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Pressure injury in the perioperative period during COVID-19 pandemic: Incidence and patient-related risk factors in a hospital in Turkey

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1. Introduction

Pressure injury (PI) refers to localized tissue damage that can be seen on the skin and subcutaneous tissues where bone prominences exist due to many factors, such as pressure, friction, tearing, and etc [1]. The effects of pressure-related skin injuries can vary from non-blanchable erythema of healthy skin to deep tissues [2]. The high incidence of the development of PI places a burden on health care and also creates a major problem for healthcare institutions [3]. The incidence of PI was first spotted by Hicks in patients who underwent surgery, and it was between 4% and 38% in Europe [4,5], whereas it was found to be 54.8% in a study carried out in Turkey [6]. In addition, varying incidences of PI are thought to depend both on healthcare settings [3] (intensive treatment units, medical and surgical clinics) and on factors such as old age, obesity, immobilization, the attributes of the operating table used, and wet skin [7]. In the literature, it has been stressed that one-fourth of PI cases in hospitals takes place during surgery [7] and having to stay in the same position for a long time during the surgery is the most significant cause of the increase in the risk of the development of PI [7,8]. Furthermore, it is pointed out that the posture the patient has to maintain in the operating room and the duration of the operation are significant factors triggering the risk of developing PI [9]. Also, the length of the operation is an important indicator of the time during which the patient is exposed to pressure. Nevertheless, no matter how old patients are, those who are exposed to prolonged and continuous pressure, shearing, and friction forces are more likely to develop PI [9–11]. While peripheral vascular diseases, diabetes mellitus (DM), smoking, nutrition, urinary incontinence, steroid use, and excessive moisture are considered to be other significant factors which have an impact on the development of PI [9–11], the knowledge level and prevention interventions of nurses are also very important for the prevention of PI [1]. Even though PI can be largely prevented by implementing preventive nursing interventions, it is considered to be a determining factor regarding the quality of nursing care and patient safety in healthcare settings [12]. In the report of the National Pressure Injury Advisory Panel (NPIAP) in 2017, PI develops in approximately 2.5 million patients every year when preventive measures are not taken, and 60,000 patients die because of PI-related complications [3]. As far as this negative information is concerned, it is predicted that more than one billion dollars is spent on health care for patients who develop PI [13]. Failure to take preventive steps which are effective in PI increases the incidence and prevalence of PI-related complications in many healthcare institutions. Therefore, the prevention of PI is the priority of a number of healthcare settings, and it has become the most significant component of nursing care [14]. All patients undergoing surgical interventions are at risk of developing PI [15]. As a consequence, all patients should be checked in terms of the risk of PI, risk factors associated with the patient should be identified, and preventive measures should be considered and arranged [15]. In this way, having a good knowledge of risk factors is essential in order to make the risk evaluation of the development of PI in patients going through surgical interventions [15]. Although many risk factors associated with PI are known, the amount of literature which includes information about the incidence of the development of PI in the perioperative period and patient-related risk factors is rather limited. Although the incidence of the development of PI among patients within the perioperative period is known to be quite high during Covid-19 pandemic in Turkey, evidence is not strong because of a lack of sufficient and up-to-date data. Consequently, data including up-to-date evidence is highly needed. Thus, it is thought that this study will play a pivotal role in gaining awareness about the incidence of the perioperative PI during Covid-19 pandemic and patient-related risks, making risk assessment, taking more systematic preventive precautions to identify surgical patients at risk of developing PI in the perioperative period, thereby increasing the quality of health care subsequently.

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2. Methods

2.1. Study design and sample selection

This cross-sectional and descriptive study was carried out in a private hospital administered by a foundation in Istanbul. The sample of the study consisted of patients who were 18 years old or older, had no preoperative PI, had undergone elective surgery for the first time, and had undergone a surgical intervention lasting over 30 min under spinal or general anesthesia. The data of the study were gathered by evaluating the risk of development of PI in the perioperative processes of patients who experienced cardiovascular surgery, general surgery, orthopedics, urology, brain and plastic and reconstructive surgery between August 1 and December 31, 2021. A total of 345 patients were included in the sample. Patients who would have urgent surgery were excluded from the study.

