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EPIDEMIOLOGICAL REPORT OF SKIN LESIONS IN CHILDREN ADMITTED TO ICU SURGERY - TRAUMA.

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Abstract

Background: patients who admitted in Intensive Care Units (ICUs) are susceptible to many complications. We aimed to investigate skin disorders prevalence's in critically ill surgical–trauma pediatrics during their ICU stay.

Methods: We recorded age, sex, Type of skin lesions, duration of ICU stay, and Pediatric index of mortality3.

We used Chi-square test ANOVA test to data analysis. Test results were evaluated at 95% confidence interval and significance level of P <0.05..

Results: Our study included 632 patients (mean age of 6.2 ±4 years). 82 of the 632 (22.6%) patients were developed the skin lesions. The most common skin lesion were: Hemorrhagic lesions were (26.8%) drug eruptions (23.1%), infectious lesions (20.7%) Xeroderma, (14.6%), Pressure ulcers (9.7%), Palmoplantar keratoderma (4.8%).

The incidence of skin lesions in pediatric ICU patients was not significantly related to their age and sex (P-Value>0.05), the incidence of skin lesions was significantly associated with the length of ICU stay and the severity of the patient's disease. (P-Value>0.05).

Conclusion: many factors such as illness severity, duration of ICU stay, increase dermatological disorders among surgical-trauma pediatrics ICU patients.

Keywords: skin, lesions, pediatrics, ICU

INTRODUCTION

Intensive care unit (ICU) is specialized hospital ward that provide high level treatments and monitoring's for critically ill patients such as acute respiratory distress syndrome and infectious shock(1) (2)

Acutely impairing vital organ systems and probability of life-threatening deterioration conditions requires hospitalization of the patient in the ICU(3).

Because the intensive care unit is managed in a multidisciplinary manner with the presence of specialists in different fields, the possibility of drug interactions and various drug side effects increases. (4).(5)

Also, due to underlying problems, immobility, immunodeficiency, malnutrition, etc., patients admitted to this ward are prone to various complications, including skin problems.(4)

Skin lesions are divided into primary and secondary categories, so that in the primary group are complications that cause the patient to be admitted to the ICU due to the threat to the patient's life, such as toxic epidermal necrolysis, or Versus host graft. While secondary lesions are caused by medications, immobility, or ICU infections(7).

Some of these lesions, such as bed sores, can be prevented with proper training of the treatment staff (8) while failure to identify and treat lesions in a timely manner may be associated with increased mortality and long-term morbidity.(9)

Critically ill child's who admitted to ICU are also susceptible to various skin complication . (10)Few studies have previously been performed on the skin problems of children admitted to the ICU Therefore, in this study, we decided to provide the basis for new studies

in this field by epidemiologic evaluation of skin complications in pediatrics ICU patients .

METHODS AND MATERIALS:

In this prospective cross-sectional study, in 2020 and 2021, we evaluated all children aged 2 to 12 years who were hospitalized in the surgical-trauma intensive care unit of Kerman (southeastern Iran) in terms of the incidence of various skin lesions**.**

Demographic information was collected from all study participants including age, sex, diagnosis, disease severity, and length of stay in the patient's ICU and outcome. Finally, we compared the demographic findings with the prevalence of various skin lesions. To assess the severity of the disease in the first 24 hours of hospitalization, we used the online calculator of the PIM 3 pediatric index of mortality scoring system, which showed the percentage of mortality probability

Statistical analysis:

We used Chi-square test to evaluate the relationship between skin lesions and demographic findings and ANOVA test to examine the relationship between skin lesions and findings such as length of stay in ICU, mean age of patients and severity of disease based on PIM 3 rating system. Parametric distribution values were expressed as mean standard deviation (SD). Test results were evaluated at 95% confidence interval and significance level of $P < 0.05$.

RESULTS:

Out of 632 patients enrolled to the study, 361 (57%) were boys and 271 (43%) were girls. The mean age of patients was 6.2±4 years. The mean length of hospital stay was 3.8± 3 days.

The most common causes of hospitalization respectively were: 34% brain trauma, 28% non-brain trauma, 15% postoperative monitoring, 10% sepsis, 7% electrolyte disturbance and 6% due to various reasons. The mean hospital stay was 7.4 ± 3 days.

82 of the 632 (22.6%) patients admitted to the ICU developed skin or mucosal complications.48 (58%) of them were boys and 34 (42%) were girls. Considering that the ratio of boys to girls hospitalized in ICU was the same, so there was no difference between the two sexes in terms of skin lesions in ICU (P-Value = 0.9)

The mean age of patients with lesions was 7.2± 4 years, which was not significantly different from the mean age of total patients (6.3±4) (P-Value = 0.2).

