International Journal of Nursing and Health Care Research

OPEN ACCESS

Alrimali AM, et al. Int J Nurs Health Care Res 6: 1482

www.doi.org/10.29011/2688-9501.101482

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Research Article

Fall Prevention Knowledge, Attitudes, and Practices among Nurses in Saudi Arabia

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Citation: Alrimali AM, Alshammari MK, Alamer AS, Alrashedi ADA, Alsaadi MHS, et al. (2023) Fall Prevention Knowledge, Attitudes, and Practices among Nurses in Saudi Arabia. Int J Nurs Health Care Res 6:1482. DOI: https://doi.org/10.29011/2688-9501.101482

Received Date: 06 November, 2023; **Accepted Date:** 01 December, 2023; **Published Date**: 03 December, 2023

Abstract

Objectives: To comprehensively assess the knowledge, attitudes, and practices related to fall prevention among nurses in multiple healthcare settings, emphasizing the crucial role of preventing falls in ensuring patient safety and well-being. **Methods:** A correlational cross-sectional design, involving the recruitment of participants through convenience sampling from sixteen government hospitals in Hail, Saudi Arabia. Data on nurses' knowledge, attitudes, and practices regarding falls were collected using a self-reported questionnaire. The findings are reported using descriptive and inferential statistics. **Results:** The analysis included 295 participants. The knowledge scores ranged from 0 to 14, with a mean of 8.54, the attitude scores ranged from 19 to 54, with a mean of 39.50, and the practice score ranged from 25 to 65, with a mean of 57.02. Significant differences existed in knowledge scores among hospitals ($p < .001$), while attitude and practice scores were statistically significant for multiple factors, including gender, place of work, experience of falling accidents, and the fall prevention training (frequency, duration, source) (all $p < .001$). **Conclusion:** This study reveals that nurses generally possess moderate knowledge and positive attitudes towards fall prevention, with high reported adherence to preventive measures. However, variations among hospitals and the influence of factors like gender, workplace, experience with falls, and training characteristics emphasize the importance of tailored training programs to enhance patient safety.

Keywords: Falls; Nurses; Patient safety; Fall prevention; Knowledge; Attitudes

What is known?

- Falls, the second leading cause of global mortality (WHO, 2021), result in approximately 646,000 deaths annually, with 37.3 million falls requiring medical attention (WHO, 2021).
- Falls with significant injuries rank among the top 10 most frequently reported sentinel events (Joint Commission, 2015).
- Despite extensive prevention measures, the rate of hospital falls continues to rise (Lee, 2019). According to recent studies, the percentage of falls occurring in hospitals is around 25 to 45% (Innab, 2022), with documented fall rates ranging from 2.2 to 25 falls per 1,000 patient days (Lee, 2019).
- Falls are predictable health issues that can be reduced by 30-50% through extrinsic and environmental improvements (Cho & Jang, 2020). Nurses, who spend 4.5 to 8.0 hours per shift providing direct patient care (Francis-Coad et al., 2019), play a significant role in addressing patient falls by implementing safety measures (Alderby et al., 2017).

What is new?

- Nurses exhibit moderate knowledge, positive attitudes, and a strong commitment to fall prevention practices. Offering a solid foundation for patient safety improvement.
- Significant variations in fall prevention knowledge scores among hospitals emphasize the need for customized training programs.
- The present study identifies key factors, including gender, workplace, experience, and training characteristics, that significantly impact nurses' attitudes and practices.
- Our findings emphasize the importance of tailored training, continuous education, and knowledge-sharing to enhance nurses' fall prevention abilities and patient safety.

Introduction

A "fall" is any occurrence in which a person unexpectedly lands on the floor, ground, or another lower level [1]. Falling is connected with increasing age and has been associated with deconditioning and hospitalization [2]. The causes leading to falls are multifaceted, and the risk factors can be intrinsic or extrinsic [3]. Intrinsic risk factors include patient age, history of falls, poor balance and walking skills, weakness in the lower limbs, diagnosis of Parkinson's disease, dizziness, and impaired eyesight [4]. Extrinsic variables can be medications used to induce sleep, unsafe floor surfaces, dim lighting, and intense physical activity that might compromise a patient's safety [3,4].

