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Evaluation of Nurses' Knowledge about Risk Monitoring and Risk Prevention for Pressure Ulcers

Elif Kopuz[1], Anita Karaca[2]

[1] Demiroglu Bilim University, Health Sciences Institute, Istanbul, Turkey
[2] Demiroglu Bilim University, Florence Nightingale Hospital School of Nursing, Istanbul, Turkey

Correspondence Author: Anita Karaca
E-mail: anitakaraca@hotmail.com
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ABSTRACT

Objective: The aim of the study was to evaluate the levels of nurse's knowledge on prevention of pressure ulcers and its associated factors.
Methods: This is a cross-sectional, descriptive study. The research sample consisted of 250 nurses who worked at a training research hospital from 1 September to 1 December 2016. The research data were collected using the "Nurse Information Form" and "Pressure Ulcer Prevention Knowledge Survey" prepared in light of the literature.
Results: The sample was mostly undergraduate (70.0%) and the mean age was 26.11±5.33 years. Nurses (98.8%) indicated that "advanced age" has a significant influence among risk factors that cause pressure ulcers. The item on the "Pressure Ulcer Prevention Knowledge Survey", that was answered incorrectly most often (92.8%) was "when conscious patients with learning ability sit on chairs, they should be informed that they should shift their weight every 15 minutes," in the sub-dimension of "Nursing Interventions for Preventing Pressure Ulcers". There was a statistically significant difference between the knowledge level scores of nurses with respect to nurses' age, education level, working unit and pressure ulcer education ($p<0.05$).
Conclusion: Nurses' knowledge level scores for prevention of pressure ulcers were above the average value. It is important to organize continuous education programs to increase nurses' knowledge about the risk factors for pressure ulcers and their prevention.
Keywords: Pressure ulcer, nursing care, risk factors, risk assessment, training programs

1. INTRODUCTION

Pressure ulcers that cause serious health problems in long-term care at home and in all types of health care settings, still occur due to difficulties in care and treatment which result in increased costs (1-4). Pressure ulcers can occur in any skin area that is exposed to pressure (5, 6). Patients confined to bed or chair with impaired sensory function, impaired mobility, impaired feeding, and immunodeficiency and elderly individuals are in the risk group for pressure ulcer development (2, 7). Intrinsic and extrinsic factors influence the development of pressure ulcers. Intrinsic risk factors in the development of pressure ulcers are diabetes, smoking, malnutrition, immunosuppression, vascular diseases, spinal cord injuries, contractures and prolonged immobility. Extrinsic risk factors for development of pressure ulcers are lying on hard surfaces, staying at nursing homes, poorly fitting prostheses, poor skin hygiene, physical restraints and medical devices (8).

Most pressure ulcers are due to preventable causes. Maintaining the integrity of the skin is one of the important objectives during the care provided for pressure ulcers (6, 9). The main way to prevent pressure ulcers is to minimize the body parts that are under pressure for long periods of time (8). Prevention and management of pressure ulcers consists of identifying persons in the risk group, eliminating or reducing risk factors, and applying specific preventive measures (10-12). The first step in identifying risk factors for pressure ulcers in individuals and planning nursing intervention to prevent pressure ulcers is the use of risk assessment scales. The risk assessment should be carried out on admission to healthcare setting and should be regularly performed according to a schedule or in line with changes in the health status of the patient (13, 14). It is important to gain knowledge and skills of preventing, evaluating, diagnosing, and treating pressure ulcers (4, 13).

Pressure ulcers are regarded as a sign of inadequate nursing care, negligence in preventive practices, and inadequate quality of care (15-17). Their prevention and treatment require a multidisciplinary team approach with holistic care, and nurses have significant responsibilities in this regard (18, 19). Nurses should ensure early prevention of pressure ulcers by regularly assessing risk for every patient admitted to the hospital. After determining the risk level of the patient, a suitable nursing care should be planned with the patient in line with the obtained data (3, 4, 20)

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The National Pressure Ulcer Advisory Panel (NPUAP), the European Pressure Ulcer Advisory Panel (EPUAP), and the Pan Pacific Pressure Injury Alliance (PPPIA), which were established as organizations for the prevention, care, treatment, and studies of pressure ulcers, prepared jointly a document entitled "Prevention and Treatment of Pressure Ulcers: A Quick Reference Guide (2014)". The aim of this cooperation is to provide evidence-based recommendations about the prevention and treatment of pressure ulcers for healthcare professionals throughout the world (21). Whatever the healthcare needs or diagnosis, nurses can use this guide while providing care for all patients and vulnerable people who are at risk of developing pressure ulcers, whether in a hospital, long-term care center, or living with help at home or elsewhere (18, 22). These guidelines form the basis for the development of training strategies for the prevention and management of pressure ulcers by contributing to evidence-based healthcare practices (15).