The mean length of hospital stay was 6.2 ± 3 days, which was significantly longer than the mean length of total hospital stay of patients (3.8 3 3) (P-Value = 0.03).

In patients with a mortality rate of more than 50% according to the pediatrics index of mortality (PMI3), skin complications were58.5% that was significantly higher than of total patients (26.7%).) (P-Value=0.001).

The most common lesions include:

- Hemorrhagic lesions were 22 (26.8%) that were created in the form of hematoma and ecchymosis following blood sampling or injection and venipuncture. In some cases, Petechia and purpura were also seen in the dependent areas due to platelet deficiency or platelet dysfunction.
- Drug eruptions were observed in 19 patients (23.1%)
- Skin and mucosal infections in 17 patients (20.7%)
- Xeroderma, which was seen in 12 patients (14.6%) and was mostly seen on the face and limbs

Pressure ulcers were seen in 8 patients (9.7%), which respectively observed in occiput (4 cases 50%), sacrum (2 patients 25%) and elbows and heels (1 patient 12.5%).

- Palmoplantar keratoderma (4.8%)

Table1: demographic characteristics of patients

variable		total	With skin lesions	p-value
sex	**male**	361(57%)	48(58%)	0.9
	female	271(43%)	34(42%)	
mean age(y) ±SD		6.2 ±4	7.2±4	0.2
Mean ICU stay(day) ±SD		3.8±3	6.2± 3	0.03
PIM 3˙>50%		169(26.7%)	)58.5%(48	0.001

Pediatric index of mortality3

Table2: frequency of different skin lesions in pediatric ICU patients.

Skin lesion	No	Percent %
Hemorrhagic lesions	22	26.8
Drug eruptions	19	23.1
infections	17	20.7
xeroderma	12	14.6
Pressure ulcer	8	9.7
Palmoplantar keratoderma	4	4.8

DISCUSSION:

Skin lesions can be present in up to 32.9%of patients requiring ICU care, Most common skin lesions are due to critical illness or various treatments (13.2%) (11)

Our results showed that 82(22.6%) of 362 children admitted to the ICU had skin lesions. After statistical analysis, we found many factors such as: duration of ICU stay and the severity of the illness which contribute to the development of dermatological disorders in pediatric ICU patients. But there was no significant relationship between the incidence of skin lesions with demographic findings such as age and sex of children. the most common skin lesions in children admitted to ICU trauma and surgery were hemorrhagic lesions (26.8%), drug eruptions (23.1%), infections (20.7%),%), xeroderma (14.6%), pressure ulcer (9.7%) and palmoplantar keratoderma (4.8%). respectively.

In the study of SM Meghdadi et al, 197 out of 406 ICU patients had skin problems, the highest frequency was in the range of 21-40 years (37%) and the lowest was under 10 years (2.5%) and older than 80 years (3%). 116 of patients with skin lesions (58.9%) were male and 81 of them (41.1%) were female. (12)

Sillevis Smitt, JH et al in 2011, found that 2.3% of all ICU admitted children's (average age 30 month) had skin problems while 30% of lesions were due to ICU complications and 50% of them were related to the underlying disease.(13)

Bedia *et al*. reported that 9.2% of ICU patients, suffered dermatological disorders.(14) In a similar study Emre *et al*. reported that13.9% of the patient's need to a dermatology consultation. (15) Lee *et al*. found that1.2% of internal ICU patients had a dermatology consultation.(16)

Srivastava A et al study resulted 164 of 776 cases (21.13%) who admitted to ICU , had skin problems while 3.05% of them had critical lesions and 29 patients died. (17)

Prashanth G et al. after a 25-month study showed that 37.1% of children had skin

complications during ICU hospitalization.(10)

In our study 22.6% of child's had skin lesions the probable reason for difference in the prevalence of skin lesions between above study is due to different Study population.

The prevalence of skin lesion in our study were: Hemorrhagic lesions were 22 (26.8%) drug eruptions (23.1%), Skin and mucosal infections (20.7%),Xeroderma, (14.6%), Pressure ulcers (9.7%),-Palmoplantar keratoderma (4.8%) while In the study of SM Meghdadi et al prevalence of dermatological problem were: hemorrhagic skin lesions (23.4%), steroid acne (22.8%) and toxic epidermal necrolysis (0.5%)

overall pressure ulcer prevalence in critically ill children is reported at 0.8% to 27%(18).Pancorbo-Hidalgo, P. L et al in an epidemiological study of pressure ulcers in pediatric ICU showed that 9.39% of patients had pressure ulcers while most of them located on the occipital region(19).

