Hazards Associated with Intensive Care Unit Bed Hygienic Nursing Practices at Al-Behera Hospitals

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Abstract

Background: Intensive care unit patients had a life-threatening condition and muscle weakness that caused active movement limitations and bathing ability. **Aim:** To identify the hazards associated with intensive care unit bed hygienic nursing care practices. **Research design:** A prospective descriptive research design was used. **Setting:** The study was conducted in general intensive care units at Al-Behera hospitals in Egypt. **Population:** 120 nurses and 270 patients were included. **Tools of data collection:** Tool one was developed that consisted of three parts. Tool two was used to determine hazards associated with bed hygienic nursing practices **Results:** 71% of studied patents were male with a mean age of 49.09±6.12. The mean of ICU days was 14.06±5.01. 70.8% of studied nurses was female with a mean age of 28.07±4.23. Risk of fall (99.9%) and dislodgment of invasive devices were the most hygiene hazards related to patients. Ratio of nurses to patients (99.3%) and lack of staff assistance (98.5%) were also most hazard related to nurses. While lack of equipment (99.9%) was the most environmental factor. **Conclusion:** Multivariate analysis logistic regression for hygiene hazards in studied patients were discontinuous from mechanical ventilator, medications, invasive devices, changing position, and nurses with chronic back pain and ICU beds. **Recommendation:** In-service training and continues workshops to train in hygiene practice is needed. Nurses in charge should have skills to supervise and observe nurses' performance and poor hygiene practices should be modified.

Keywords: Hazards, Hygiene, ICU patient, Nurses & Safety.

Introduction:

Intensive care unit patients had a life-threatening condition and muscle weakness which caused active movement limitations and bathing ability. They may be dependent on health care providers in complete or incomplete pattern in bathing and caring practice. Nurses need to evaluate the ability of patients to perform self-care activity and their preference. To optimize independence and safety, nurses should alter and apply therapeutic approaches (**Butcher et al., 2018**). In addition to ensuring personal cleanliness, nurses want to help patients avoid negative consequences from immobility and promote early recovery (**Decormeille et al., 2020**). The self-care deficiency theory developed by Orem examined patients' capacity to take care of themselves by exercising self-care agency.

A general phrase for practices that promote cleanliness and stop the spread of illness is hygiene (**Branthover, 2018**). Interventional patient hygiene (IPH) is a framework for critical reflection on basic nursing care which help nurse to use evidence based nursing care interventions with a systematic approach (**Bambi et al., 2014; El-Soussi & Asfour, 2017**). Oral care, bathing, elimination, shaving, tooth brushing, and maintain hair hygiene are the basic procedures to care ICUs patients, and therefore, it is important to be up to date with the nursing literature (**StatPearls, 2021**). Using a variety of therapeutic techniques, nurses provide patient care to protect patients from infections and skin integrity issues (**Mustafa, 2021**). Most ICU patients frequently receive daily bed baths to boost comfort, improve cleanliness, and enhance health outcomes. They are fundamentally unwell are more susceptible to infections with multiple treatment resistance colonizing and contaminating their skin. Since poor hygiene may raise the risk of infection, it is imperative to give critically sick patients good close-to-home cleaning, especially bed baths (**Shareef, 2021**).

Nurses need assistance from other ICU staff during bed-bath for immobile patients who attached to several invasive devices and tubes; also need to follow stepwise steps of turning these patients. Several adverse events should be considered during turning and bathing to prevent deterioration for those patients. Nurses also need to monitor their hemodynamic stability, respiratory, neurological changes, and sudden dislodgment for attached devices which effect on the patients safety (**Decormeille et al., 2020**).

There are presently no well-defined safe and effective methods to enhance skin integrity, cleanliness, and

comfort, despite the fact that giving patients a bed bath is an essential part of nursing care and is frequently done in medical settings (**Konya et al., 2021**). Academic scholars pay attention to adverse events that occur during bed hygiene activities; some of them have looked at the frequency of these adverse occurrences in intensive care units (**Decormeille et al., 2020; Engström et al., 2017**). According to **Decormeille et al (2020)**, 20% of nursing procedures result in adverse occurrences, almost half of which happen within the first three days of an ICU stay. Before, during, and after bed washing, nurses must keep an eye on patients' body temperatures, heart rates, respiration rates, blood pressure, presence of discomfort, and oxygen saturation (**Scozzo et al., 2022**).

