J Wound Ostomy Continence Nurs. 2023;50(4):289-295.
Published by Lippincott Williams & Wilkins

Pressure Injury Prevalence and Risk Factors

A National Multicenter Analytical Study

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ABSTRACT

PURPOSE: The purpose of this study was to determine the point prevalence (PP) of general pressure injuries (PIs), hospital-acquired PIs, PI-related risk factors, and PI preventive interventions performed by nurses.

DESIGN: Descriptive, multicenter, prospective, analytical study.

SUBJECTS AND SETTING: The sample comprised 5088 patients cared for in 13 hospitals in 12 geographic regions of Turkey. Data were collected between November 5, 2018, and July 17, 2019.

METHODS: The study was carried out in 2 stages. First, nurses who collected data were trained in the diagnosis of PI, risk assessment, staging, and prevalence studies, and informed about the purpose and methods of the study, including data collection. Second, nurses and researchers who had received training related to data collection for this study conducted a PP study for PIs in their inpatient clinics using the ASSIST II method. The PI Prevalence Study Tool and the Braden Scale for Predicting Pressure Sore Risk were also used during data collection.

RESULTS: The PP of general PIs was 9.5%; the prevalence of PIs with hospitalization in intensive care units was 43.2%; medical device–related pressure injuries prevalence was 10.7%. We found that 65.1% of the PIs were acquired after hospital admission.

CONCLUSIONS: Similarities exist between PI prevalence in Turkey and reported PI prevalence rates worldwide. However, the prevalence of nosocomial PIs related to intensive care units and the prevalence of all nosocomial injuries were higher than rates previously reported. Based on results, there is a need to develop strategies to reduce the prevalence of nosocomial PIs.

KEY WORDS: Point prevalence, Pressure injury, Prevention, Risk factor.

INTRODUCTION

A pressure injury (PI) is defined as localized damage to the skin and/or underlying tissue due to pressure or pressure in combination with shear.[1] Pressure injuries continue to occur despite advances in medical treatment, care, and technology.[2-6] They have many adverse effects on both patients and healthcare institutions, including prolonged hospital stay, increased risk of nosocomial infection, increased morbidity and mortality rates, increased treatment costs, and decreased quality of life.[7–11]

Reported PI prevalence varies from 8.3% to 23.0% in Europe,[7] 12.0% to 19.7% in North America,[9] and 2.5% to 7.7% in Australia.[12,13] Moore and colleagues[14] conducted a 2019 systematic review to determine PI prevalence in Europe and reported a mean prevalence in Europe of 10.8%; the highest rate was in the Netherlands (27.2%) and the lowest was in Finland (4.6%).

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Turkish Wound Ostomy Incontinence Nurses Society conducted this study with financial support from the Nursing Support Fund Program of the Vehbi Koç Foundation (24.01.2018/2018.24). None of the authors have relevant financial relationships to disclose.

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DOI: 10.1097/WON.0000000000000995

No large-scale prevalence studies have been conducted in Turkey. Current studies usually show the findings from a specific hospital or individual departments of 1 hospital.[15-24] We reviewed findings of 3 Turkish studies on the point prevalence (PP) of PIs, which used comparable methods and were conducted at different periods of time. The PP and nosocomial PIs PP were 8.1% and 3.7%, respectively, in 1 study of 530 participants[18]; the rates were 8.3% and 5.7% in a second study of 508 participants[19] and 10.3% and 6.0% in a third larger study of 2326 participants.[25] Variability in epidemiologic studies of PI prevalence in Turkey limits comparisons to other regions and makes it difficult to provide strong data guiding development of strategic prevention programs. Accurate measurement of PI prevalence is clinically relevant because occurrence of PIs is recognized as quality of healthcare services.[26-29] The primary role of nurses in PI care includes evaluation of patients at risk for PI and implementation of effective preventive interventions.[30]

The purpose of this study was to measure PI PP and identify associated risk factors across Turkey. Findings from this study will aid healthcare institutions to develop guidelines for preventing and managing PI, based on national-level statistical data for the Ministry of Health and the Office of Social Insurance. Results may contribute to PIs cost analysis studies and lead to greater PI awareness in institutions where future studies will be conducted.