Pressure ulcers are an important complication, which is very common despite being preventable with appropriate precautions. Pressure ulcers are an indicator of deficiency in nursing care, negligence in preventive practices and inadequate quality of care. Nurses have very important responsibilities regarding pressure ulcers. Evidence-based practices reduce the incidence of pressure ulcers and improve the quality of care (23). Therefore, determining nurses' knowledge about, skills in and practices for preventing pressure ulcers is important. In Turkey, there are no valid and reliable measurement tools for assessing the nurses' knowledge levels related to pressure ulcer prevention. The number of national and international studies assessing nurses' level of knowledge about preventing pressure ulcers is limited. This study will provide an insight into further studies to be conducted on this topic.

The aim of the study was to evaluate the levels of nurse's knowledge on prevention of pressure ulcers and its associated factors. The research questions were as follows:

- What are the nurses' knowledge levels about preventing pressure ulcers?
- What are the knowledge of the nurses regarding risk factors of pressure ulcers?
- Are there any differences between the nurses' knowledge levels about preventing pressure ulcers according to their sociodemographic and occupational characteristics and training and practice related to the pressure ulcers?

2. METHODS

2.1. Design

This study is a descriptive, cross-sectional research design.

2.2. Setting

The research was conducted in a training and research hospital in Istanbul. It serves for many specialties by combining its academic activities with health services.

2.3. Sample

The research population consisted of 350 nurses working in the hospital between September 1 and December 1, 2016. This study attempted to include all the nurses in the study population in its sample. A total of 250 (71.4%) nurses were included the study. Nurses who did not agree to participate in the study or could not be reached for various reasons (annual leave, rest, maternity leave, etc.) were not included in the survey.

2.4. Ethical considerations

Ethical approval was obtained from the IBU Ethics Committee of Clinical Investigations (Decision No: 16.08.2016/53-15) before the study was conducted. In addition, permission was obtained from the management of the hospitals where the study was conducted. The nurses who participated in the research signed an Informed Volunteer Consent Form that explained the aim of research. They were informed that the data from the questionnaires would be kept confidential so that their anonymity was guaranteed.

2.5. Data collection

The data collection forms were prepared by the researchers based on the literature review (4, 13-15, 21). "Nurse Information Form" and "Pressure Ulcer Prevention Knowledge Survey" were used as data collection tools in the study. After the nurses were informed about the study, the forms were distributed to those who agreed to participate in the study. The nurses were asked to fill out the questionnaire after the information was given.

2.6. Instruments

Nurse Information Form: This form has 16 questions in two sections. The first section has questions about socio-demographic (age, gender, marital status, educational level) and occupational characteristics (professional experience, unit working time, position, unit). The second section has questions about nurses' training and practice characteristics regarding pressure ulcers (average number of patients with pressure ulcers given care, training about pressure ulcers, training needed for assessment and prevention of pressure ulcers, etc.).

Pressure Ulcer Prevention Knowledge Survey: The form was developed to assess the knowledge level of nurses about risk monitoring, evaluation, and prevention of pressure ulcers. This form has 5 sections: (1) Risk factors for pressure ulcers (16 items), (2) Medical interventions that cause pressure ulcers (10 items), (3) Evaluation of skin care (7

items), (4) Stages of pressure ulcers (5 items) and (5) Nursing interventions for preventing pressure ulcers (28 items). The items were answered according to the True/False format. Correct answers were scored 1 while incorrect answers were scored as 0. The lowest possible score that can be obtained from this form was "0" and the highest possible score was "66". An increase in score indicates an increase in the nurses' knowledge level about preventing pressure ulcers.

To evaluate the items in the questionnaire in terms of wording, understandability and content validity, expert opinions were obtained. The panel of experts consisted of five specialists: two in the fundamentals of nursing, two in surgical nursing and one in internal disease nursing. They expressed their opinions by scoring each item on three-point scale, ranging from one to three (1=not understandable and not relevant, 2=relevant with rewording, 3=understandable and relevant). The acceptable score for each item was two or more, and there was no item removed from the scale. According to the views of specialists, the scale's Content Validity Index (CVI) was .91. A pilot study was also conducted to determine whether the items on the questionnaire were understandable or not. Before the study was conducted, the questionnaire was administered to 15 nurses. In accordance with their recommendations, some minor revisions were made, and the final form of questionnaire was obtained.