Significance of the study:
Intensive care unit patients had dependence on their caregivers in bathing activity in complete or incomplete pattern. Nurses need to evaluate the performance using Interventional patient hygiene (IPH) framework. To ensure safety and increase dependency of ICU patients, nurses should identify different sources of ICUs hazards may negatively impact on patients' safety. It might be difficult for nurses to coordinate their basic care procedures with complex technology that involve attaching patients to several tubes and wires in order to monitor their status (**El-Soussi & Asfour, 2017**). Therefore, the aim of this study is to identify the hazards associated with intensive care unit bed hygienic nursing care practices.

Aim: This study was aimed to identify the hazards associated with intensive care unit bed hygienic nursing care practices.

Research question: What are the hazards associated with intensive care unit bed hygienic nursing practices?

Operation definition: Hazards associated with intensive care unit bed hygienic nursing practices indicated for all associated risk that critically ill patients exposed to it during bed bath hygiene that can be related to patient, nurses, and environment.

Design and Methods:
Research design: A prospective descriptive research design was conducted.

Setting: The current study was conducted in general intensive care units (ICUs) in Damanhur Medical National institute hospital (24 beds divided in three separated ICUs) and Kom Hamada hospital (23 beds divided in three ICUs Hall) at Al-Behera government in Egypt. Those units received patients with critical illness and immobile, independent on nursing care to meet their basic needs.

Subjects: A convenience sample of 120 nurses who worked at the selected setting and caring for the studied patients were selected. A convenience sample of 270 adult aged ≥ 16 years patients who partial or full dependent on nurses in their hygiene activity were included. The sample size was determined bases power analysis,
at significance level 5%, and the total number of patients admitted during the previous six months was 900 patients.

Tools of the study: After reviewing related literature(**Bambi et al., 2014; El-Soussi & Asfour, 2016; Engström et al., 2017; Mohamed et al., 2022; Toledo et al., 2020**), data gathering utilized two tools. Tool one patient's assessment tool was developed and consisted of three parts. **Part I** included demographic variables patient age, sex, ICU duration of stay, APACHE II scoring system, SOFA, cause for admission, and prior medical history. **Part two** hemodynamic and perfusion parameters include vital signs, capillary refill, presence of edema, high risk for bed sores using Braden scale, as well as skin color, condition, and temperature. Richmond agitation sedition scale used to assess level of agitation, whereas Glasgow coma scale used to assess level of consciousness. **Part three** laboratory investigations include hemoglobin, white blood count, and albumin.

Tool two: The nurses hygiene practice assessment developed by researcher after review related literature (**Bambi et al., 2014; El-Soussi & Asfour, 2016; Engström et al., 2017; Mohamed Ahmed et al., 2022; Toledo et al., 2020**). It consisted of two parts. **The first part** is used to obtain data about nurses including gender, educational level, years of experience, and previous attend to a hygienic care education course. **Part two** was adopted from **El-Soussi & Asfour, 2016 and** was used to assess nursing practice in patient hygiene using interventional Patient Hygiene Observational Checklist. This checklist consisted of 30 items used to evaluate nursing practice in hand hygiene, oral care, catheter care, and skin care. This checklist is used to assess compliance of each item: Yes, indicated compliant scored 1 and no indicated non-compliant and score zero. The total score was calculated and using cutoff point 75%; If more than or equal indicated proper practice and if less than 75% indicated improper practice. **Part three** was developed after review literature and it is used to determine hazards associated with bed hygienic nursing practices. It was once used to pinpoint risks related to nursing procedures for bed hygiene. The hazards are categorized according to factors connected to patients, nurses, equipment, and the environment. Patient-related risks include the possibility of falling, stopping life-saving drugs,

removing invasive equipment, hemodynamic instability, hypothermia, cutting off the mechanical ventilator, cardiac monitor, and gaining weight. The issues connected to nursing, such as the nurse-to-patient ratio, complaints of persistent back discomfort, and difficulty changing positions due to a staffing shortage. Factors related to the environment and the equipment include a shortage of warm water, a lack of staff, conventional ICU beds, the timing of bedtimes, and frequency. Each factor was given a code, either 1 for presence or 0 for absence.