Falls, the second leading cause of global mortality [1], result in approximately 646,000 deaths annually, with 37.3 million falls requiring medical attention [1]. Falls with significant injuries rank among the top 10 most frequently reported sentinel events [5]. Despite extensive prevention measures, the rate of hospital falls continues to rise [6]. According to recent studies, the percentage of falls occurring in hospitals is around 25 to 45% [3], with documented fall rates ranging from 2.2 to 25 falls per 1,000 patient days [6]. However, the true number of falls is believed to be significantly higher due to poor reporting rates, especially when falls result in no harm [6]. This underreporting is particularly evident in Asian nations, where the proportion of falls resulting in injury is significantly greater [6]. According to the Saudi Arabian Ministry of Health, over 5.42 million individuals in the country are either children or seniors [7], and falls lead to serious injuries and hospitalizations for up to half of all children and elderly persons each year [8,9]. In the Hail area, with an average hospital stay of 10.5 days and approximately 40,000 admissions per year [7], 42 hospital fall cases were reported in 2022. However, it is important to reiterate that underreporting of falls is common in healthcare settings, and the actual number of falls may have been higher.

Falls are predictable health issues that can be reduced by 30-50% through extrinsic and environmental improvements [10]. Nurses, who spend 4.5 to 8.0 hours per shift providing direct patient care [11] play a significant role in addressing patient falls by implementing safety measures [12]. However, preventing and managing patient falls in healthcare settings present significant challenges for the nursing profession [12]. Nurses thus need adequate knowledge of the risk factors to identify potential fallers and effectively collaborate with the multidisciplinary team [13]. Overall, their participation is critical to preventing inpatient falls and their consequences [11,13].

To ensure effective fall prevention practices, it is crucial to understand hospital-based nurses' knowledge and attitudes that influence their participation in fall prevention activities [10,14]. Nurses play a significant role in implementing fall prevention treatments, but there is limited knowledge about their perceptions and utilization of these practices [14]. To reduce patient falls and the associated risks, it is thus important to comprehend nurses' perspectives on fall prevention, especially as inpatient falls have been linked to the nursing quality of care [10]. However, with the lack of data on this topic in Saudi Arabian hospitals [15], gaining a comprehensive understanding of nurses' knowledge, attitudes, and practices related to fall prevention is crucial for the well-being of patients, nurses, and the overall hospital environment.

According to the literature, implementing multifaceted practices that address inpatient risk factors is beneficial in preventing falls [11]. To provide effective care for at-risk patients, adopting up-to-date, evidence-based guidelines on fall prevention is recommended [16]. Successful fall prevention can be achieved by managing specific risk factors using standardized assessments or individualized interventions based on patient risk [15]. Schoberer et al. [16] recommend a set of crucial steps, including analysing fall incidence, identifying at-risk patients, familiarizing staff with the guidelines, and involving all relevant personnel in the implementation process. Fall prevention is a crucial nursing responsibility in hospitals, and nurses' contribution is essential to ensure that multifaceted strategies and practices are effectively translated into actual care [11,16]. Notably, equipping nurses with the necessary knowledge and resources to actively participate in the fall prevention process results in a significant decrease in falls and fall-related injuries [17], indicating the positive impact of providing relevant information and tools on patient safety and well-being. Nevertheless, despite evidence of the efficacy of fall prevention guidelines, there is scarce research investigating nurses' perspectives on the subject [3,18]. It is also worth noting that falls in hospitals are not solely caused by variables intrinsic to patients, but also by factors related to nursing and the hospital environment [15].

The available literature primarily focuses on nurses' knowledge and perceptions of risk factors and fall prevention practices for elderly inpatients [11,19-21]. Studies in Korea and Australia have found no association between geriatric hospital nurses' knowledge and fall prevention practices [11,19,21]. However, positive correlations have been found between nurses' attitudes and fall prevention activities for the elderly, as well as between nurses' fall prevention experience and their implementation of fall prevention strategies [11,19,21]. Nevertheless, a comprehensive evaluation of all nursing specialities involved in the care of inpatients of varying ages is still required. Additionally, few studies have examined the impact of educational programs on nurses' efforts to reduce the occurrence of falls [3].

A recent descriptive study by Innab [3] investigated nurses' perceptions of fall risk factors, revealing that nurses working in general wards have more positive attitudes than those working in intensive care units. Additionally, reducing the number of patients per nurse was found to significantly improve the quality of care and lower the incidence of falls in acute care settings. Another study in Saudi Arabia explored the factors influencing inpatient falls, revealing a positive association between nurses' perceptions of frequently recognized risk factors and the effectiveness of their interventions [12]. However, there are limitations regarding the generalizability of the current research findings on this topic. Firstly, the sample sizes of the Saudi Arabian studies were relatively small. Secondly, data collected from a single location and hospital may not be generalizable to other settings [22]. Furthermore, most prior research on fall prevention was conducted in larger tertiary care institutions, leaving knowledge gaps about falls in smaller and medium-sized hospitals [10]. Despite their importance in providing access to healthcare and emergency care, small and medium-sized hospitals face obstacles, including a low sense of patient safety culture, in implementing effective strategies and practices to prevent patient falls [10].

