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***Incidence of pressure sore
development in the ICU of Alkadhimia
teaching hospital***

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Great Thanks for my friends (ali hardy ,jaafer w, hussein ali)

Special thank for my patients who became part of this study and for whom died rest in peace.

Dedication

I dedicate this thesis To my beloved parents I'm here today because of your great love, support and encouragement

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Abstract

A pressure sore It is localized soft tissue injuries resulting from unrelieved pressure over a bony prominence

Highest incidences

Elderly patients with femoral neck fractures (66%).

Quadriplegic patients (60%).

Neurologically impaired young (spinal cord injury [SCI] and veterans).

Chronic hospitalization and palliative care.

Highest provenances

General acute setting: 10%-18% (average approximately 15%).

Long-term care facilities: 2.3%-28% (average approximately 15%).

Home care setting: 0%-29% (average approximately 15%).

Susceptible Areas are Bony prominences include Ischial tuberosity, Trochanter, Sacrum, Heel, Scalp.

The aim of our study is to compare between the incidence of pressure in AL- kadhymiah teaching hospital with incidence of pressure sore in other studies.

We do prospective study, 250 patients after getting their approval in ICU of Al_khadymiah teaching hospital.

We have out of 20 patients who developed pressure sore, 45 patients followed for more than 4 days 125 followed for 2days,80 patients followed for less than 2 days.

1 INTRODUCTION

ICU:

An intensive care unit (ICU), also known as an intensive therapy unit or intensive treatment unit (ITU) or critical care unit (CCU), is a special department of a hospital or health care facility that provides intensive treatment medicine.

Intensive care units cater to patients with severe and life-threatening illnesses and injuries, which require constant, close monitoring and support from specialist equipment and medications in order to ensure normal bodily functions. They are staffed by highly trained doctors and nurses who specialize in caring for critically ill patients. ICUs are also distinguished from normal hospital wards by a higher staff-to-patient ratio and access to advanced medical resources and equipment that is not routinely available elsewhere. Common conditions that are treated within ICUs include acute (or adult) respiratory distress syndrome (ARDS), trauma, multiple organ failure and sepsis.

Patients may be transferred directly to an intensive care unit from an emergency department if required, or from a ward if they rapidly deteriorate, or immediately after surgery if the surgery is very invasive and the patient is at high risk of complications.

[1]

A pressure sores

It is localized soft tissue injuries resulting from unrelieved pressure over a bony prominence. The term of pressure is preferred rather than bedsore or decubitus ulcer as they suggest all the sores are a result of supine positioning ⁽²⁾.

Pathophysiology

Compression of soft tissues results in ischemia and if not relieved, it will progress to necrosis and ulceration, even in well vascularized areas. In susceptible patients, progression from excessive pressure to irreversible ischemia and tissue necrosis is accelerated by infection, inflammation, edema, and factors that not yet understood ⁽²⁾.

Factors contributing to the development of pressure sore include:

Extrinsic Factors

+ Mechanical forces on soft tissue

- **Shear:** Mechanical stress **parallel** to plane
- ❖ Stretches or compresses muscle perforators to the skin resulting in ischemic necrosis: *Superficial necrosis*

- **Pressure:** Mechanical force per unit area **perpendicular** to plane¹³ (Fig. 55-1)
- ❖ Leads to tissue deformation, mechanical damage, blockage of vessels: *deep necrosis*
- ❖ Pressures of 2 times capillary arterial pressure for 2 hours produces irreversible ischemia in animal models

- **Friction:** Resistance to movement between two surfaces
- ❖ Outermost skin layer lost, resulting in increased water loss
- ❖ Most often incurred during **patient transfers**

- **Moisture**
- ❖ Leads to skin maceration and breakdown
- ❖ Most often the result of **incontinence**

Intrinsic Factors

Patient factors on soft tissue

- **Ischemia/sepsis**
- ❖ Causes decreased tissue perfusion and predisposes to necrosis

