, increase the risk of medical errors, and impact job performance [94]. Therefore, reducing the workload associated with nonnursing tasks is essential for reducing workplace stress and improving nurses' well-being. This highlights the need for hospitals to carefully evaluate nurses' roles and responsibilities to ensure that they focus on their core competencies and are not overwhelmed with administrative duties.

The second highest source of job stress in our study was the "death and dying" subscale, which is in line with previous research [95-97]. The most stressful events in this subscale were "watching a patient suffer" and "performing procedures that patients experience as painful". S Al-Yaqoubi and J Arulappan [44] reported similar results. Many studies have identified dealing with death and dying as a common source of job stress [44, 98–100]. Caring for suffering or dying patients can place a significant emotional burden on nurses. Observing patients die can also cause intense emotions and significant job stress [101]. Even experienced nurses may face emotionally challenging situations when caring for dying patients and their families [102]. The emotional distress experienced by the nurses in our study related to patient death and dying may stem from their cultural and humanitarian values. Healthcare workers, including nurses, may experience feelings of helplessness, frustration, and guilt when they witness suffering and feel unable to adequately intervene, which can exacerbate job stress. Dealing with suffering and dying patients, coupled with feelings of helplessness, contributes to increased anxiety and stress, impacting nurses' physical, psychological, and social well-being [103].

Participants' demographics and job stress

The study revealed that male nurses and those with higher educational levels experienced greater job stress. Tailoring stress management programs to address gender-specific stressors and role ambiguity among highly educated nurses can alleviate job stress. The relationship between gender and job stress is complex and influenced by individual, social, and cultural factors. While our study revealed that male nurses reported higher levels of job stress than did female nurses, this contrasts with the findings of some previous studies [44, 100, 104–106], while aligning with others [16, 107–109]. This discrepancy highlights the importance of considering contextspecific factors, particularly within the Palestinian context. Traditional gender roles in Palestine often place a strong emphasis on men as the primary breadwinners, a responsibility that can be particularly burdensome given the current economic challenges, including wage stagnation and unemployment [110]. This pressure to provide for families, coupled with the demands of the nursing profession in a resource-limited setting, may contribute significantly to job stress in male nurses. Furthermore, cultural norms may influence coping mechanisms and help-seeking behaviors, potentially impacting how men and women perceive and manage stress. For example, men may be less likely to seek social support due to societal expectations of stoicism [111]. S Tsegaw, Y Getachew and B Tegegne [108], for example, reported that greater stress in male nurses was related to a perceived lack of career development, which could be linked to societal expectations of male achievement. While our study did not directly assess these cultural and social factors, future research employing qualitative methodologies, such as in-depth interviews, could explore these nuances further. Understanding these contextual factors is crucial for developing effective and culturally sensitive stress management interventions for nurses in Palestine. Specifically, interventions that address the unique challenges faced by male nurses, such as financial pressures and societal expectations, may be particularly effective.

Education level was also a predictor of job stress. Nurses with higher education levels reported greater job stress. While some studies have reported this association [40, 108, 112], others have not [16, 23, 100, 113]. While more education can provide better job resources, such as income, autonomy, and diverse tasks, it can also lead to greater job demands, including longer hours, pressure, and tight deadlines. These demands can create more stress and less job satisfaction [114]. In Palestine, nurses with bachelor's or master's degrees sometimes have poorly defined responsibilities. This may lead to role conflict and ambiguity [115]. These issues may contribute to increased job stress. As our study did not investigate organizational factors, further research is needed to identify specific stressors affecting nurses with different education levels. This finding suggests that while education provides nurses with valuable skills, it can also lead to higher expectations and responsibilities, which may contribute to stress if not adequately supported. Future research should examine organizational factors related to stress among highly educated nurses in Palestine, such as role clarity, professional development opportunities, and access to resources.

The univariate analysis also revealed a correlation between nurses' income and job stress, with higher income associated with lower stress levels. This aligns with research suggesting that higher income is linked to reduced job stress among nurses, as appropriate compensation influences motivation and enthusiasm, leading to lower work stress [116]. This reduction in stress can enhance nurses' performance and job satisfaction, optimizing nursing services. Reduced stress can improve nurses' performance and job satisfaction. Fair and competitive compensation for nurses in Palestine is important not only for their financial well-being but also for reducing stress and increasing job satisfaction.

Participants' workplace characteristics and job stress

The study revealed that performing activities to relieve job stress and improve PSC was associated with lower job stress. This finding reinforces the importance of organizational support for nurses' well-being and a positive safety culture. Comprehensive stress relief programs and prioritized PSC initiatives can reduce job stress and enhance nurse well-being [117]. The implementation of stress relief activities helps reduce job demand and stress [118]. Job/task-level interventions such as job redesign and enhanced job control can also reduce stressors [119]. Many interventions and programs can improve work organization and lessen the adverse effects of stressful employment [120]. However, preventing job-related stress and addressing its root causes are crucial [121]. Simply offering stress relief activities may not be enough. Hospitals must address the underlying organizational factors that contribute to stress, such as workload, staffing, and resources.