Methods:

- After Damanhour University's nursing faculty's ethics committee approval was taken. After explanation of the study's purpose, hospitals administrative authorities' permission to perform the study was acquired from selected hospitals.

- After reviewing literature, two tools were developed. Tool one was used to assess nurse's demographic and job-related data in part one. Part two evaluated practice of nurses in bed path hygiene using interventional patient hygiene observational checklist which adopted from **El-Soussi & Asfour, (2017)**. Part three was used to evaluate clinical conditions of the studied patients including hemodynamic parameters, capillary refill, and edema.

- Tool two was used to determine the hazards associated with bed hygienic nursing practices in the studied patients and it was adopted from **Decormeille et al., (2020)**. If the hazard presence given code 1 (yes), and not present give code (0).

- **Reliability and validity**: the content validity was assessed by 5 critical care and emergency nursing professionals in the study's field from critical care and emergency department at Tanta and Damanhour University. The reliability of tool was done, and it was accepted (tool I: 0.89, tool II: 0.79). A pilot study was done on 10% of the studied population to assess accessibility oof two tool and necessary modifications were done.

- Patient data were collected using patient hospital records to detect demographic and laboratory investigation data and assessment patient was done to monitor hemodynamic and perfusion data and recorded in tool one. The clinical condition of a patient is assessed once per day. The researchers introduced themselves and explained the purpose of the study after introducing herself at the break time of nurses to collect demographic and job-related data. Semi-structure interviews were used by nurses in the selected settings to collect demographic and job-related data of nurses. It was filled by researchers which take 10 minutes at break time. The interventional patient hygiene observational

checklist was used to identify nurses' hygiene practice to selected patients. Data was recorded using part one and two of tool two. Hazards associated with bed hygienic nursing practices was collected by researcher and recorded in part three of tool one. If the hazard is present used score 1 and of absence using score zero. Data were collected through five months starting from October 2022. Data privacy and confidentiality of the collected data was maintained during the implementation of the study. The studied nurses and patients had the right to withdraw from the study at any time.

Ethical considerations:

Damanhour University's nursing faculty's ethics committee approval was taken (code no 63). After explanation of the study's purpose, hospitals administrative authorities' permission to perform the study was acquired from selected hospitals.

Statistical analysis:

Data were fed to the computer and analyzed using IBM SPSS software package. Comparisons among groups for categorical variables were assessed using the Chi-square test. Regression was assessed to detect the most independent/ affecting factor for affecting interventional patient hygiene observational practice.

Results:

Table (1): Frequency distribution of studied patients' demographic data and clinical data (n = 270)

Patient Characteristic (n = 270)	N.	%
Sex		
Male	192	71.1
Female	78	28.9
Patients age (years) Mean ± SD	49.09±6.12	
Duration of stay in intensive care unit	14.06±5.01	
APACHE II scoring system	56.49±5.37	
Medical health history ∗ (multiple response)		
Respiratory	41	15.2
Cardiac	125	46.3
Renal	13	4.8
Neurological	178	65.9
Sepsis	3	1.1
GIT	45	16.7
Diagnosis of admission		
Neurological stroke	101	37.4
Shock	84	31.1
Respiratory failure	48	17.8
Heart failure	24	8.9
Bleeding	13	4.8
Heart rate (b/min)	96.91±14.89	
Mean arterial pressure (mmHg)	95.57±17.37	
Respiratory rate (c/min)	22.41±1.88	
Temperature (0C)	37.99±0.61	
Braden scale	10.91±0.78	
Edema (edema scale)		
Pitting edema	163	60.4
Non pitting edema	107	39.6
Capillary refill		
Normal	120	44.4
Delayed	150	55.6
Hemoglobin in (mg/dL)	11.57±1.24	
WBC in Cmm	14.59±7.47	
Albumin (g/min)	3.55±0.94	
Skin color		
Pink	131	48.5
Pale	139	51.5
Skin condition		
Dry	181	67.0
Normal	89	33.0
Skin temperature		
Hot	111	41.1
Cold	9	3.3
Warm	150	55.6

Table (2): Frequency distribution of the studied nurse's demographic data and their hygiene practice (n = 120)