The prevalence of pressure ulcer in the study of Suddaby EC et.al was 23% in pediatric ICU patients,. Occiput ulcer was more common in critically ill (PICU) patients while diaper dermatitis was more common in the general medical-surgical population.(20)

1.2% of our patients developed pressure ulcer. it seems that strict programs for preventing pressure sores can reduce its incidence. As in the above studies, the most common site of pressure ulcer was the occiput (4 cases 50% of total pressure ulcers).

In many studies, the prevalence of drug eruptions has been estimated to be between 9.3% and 21.6%, while the most common cutaneous manifestation of drug eruption has been maculopapular rashes.(14, 21)

The most prevalence of cutaneous drug reactions was reported in the study of Pektas SD et al (42.5%,).(20) Which was similar to our results 45.2%. Trauma patients, need to anticonvulsants and wide spectrum, and sometimes corticosteroids, which increase the incidence of drug eruptions compared to similar studies in General PICU.

Emre *et al*. reported that drug reactions were more common in women, and Infectious skin lesions did not show any sex dependency(23). It may be due to estrogen effects.(22)many studied denied any association between sex and dermatological disorders (8,10).

Our study failed to show any sex-related association. We believe that the most of our patients were pre-adolescent and were deprived of the potential effects of female sex hormones.

Study of Dunnill M et al have shown that parallel to increasing ICU stay time, the incidence of dermatological problems in patients has increased. (24).

The results of George SM et al study showed that length of stay in ICU was longest for patients with acute skin failure (median 4.7 days for ICU survivors and 5.1 days for ICU non-survivors).(25)

The prevalence of skin lesions in the study of Pektas SD et al was greater in patients with ICU stay > 10 days, but no association could be found between duration of stay and type of lesion (25). We found a positive and significant relationship between length of ICU stay and prevalence of skin lesions. We believe that with increased length of ICU stay, patients are exposed to more complications, and more drugs and various treatments, leading to a greater rate of dermatological disorders.

Some studies showed that factors such as renal failure, DM, cardiac disorders, hypothyroidism and immunosuppressive drugs were associated with an increased dermatological disorder prevalence. (26, 27)

Agrawal P et al showed Acute Physiology And Chronic Health Evaluation II (APACHE-II) score, mechanical ventilation and dialysis, are association to dermatological manifestations in critically ill patients (28)

Our results also showed a direct and significant relationship between the severity of the disease in children admitted to the ICU and the incidence of skin

complications. Skin and mucosal infections was (20.7%) in our study including wound infections, mouth candidiasis, herpes simplex and impetigo. Díaz Posada reported incidence of dermatosis was 19.59%, with a predominance of fungal diseases,(26) results of showed cutaneous cellulitis and necrotizing fasciitis were the most common manifestation of skin infection disorders in ICU.(25)

Pediatric Intensive Care Unit Patients are susceptible to nosocomial infections which may be a complication of ICU hospitalization.(29)

The development of a Surgical site infections (SSI) is dependent on multiple factors, including patient , hospital, surgeon, operation type, and surgical site characteristics, among others(27) .

Infections are the predominant etiology of skin changes in the ICU, (28)Surgical site infections (SSI) are common, occurring after up to 9 % of operations depending on surgical site(30) .Surgical site infections(SSI) range from surgical site skin wound infections to the development of sever sepsis. incidence of SSI is about 3.09%(31)

In some studies, the prevalence of wound infection in the ICU is about 18%(32)

On the other hand, patients admitted to ICU are prone to fungal infections, especially oral candidiasis, due to the use of broad-spectrum antibiotics and the intake of blood products and malnutrition.

As Haylen González Gravina et al found that 69.35% of children and adolescents with cancer had oral candidiasis.(33)

the most common pathogen in many studies in ICU was *Candida* (14, 34). The high prevalence of *Candida* infections in ICU patients is due to suitable temperatures and moisture, its abundance of human flora, its ability to involve intertriginous areas, and use of broad-spectrum antibiotics and total parenteral nutrition at ICU.(35)

Our study demonstrated skin and mucosal infection prevalence of (20.7%)We believe that the high prevalence of superficial infections could be due to, disrupted skin, and surgical infectious factors in surgical patients. we also believed that mouth candidiasis is common infection in PICU due to many predisposing factors. .

Conclusion:

Based on the findings of the present study, skin problems are common in children admitted to the ICU. There was no relation between the prevalence of skin lesions and demographic properties (age and sex) of patients. Severity illness and length of ICU stay are the most important contributor factors to the development of dermatological disorders.

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