Performing activities to improve PSC and nurses' ratings of patient safety in their work units also predicted job stress. Nurses whose hospitals engage in activities to improve PSC and who rated their units as "very good" or "excellent" in terms of patient safety perceived lower levels of job stress. This finding is consistent with other studies [83, 122-124]. Promoting patient safety nursing activities requires a positive work environment, an organizational culture, appropriate treatment and rewards, a well-organized nursing team, and effective communication [125]. Therefore, when healthcare organizations focus on enhancing PSC, they create a supportive and safe workplace for nurses, which reduces stress and improves patient outcomes. This finding highlights the interconnectedness of job stress and PSC. When hospitals prioritize patient safety and create a supportive work environment, nurses experience less stress, which in turn further strengthens the safety culture.

While hospital type and experience in the current unit were associated with job stress in the univariate analysis, these factors were not confirmed as predictors in the multiple linear regression. Nurses with 11 or more years of experience had lower stress scores, which contrasts with the findings of some studies suggesting that increased experience is correlated with greater stress [113, 126]. Other studies have reported no correlation [23, 44]. These discrepancies may be due to differences in study settings and organizational types. More experienced staff may have lower job stress levels than their younger counterparts do [107, 108]. This may be due to their ability to manage work, stress, and emotions better. While experience may offer some protection against stress, it is not guaranteed, and other factors, such as workload and organizational support, are also important.

The working unit and type of hospital were also associated with job stress. Nurses in ICUs and ORs, for example, often face greater stress due to the demanding nature of their work [108, 113]. Nurses in public hospitals may also experience greater stress than those in private hospitals do [108, 115]. Increased workload and resource shortages in public hospitals likely contribute to this increased stress [108, 115]. Therefore, initiatives to improve workplaces and stress relief activities are essential. Targeted interventions are needed for nurses in different settings. For example, nurses in ICUs and ORs might benefit from specialized stress management and resilience training, whereas nurses in public hospitals might need more support related to resource allocation and workload management. Further research is needed to understand the complex factors contributing to stress in these different work environments.

Relationship between job stress and PSC

The study's most significant finding was the clear negative relationship between job stress and PSC. This strong inverse correlation demonstrates that as job stress increases, perception of PSC decreases, and vice versa. This finding directly addresses our primary research question and underscores the critical importance of considering job stress when seeking to improve PSC within healthcare settings. Organizational support and effective stress management strategies are crucial for maintaining a positive PSC. This finding aligns with a growing body of research that recognizes the interconnectedness of job stress and PSC [107, 127, 128]. For example, studies have shown that high job stress and burnout are associated with a more negative perception of PSC, which can ultimately compromise the quality of patient care [14]. Our research reinforces this connection and provides further evidence of its relevance in the Palestinian healthcare context.

The implications of these findings are profound. Job stress not only affects nurses' well-being but also has direct consequences for organizational outcomes and, most importantly, patient safety. D Chatzigianni, A Tsounis, N Markopoulos and P Sarafis [129] noted that job stress impacts the performance of both nurses and organizations. High levels of stress can negatively affect nurses' professional attitudes, their communication with colleagues, and, ultimately, the quality of the nursing care they provide [130]. Moreover, burnout and heavy workloads, both of which are components of job stress, can lead to a negative perception of PSC, increased fatigue, decreased motivation, exhaustion, negative workplace interactions, mental anguish, higher turnover rates, and lower productivity [14, 131]. All of these factors can create a work environment that is not conducive to patient safety. When nurses are stressed, burned out, and demotivated, patient safety can be compromised. Therefore, addressing job stress is not just a matter of improving nurse satisfaction; it is a fundamental requirement for creating a safer healthcare environment.

Study limitations

This study offers a unique and comprehensive approach by potentially being the first to investigate job stress and PSC among nurses in Palestine. The inclusion of nurses from 16 hospitals across various settings with a high response rate strengthens the generalizability of the findings to other Palestinian hospitals.

Despite these strengths, the study design has several limitations. First, the use of a convenience sample, where readily available participants are recruited, might not accurately represent the entire population of Palestinian nurses. This could limit the generalizability of the findings to all Palestinian nurses, as certain groups may be underrepresented. Second, the nonexperimental design allows for the identification of correlations but cannot establish causality between job stress and PSC. This means that while relationships can be observed, it is not possible to definitively determine whether job stress causes changes in PSC or vice versa.

Moreover, the reliance on self-reported data through questionnaires introduces potential bias. Participants may misinterpret questions or provide inaccurate answers, either intentionally or unintentionally. One specific concern is the possibility of social desirability bias, where nurses might respond in a manner they perceive as more favorable or acceptable rather than providing true reflections of their experiences. This can skew the results and affect the study's validity, as it may not accurately capture the actual perceptions of job stress and PSC.