2.7. Statistical analysis

Data were analyzed using the Statistical Program for Social Sciences (SPSS) 21.0 package program. The nurses' knowledge level about pressure ulcer prevention was the dependent variable. The nurses' sociodemographic and occupational characteristics and their training and practice related to the pressure ulcers were the independent variables. Frequencies, arithmetic means, standard deviations and percentages were used for descriptive statistics. Chi square test was used for comparing categorical variables; whereas Student's t test and one-way ANOVA tests were used in comparing the means. The relationship between the variables was examined using Pearson's correlation analysis. The results were evaluated at a confidence interval of 95% and a significance level of $p<0.05$.

3.RESULTS

3.1. The nurses' sociodemographic and occupational characteristics and training and practice related to pressure ulcers

The mean age of the nurses was 26.11±5.33 years old. More than eighty percent (81.2%) of the nurses were women, and 70.0%" had an undergraduate education. Less than one quarter of the nurses (23.6%) worked in the intensive care unit. The mean duration of professional experience of the nurses in this study was 63.80±63.80 months (Table 1).

Table 1. *Distribution of nurses according to sociodemographic characteristics (n=250)*

Characteristic	Category	n	%
Age	*Mean*: 26.11±5.33 (*Range*: 18-45)		
Age group	18-19 years	18	7.2
	20-29 years	187	74.8
	30-39 years	35	14.0
	40 years and over	10	4.0
Gender	Female	203	81.2
	Male	47	18.8
Marital status	Married	50	20.0
	Single	200	80.0
Education level	Health vocational high school	50	20.0
	Associate degree	9	3.6
	Undergraduate	175	70.0
	Graduate	16	6.4
Professional experience (months)	*Mean*: 63.80±63.80 (*Range*: 1-324)		
Professional experience (years)	0-1 years	62	24.8
	2-5 years	99	39.6
	6-10 years	52	20.8
	11 years or over	37	14.8
Unit working time (month)	*Mean*: 39.09±42.40 (*Range*: 1-264)		
Unit working time	0-1 years	93	37.2
	2-5 years	108	43.2
	6-10 years	39	15.6
	11 years and over	10	4.0
Position	Service nurse	87	34.8
	Service responsible nurse	7	2.8
	Intensive care unit	59	23.6
	Operating room nurse	20	8.0
	Emergency nurse	25	10.0
	Other (nursing instructor, nursing polyclinics, supervisor nurse, angiography nurse, endoscopy nurse, etc.)	52	20.8
Unit	Intensive care unit	59	23.6
	Internal medicine service	21	8.4
	Surgical service	19	7.6
	Mixed service (internal diseases, surgery, gynecology)	54	21.6
	Operating room	20	8.0
	Emergency	25	10.0
	Other (angiography, outpatients, etc.)	52	20.8

Nearly sixty percent (58.4%) of the nurses stated that they were working in a hospital and provided care for patients with pressure ulcers, 83.6% had been educated about pressure ulcers, and 63.2% had received this education during their nursing education. Only 34.4% of the nurses in the sample group indicated that they needed education about the evaluation and prevention of pressure ulcers and that they wanted most to receive education about risk factors and risk assessment (21.2%) and causes of pressure ulcers (23.6%) (Table 2).

Table 2. *Distribution of nurses according to professional qualifications regarding pressure ulcers (n=250)*

Characteristic	Category	n	%
Providing care to pressure ulcer patients	Yes	146	58.4
	No	104	41.6
Average number of patient with pressure ulcers given care	Never	106	42.4
	1-2 patients	127	50.8
	3-4 patients	14	5.6
	5 patients or over	3	1.2
Received any training about pressure ulcers	Yes	209	83.6
	No	41	16.4
Where training about pressure ulcers was received	Within the curriculum of nursing education	158	63.2
	In-service training program	86	34.4
	Courses, seminars, and symposiums	42	16.8
Information sources used to prevent pressure ulcers	Information received during nursing education	150	60.0
	Practices of experienced nurses working together	69	27.6
	Physician recommendations	34	13.6
	Magazines, books, etc. professional spreads	26	10.4
	Internet, newspaper, or TV	16	6.4
Training needed for assessment and prevention of pressure ulcers	Yes	86	34.4
	No	164	65.6
Training subjects needed for assessment and prevention of pressure ulcers	Etiology and pathology	20	8.0
	Risk factors	59	23.6
	Risk assessment	53	21.2
	Skin evaluation	48	19.2
	Skin care	37	14.8
	Selecting and using pressure distributing-reducing support surfaces	24	9.6
	Position changes to reduce pressure, friction, and tears	15	6.0
	Management of pressure ulcers and understanding nursing roles and responsibilities in the multidisciplinary team	29	11.6
	Policies and procedures	11	4.4
	Education of patients and their relatives	12	4.8
	Recording	11	4.4