This study addresses the existing knowledge gap by investigating nurses' knowledge, attitudes, and practices regarding falls and fall prevention in tertiary and small to medium-sized hospitals in Saudi Arabia. The primary objective is to conduct a comprehensive assessment of nurses' knowledge of fall prevention, their attitudes toward fall prevention measures, and their implementation of fall prevention practices. Additionally, it explores potential correlations between nurses' demographic characteristics and their knowledge, attitudes, and practices related to fall prevention.

Theoretical Underpinning

This research endeavour will be based on the Swiss cheese model by James Reason (2000) [23]. The Swiss Cheese Model is a widely recognized and influential model used to understand the complex interactions of multiple factors leading to errors or accidents in various domains, including healthcare. The Model suggests that errors or accidents occur when multiple system defences (represented by layers of slices of cheese) fail, allowing hazards to align and lead to an adverse event. Each layer represents a different defence mechanism, and the holes or "latent conditions" in the cheese slices depict the vulnerabilities or weaknesses that can occur in the system.

Method

Research Design

The study utilizes a correlational cross-sectional design to examine the relationships between the variables, specifically investigating the associations between nurses' knowledge, attitudes and practices regarding falls. Adhering to the STROBE guidelines ensures that the study's outcomes are reliable and robust, promoting transparency and completeness in reporting the research methodology and findings.

Study Setting

Participants were recruited from sixteen government hospitals in Hail, Saudi Arabia, including a 300-bed general tertiary hospital (HGH), the 300-bed King Khaled Hospital (KKH), the 500-bed King Salman Hospital (KSH), a specialist hospital for women and paediatric patients (MCH), a Mental Health Hospital (ECMHH), and an urgent care hospital (Sharaf). Additionally, the 30-bed Cardiac Center and the 28-bed Aja Long-Term Care Center were included. Eight small-sized peripheral hospitals, each with a capacity of 50 beds, were also part of the study, namely Baqaa, Al-Shamli, Gazhala, Muaqaq, Hayiet, Samira, Sualaymi, and Shanan.

Sampling and Participants

To recruit eligible nurses, non-probability convenience sampling was used, targeting registered nurses currently employed at the research sites. Inclusion criteria required nurses to be directly involved in inpatient care with a minimum of three months of experience. Nurses from various inpatient wards, including medical, surgical, and intensive care units, were included as they work with patients with a high fall risk. Nurses in primary healthcare, outpatient clinics, and administrative positions were excluded due to limited exposure to patients with high fall risk. Given the inherent diversity of nurses within each setting, no attempt was made to balance factors such as gender, nationality, or religion, as this would have reduced the participant pool [24]. Using G*Power, the optimal sample size for statistical power was determined [25]. A minimum sample size of 270 participants is required to perform regression analysis with a significance level of 0.05, a power of 0.80, an effect size of 0.15, and four predictors. The fact that 295 participants were included in the sample indicates that these requirements were fulfilled.

Data Collection Procedure

Participants were asked to voluntarily complete an anonymous closed-ended self-reported web-based questionnaire on the Google Forms platform. The link to access the questionnaire was distributed through the nursing management office of each hospital to ensure that all nursing staff could participate.

Instrument

The utilized research instrument consisted of two main components: a demographic form and a questionnaire to assess fall-related knowledge, attitudes, and practices od nurses. The demographic form, based on the work of Innab [3], gathered information on age, gender, education level, experience, position, recent fall prevention education, unit type and acuity level. These demographic factors were considered important to understanding the participants' background and context in relation to fall prevention.

In addition, a questionnaire utilized to assess different aspects of nurses' fall-related knowledge, attitudes, and practices, adopted by Han et al [21]. The first tool was the 14-item questionnaire developed by Kim [26] to assess nurses' knowledge of fall risk factors and prevention practices. The questionnaire employed a scoring system where correct answers were assigned a score of 1 point ("Yes"), while incorrect responses ("No" and "I don't know") received 0 points. The total score ranged from 0 to 14, with higher scores indicating greater knowledge of fall prevention. Previous studies by Kim [26] and Lee and Choi [27] demonstrated the reliability of this questionnaire, with Cronbach's α values of 0.76.

The second tool measured nurses' attitudes toward falls using a 13-item Likert scale also developed by Kim [26]. The scale consisted of statements ranging from "Strongly disagree" to "Strongly agree," with questions 2, 8, 9, 11, and 12 subjects to reverse scoring. The total score ranged from 13 (minimum) to 65 (maximum), with higher scores indicating a stronger interest in fall prevention. The internal consistency of the scale was evaluated using Cronbach's α, which yielded values of 0.75 [26] and 0.72 [21] Items 8 and 9 were excluded from the analysis in this study to improve the internal consistency.