Nurses Characteristic (n = 120)	N.	%
Nurses sex		
Male	35	29.2
Female	85	70.8
Nurses age	28.07±4.23	
Nurses' education		
Technical	42	35.0
Bachelor	45	37.5
Master	24	20.0
PhD	9	7.5
Previous hygiene practice courses		
Yes	35	29.2
No	85	70.8
Suffering from chronic illness		
Yes	75	62.5
No	45	37.5
Years of experiences	5.70±4.32	
Total score of interventional patient hygiene observational practice	35.19±16.86	
Percent score of interventional patient hygiene observational practice	40.91±19.60	

Figure (1) : Nurses interventional patient hygiene observational practice

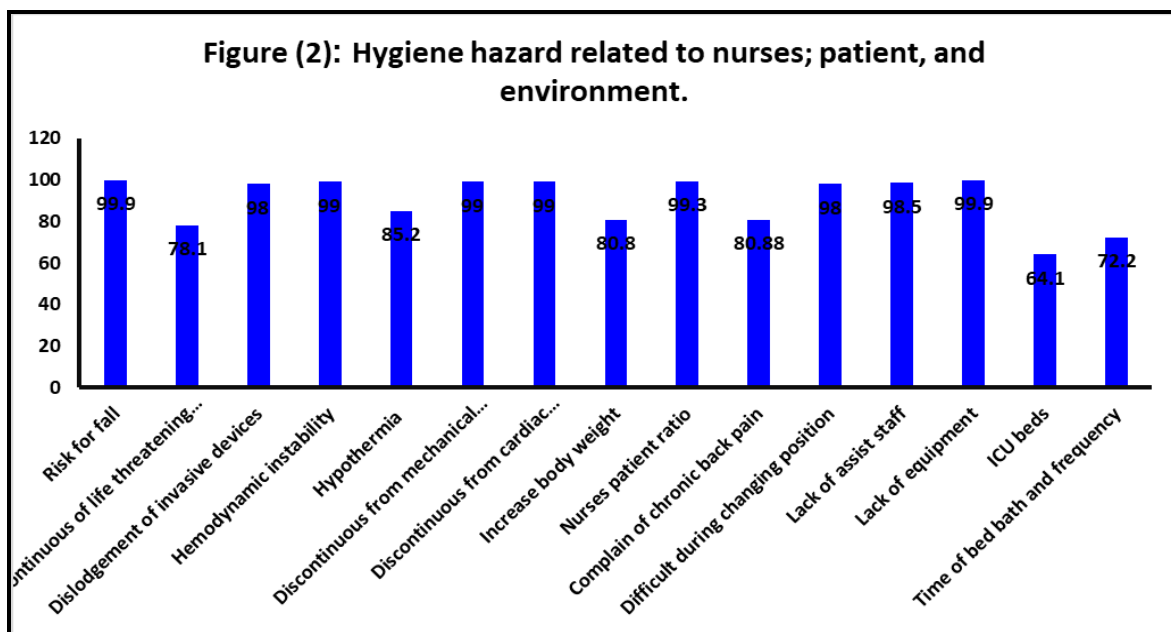Figure (2): Hygiene hazard related to nurses; patient, and environment.
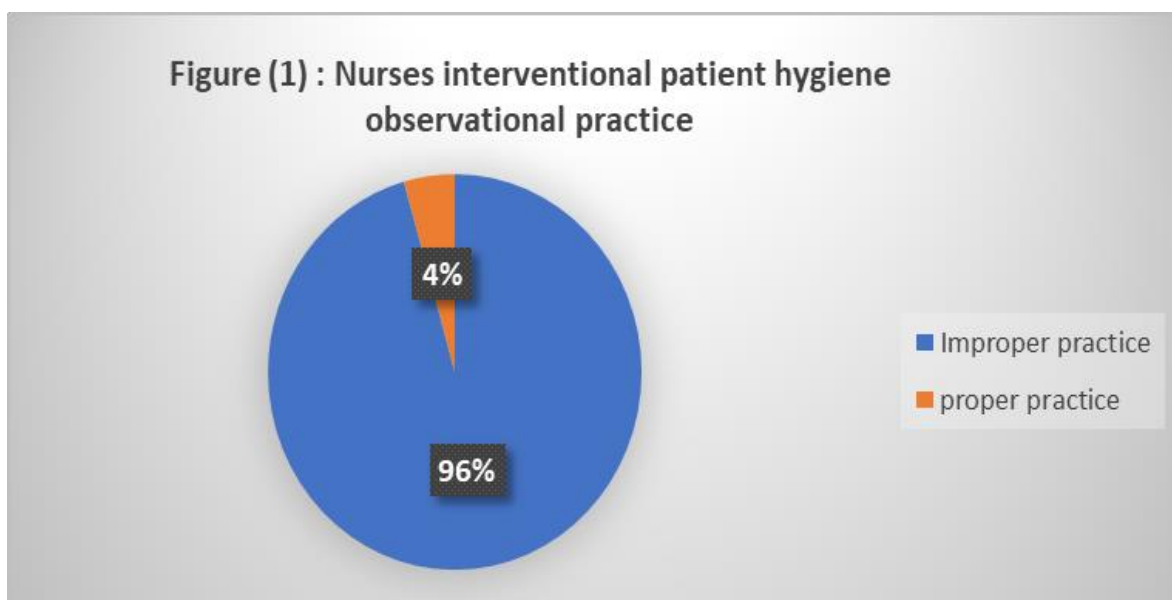
Table (3): Relationship between the nurse's hygiene observational practice and hygiene hazard, (n = 270).