3.2. Pressure ulcer prevention knowledge survey scores

The mean score on the "Pressure Ulcer Prevention Knowledge Survey" was 52.95±5.78 (ranging from 28 to 63) (Table 3). The nurses' knowledge level scores for the prevention of pressure ulcers were above the mean value.

Table 3. *Pressure ulcer prevention knowledge survey score distribution (n=250)*

	Potential Distribution	Mean	±SD	Min	Max
Pressure Ulcer Prevention Knowledge Survey	0-66	52.95	5.78	28	63

The majority of nurses (98.8%) selected "advanced age" among the risk factors leading to pressure ulcer development, 89.2% selected the maximum pressure ulcer risk for "compression sleeves". Among the factors that nurses should pay attention to when evaluating the skin condition for pressure ulcers, the most accurate answer (99.2%) was "skin assessment should be started on the day the patient is hospitalized," whereas the most selected wrong answer (11.6%) was "apart from bone spurs, tissues should also be assessed because pressure ulcers develop on these areas particularly due to external pressure caused by medical tools". More than half of the sample (67.6%) correctly answered the definition of "Stage I" regarding the stages of pressure ulcers. Nurses (98.8%) demonstrated they knew the correct intervention to prevent pressure ulcers "when the skin of a patient with incontinence gets wet, it should be cleaned immediately and at certain intervals" and "the mobilization and transfer of fully bedridden patients should be performed by two or more people". It should be noted many nurses (92.8%) also selected that "when conscious patients with learning ability sit on chairs, they should be informed that they should shift their weight every 15 minutes" (Table 4).

3.3. Comparison of the nurses' knowledge level scores for pressure ulcer prevention according to their sociodemographic and occupational characteristics and training and practice related to pressure ulcers

We did not find statistically significant differences between Pressure Ulcer Prevention Knowledge Survey scores with respect to nurses' gender, marital status, occupation or professional experience (chi square test; p>0.05).

According to the results of the analysis, the Pressure Ulcer Prevention Knowledge Survey scores of nurses in the age groups of 20-29 years, 30-39 years, and 40 years or older (53.41±5.66, 53.23±4.65, and 54.50±4.20, respectively) were significantly higher than those of nurses aged 18-19 years (46.78±6.43). Considering the educational levels of the participants, the knowledge scores of the participants with associate, undergraduate and post-graduate degrees (51.56±4.50, 54.81±4.07 and 55.25±3.40, respectively) were significantly higher than those of the graduates of vocational health high schools (45.96±6.29).