The third tool assessed nurses' adherence to fall prevention activities and consisted of 13 questions originally developed by Kim and Jeon [28] and modified by Kim [26]. The participants rated their responses on a 5-point Likert scale ranging from "Strongly disagree" to "Strongly agree." The total score for this tool ranged from 13 (minimum) to 65 (maximum), with higher scores indicating greater adherence to fall prevention practices. The internal consistency of the scale, measured by Cronbach's α, was found to be 0.94 [21] and 0.68 [26].

Ethical Considerations

The study obtained ethical approval from the Research Ethics Committee of Hail Region (Approval no 20/2023). Data collection was conducted online using Google Forms, ensuring participant anonymity and confidentiality. Participants were provided with a description, consent statements, and information about the study's purpose, their rights, and the time required to complete the questionnaire. By voluntarily answering and submitting the questionnaire, participants indicated their willingness to participate [22].

Data Analysis

The data were collected, exported to a Microsoft Excel spreadsheet, and cleaned, recoded, and analysed using IBM SPSS Statistics software, version 29.0. Descriptive statistics were produced with means and percentages. Means were expressed ± the standard deviation. T-tests and ANOVA were used to compare the means of the continuous variables against those of the nominal variables. Data normality was assessed, and assumptions were satisfied. List-wise deletion was used for missing variables in the analyses. All analyses were calculated with a 95% confidence interval and considered statistically significant with a p-value < .05.

Results

Internal Consistency

A questionnaire was created to measure three different dimensions of fall prevention in medical settings in addition to capturing demographic data. The "knowledge" construct comprised 14 questions and had fair internal consistency with a Cronbach's alpha of 0.764. The second construct, "attitudes", was created from 11 questions and also had fair internal consistency with a Cronbach's alpha of 0.773. The final construct, "practices", comprised 13 questions and had high internal consistency with a Cronbach's alpha of 0.947.

Demographic Characteristics

Of the 295 participants included in this analysis, 76.6% (n = 226) were female and 23.4% (n = 69) were male. The largest proportion (51.5%; n = 152) was in the 30 to 39-year-old age group, 35.9% (n = 106) were in the 20 to 29 years old, 10.8% (n = 32) were 40 to 49 years old, and 1.7% (n = 5) were 50 years old or greater. Meanwhile, 11.5% (n = 34) had a diploma, 82.4% (n = 243) had a bachelor's degree, 5.4% (n = 16) had a master's degree, and 0.7% (n = 2) had an educational attainment that fell into the "other" category. Regarding their years of nursing experience, 7.1% (n = 21) reported less than 1 year, 22.6% (n = 99) 1 to 5 years, 31.5% (n = 93) 5 to 10 years, 16.6% (n = 49) 10 to 15 years, and 11.2% (n = 33) 15 years or more.

Over half of the participants (67.1%; n = 198) were staff nurses, while 32.9% (n = 97) were charge nurses. In addition, 73.2% (n = 216) worked in a non-intensive care unit and 26.8% (n = 79) worked in an intensive care unit. When asked if they had recently participated in fall prevention education, 15.9% (n = 47) replied they hadn't, while 54.2% (n = 160) reported that they had within the last 12 months and 29.8% (n = 88) had more than 12 months ago. The duration of education was 0 to 5 hours for 68.8% (n = 203), 5 to 10 hours for 23.1% (n = 68), and over 10 hours for 8.1% (n = 24) of the participants. The source of education was continuing nursing education programs for 60.7% (n = 179), the internet for 12.5% (n = 37), the Academic Society for 8.5% (n = 25), and in-service training for 7.8% (n = 23) of the participants. Overall, 78% (n = 230) said that they did not have any experience of falling accidents in their charge, while 22% (n = 65) said that they did, with a mean number of 2.61 (SD = 2.32) falls and a range of 1 to over 10 falls. The demographic and background characteristics can be viewed in Table 1.

Participant's Knowledge, Attitudes, and Practices.

The total raw knowledge scores ranged from 0 to 14 with a mean of 8.54 (SD = 3.18), the total raw attitude scores ranged from 19 to 54 with a mean of 39.50 (SD = 7.47), and the total raw practice score ranged from 25 to 65 with a mean of 57.02 (SD = 10.32).

Knowledge

The knowledge scores were highest for nurses working in Sulaymi Hospital (M = 10.60, SD = 1.71), followed by Hail General Hospital (M = 10.25, SD = 2.99), and the Cardiac Center (M = 10.13, SD = 2.13), while the lowest scores were obtained by nurses at Shenan Hospital (M = 5.71, SD= 3.52). A significant difference in knowledge scores was found among the hospitals, as indicated by F (15, 279) = 3.151, $p < .001$. A summary of the knowledge scores by participant demographic and background characteristics can be viewed in Table 1.