METHODS

This descriptive, multicenter, prospective analytical study was conducted to determine PI PP, associated risk factors, and PI preventive interventions performed by nurses in Turkey. We also determined the hospital-acquired pressure injury (HAPI) rate, which was defined in conjunction with PP, and described only those individuals with PIs that were acquired within the hospital.[1]

The target population was patients cared for in training and research hospitals of the Turkish Ministry of Health. The Classification of Territorial Units for Statistics of Turkey in 2002 divides Turkey into 12 regions.[31] To ensure adequate representation of all 12 regions, at least 1 hospital from each region with the highest bed capacity that agreed to participate in the study was included.[32] Six of the 13 hospitals were university based, 3 had a mission of research and training, and 2 were administered by a city and 1 by a state. Adult patients in all inpatient care units and intensive care units (ICUs) were eligible if they were hospitalized in the clinics at the time of the study, gave consent to participate, and were 18 years of age or older. Special patient groups such as pediatric, gynecology, and psychiatry clinics, and clinics with patients with a low PI risk, were excluded from this study.[21,33,34]

Study procedures were reviewed and approved by a university's ethics committee June 25, 2018-2018/241. Institutional permission was obtained from the 13 hospitals where the study was to be conducted, and verbal informed consent was also obtained from participating nurses, patients, and patients' relatives.

Instruments

Data were obtained using PI Prevalence Study Tool and Braden Scale for Pressure Sore Risk as study instruments. The Pressure Injury Prevalence Study Tool was designed as an optically coded instrument, developed by the authors by adapting the ASSIST II to Turkish language, and tested at different time periods.[4,7,9,18,19,25,35] The International Pressure Ulcer Prevalence survey was introduced in 1989 to assess the number and severity of PIs occurring in healthcare facilities and the tool was updated in 1992 and renamed ASSIST II.[36] New questions were added for our study; data collection forms can be read by an optical scanner.[8,37-39] The form contains 48 items that query demographic information (age, gender, and body mass index [BMI]), information about their health status that may be associated with PIs (systemic disease, hospital length of stay (LOS), incontinence, nutritional status, and plasma albumin level), and PI stage/category and location, along with information about PI preventive interventions such as support surface use, risk assessment, skin assessment, and so forth. For purposes of this study, PI staging was conducted according to the 2016 revised classifications of the National Pressure Injury Advisory Panel (NPIAP).[30,40]

The Braden Scale for Predicting Pressure Sore Risk was developed by Bergstrom and colleagues[41] in 1987, and validity and reliability study of the scale for Turkish was conducted by Oğuz and Olgun[42] in 1998; its Cronbach α value is 0.95.[39,41] The Turkish version of the Braden scale was selected for identification of PI risk because it is the most widely used scale in Turkey.[42]

Study Procedures

Data were collected between November 5, 2018, and July 17, 2019. The study was carried out in 2 stages. During stage 1, the number of nurses to collect the data was determined by accounting for the number of patients who had agreed to participate. Approximately 20 to 40 nurses were included in data collection teams per the number of patients in each hospital; researchers affiliated employed in these institutions were also included. Selected nurses were trained using the standard content created by the Education Commission of the Turkish Wound Ostomy Incontinence Nurses' Society (*Yara Ostomi İnkontinans Hemşireleri Derneği*, YOIHD). A half-day training session that focused on how to complete a risk assessment, diagnose and stage a PI, and collect data for a prevalence study was completed. The session's focus on study aim and methods, how to complete data collection forms, and obtain support from the researchers was included. Posters containing information on PI staging and prevention methods were displayed in the clinics, and the training manual for PIs created by YOIHD was distributed.[43]