Tablo 4. *Pressure Ulcer Prevention Knowledge Survey (n=250)*

Item	True		False	
	n	%	n	%
(1) Risk Factors for Pressure Ulcers				
1. Advanced age	247	98.8	3	1.2
2. Disturbance in sensory perception	153	61.2	97	38.8
3. Changes in states of consciousness	157	62.8	93	37.2
4. Malnutrition	204	81.6	46	18.4
5. Dehydration	210	84.0	40	16.0
6. Obesity/Cachexia	243	97.2	7	2.8
7. Hypotension	166	66.4	84	33.6
8. Immobility	239	95.6	11	4.4
9. Edema	246	98.4	4	1.6
10. Wet skin	215	86.0	35	14.0
11. Anemia	171	68.4	79	31.6
12. Hypodermia/Hyperthermia	63	25.2	187	74.8
13. Medicines	236	94.4	14	5.6
14. Pressure (duration, intensity)	242	96.8	8	3.2
15. Raising the head of bed 30 degrees more	62	24.8	188	75.2
16. Comorbid diseases (diabetes mellitus, cardiovascular, etc.)	241	96.4	9	3.6
(2) Medical Interventions that Cause Pressure Ulcers				
1. Contact with nasogastric catheter or oxygen cannula	157	62.8	93	37.2
2. Lips connected to an endotracheal tube	176	70.4	74	29.6
3. Ears in contact with oxygen cannula or pillow	165	66.0	85	34.0
4. Drainage tube	177	70.8	73	29.2
5. Foley catheter (generally inner face of the thigh)	168	67.2	82	32.8
6. Physical detection (wrists)	218	87.2	32	12.8
7. Contact zones of orthopedic devices, splints, positioning tools	220	88.0	30	12.0
8. Compression sleeves	223	89.2	27	10.8
9. Anti-embolism stocking	216	86.4	34	13.6
10. Central catheter	100	40.0	150	60.0
(3) Evaluation of Skin Care				
1. Skin assessment should be started on the day the patient is hospitalized.	248	99.2	2	0.8
2. The skin of a patient at risk should be observed for pressure ulcer development.	243	97.2	7	2.8
3. Skin should be assessed in terms of color change, temperature, turgor, humidity and bubbles.	242	96.8	8	3.2
4. Since pressure ulcers are generally observed on bone spurs, the assessment should focus on these areas first.	234	93.6	16	6.4
5. Apart from bone spurs, tissues should also be assessed because pressure ulcers develop on these areas particularly due to external pressure caused by medical tools.	221	88.4	29	11.6
6. All hospitalized patients should be assessed using the Pressure Ulcer Risk Assessment Scale.	230	92.0	20	8.0
7. Patients and caregivers should be provided with training for skin assessment.	244	97.6	6	2.4
(4) Stages of Pressure Ulcers				
1. There is a skin loss in the dermis layer. There is a superficial ulcer. The wound bed is red or pink, and it does not have necrosis (Stage II)	111	44.4	82	32.8
3. There is no open wound. There is a redness which does not fade after pressing on it. It may be the sign of ulceration (Stage I)	169	67.6	42	16.8
4. There is a deep ulceration which is followed by bone, tendon or muscle involvement. There is necrosis tissue on the wound bed (Stage IV)	76	30.4	120	48.0
5. There is a full-thickness ulcer. Subcutaneous fat tissue is observed. There is no bone, tendon or muscle involvement. There may be necrosis (Stage III)	77	30.8	112	44.8

Tablo 4. *Pressure Ulcer Prevention Knowledge Survey (n=250) (continued)*

Item	True		False	
	n	%	n	%
(5) Nursing Intervention for Preventing Pressure Ulcers				
1. Position should be changed regularly every two hours.	227	90.8	23	9.2
2. Pressure areas should be observed with every position change.	241	96.4	9	3.6
3. Skin should be kept dry and clean.	243	97.2	7	2.8
4. Friction and damage to the skin should be prevented.	236	94.4	14	5.6
5. The position of bedridden patients should be changed regularly every three hours.	150	60.0	100	40.0
6. It should be noted that bed linen is clean and stretched.	241	96.4	9	3.6
7. Skin protection creams should be used for patients with incontinence.	226	90.4	24	9.6
8. Protein and calorie intake of patients appropriate to their needs should be maintained..	238	95.2	12	4.8
9. Sufficient fluid intake of patients should be ensured.	237	94.8	13	5.2
10. Bone spurs on which redness has occurred should be massaged.	174	69.6	76	30.4
11. Patients should be enabled to perform active-passive exercises in the bed.	239	95.6	11	4.4
12. Protruding and pressure zones should be massaged.	215	86.0	35	14.0
13. Special protective pillows should be used for heels and elbows.	223	89.2	27	10.8
14. Supporting surfaces such as inflatable mattresses that distribute and reduce pressure, silicone beds, pillows, foams (recommended tools and materials for the prevention of pressure ulcers) should be used.	238	95.2	12	4.8
15. Ring-shaped cushions should be used to prevent pressure ulcers.	175	70,0	75	30.0
16. The blood sugar, hemoglobin and hematocrit values of patients should be checked.	213	85.2	37	14.8
17. The head of the bed should not be elevated more than 30 degrees in accordance with the clinical status and medical recommendations.	202	80.8	48	19.2
18. When conscious patients with learning ability sit on chairs, they should be informed that they should shift their weight every 15 minutes.	18	7.2	232	92.8
19. Heels should be kept high to reduce pressure on them.	230	92.0	20	8.0
20. Pressure should be alleviated by putting a water-filled glove on the heel of the foot.	203	81.2	47	18.8
21. Sheets or bed linens should be used to move or transfer patients.	231	92.4	19	7.6
22. Cushions should be used for patients sitting on chairs.	235	94.0	15	6.0
23. Changes that occur to decubitus ulcers should be recorded.	234	93.6	16	6.4
24. When the skin of a patient with incontinence gets wet, it should be cleaned immediately and at certain intervals.	247	98.8	3	1.2
25. The skin of individuals at the risk of pressure ulcers should be assessed at least once a week.	192	76.8	58	23.2
26. The mobilization and transfer of fully bedridden patients should be performed by two or more people.	247	98.8	3	1.2
27. Hot water and soap should not be used because they dry out the skin and increase the risk of pressure ulcers.	206	82.4	44	17.6
28. Patients and their families should be informed about the development, risk factors and causes of pressure ulcers.	235	94.0	15	6.0