Attitudes

The raw attitude scores were higher for females (M = 40.50, SD = 6.93) than males (M = 36.22, SD = 8.25), with a statistically significant difference, M = 4.28, 95% CI [2.32, 6.25], t (293) = 4.289, $p < .001$. The attitude scores were also greatest for those with no recent fall prevention education (M = 41.53, SD = 5.60), followed by those who had received training within the last 12 months (M = 39.98, SD = 7.40) and more than 12 months ago (M = 37.53, SD = 8.08), F (2, 292) = 5.265, p = .006. Those with 0 to 5 hours of training had the highest attitude scores (M = 40.57, SD = 7.05), followed by those with 5 to 10 hours of training (M = 37.90, SD = 7.46) and those with over 10 hours of training (M = 35.00, SD = 8.75), F (2, 292) = 8.388, $p < .001$. The attitude scores were greatest for those who trained through CNE (M = 40.31, SD = 7.36), followed by those who received training via the internet (M = 39.03, SD = 6.21), through in-service training (M = 36.35, SD = 7.91) and from the Academic Society (M = 34.84, SD = 7.70), F (3, 260) = 5.526, $p < .001$. Those with no experience in falling accidents in their charge had higher attitude scores (M = 40.40, SD = 6.71) than those with some experience (M = 36.32, SD = 9.05), M = 4.07, 95% CI [2.06, 6.09], t (293) = 3.977, $p < .001$. A summary of the attitude scores by participant demographic and background characteristics can be viewed in Table 1.

Practices

The raw practice scores were greater for females (M = 58.51, SD = 9.90) than males (M = 52.13, SD = 10.23), whereby the difference was statistically significant, M = 6.378, 95% CI [3.68, 9.08], t (293) = 4.648, $p < .001$.

The practice scores were highest for those who had received training within the last 12 months (M = 58.13, SD = 10.02), followed by those with no training (M = 57.98, SD = 9.25), and those who had received training more than 12 months ago (M = 54.48, SD = 11.05), F (2, 292) = 3.875, p = .022. Those with 0 to 5 hours of training (M = 58.21, SD = 9.19) obtained the highest practice scores, followed by those with over 10 hours (M = 57.63, SD = 11.92) and those with 5 to 10 hours of training (M = 53.25, SD = 12.04), F (2, 292) = 6.126, p = .002. Practice scores were greatest for those who training with CNE (M = 58.61, SD = 9.34), followed by those with in-service training (M = 55.61, SD = 12.00), those who trained via the internet (M = 54.05, SD = 11.91), and those who trained with the Academic Society (M = 50.40, SD = 10.85), F (3, 260) = 6.254, $p < .001$.

Finally, nurses working in Sulaymi Hospital had the highest practice scores (M = 64.10, SD = 1.37), followed by those in Samira Hospital (M = 64.00, SD = 1.00). The lowest scores were obtained by the nurses working in Shenan Hospital (M = 48.29, SD = 14.55); a significant difference in practice scores was found among the hospitals, as indicated by F (15, 279) = 4.360, $p < .001$.

A summary of the practice scores by participant demographic and background characteristics can be viewed in Table 1.