Hazards	Hygiene observational practice				χ^2	FEp
	Improper practice (n =258)		Proper practice (n =12)			
	N.	%	N.	%		
Patient related hazard						
Risk for fall	157	60.9	3	25.0	6.105*	0.017*
Discontinuous of life-threatening medications	203	78.7	8	66.7	0.969	0.302
Dislodgement of invasive devices	245	95.0	12	100.0	0.635	1.000
Hemodynamic instability	157	60.9	3	25.0	6.105*	0.017*
Hypothermia	220	85.3	10	83.3	0.034	0.694
Discontinuous from mechanical ventilator	188	72.9	7	58.3	5.208	0.023
Discontinuous from cardiac monitor	186	72.1	5	41.7	5.129*	0.045*
Obesity	148	57.4	3	25.0	4.873*	0.036*
Nurses related hazard						
Nurses' patient ratio	256	99.2	12	100.0	0.094	1.000
Difficult during changing position	53	20.5	4	33.3	1.126	0.286
Complain of chronic back pain	246	95.3	19	91.7	4.339	0.054
Lack of assist staff	255	98.8	11	91.7	4.039	0.167
Environment related hazard						
Lack of equipment	167	64.7	6	50.0	1.081	0360
ICU beds	167	64.7	6	50.0	1.081	0360
Time of bed bath and frequency	186	72.1	9	75.0	0.048	1.000

χ^2: Chi square test, FE: Fisher Exact.   *: Statistically significant at $p \leq 0.05$.

Table (4): Multivariate analysis logistic regression for hygiene hazards in the studied patients, (n = 270)

Hygiene hazards	p	OR	95% CI	
			LL	UL
Patient related hazard				
Risk for fall	0.289	4.868	0.261	90.772
Obesity	0.591	0.685	0.173	2.718
Hypothermia	0.591	0.685	0.173	2.718
Hemodynamic instability	0.917	1.169	0.062	22.071
Discontinuous of life-threatening medications	0.289	4.868	0.261	90.772
Discontinuous from cardiac monitor	0.917	1.169	0.062	22.071
Dislodgement of invasive devices	0.289	4.868	0.261	90.772
Discontinuous from mechanical ventilator	0.289	4.868	0.261	90.772
Nurses related hazard				
Complain of chronic back pain	0.917	1.169	0.062	22.071
Nurses' patient ratio	0.591	0.685	0.173	2.718
Difficult during changing position	0.289	4.868	0.261	90.772
Lack of assist staff	0.491	0.385	0.273	1.718
Environment related hazard				
Lack of equipment	0.591	0.685	0.163	1.718
ICU beds	0.891	1.495	0.163	1.918
Time of bed bath and frequency	0.391	0.285	0.283	3.728

OR: Odd ratio,   *CI: Confidence interval.*

Table (1): Illustrated Studied Patients Demographic data and clinical data. It was found that 71% of the studied patents were male, and mean age was 49.09±6.12. The mean of ICU days was 14.06±5.01. APACHE II scoring system was 56.49±5.37. 65.9% of them had a neurological history and 1.1% of them had sepsis. 37.4% of them were diagnosed with a neurological stroke and 4.8% of them were diagnosed with bleeding. The clinical assessment of the studied patients showed that mean heart rate was 96.91±14.89; MAP was 95.57±17.37, respiratory rate was 22.41±1.88; temperature was 37.99±0.6; and mean of Braden scale was 10.91±0.78. 60.4% of them had pitting edema; 55.6% of them had delayed capillary refill; 51.5% of them had a pale skin; 67.0% of them had dry skin; and 55.6% of them had warm skin.