When the nurses' knowledge level scores for pressure ulcer prevention are examined according to the unit they were working, the Pressure Ulcer Prevention Knowledge Survey scores of the nurses working in internal medicine, surgical service, and the operating room (53.57±4.69, 53.68±4.73, and 57.55±3.55, respectively) were higher than those working in the emergency unit and other units (outpatient clinic, electrocardiography, x-ray, blood collection department, etc.) (44.24±5.85 and 50.12±5.26, respectively). The knowledge scores of the nurses working in the intensive care unit (57.08±3.13) were statistically higher than those of the nurses working in medical wards or units, surgery, mixed service, emergency nursing, and other departments.

The scores of the nurses who received any education about pressure ulcers (54.43±4.38) were higher than those of the nurses who were not educated about the pressure ulcers (45.44±6.22). According to the analysis, the scores of the nurses who did not need any training for the evaluation and prevention of pressure ulcers (54.54±4.34) were significantly higher than those of the nurses who need education about the prevention of pressure ulcers (49.92±6.90) (Table 5).

Table 5. *Comparison of pressure ulcer prevention knowledge survey scores with practice and training characteristics of nurses for pressure ulcers (n=250)*

Practice and training characteristics of nurses for pressure ulcers		n	Knowledge level score		*t/F* p
			Mean	±SD	
Providing care for pressure ulcer patients	Yes	146	54.85	4.16	t=6.668* p=0.000
	No	104	50.29	6.64	
Average number of patients with pressure ulcers given care	[a]Never	106	50.32	6.60	F=15.010* p=0.000
	[b]1-2 patients	127	54.89[(a)]	4.22	
	[c]3-4 patients	14	54.50[(a)]	3.94	
	[d]5 or over	3	56.67	2.31	
Received any training about pressure ulcers	Yes	209	54.43	4.38	t=11.131* p=0.000
	No	41	45.44	6.22	
Training needed about assessment and prevention for pressure ulcers	Yes	86	49.92	6.90	t=-6.490* p=0.000
	No	164	54.54	4.34	

*t: t-test, F: one-way ANOVA, *p<0.001*

4. DISCUSSION

Prevention of pressure ulcers is an indication of the care quality (4, 24). The development of preventive activities specific to health personnel, hospital, family education, and the institution is the basis of effective prevention programs (17, 19). For the prevention of pressure ulcers, it is important to determine the knowledge level of nurses and to develop action plans for the patients by identifying possible risk groups (15).

Several causes contribute to the risk of pressure ulcer development. In this study, a significant number of nurses stated that the most important risk factor for developing pressure ulcers was "advanced age". Due to old age, some changes occur in the skin (3, 25). A study conducted by Katran (26) found that 31.4% of the patients in the age group of 75 years and over developed pressure ulcers and there was a significant relationship between age and pressure ulcer development. Similarly, some research (27,28,29) have reported a significant relationship between the age of the patients and pressure ulcer development.

Medical tools (nasal cannulae, oxygen masks, intubation tubes, nasogastric catheters, urinal catheters, blood pressure cuffs, splints, etc.) used for the purposes of diagnosis and treatment improve the quality of life of patients and causes medical tool-related pressure ulcers, which threatens patient safety. As a result of the external pressure caused by medical devices fixed on tissue, blood and lymph circulation is impaired, which causes pressure ulcers (28, 30). Approximately half of the nurses in this study reported that the pressure ulcer was seen only in bedridden patients and that pressure ulcers associated with medical devices were most often caused by a compression sleeve. A study conducted by Black et al. (30) found that the most common region of pressure ulcers due to medical devices did the ears, which is caused by the oxygen cannula. A study conducted in the intensive care unit of a university hospital (31) reported that the answer for the item "the pressure ulcer is only seen in bedridden patients" was 39.6% for pre-training and 43.8% for post-training. Therefore, it will be useful to raise the awareness of nurses to prevent pressure ulcers caused by medical devices and to develop policies and procedures in this direction. It is the responsibility of nurses to prevent the pressure ulcers associated with medical devices and to detect any ulcers early. This requires nurses to evaluate and care for the skin and mucous membranes under and around the medical device.