Characteristic	Categories	N (%)	Knowledge	t/F	*p*-Value	Attitude	t/F	*p*-Value	Practice	t/F	*p*-Value
Gender	Female	226 (76.6)	8.7 ± 3.11	1.644	0.101	40.5 ± 6.93	4.289	< .001	58.51 ± 9.9	4.648	< .011
	Male	69 (23.4)	7.99 ± 3.37			36.22 ± 8.25			52.13 ± 10.23		
Age Range	20-29	106 (35.9)	8.19 ± 3.43	1.432	0.233	38.58 ± 7.39	1.674	0.713	56.23 ± 10.06	1.796	0.148
	30-39	152 (51.5)	8.56 ± 2.98			40.22 ± 7.45			56.71 ± 11.07		
	40-49	32 (10.8)	9.38 ± 3.28			38.47 ± 7.84			60.19 ± 7.2		
	50+	5 (1.7)	9.8 ± 2.68			43.4 ± 5.22			62.8 ± 3.19		
Educational Attainment	Diploma	34 (11.5)	8.71 ± 4.2	1.483	0.219	36.76 ± 7.71	1.83	0.142	55.62 ± 12.51	0.657	0.579
	Bachelor's	243 (82.4)	8.43 ± 3.02			39.92 ± 7.26			57.26 ± 10.11		
	Master's	16 (5.4)	9.31 ± 3.03			38.88 ± 9.19			57.31 ± 8.62		
	Other	2 (0.7)	12.5 ± 2.12			39.5 ± 10.61			49 ± 11.31		
Years of Experience	< 1 yr	21 (7.1)	7.95 ± 3.92	0.824	0.511	36.86 ± 7.65	0.753	0.557	54.14 ± 10.42	1.571	0.182
	1-5 yrs	99 (33.6)	8.3 ± 3.12			39.78 ± 7.31			57.03 ± 10.21		
	5-10 yrs	93 (31.5)	8.49 ± 3.15			39.71 ± 7.02			56.05 ± 10.92		
	10-15 yrs	49 (16.6)	8.88 ± 3.1			39.88 ± 7.99			57.78 ± 10.69		
	> 15 yrs	33 (11.2)	9.21 ± 3.13			39.18 ± 8.35			60.39 ± 7.52		
Title	Head/Charge Nurse	97 (32.9)	8.41 ± 3.22	0.134	0.874	39.27 ± 8.02	0.169	0.845	56.83 ± 10.63	0.412	0.663
	Staff Nurse	198 (67.1)	8.6 ± 3.18			39.59 ± 7.22			57.15 ± 10.2		
Place of Work	Aja LTCH	22 (7.5)	8.91 ± 2.74	3.151	< .001	42.95 ± 4.82	3.456	< .001	61.91 ± 6.55	4.36	< .001
	Al Hayit Hospital	26 (8.8)	9.35 ± 3.51			40 ± 7.01			58.23 ± 10.21		
	Baqaa General Hospital	19 (6.4)	9.95 ± 2.59			40.84 ± 5.13			58.47 ± 8.8		
	Cardiac Center	16 (5.4)	10.13 ± 2.13			44.06 ± 6.65			62.75 ± 2.57		
	Eradh Mental Health Complex	24 (8.1)	7.96 ± 3.21			37.54 ± 8.79			50.42 ± 11.73		
	Ghazala Hospital	14 (4.7)	7.93 ± 3.25			39.79 ± 7.69			57 ± 9.88		
	Hail General Hospital	4 (1.4)	10.25 ± 2.99			39.5 ± 11.12			61.25 ± 3.3		
	King Khaled Hospital	19 (6.4)	9.95 ± 3.49			35.16 ± 8.11			58.79 ± 8.13		
	King Salman Specialist Hospital	27 (9.2)	7.44 ± 2.68			33.85 ± 7.9			49.41 ± 11.32		
	Maternal & Children's Hospital	25 (8.5)	7.36 ± 3.97			39.56 ± 6.8			57.56 ± 11.45		
	Mawqaq Hospital	14 (4.7)	9.79 ± 2.12			40.79 ± 9.59			61.36 ± 6.96		
	Samira Hospital	3 (1.0)	9 ± 2			44.33 ± 2.08			64 ± 1		
	Shamli Hospital	6 (2.0)	9 ± 2.19			43.17 ± 4.07			60.83 ± 8.77		
	Sharaf Urgent Care Center	52 (17.6)	7.83 ± 2.92			41.33 ± 5.76			56.79 ± 9.35		
	Shenan Hospital	14 (4.7)	5.71 ± 3.52			35.07 ± 7			48.29 ± 14.55		

	Sulaymi Hospital	10 (3.4)	10.6 ± 1.71			39.6 ± 7.49			64.1 ± 1.37		
Type of Unit	Intensive Care	79 (26.8)	8.08 ± 3.44	1.502	0.134	38.7 ± 8.16	1.116	0.266	57.05 ± 9.5	0.034	0.973
	Non-Intensive Care	216 (73.2)	8.7 ± 3.08			39.79 ± 7.2			57 ± 10.63		
Recent Fall Prevention	None	47 (15.9)	8.6 ± 3.22	0.054	0.948	41.53 ± 5.6	5.265	0.006	57.98 ± 9.27	3.875	0.022
Education	< 12 months ago,	160 (54.2)	8.57 ± 3.03			39.98 ± 7.4			58.13 ± 10.02		
	> 12 months ago,	88 (29.8)	8.44 ± 3.47			37.53 ± 8.08			54.48 ± 11.05		
Fall Training Duration Last	0-5 hrs	203 (68.8)	8.52 ± 3.02	2.114	0.123	40.57 ± 7.05	8.388	< .001	58.21 ± 9.19	6.126	0.002
Two Years	5-10 hrs	68 (23.1)	8.16 ± 3.38			37.9 ± 7.46			53.25 ± 12.04		
	10+ hrs	24 (8.1)	9.71 ± 3.84			35 ± 8.75			57.62 ± 11.92		
Recent Training Source	Academic Society	25 (8.5)	8.2 ± 2.94	2.074	0.104	34.84 ± 7.7	5.526	0.001	50.4 ± 10.85	6.254	< .001
	CNE	179 (60.7)	8.88 ± 3			40.31 ± 7.36			58.61 ± 9.34		
	In-service	23 (7.8)	7.74 ± 2.93			36.35 ± 7.91			55.61 ± 12		
	Internet	37 (12.5)	7.76 ± 3.93			39.03 ± 6.21			54.05 ± 11.91		
Experience of falling accidents	No	230 (78.0)	8.42 ± 2.97	1.2	0.231	40.4 ± 6.72	3.977	< .001	58.03 ± 9.38	3.223	< .001
	Yes	65 (22.0)	8.95 ± 3.85			36.32 ± 9.05			53.43 ± 12.56		

Table 1: Knowledge, Attitudes, and Practice Scores (n= 295).