2.2. Data collection procedures

Preoperative demographic data of the patients were taken, risk diagnosis was made and evaluated with respect to PI when they were taken to the ward at the end of the operation. PI was classified in accordance with practice guidelines of NPIAP. In the study, questionnaire form and the Braden Risk Assessment Scale were used. The patient identification form is made up of a wide range of questions, such as demographic information (age, gender, BMI, comorbidities), the type of surgery, the value of serum albumin, arterial blood pressure, body temperature as well as the development, stage, and anatomical localization of PI.

The Braden Risk Assessment Scale: The first study of the Braden Risk Assessment Scale developed by Bergstrom et al. [16] was conducted with a special reference to its reliability and validity by Pınar and Oğuz in 1998 in Turkey [17]. The scale consists of 6 sub-dimensions, including perception of stimulus, moisture, activity, movement, nutrition, friction and irritation, and a total score which ranges from 6 to 23 is obtained [16,17]. As far as the total score is concerned, 12 points and below means high risk, 13–14 points represents a risky situation, 15–16 points is low risk, whereas 15–18 points is considered low risk for people over 75 years old.

2.3. Ethical considerations

Before research data were gathered, permission was obtained not only from the institution, in which the research was carried out, but also from the Ethics Committee of Koç University (Date: July 15, 2021, No: 2021.303. IRB3.133).

2.4. Data analysis

Research data were evaluated by coding statistics in SPSS (Statistical Package for the Social Sciences) 20 program. Descriptive statistics was employed for demographic data, continuous variables were shown as mean, standard deviation, and categorical variables were indicated as percentages (%). In addition, Mann-Whitney *U* Test was used in order to determine the difference between the patients who develop PI and those who do not develop it and the scores of Braden Scale, and Spearman and Pearson correlation analysis were used to determine the relation between different variables. A p value less than 0.05 is statistically significant.

3. Results

The mean age of the participants was 53.94 ± 17.44, 56.2% were females, and 37.4% had a BMI between 25 and 29.9 kg/m^2 66.1% (n = 228) did not have any kind of chronic disease. Among those with the chronic disease, 32.8% had hypertension, as can be seen in Table 1.

Table 1
Sociodemographic characteristics of the patients (n = 345).

Age (, SD, Range)	53.94 ± 17.44 (18–93)	n	%
Gender			
Female		194	56.2
Male		151	43.8
Body Mass Index			
Weak (18.5 kg/m2)		5	1.4
Normal (18.6–24.9 kg/m2)		118	34.2
Overweight (25–29.9 kg/m2)		129	37.4
Obese (30 kg/m2 and above)		93	27.0
Comorbities (n = 117)			
Hypertension		107	32.8
Diabetes		69	21.2
COPD		12	3.7
Heart disease		36	11.0
Other		102	31.3

Six (1.7%) patients developed PI immediately after the operation. PI was detected in different parts of the body, including coccyx (2 patient), right heel (1 patients), left heel (1 patient), left gluteal (1 patient), and back (1 patient), as can be seen in Table 2.

The mean of Braden scale total score of the patients with PI was found to be 16.50 ± 3.83 and 20.05 ± 3.07 for those without PI. The difference between the mean scores was found to be statistically significant ($p < 0.05$), as can be seen in Table 3.

The relationship between the Braden scale score and patient-related factors along with the duration of the operation is considered, it has been noted that there is a negative moderate relationship with the duration of the operation; a weak negative relationship between age, pulse and body temperature, and a weak positive relationship with oxygen saturation, as can be seen in Table 4.

4. Discussion

4.1. Demographic and clinical characteristics of elective surgery patients

The study was conducted in a private hospital where there were 2 certified wound ostomy nurses and the Braden Risk Assessment Scale was used in order to determine the incidence of PI and patient-related risk factors in the perioperative period during Covid-19 pandemic. PI occurs in all healthcare settings, but mostly in hospitals. However, more recent data indicate that the risk of developing PI might be high, especially in surgical departments [3]. External and internal factors associated with the patient are known to play a role on the incidence of PI. Such internal factors include old age, comorbidities, malnutrition, abnormally low or high BMI, poor circulation, diabetes, and low hematocrit levels [3]. Certain external risk factors include type of anesthesia used, duration of surgery, hypothermia, moisture-treatment, type of bed and duration of surgical positions [3,7]. In this study, the mean age of the patients was 53.94 ± 17.44 (18–93). It was found that nearly one third of the patients were slightly overweight and suffer from at least one chronic disease. The literature has contradictory results as to whether age is a risk factor for PI. Even though the results of many studies reporting that patients over 40 and 60 are at high risk for the development of PI [18,19] are consistent with the results of this study, there are a number of studies indicating that age is not a predisposing factor for the development of PI [18,20]. These conflicting results can

Table 2
Location of PI and its stages (n = 345).