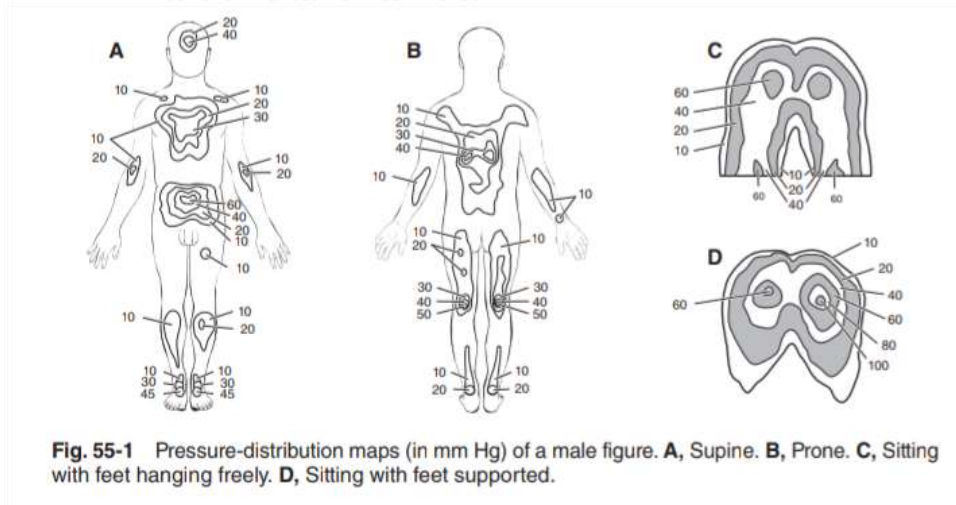
- **Decreased autonomic control**
- ❖ Can lead to excess perspiration, spasms, and lack of bowel or bladder control

- **Infection**
- ❖ *Staphylococcus aureus*, *Streptococcus* spp., *Corynebacterium* (skin), *Proteus mirabilis*, *Escherichia coli*, *Pseudomonas aeruginosa*, or *Enterococcus* spp.

- **Increased age**
- ❖ Decreased skin moisture, tensile strength
- ❖ Increased friability

- **Sensory loss**

- ❖ Unable to experience discomfort from prolonged sitting or other position, leading to tissue ischemia with feet hanging freely, sitting with feet supported.⁽³⁾



Prevalence

- **General acute setting:** 10%-18% (average approximately 15%)
- **Long-term care facilities:** 2.3%-28% (average approximately 15%)
- **Home care setting:** 0%-29% (average approximately 15%)⁽³⁾

Incidence

- ✚ **General acute setting:** 0.4%-38%
- ✚ **Long-term care facilities:** 2.2%-23.9%
- ✚ **Home care setting:** 0%-17%
- ✚ **Highest incidences**
 - Elderly patients with femoral neck fractures (66%)
 - Quadriplegic patients (60%)
 - Neurologically impaired young (spinal cord injury [SCI] and veterans)
 - Chronic hospitalization and palliative care ⁽³⁾

Susceptible Areas⁽¹⁾

Bony prominence

- Ischial tuberosity (28%)
- Trochanter (19%)
- Sacrum (17%)
- Heel (9%)
- Scalp

Classification

National Pressure Ulcer Advisory Panel Stages

- + **Stage I:** Non-blanchable erythema of intact skin.
 - Can be seen within **30 minutes** and usually resolves after **1 hour**
 - Can be difficult to detect in dark-skinned patients
- + **Stage II:** Partial-thickness skin loss that presents clinically as a blister, abrasion, or shallow open ulcer.
 - **2-6 hours** of pressure
 - Erythema lasts more than 36 hours.
- + **Stage III:** Full-thickness tissue loss down to, but not through, fascia.
 - Subcutaneous fat *may* be exposed, the thickness of which varies by body site (i.e., bridge of nose vs. buttock).
 - Undermining and tunneling may be involved.
- + **Stage IV:** Full-thickness tissue loss with involvement of underlying muscle, bone, tendon, ligament, cartilage, or joint capsule⁽³⁾