Discussion

This study comprehensively assessed nurses' knowledge, attitudes, and practices related to fall prevention, examining their associations with the demographic characteristics. The results indicated that, on average, nurses have moderate knowledge and positive attitudes towards fall prevention. In terms of their practices, the findings imply that nurses' self-reported practice of fall prevention measures is at a high level. Additionally, significant differences existed in knowledge scores among hospitals, while attitude and practice scores were statistically significant for multiple factors, including gender, place of work, experience of falling accidents, and the fall prevention training (frequency, duration, source).

The nurses' knowledge of fall prevention was assessed in this study, revealing an average knowledge score of 8.54 out of 14, indicating a moderate level of knowledge. This score is slightly lower than the average knowledge score of 11.7 in Han et al's [21] study, but higher than the 6.84 reported by Lee and Choi [27], with both studies utilizing the same survey. These differences in knowledge scores could be attributed to the variations in sample size and the content of the educational programs received by the participants. While this study observed a significant difference in knowledge scores among hospitals, indicating variations in knowledge levels, the impact of other demographic and background characteristics on knowledge was not found to be significant. In contrast, a study on Indian nurses highlighted a significant association between years of experience and the level of knowledge on falls [29]. Similarly, a study among South Korean nurses identified a correlation between knowledge and participants' experience of inpatient falls [10]. Furthermore, a study in Saudi Arabia with similar objectives discovered a correlation between nurses' nationality, work experience, and knowledge [15]. While variations in knowledge scores among hospitals were evident, the impact of demographic and background characteristics on knowledge was not consistently significant across studies. These disparities could be due to varying educational approaches, cultural contexts, and healthcare systems in different regions, highlighting the need for tailored and culturally sensitive training programs to effectively improve nurses' knowledge of fall prevention and enhance patient safety.

The nurses in this study exhibited positive attitudes toward fall prevention, in line with the findings of previous studies [21,29]. The study also revealed significant differences in attitude scores based on gender, with females exhibiting higher scores than males, consistent with James et al [29]. This may be because the nursing profession is predominantly female, meaning female nurses have more experience and exposure to fall prevention strategies in their daily work. Another possible explanation could be that women have a greater interest in preventing falls among their patients, given their natural inclination to care for others [30]. Interestingly, the study found that nurses with no recent fall prevention education had the highest attitude scores. This finding appears counterintuitive as one might expect those with more education in fall prevention to have higher attitude scores. However, it is possible that those with no recent education may have a greater interest in learning about fall prevention, leading to a more positive attitude toward it. The study also revealed that nurses with no experience in falling

accidents in their charge had slightly higher attitude scores, possibly because they are unaware of the potential negative consequences of falling accidents and thus have a more positive attitude toward fall prevention. It is also possible that those who have experienced falling accidents may feel a sense of guilt or responsibility, giving them a more negative attitude toward fall prevention.

The current study found that participants had a high level of implementation of fall prevention measures, in line with Ganabathi et al [15]. It was also identified that certain demographic factors may influence nurses' fall prevention practices. Of the demographic factors studied, gender had a significant effect on fall prevention practices, with female nurses reporting higher levels of fall prevention practices compared to male nurses, which could be attributed to differences in risk perception and awareness between the genders [31]. In contrast to our study, Ganabathi et al [15] found an association between practices and both age and educational background, while Han et al [21] and Kim [26] found that age and work experience have a significant impact on fall prevention practices in the Korean context. Additional factors that were found to influence fall prevention practices in other studies included the type of unit [21], educational level, and frequency of fall prevention education [27,32]. Consistent with Han et al [21], our study found that practice scores were greatest for those who had received training within the last 12 months. Furthermore, recent training on fall prevention, particularly through CNE and in-service training, was found to have a positive impact on nurses' practices of fall prevention. This is likely because these programs offer more comprehensive and updated information, as well as hands-on practice and feedback [29]. Interestingly, our study also revealed a significant difference in practice scores between hospitals, with the same hospitals that had the highest and the lowest knowledge levels producing similar scores for practices. This suggests that knowledge may play a role in the implementation of fall prevention practices. Furthermore, having experience with falling accidents was found to significantly affect nurses' practices. This suggests that first-hand experience with fall incidents may serve as a motivating factor for nurses to be more vigilant and proactive in their fall prevention practices. However, our finding revealed that nurses with no prior experience in falling accidents had slightly higher practice scores, which contradicts Han et al's [21] research, where nurses with such experience reported higher fall prevention practices. Our finding may be due to the participants' increased awareness, strict adherence to protocols, recent training, or a proactive mindset, emphasizing preventive measures as a fundamental aspect of their caregiving. Or they might have learned from peers' experiences observing the negative outcomes associated with falls or been influenced by the study's specific context emphasizing fall prevention. Overall, this underscores the importance of providing opportunities for nurses to learn from their experiences and continuously improve their practices.