Location of PI (n = 6)	Stage
Left heel	1
Right heel	1
Left gluteal	1
Coccyx	2
Back	1

Table 3
Braden scale score averages of patients with and without PI (n = 345).

Pressure injury	Braden scale total score (±SD	Min- Max	P Z
PI evolving	16.50 ± 3.83	11–22	−2.375*
without PI evolving	20.05 ± 3.07	8–23	.018*

Mann-Whitney Test*.

Table 4
The relationship between physical parameters, operation time and the score of Braden Scale (n = 345).

Parameters	±SD	Min	Max	r	p
Age	53.94 ± 17.44	18	93	−.270	**.000**[a]
The duration of the operation (min)	174.42 ± 128.59	15	780	−.423	**.000**[a]
Oxygen Saturation	97.63 ± 1.72	90	100	.252	**.000**[a]
Pulse	76.67 ± 12.02	36	130	−.181	**.001**[a]
Systolic blood pressure	124.66 ± 18.11	80	208	.120	**.025**[a]
Diastolic blood pressure	75.41 ± 10.68	36	112	.054	.318[a]
Body temperature	36.43 ± 0.44	35	38	−.144	**.008**[a]
BMI	27.41 ± 5.42	17.15	54.97	−.097	−071[b]

[a] Sperman Correlation Analysis.
[b] Pearson Correlation Analysis.

stem from the limitations of those studies, such as limited sampling groups, Purposive sampling age, limited clinical areas, and insufficient nurse-to-patient ratios. As a consequence, it is clear that more research should be carried out in different clinical settings with different age groups in order to examine and have strong evidence in order to be able to predict the development of PI. While very few patients had a low BMI, more than half of the group were overweight and/or obese in this study. Particularly, it is known that obesity leads to inactivity and an increase in pressure at the interfaces of the skin [21]. Although there are not enough studies showing the relationship between the development of PI and BMI, it has been reported that low weight and extremely high BMI are not only a predisposing but also a triggering factor for the risk of PI development [21–23]. In one study, it has been pointed out that there is a relationship between increasing malnutrition and the development of PI, especially in intensive care units, but this relationship is vague among the patient population undergoing elective surgery [24]. In this study; age, comorbidities, BMI, and low Braden Scale scores were found to be major risk factors leading to the development of PI. These results are confirmed by the results of other studies as well [18,19,25].

In this study, during the perioperative period, only in stage 1 and 2, 6 patients in total developed PI mainly in the parts of heel, gluteal, coccyx and back. In the literature, stage 1 and 2 are frequently seen depending on the intraoperative position, and PI develops in the gluteal, coccyx, sacrum and heel as anatomical locations [18,20,26]. In a study conducted by Engels et al., the most common locations for PI in 15 patients who were examined in the perioperative period were the sacrum (70%), heel (12%), chin, sternum, and trochanters (6%) [27]. In their study, Akan and Yazıcı Sayın reported 24.1% of the patients developed stage 1 PI in the locations of the coccyx and sacral [30]. While studies have reported that the most widespread areas where PI develops are the sacral/coccygeal and hip [18,27,28], whether such parts of the body are related to the surgical position is not clear [28]. Nevertheless, the patient should be positioned during surgery in such a way that the risk of PI is reduced, and also heels should be elevated [29]. More research is highly needed with regard to the relationship between PI and surgical positions.