Table (2): With a mean age of 28.07±4.23, it demonstrates that more than 70.8% of the nurses under study were female. They were mostly technical (35.0%) and bachelor's (37.5%) graduates. 70.8% of them have never taken a hygiene course before. The average number of years of experience among the nurses was 5.70±4.32. The mean of the overall score utilizing the interventional patient hygiene observational practice checklist was 35.19±16.86; the percentage score was 40.91±19.6regardingto the hygiene practices of the examined nurses.

Figure (1): Shows the nurses who were the subject of the study's hygiene practices. It was discovered that

96% of the nurses who were the subject of the study had poor hygiene habits.

Figure (2): Presented the hygiene hazard related to nurses, patient, and environment. Risk of fall (99.9%) and dislodgment of invasive devices were the most hygiene hazards related to patients. Ratio of nurses to patients (99.3%) and lack of staff assistance (98.5%) were also the most hazard associated with nurses. While lack of equipment (99.9%) was the most hygiene hazard in relation to environmental factors

Table (3): Illustrated the relationship between the nurse's hygiene observational practice and hygiene hazard. Patients related factors such as risk of fall p=0.017, hemodynamic instability p=0.017, discontinuous from mechanical ventilator p=0.023, discontinuous from cardiac monitor p=0.045, and obesity p=0.036 had a statistically significance with the hygiene practice. Complaints of chronic back pain from the studied nurses also significantly differed with the hygiene practice, p=0.054.

Table (4): Showed the multivariate analysis logistic regression for hygiene risk factors. It was found that the studied patients were at risk for hygiene hazard, they were at higher risk for fall with an odd ratio of 4.868 and discontinuous from mechanical ventilator, life-threatening medications, invasive devices with an odd ratio of 4.868. On other hand, the studied patients had lower risk for hygiene hazard in relation to obesity with OR of 0.685 and hypothermia of OR=0.685. Concerning nurses related factors,

difficulty during changing patient position had a high risk for nurses related hazard with values of OR= 4.868, and chronic back pain complaint, OR=1.169. In relation to environment related hazard, ICU beds increase risk for hygiene hazard, OR= 1.495.

Discussion:

The study described the hazards associated with ICU bed hygienic nursing practices at selected hospitals at Al-Behera government in Egypt. ICU patients are particularly prone to a high risk group due to the nature of their illness and require continuous monitoring **(Adelman, 2017)**. Regular nursing interventions in ICUs, especially bed washing, may cause adverse events, which are physiological changes that might compromise patient safety or lengthen hospital stays **(Decormeille et al., 2020)**. The present study multivariate analysis found that nurses suffer from chronic back pain, ICU beds, difficulty of changing position, fall risk, hemodynamic instability, discontinuous from cardiac monitor, mechanisms ventilator, and invasive devices were associated with higher rates of adverse events practice hygiene.

The mean percentage of studied nurses practice was low using interventional patient hygiene observational practice that interrupted by improper hygiene care practice. This could be due to the limited training of proper hygiene nursing care for patients in ICUs, most of the studied nurses suffering from chronic illness, and unequal nurse patient ratio. In addition, the sickness intensity of ICU patients has increased, and they are hooked to more intrusive devices like syringe pumps, mechanical ventilators, and heart monitors. Another factor is the increased body weight of ICU patients, which may make it difficult for ICU nurses to change positions when no one else is there to help. An additional factor is the increased burden for nurses and their increased vigilance when doing procedures like arterial blood sampling, measuring central venous catheters, and suctioning to keep the airway open. Change your posture to avoid developing pressure ulcers and increase your range of motion to avoid developing ICU weakness.