Medical Management

- ❖ **Relieve pressure**
 - Positional changes
 - Proper mattress, cushion, or wheelchair
- ❖ **Control infection**
- ❖ **Control extrinsic factors** (shear, moisture, friction)
- ❖ **Debridement:** Surgery vs. topical enzymatic agent
- ❖ **Dressings**
 - DuoDerm (ConvaTec, Princeton, NJ)
 - Wet-to-dry saline dressing changes
 - Dakin's solution if *Pseudomonas* spp. Suspected
 - Silver sulfadiazine
 - Other topicals (e.g., hydrogels, absorbent foams⁽²⁷⁾)

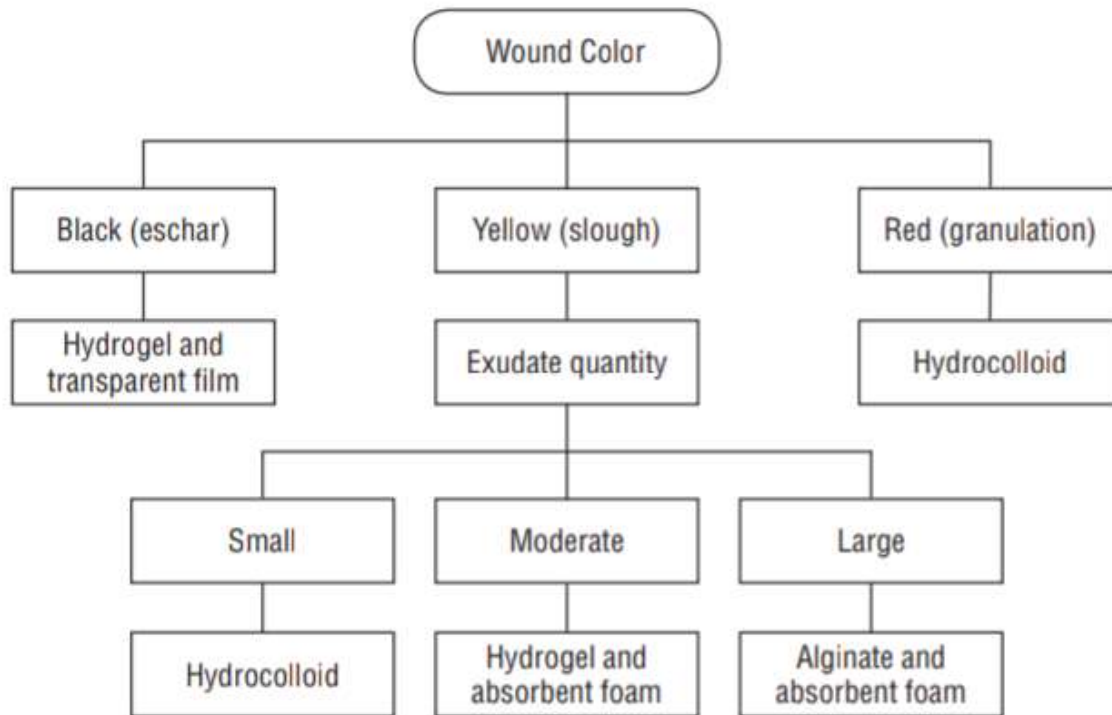


Fig. 55-3 Simple algorithm for wound care in full-thickness, noninfected, chronic wounds

- ❖ **Osteomyelitis** diagnosis critical to effective medical treatment
 - **Benchmark: bone biopsy**
 - MRI, CT, and plain film may be used in conjunction with physical examination for diagnosis.
- ❖ **Negative-pressure wound therapy (NPWT)**
 - Effective for first-line treatment of stage III ulcers and some stage IV ulcers
 - May bridge stage IV ulcers to surgery
 - Effective for treatment of chronic wounds with 25% (average) faster healing rates

Surgical Guidelines

- ❖ **Stage I and II** pressure ulcers usually can be managed **non-surgically**.
Stage III and IV pressure ulcers frequently require **surgical intervention**.
 - Consider the patient's **ambulatory status** to help with proper flap selection.
 - **Design flaps as large as possible** with suture lines away from area of direct pressure.
 - **Do not violate adjacent flap territories** for possible future flap coverage.