During stage 2, a trained researcher and a nurse were paired to collect prevalence data from participating hospital inpatient and intensive care units. They reviewed medical records for demographic and pertinent clinical characteristics (age, gender, BMI, hospital LOS, systemic diseases, and pertinent laboratory tests such as serum albumin level). They also collected about PI preventive interventions documented by nurses. In addition, they assessed participating patients and documented skin-related characteristics, presence, stage and location of any PIs, presence of incontinence, and feeding-related characteristics. The paired data collectors also assessed type of hospital bed and bed-related characteristics such as slope of the head of the bed and type of support surface. To maximize the validity of data collected, the patients were seen on the same day; similarly, to enhance the reliability of data collected, all nurses were trained on the same day with identical educational materials. To maximize objectivity of data collected, a nurse and a researcher worked together in each unit or ICU. In cases in which the observers disagreed or were uncertain about their about evaluations, a third opinion was obtained, and a

consensus was reached. Finally, to maximize the accuracy of data collected from medical records, data were compared with direct patient observations as described previously.

Data Analysis

Data were analyzed using SPSS software for Windows version 21.0 (IBM Corporation, Armonk, New York). Frequency and percentage were used to describe discrete data; mean and standard deviation were used to summarize continuous data. Univariate and multivariate logistic regression models were conducted to identify demographic or clinical factors associated with PIs. All *P* values of less than .05 were deemed statistically significant.

RESULTS

Data were collected on 5088 patients, 47.0% (n = 2394) were female, while 53.0% of them were male (n = 2694); 70.4% (n = 3582) had at least 1 systemic disease. The mean age of the patients was 59 (SD: 17.78) years, and their mean BMI was 26.91 (SD: 5.73) kg/m^2 (Table 1).

The sample population comprised 5.08 patients cared for in 13 hospitals located throughout Turkey. The PP of all PIs was 9.5% (n = 483/5088). The PP among ICU patients was 43.2% (n = 208); these PIs were mostly observed in the anesthesia and postanesthesia care areas. The PP of PI was 3.4% when stage I was excluded; 65.1% were hospital-acquired PIs (HAPIs). A total of 1044 PIs were identified in 483 individuals. The 2 most common stages of these 1044 PIs were stage 2 (36.2%) and stage 1 (29.7%), respectively. The most PI locations were the sacrum/coccyx (32.9%), heel (13.8%), and hip (10.7%). One hundred twelve (10.7%) of the 1044 PIs were medical device–related pressure injuries (MDRPIs) (Table 2). The most common medical devices related to PI occurrences were compression stockings (28.6%), intubation/endotracheal tube connector (10.7%), and oxygen masks (9.8%).

Univariate and Multivariate Analyses of Risk Factors

Univariate analysis identified low albumin levels (n = 483, 75.8%), fecal incontinence (n = 483, 54.5%), immobility (n = 483, 48.1%), urinary incontinence (n = 483, 38.9%), bedside slope higher than 30° (n = 483, 30.3%), dry skin (n = 483, 35.9%), wet skin (n = 483, 13.9%), and enteral or parenteral feeding (n = 483, 30.5% enterally; 18.5% parenterally) (Table 3) as associated with a higher likelihood of PIs.

TABLE 1.
Demographic and Clinical Characteristics of Participants (N = 5088)

Participants' Characteristics	$\bar{X}$ (SD)	
Age, y	59 (17.78)	
BMI (kg/m^2)	26.91 (5.73)	
LOS, d	11.26 (29.50)	
Sex	n	%
Female	2394	47.0
Male	2694	53.0
Systemic disease		
Yes	3582	70.4
No	1506	29.6

Abbreviations: BMI, body mass index; LOS, length of stay.