It is very important to use risk diagnostic tools to prevent pressure ulcers. It is also very important to use valid and reliable risk assessment scales and perform evidence-based practices to improve and standardize the quality of patient care (32). Skin assessment provides information for practices intended to minimize risk and evaluating their consequences. For this reason, daily skin assessment should be performed for all patients and a care plan should be prepared for each patient. All the areas of the skin should be examined in every position, and special attention should be paid to skin over bone protrusions (33). Health professionals should have complete knowledge about how to perform a comprehensive skin assessment (34). One study (35) reported that the pressure ulcer was assessed on the first day of hospitalization, almost immediately, in the risk intensive care unit. The point about skin condition assessment emphasized most by the nurses (99.2%) was that it should be carried out as soon as the patient is hospitalized.

The National Pressure Ulcer Advisory Panel and the European Pressure Ulcer Advisory Panel, as part of the guideline development process, have developed an international general definition of pressure ulcers and a classification system. After a joint study, it was concluded that skin-tissue damage occurs at four levels (21, 22). Once a pressure ulcer is identified, the stages and size of the wound should be carefully documented (8). Staging of pressure ulcers is very important in terms of the diagnosis of pressure ulcers and appropriate treatment and care interventions according

to wound type. The examination of skin areas developing pressure wounds and their stages showed that the pressure wounds developed most in the sacrum area and the pressure wounds in this region were mostly in Stage II (25, 28, 36). The correct answers were below the mean score in the study (37) in which nurses' knowledge and practice related to deep tissue injury and Stage I pressure ulcer prevention and management were assessed. More than half (67.6%) of the nurses in this study responded correctly to the definition of Stage 1 in the pressure ulcer classification. This result shows that most nurses have the knowledge to take measures to prevent the development of pressure ulcers. In addition, the nurses should have adequate experience and equipment when the ulcers are correctly staged.

Among the practices of nurses to prevent pressure ulcers in this study, the most accurate answers were "when the skin of a patient with incontinence gets wet, it should be cleaned immediately and at certain intervals" and "the mobilization and transfer of fully bedridden patients should be performed by two or more people." It should be pointed out that "when conscious patients with learning ability sit on chairs, they should be informed that they should shift their weight every 15 minutes" is the most incorrectly answered item by the nurses. A study examining the knowledge levels and attitudes of nurses in a nursing home in Belgium (15) found that the highest score obtained by the participants was related to risk assessment. Only 16% of respondents stated that it is important to shift position regularly while sitting on a chair. Another study (38) showed that more than half of the participants (54.4%) had appropriate knowledge for the prevention of pressure ulcers, but the remaining participants (45.6%) did not. In a study conducted by İnan and Öztunç (28), 98.8% of the nurses stated that the incontinent patients should be cleaned immediately and at regular intervals when the skin gets wet and two or more people should perform the mobilization and transfer of fully dependent patients. In another study (39), 9% of nurses stated that massage of bone protrusions and the use of inflatable rings were effective protective measures, although nurses correctly identified many strategies to prevent pressure ulcers.

This study found that there were significant differences between the nurses' knowledge level scores and their age, educational level, providing care for a patient with a pressure ulcer, and prior education regarding pressure ulcers.

This study also found that nurses in the age group of 18-19 years had the lowest level of knowledge. This may be related to the fact that nurses at the ages of 18 and 19 do not have much experience in caring for patients with pressure ulcers. Moreover, since these nurses graduated from health vocational high schools, pressure ulcer prevention may not have been emphasized within the scope of their education. Similarly, a study conducted by Doğu (31) found that there was a statistically significant difference by age in nurses' knowledge level scores about pressure ulcers and caring for them. Another study (40) reported no significant relationship by age in nurses' knowledge levels about managing pressure ulcers.

In the present study, the knowledge level scores of the nurses who had associate, undergraduate, and graduate educational levels were higher than those of the nurses who graduated from health vocational high school. According to these results, the training and practices of undergraduate nurses for 4 years are effective and sufficient. A study (41) conducted with 740 nurses to determine their knowledge levels about the prevention of pressure ulcers found that knowledge levels of nurses with bachelor's degrees were 80.3%, and that those of nurses with associate's degrees were 71.7%. Another study (38) found a significant difference between the educational level of nurses and their knowledge level about prevention of pressure ulcers. Thus, the pressure ulcer knowledge levels of nurses with bachelor's degrees were 2.4 times higher than those of the nurses with a high school diplomas.