Staged operations: Some evidence suggests one-stage debridement, ostectomy, and immediate reconstruction is as successful as staged debridement, negative-pressure therapy, and delayed reconstruction.

Goals of Reconstruction

- Debridement of all devitalized tissue
- Complete excision of pseudobursa
- Ostectomy of all devitalized or infected bone to clinically hard, healthy, bleeding bone
- Excellent hemostasis
- Obliteration of dead space with well-vascularized tissue
- Selection and creation of flaps that do not jeopardize future flap coverage
- Tension-free closure Pressure off-loading of reconstructed area⁽³⁾

Patients and Methods:

Study setting and design

this prospective study was conducted in intensive care unit of AL-Imamain AL-Kadhymian medical city in period from October 2018 to March of 2019, for a total of 5 months which include 250 patients 20 of them developed pressure sore 6 of them females and others males. The data information is collected based on name, age, gender, date of admission, cause of hospitalization (trauma/ non trauma), and comorbidities like hypertension diabetes mellitus and heart failure.

Pressure sore severity classification

- Stage 0 no clinical evidence of pressure sore
- Stage 1 discoloration of intact skin (light finger pressure applied to site does not alter the discoloration)
- Stage 2 partial-thickness skin loss or damage involving epidermis and/or dermis
- Stage 3 full thickness skin loss involving damage or necrosis of subcutaneous tissue but not extending to the underlying bone, tendon, or joint capsule.
- Stage 4 full thickness skin loss with extensive destruction and tissue necrosis extending to underlying bone, tendon or joint capsule.

Study tools

A questionnaire form paper had been developed by direct interview with medical staff and observation of patients.

Data analysis

Descriptive statistics were used to describe demographic data and the count, position, stay of patient, observation and pressure score.

Questionnaire

1-Name

2-Age

3- Gender

4-Date of admission

5-Site of pressure sore

*sacrum

*Ischial tuberosity

*trochanteric

* Heel

*Scalp

6- Stage of pressure sore

I

II

III

IV

7-Comorbidities

1-Hypertention

2-Diabetes mellitus

3-Heart failure

8- Cause of immobility

9- stay in hospital (duration):

*less than 2 days

*2-4days

*more than 4 days

Aim

the aim of the study is to compare between the incidence of pressure in AL-kadhymiah teaching hospital with the incidence of pressure sore in other studies.

THE RESULT

In this study that was conducted in the Intensive care unit at Al-Imiamians Al-Kadhimin teaching hospital the study sample were 250 patient 20 of them developed pressure sore the male (54%) patients were more prevalence than female (46%) and the mean age of our sample was 47.36 years old as it shown in the fig1and table1.