To address these limitations, future studies could utilize random sampling to better represent the population of Palestinian nurses, incorporate experimental designs to explore causality and use objective measures alongside self-reported data to reduce bias and increase the validity of the findings.

Conclusions

This study revealed a negative association between nurses' job stress and their perception of PSC. Several factors influenced these perceptions, highlighting areas for improvement within Palestinian healthcare organizations. By fostering open communication, reducing workload, and enhancing psychological support, these organizations can cultivate stronger PSC and ultimately deliver safer, higher-quality patient care. This study is a valuable resource for informing training, professional education, and stress-reduction strategies, paving the way for a more supportive and safer work environment for nurses. However, the implications of these findings extend beyond individual interventions and have the potential to contribute significantly to both future research and policy change within Palestinian hospitals. For future research, longitudinal studies could examine the long-term impact of multifaceted interventions on

PSC and patient outcomes. Qualitative research exploring nurses' lived experiences, stressors, coping mechanisms, and the perceived impact of organizational support could further enrich our understanding. From a policy perspective, systemic changes are needed. Hospitals should prioritize a culture of support, including policies that address workload, staffing, mental health access, and professional development. Policymakers, in collaboration with hospital administrators, should invest in resources to support these initiatives and evaluate their effectiveness. This study serves as a call to action for all stakeholders to prioritize nurse well-being as a crucial component of patient safety. By fostering support, investing in resources, and implementing evidence-based interventions, Palestinian hospitals can empower nurses to provide the highest-quality care.

Recommendations

This study recommends reducing nurses' job stress and improving PSC through the creation of a supportive environment. This can be accomplished by fostering a culture of open communication and error reporting by eliminating the fear of punishment. Investing in training programs to equip nurses with patient safety skills. Regularly assessing PSC to identify areas for improvement. Developing a "just culture" that balances accountability with understanding. Integrating PSC principles into nursing education. Moreover, this study recommends addressing nurses' job stress through multifaceted strategies. Hospitals should increase staffing, consider assigning aid nurses, and delegate non-nursing tasks. Creative coping mechanisms, counseling services, and supportive leadership are also crucial. Furthermore, collaboration between the MOH and hospitals on stress management plans with early intervention is essential. Hospitals can create a more positive work environment by prioritizing patient safety and nurse well-being.

Abbreviations

PSC	Patient Safety Culture
HSOPSC	Hospital Survey of Patient Safety Culture
WHO	World Health Organization
MOH	Ministry of Health
PSFHI	Patient Safety Friendly Hospital Initiative
JCIA	Joint Commission International Accreditation
NCCIH	National Center for Complementary and Integrative Health
AIS	American Institute of Stress
AHRQ	Agency for Healthcare Research and Quality
SPSC	Saudi Patient Safety Center
NSS	Nursing Stress Scale
AM	Arithmetic Mean
NIS	New Israeli Sheqel
SPSS	Statistical Software Package for the Social Sciences
Q1	First quartile; Q3:Third quartile
SD	Standard Deviation
IRB	Institutional Review Board
AAUP	Arab American University

Supplementary Information

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Supplementary Material 1

Supplementary Material 2

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Author contributions

LZ designed the study, reviewed the literature, collected and analyzed the data, and wrote the draft manuscript. He also coordinated the data, and JQ and SG critically reviewed the manuscript to improve intellectual content and review the final manuscript.

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None.

Data availability

Research data were securely encrypted on the researcher's computer and accessible only to the researcher and assistants. Hard copies of questionnaires were stored in a locked cabinet for confidentiality. The data are available from the corresponding author upon request.

Declarations

Ethics approval and consent to participate

Approval to conduct this study was sought from the Institutional Review Board (IRB) of the Arab American University (AAUP) under the code number 2023/A/114/N. The researcher obtained permission from the MOH and administrations of private hospitals to distribute the questionnaires to the nurses. Moreover, permission to use the Arabic version of HSOPSC 2.0 was obtained from the SPSC and the AHRQ. Furthermore, the researcher obtained permission to use the Arabic version of the NSS from Alhajjar's supervisor at Manchester University in the UK. The questionnaires were distributed with a cover page containing the study objectives and expected outcomes. This study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki [132]. All participants provided informed consent, were fully informed of the study's purpose, and were assured of their right to withdraw at any time, ensuring autonomy and beneficence. Their input remained anonymous, and confidentiality was safeguarded. Participants were provided with an information sheet addressing potential queries. Confidentiality was strictly maintained, aligning with ethical principles of nonmaleficence. Additionally, the participants voluntarily participated without compensation. The participants in the study were not exposed to any dangerous behaviors that might have affected their health or wellbeing (nonmaleficence). Furthermore, to ensure participant anonymity, the researcher assigned numerical codes for the completed questionnaires to protect their information and prevent tracing.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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