TABLE 2.
Characteristics of Pressure Injury PP (n = 483)

Characteristics	n	%
PP		
PP for all clinics (including stage 1[a])	483	9.5
PP for all clinics (excluding stage 1[a])	173	3.4
HAPI PP[b]	680	65.1
MDRPIs PP[b]	112	10.7
PI stages[b]		
Stage 1	310	29.7
Stage 2	378	36.2
Stage 3	116	11.1
Stage 4	66	6.3
Unstageable	102	9.8
Deep-tissue injury	59	5.7
Mucosal membrane damage	13	1.2
PI location[b]		
Sacrum/coccyx	344	32.9
Heel	144	13.8
Medical device regions[c]	112	10.7
Hip	112	10.7
Leg	75	7.2
Scapula	52	5.0
Arm	42	4.1
Trochanter	33	3.2
Ear	29	2.8
Spine	26	2.5
Foot	26	2.5
Scrotum	20	1.9
Ischium	16	1.5
Other[d]	13	1.2
PIs in ICUs[e]	208	43.2
Anesthesia and recovery	83	17.2
Internal medicine ICUs	50	10.4
Neurology ICUs	18	3.7
General surgery ICUs	16	3.3
Coronary ICUs	13	2.7
Cardiovascular surgery ICUs	10	2.1
Pulmonary medicine ICUs	9	1.9
Neurosurgery ICUs	8	1.7
Thoracic surgery ICUs	1	0.2

Abbreviations: HAPI, hospital-acquired pressure injury; ICU, intensive care unit; MDRPI, medical device–related pressure injuries; PI, pressure injury; PP, point prevalence.
[a]Total patient (n = 5088).
[b]Total pressure injury (n = 1044).
[c]Ankle: 3.9%, knee: 2.1%, nose: 1.7%, chin: 0.8%, nape: 0.8%, cheekbone: 0.5%, forehead: 0.4%, and hand: 0.4%.
[d]PIs in an area of the body other than the listed areas.
[e]Patients with PIs (n = 483).

Multivariate analysis identified longer LOS (odd ratio [OR], 1.006; 95% confidence interval [CI], 1.002-1.010), having fecal incontinence (OR, 4.056; 95% CI, 2.687-6.123),

TABLE 3.
Risk Factors Related to Pressure Injuries

	TP (N = 5088)		PPI (n = 483)	
Risk Factor	**n**	**%**	**n**	**%**
Low albumin level	2091	41.1	366	75.8
Bedside slope: >30°	1078	21.2	146	30.3
Urinary incontinence	707	13.9	188	38.9
Immobilization	692	13.7	232	48.1
Fecal incontinence	607	12.0	263	54.5
Impaired skin moisture				
Dry	639	12.5	173	35.9
Wet	143	2.8	67	13.9
Enteral or parenteral feeding				
Enteral	275	5.4	147	30.5
Parenteral	237	4.7	89	18.5

Abbreviations: PPI, patients with pressure injury; TP, total patient.

being immobile (OR, 2.175; 95 % CI, 1.590-2.974), parenteral or enteral feeding (OR, 3.962; 95% CI, 2.804-5.598), having wet or dry skin (OR, 2.631; 95% CI, 1.914-3.615) and low albumin levels (OR, 3.055; 95% CI, 1.914-4.877) as independent predictors of PI occurrences (Table 4).

Risk Assessment and Preventive Interventions

Analysis indicated that 71.5% (3628/5088) of patients underwent a skin assessment within 24 hours of hospital admission, and 74.8% of these had been assessed for PIs. Nursing assessments identified that 25.0% (1272/5088) of participants were at risk for PIs; specifically, 11.9% were deemed at risk due to Braden Scale scores and 13.1% due to the patients' clinical condition. Preventive interventions were documented in 20.8% (n = 365) of patients deemed at risk for PIs and 91.9% (444/483) of patients who had developed a PI in the previous 24 hours (Table 5). The 5 most common interventions for patients who developed PIs were regular turning and repositioning, evaluating the skin, performing skin care, providing nutritional support, and managing moisture/wetness (Table 5). Viscoelastic support surfaces and support surfaces with a low air loss feature were applied much less frequently.