These results in congruence with **El-Soussi & Asfour (2017)** who reported that despite the studied nurses had satisfactory knowledge about hygiene, their practices was improper. **Karlou et al (2018)** concluded that poor caring hygiene can boost the risk of infection and disease, which can lead to a variety of issues. Nurses must be able to identify the patients' hygiene routines and the level of help needed to manage patient care effectively. **Ishimaru et al. (2018)** said that nurses would have seen that, as is the case in the majority of hospital instances, patients

with distorted body confidence and degraded physical condition will find it difficult to execute sanitary practices. They are unable to manage adequate hygiene care on their own due to their limitations and impairments.

The current study reported that risk of fall, hemodynamic instability, and dislodgment of attached devices and machine were the most hygiene hazards related to patients' factors. The ratio of nurses to patients and lack of staff assistance were also the most hazard associated with nurses. The current study well matched with **Mohamed Ahmed et al (2022)** that unequal nurses to patient ratio and increase staff workload were the nurses related factors. Lack of hygiene supplies and equipment were the most reported environmental factors. Hemodynamic instability was one of the major hazards that occur with hygiene care practices. The current findings also reported that there was a significant association between the hemodynamic instability and improper hygiene observation practice of the studied nurses.

This finding is in line with **Engström et al (2017)** who reported that sever and the most common changes in the physiological changes associated all regular routine nursing procedures in the ICU. Obesity and the risk of falling are two factors that mothers should consider because they are strongly correlated with poor breastfeeding techniques. Similarly, there was a strong link between discontinuing the mechanical ventilator and the cardiac monitor and poor nursing practices. **Decormeille et al (2020)** reported that routine nursing procedures, particularly bed bathing, can result adverse events, which are physiologic changes that can be increase lengthen hospital stays. The key objective was the percentage of patients who encountered at least one severe adverse event while taking a bed bath, regardless of the frequency or form of these unfavorable events. The secondary objectives were to determine the frequency of each type of severe adverse event and to identify risk factors for these adverse occurrences.

Another studies supported our findings, where **Lesny et al (2020)** reported that nursing practices need frequent mobilization, which imposes patients at risk for serious adverse events such as hemodynamic and respiratory instability, unintended extubation, pain, the need for sedation analgesia, and accidental catheter removal that increases staff workload, stress levels, and hospitalization costs. Up to one million mechanically ventilated patients experienced an unplanned extubation due to decrease nurse years' experience and improper nurses patient ratio during nursing procedures **(Berkow & Kanowitz, 2020)**.

Several studies supported that bad baths of the basic nursing intervention that may be a source of stress for

patients and effect on the hemodynamic stability **(Lopes et al., 2010; Nøddeskou et al., 2015; Veje et al., 2019)**. **Tai et al., (2021)** reported that bed baths may lead to several adverse events such as patients become agitated and hemodynamic changes, such as increased heart rate, blood pressure, and chills. All patients who need assisted with bathing should be given the chance to do otherwise, if it is clinically appropriate and according to their preferences **(Operations et al., 2011)**. ICU nurses and nurses' aids should have continuously educated and proposed educational workshops and posters in continuous manner to detect positively improvement on the hygiene routines compliance. Therefore, the current study pinpoint on hazard associated with hygiene practices in the selected hospitals.

Conclusion:

ICU patients are exposed to several hazards from the patient himself, nurses, and environment. Multivariate analysis logistic regression for hygiene hazards in the studied patients were discontinuous from mechanical ventilator, life-threatening medications, and invasive devices. On other hand, they had lower risk for hygiene hazard in obesity and hypothermia. Concerning nurses' factors included difficulty during changing patient position, and chronic back pain complaint. Environment related hazard was ICU beds.

Recommendation:

Hygiene is a basic nursing care procedure. Nurses should have skills and knowledge to deliver high quality patient care. In-service training and continuous workshops to train in hygiene practice practical training. Nurses in charge should have skills to supervise and observe nurses' performance and poor hygiene practices should be modified. Policy makers should develop a framework for ICU staff and novice staff should be orientated and trained. Hiring more assisting staff, organize priority of care, and closely monitor hygiene performance using checklists. Also, hospital administration should develop a plan to cover lack of staff assistance and equipment as well as nurse: patient ratio during hygiene practice.

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