Patients admitted to the intensive care unit are individuals who are at high risk of developing pressure ulcers due to their vulnerability to widespread systemic effects from the nature of their health problems, having lost their ability to perceive and act on stimuli, the treatment options used, and the intensive care environment (11, 42). In this study, the knowledge level scores of the nurses working in the intensive care unit were significantly higher than those of the nurses working in the internal medicine service, surgical service, mixed service, emergency service, and other units. Karadağ Aydin and Karadağ (37) reported that nurses working previously in a service with pressure ulcer patients had a higher level of correct response scores for prevention/treatment of pressure ulcers than those not working in these services. Another study (40) found no significant relationship between the unit where nurses were working and their knowledge levels about managing pressure ulcers.

There were no statistically significant differences between knowledge level scores by professional experience and unit. A study conducted by Nuru et al. (38) found that there was a significant difference by work experience in nurses' levels of knowledge about preventing pressure ulcers. Nurses with 11-20 years of work experience had a 4.8-fold higher level of knowledge than those with less than 10 years of work experience. Another study (41) conducted with nurses in Spain on the clinical practice of information and pressure ulcer care revealed that the longer the work experience, the more knowledge nurses gained. The reason for this is that nurses with more working experience may have benefited from the knowledge and skills gained by working with other team members. While Karadağ Aydin and Karadağ (37) found a significant difference between the knowledge level of nurses and previous experience on pressure ulcer management, there was no statistically significant difference between working period and knowledge scores in the study conducted by Doğu (31).

This study found that nurses trained in preventing pressure ulcers had significantly higher scores than non-educated

nurses. Of the participants, 83.6% received training on pressure ulcers and 63.2% stated that they received this training within the curriculum of nursing education. In another study (38), nurses who received formal training in pressure ulcers had a 4.1 times greater knowledge level than those who were not trained on pressure ulcers. A study (14) conducted by Swedish nurses to assess the knowledge level, attitudes, and practices related to pressure ulcer prevention showed that nurses participating in the post-graduate training course were significantly better at all parts of the applied knowledge test than those not taking the course. Another study (17) found that there was a significant difference between nurses' knowledge levels and their participation in in-service programs, and that continuous education after graduation changed their knowledge and attitudes. Similarly, a study conducted Acaroğlu and Şendir (39) showed that nurses needed training in pressure ulcers to support blood-based practices and to reduce the use of ineffective strategies. A study conducted by Unver et al. (43) found that nurses who had received any education about pressure ulcers had better attitudes towards the prevention of pressure ulcers.

The data obtained in this study were limited to the nurses who were working at a Practice and research hospital affiliated with a foundation university in Istanbul during the period when the study was conducted and agreed to participate in the study. Further studies should be conducted with nurse groups working in different types of hospitals to obtain detailed information about nurses' knowledge levels regarding pressure ulcer prevention and to generalize the results.

5. CONCLUSION

In this study, nurses' knowledge level scores for prevention of pressure ulcers were above average. This study found that the knowledge levels of nurses whose educational levels were high, who participated in in-service training programs, courses etc. and who provided care for patients with pressure ulcers were higher. The knowledge levels of nurses working in intensive care were higher, and the nurses working in the emergency department were the lowest. The knowledge level scores of nurses whose had less experience and who were recent graduates were lower.

A high incidence of pressure ulcers in an institution may result from the fact that nurses working in clinics do not have adequate levels of knowledge. When nurses are educated and have knowledge about the prevention of pressure ulcers, nursing practices can be improved. Therefore, the knowledge levels of nurses working in all units regarding the prevention of pressure ulcers and practices related to them should be assessed periodically. Their lack of knowledge about this topic can be overcome by obtaining evidence-based data and correcting misinformation. Supporting the continuous participation of nurses in training programs such as courses, workshops and in-service training programs, etc. is very important to ensure the continuity of care and increase nurses' awareness about pressure ulcers. These continuous training programs should be planned in accordance with changes in information and technology and use international guidelines about evidence-based practices for pressure ulcers. These training programs should be included in the in-house orientation training programs planned for nurses who are starting work. Patients' quality of life can be improved by enabling nurses to provide care in accordance with the evidence-based practices for the prevention of pressure ulcers.

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