DISCUSSION

To the best of our knowledge, this multicenter study evaluated the largest sample to date (N = 5088) examining PI prevalence, risk factors, and preventive interventions. The overall PP of PIs was 9.5%. This finding is consistent with other prevalence studies in Turkey,[18,19,25] and in other regions of the world.[33,44-46] However, the PI prevalence in ICUs was 43.2%, and the majority of these (65.1%) were HAPIs. These prevalence rates are higher than those found in the literature.[37,45,47-49] These findings suggest that, while multiple preventive interventions for high-risk patients were undertaken, more needs to be done to prevent PI and HAPI in this vulnerable population.

The prevalence rates of various PI stages and locations on the body were also consistent with previous reports in the literature with 1 exception.[33,34,37,38,44,47,48,50-54] The prevalence of MDRPI we found was higher than in prior studies, though the devices most likely to cause were similar.[46,55] This finding is consistent with a previous study of MDRPIs prevalence based in Turkey that reported that a 40% prevalence rate in 175 patients mostly attributed to endotracheal tubes (45.0%).[56] This result indicated that skin examination and preventive interventions in patients with MDRPIs were not adequately performed.

Prolonged LOS, fecal incontinence, enteral/parenteral nutrition, wet/dry skin, low albumin level, and immobility were identified as independent risk factors for the development of PIs, which are well-known risks for the development of PIs in the literature.[1,19,21,30] These results are consistent with the literature that incontinence was an independent risk factor.[54,57] A prior study that enrolled 70 participants also reported that low serum albumin level is an independent risk factor for PIs.[58] Other studies in the literature analyzing the PI prevalence and associated risk factors have had similar results and thus support our findings.[34,44,46,59,60]

A prior study of nurses practicing in Turkey found that their knowledge and application of preventive interventions for PIs were lower than expected.[61] Findings from our study indicated

TABLE 4.
Univariate and Multivariate Logistic Regression Models of Characteristics Included in the Multivariate Analysis for Risk Factors of Pressure Injuries[a]

	Univariate Logistic Regression Model		Multivariate Logistic Regression Model	
Characteristics	**OR (95% CI)**	***P***	**OR (95% CI)**	***P***
BMI, kg/m^2	0.962 (0.945-0.980)	**<.0001**	0.989 (0.963-1.015)	.407
LOS, d	1.020 (1.016-1.023)	**<.0001**	1.006 (1.002-1.010)	**.004**
Urinary incontinence	5.075 (4.128-6.239)	**<.0001**	1.071 (0.715-1.605)	.737
Fecal incontinence	15.672 (12.647-19.421)	**<.0001**	4.056 (2.687-6.123)	**<.0001**
Systemic disease	3.335 (2.517-4.420)	**<.0001**	1.245 (0.816-1.899)	.309
Immobile vs mobile	4.927 (4.034-6.018)	**<.0001**	2.175 (1.590-2.974)	**<.0001**
>30° vs ≤30° bedside slope	1.674 (1.360-2.060)	**<.0001**	1.230 (0.879-1.721)	.226
Wet/dry vs normal skin	7.613 (6.223-9.314)	**<.0001**	2.631 (1.914-3.615)	**<.0001**
Enteral/parenteral vs oral nutrition	20.734 (16.375-26.254)	**<.0001**	3.962 (2.804-5.598)	**<.0001**
Low vs normal albumin	7.207 (5.030-10.324)	**<.0001**	3.055 (1.914-4.877)	**<.0001**

Abbreviations: BMI, body mass index; CI, confidence interval; LOS, length of stay; OR, odds ratio.
[a]Bold indicates statistically significant *P* values.