4.2. Risk assessment of PI and factors associated with the patients

The Braden Scale has low sensitivity and modest specificity for the prediction of PI, but it is still used for surgical patients [28]. In this study, Braden Risk Assessment Scale mean scores of patients who developed PI were found to be lower than those who did not. In the present study, the Braden Risk Assessment Scale was used for the risk assessment of the patients during the perioperative period, and it was concluded that the mean scores of the patients who have developed PI were lower than those of the ones who did not develop it, and as a consequence, risk development of PI was much higher. In the study, where Gül et al. adapted the Perioperative Risk Assessment Scale (MUNRO) into Turkish in 2021, they state that the Braden scale may be limited in order to determine the risk of PI development in patients within the perioperative period and that the use of MUNRO may bring about more comprehensive and objective data [7]. Yet, the hospital where this study was carried out and many other hospitals use Braden scale in Turkey nowadays. In this study, 6 patients developed PI, as mentioned previously. As in the case of this study, in one study, it was pointed out that 85% of the patients whose mean scores of Braden scale were considered low (10 points) developed PI [25]. In many studies [8–19,25,28], low scores of Braden scale are reported to be related to the development of PI [29]. In their study, Akan and Sayın report that the patients with PI have lower Braden scale score (18.434 ± 6.621) than those (75.8%) (20.243 ± 3.954) without PI (p = 0.035) [30]. However, Celik et al. compared preoperative scores of Braden scale, and they stated that there was no significant difference between the patients who developed PI and those who did not [31]. Kim et al. pointed out that blood pressure, preoperative albumin-lactate-hemoglobin levels, APACHE II score, operation time and position of the patient are important risk factors for the development of PI [28]. In their study, Kim et al. point out that blood pressure, levels of preoperative albumin-lactate-hemoglobin, score of APACHE II, duration of the operation are the important risk factors for the development of PI in the perioperative period, and the position of the patient and the development of PI are directly related [28]. It is important to know the risk factors in the intraoperative period along with those in the preoperative and postoperative period, as mentioned above, in the development of PI, and many studies in the literature highlight that these factors have a strong effect on the development of PI [7,32,33]. Especially, the amount of fluid applied during the intraoperative period, the total amount of blood transfusions, the amount of bleeding, the mean body temperature during the operation, anesthesia and the duration of the operation are determined and decided by specialists and surgeons by reaching a consensus [7,32]. It is stated that surgeries taking longer than 4 h increase the risk of developing PI 2 to 4.5 times. In current study; age, the duration of surgery, oxygen saturation, pulse, systolic blood pressure, and body temperature were associated with scores of Braden scale. Prolonged surgeries decrease oxygenation levels by resulting in both hypotension and decreased tissue perfusion as a consequence of major intraoperative bleeding, therefore they may increase the risk of developing PI [7,32,33]. Celik et al. found that intraoperative vasopressor use, skin turgor, and diastolic blood pressure equal to or lower than 60 mm Hg were significantly related to the development of PI [31]. In previous study, it is stated that for each 1 h rise in the duration of the operation, the risk increased by 1.007, and the need for additional nutrition before the operation and low albumin increased the risk by 2.4 times [30]. In a systematic review by Rao et al., in 2016, one of the most major risk factors influencing patients during the perioperative period is the time they spend on the bed in the operating room and the type of surgical positions [34]. Furthermore, in the perioperative period, patients are under the influence of developing PI due to their exposure to friction and shearing during transfer to the bed in the operating room and during repositioning and because of the prevalence of their major comorbidities [35]. In the light of this information, the duration of the surgery is one of the most significant risk factors, and directly related to

the duration of immobilization, and it can be argued that as the duration of surgery increases, the risk of developing PI is more likely to be higher. In this sense, making risk assessment of the patients undergoing elective surgery in three periods: preoperative, intraoperative and postoperative should be prioritized. There should also be consistent assessment for the incidence and development of patient-related risk factors [7].

5. Limitations

There are two limitations in this study. First of all, it covers the perioperative period of patients undergoing elective surgery over a period of time in a hospital in Istanbul, during Covid-19 pandemic. Secondly, the Braden Risk Assessment Scale, which is not specific to the perioperative period, was used to assess risks involved in the hospital in which the study was carried out.

6. Conclusion

This study reported the incidence of preoperative PI and risk factors in a private hospital in Turkey during Covid-19 pandemic. Determining the rates of PI incidence and the risk factors associated with the patient in the preoperative period provides considerable amount of comprehensive, basic information as to how preventive measures can be taken and the quality of patient care and outcomes are evaluated. For the province of Istanbul, the incidence of PI in the perioperative period is low in a private but full-fledged hospital. However, 2 certified wound ostomy nurses evaluate patients frequently and high levels of preventive measures are taken in this hospital. Therefore, development of PI may pose a serious threat to health care for many state hospitals which lack these facilities. On the basis of these results, especially patients with such risk factors should be paid close attention, followed and evaluated. Therefore, it is recommended that studies in the future should be carried out by using specific measurement tools specific to the perioperative period while assessing the risk of the development of PI.

Declaration of competing interest

The authors declare that there is no conflict of interest.

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