The findings of this analysis can be aligned with the Swiss Cheese Model in the context of healthcare quality and safety. The Swiss Cheese Model illustrates how multiple layers of defence, represented as slices of cheese, can have vulnerabilities (holes) that, when aligned, can lead to adverse events. The variability in knowledge scores among hospitals suggests potential gaps in the "knowledge" layer's effectiveness in different healthcare settings. Likewise, the significance of attitude and practice scores concerning factors like gender, place of work, experience of falling accidents, and the fall prevention training (frequency, duration, source) indicates variations (holes) in the "attitude" and "practice" layers, influencing fall prevention strategies. These insights highlight the importance of recognizing and addressing weaknesses in these layers to enhance patient safety and prevent falls in healthcare settings.

Implications for future practice

To improve patient safety, it is crucial to focus on addressing the factors that influence fall prevention knowledge, attitudes, and practices.

Given that the place of work was identified as a significant factor influencing fall prevention knowledge, attitudes, and practices, healthcare institutions should consider the context of their work environments. Hospitals, clinics, and long-term care facilities may have distinct challenges and requirements in terms of fall prevention. Tailored training programs should take these differences into account, ensuring that nurses are equipped with the knowledge and skills relevant to their specific workplace. Moreover, inter-facility collaboration and knowledge-sharing can be promoted to disseminate best practices and improve fall prevention efforts across various healthcare settings. Lastly, seeking input from nurses will highlight areas for improvement and allow interventions to be tailored accordingly. By continuously assessing and addressing the evolving needs of nurses, healthcare organizations can foster a culture of continuous learning and improvement in fall prevention practices.

The study indicates that fall prevention education frequency, duration, and source have a significant impact on attitude and practice scores. Future practice should prioritize targeted educational programs, workshops, and continuing education courses that cover the latest evidence-based practices and guidelines. It is hereby important to ensure that educational programs are comprehensive, up-to-date, and tailored to the specific needs of nurses in different healthcare settings and developed to engage both genders effectively in fall prevention efforts.

The experience of falling accidents has a significant impact on attitude and practice scores, providing opportunities for nurses to gain first-hand experience with falling accidents can serve as a motivating factor for them to be more vigilant and proactive in their

fall prevention practices. This can be achieved by incorporating experiential learning methods, such as case studies, simulation training, and debriefing sessions, that allow nurses to learn from real-life incidents, thereby enhancing their understanding of the consequences of falls.

Limitations

This study has several limitations. Its use of self-reported data, which can be subject to social desirability bias, may have affected the accuracy of the reported practices. Moreover, the cross-sectional design restricts the ability to establish causality or temporal relationships. Additionally, the analysis was divided solely into critical and non-critical departments, which may introduce bias into the results. By not examining each department individually, the study might not capture the nuances and specific risk factors associated with different clinical areas. The sample is limited to nurses in Hail, Saudi Arabia, limiting the generalizability of the findings to other populations. However, despite these limitations, the study provides valuable insights that call for further research and targeted interventions to enhance patient safety through fall prevention measures.

Conclusion

This study reveals that nurses generally possess moderate knowledge and positive attitudes towards fall prevention, with high reported adherence to preventive measures. However, variations among hospitals and the influence of factors like gender, workplace, experience with falls, and training characteristics emphasize the importance of tailored training programs. By focusing on these factors, healthcare organizations can improve patient safety and reduce the incidence of patient falls in clinical settings.

Acknowledgment

We extend our appreciation to all who supported the completion of this study, especially the participants.

Funding

The authors of this manuscript provided self-funding for this project.

Author Contributions

Afaf Alrmali and Mohmmad Khalf developed the project, its primary conceptual concepts, and the outline of the proof. Abduallh Alamir and Abdulmajed Duaifaullh. completed nearly all of the technical details and numerical computations for the proposed research. Mohmmad Hamoud, Shaleh H, and Abduallh Ayad. Completion of the vast majority of data collection and paper review. All authors work together. writing the manuscript.

Another Acknowledgement

The authors would like to express they're thanks to all of the hospitals that helped us along the way with our research. In addition, we would like to express our gratitude to all of the participants who assisted us by filling out the questionnaires.

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