TABLE 5.
Pressure Injury Preventive Interventions

Preventive Interventions	TP (N = 5088)[a]		PPI (n = 483)[a]	
	n	%	n	%
Number of patients receiving preventive interventions in the previous 24 h[b]	1057	20.8	444	91.9
Interventions	n = 1057		n = 444	
Changing positions	958	90.6	415	93.5
Skin examination	957	90.5	413	93.0
Skin care	866	81.9	391	88.1
Managing moisture/wetness	798	75.5	359	80.9
Nutritional supplementation	789	74.6	367	82.7
Recording nutritional status in the previous 24 h	785	74.3	356	80.2
Managing moisture/wetness in the previous 24 h	678	64.1	312	70.3
Reporting PIs in the previous 24 h	649	61.4	324	73.0
Using supporting surfaces in the previous 24 h	638	60.4	314	70.7
Moisture management in the previous 24 h	562	53.2	273	61.5
Type of hospital bed	N = 5088		n = 483	
Standard	4106	80.7	184	38.1
Air-filled	527	10.4	197	40.8
Viscoelastic foam	429	8.4	87	18.0
Low air loss	26	0.5	15	3.1

Abbreviations: PIs, pressure injuries; PPI, patients with pressure injury; TP, total patient.
[a]All percentages were calculated using these numbers for all patients and patients with 1 or more PIs.
[b]Patients receiving interventions.

that while use of support surfaces within 24 hours of detection of a PI was high (70.7%), most had been previously placed on inappropriate support surfaces such as standard mattresses and air-filled beds, suggesting limited use of guidelines for PI prevention.[1]

The most common preventive intervention used in patients deemed at risk for PI was routine turning and repositioning, skin care, moisture/wetness management, and nutritional support. Evidence-based guidelines also recommend use of support surfaces to prevent PIs.[1,30] In addition, patients deemed at risk for PI occurrences should receive preventive interventions until there is no longer any risk.[4,7,30] Our study findings suggest that nurses did not provide adequate documentation of PI preventive interventions. We assert that medical records were insufficient in terms of monitoring the preventive interventions applied (including frequency and appropriateness of specific interventions) and failed to provide continuity of care until the risk for a PI was alleviated. An earlier study has reported that the knowledge and attitudes of nurses and their effective use of preventive interventions and clinical practice guidelines have a significant effect on the prevention and management of PIs.[62] Nevertheless, we recommend additional research evaluating the efficacy of strategies to ensure that PI guidelines are implemented both promptly and consistently when patients are identified as increased risk for PI development.

Strengths/Limitations

This multicenter study of PI epidemiology enrolled the largest sample size to date in Turkey. We further assert that the study design and larger sample size will enable international comparison. The interventions applied by the nurses to prevent the development of PIs were taken from the records, but many details about the frequency and consistency of interventions were not available, which may have limited our analysis of the use of these interventions. Serum albumin levels of the patients were reported as "low, normal, or high" because of the different normalized ratios of various hospitals; use of quantified numbers may have allowed a more complete analysis of the effect of malnutrition on PI development.

CONCLUSIONS

This multicenter study identified a 95.5% PI prevalence in Turkey, which falls in the range of previous studies. The proportion of HAPIs among all PIs in our study and MDRPIs were 65.1% and 10.7%, respectively; these prevalence rates are higher than those reported in prior studies. We identified potentially modifiable risk factors such as prolonged hospital LOS, fecal incontinence, enteral/parenteral nutrition, wet/dry skin, low albumin levels, and immobility. Findings support the need for periodic measurement of PI prevalence on a national level to provide a basis for and evaluate the effects of additional preventive initiatives. Studies evaluating the effectiveness of PI preventive interventions, including the development of protocols aimed at reducing the rates of HAPIs and MDRPIs, are also needed. Finally, we recommend cost analysis studies so that the cost of PI occurrences to the Turkish Health Ministry can be quantified.

ACKNOWLEDGMENTS

The authors thank the Turkish Wound Ostomy Incontinence Nurses Society (*Yara Ostomi İnkontinans Hemşireleri Derneği*, YOIHD), the Vehbi Koc Foundation Nursing Fund, and nurses and patients who participated in this study.

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