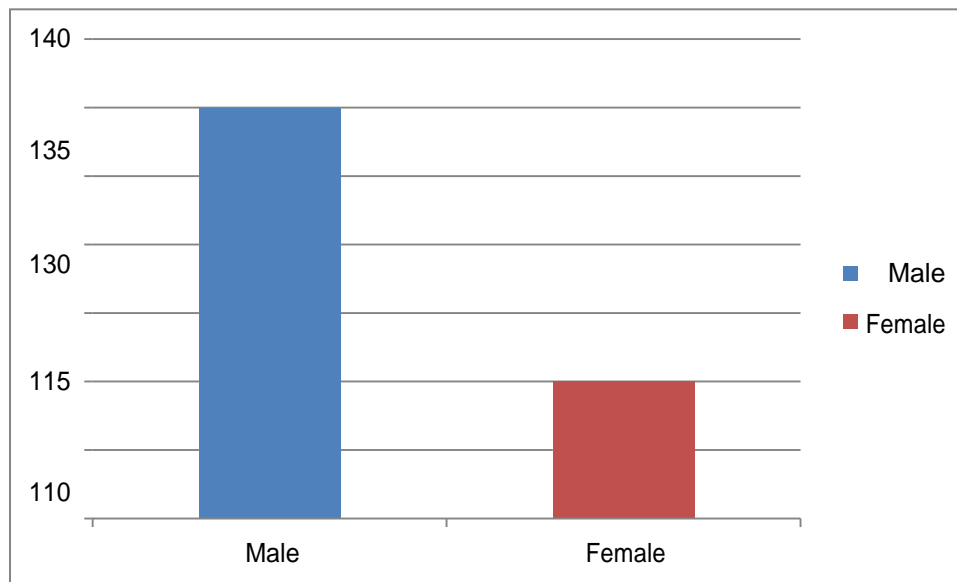


Figure 1: The distribution of ICU patient according to Gender

Table1: Age Distribution of ICU Patient

Age Group	N	%	Mean Age
Adolescence (12-18)yrs	81	7.2%	63.74
Young Adult (19-40) yrs	73	38.8%	
Middle-Age Adult(41-65)yrs	18	32.4%	
Elderly (more than 65) yrs	46	21.6%	
Total	042	100%	

The incidence of pressure sore among the ICU patient were 20 (8%), 15 (75%) were male and 5 (25%) were female as it shown in fig 2.

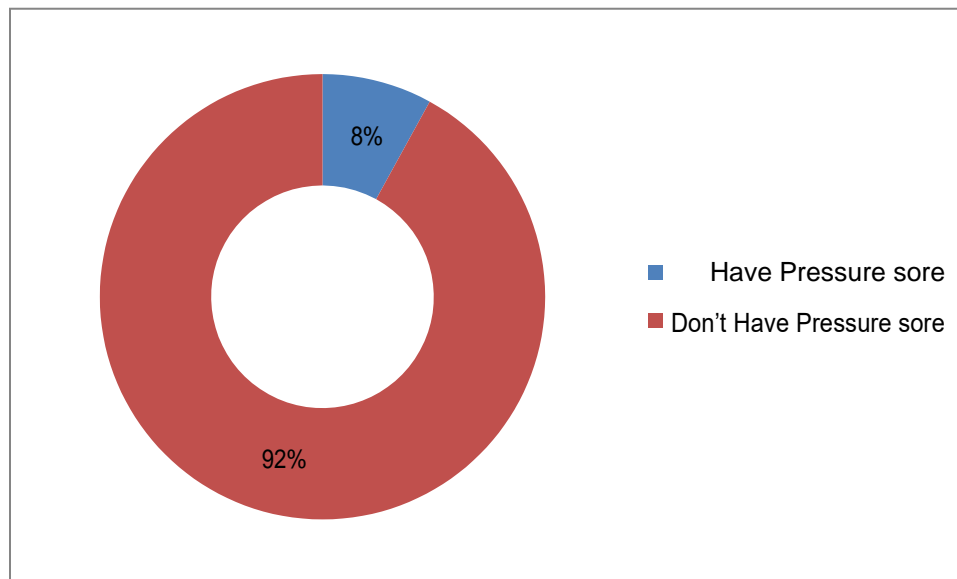


Figure 2: Incidence of Pressure Sore in ICU patients.

According to site of pressure sore the most frequent site was the sacrum which accounts 50 % of the cases as it show in table 2.

Table 2: The Patient Distribution according to the site of pressure sore

Site	N	%
Ischial Tuberosity	2	10%
Trochanter	2	10%
Sacrum	16	50%
Heel	0	0%
Scalp	0	0%
Total	20	100%

Also we found that majority of case where in the stage II (55%) according to National Pressure Ulcer Advisory Panel Stages as it shows in table 2

Table 3: The Patient Distribution according to the stage of pressure sore

Stage	N	%
Stage I	0	0%
Stage II	11	55%
Stage III	8	40%
Stage IV	1	5%
Total	20	100%

In the cross tabulation between the Gender and the site of pressure sore we found that sacral pressure sore was more frequent than other sites of pressure sore both in male (11 of 15) and female (5 of 5) as its shows in Fig 3.

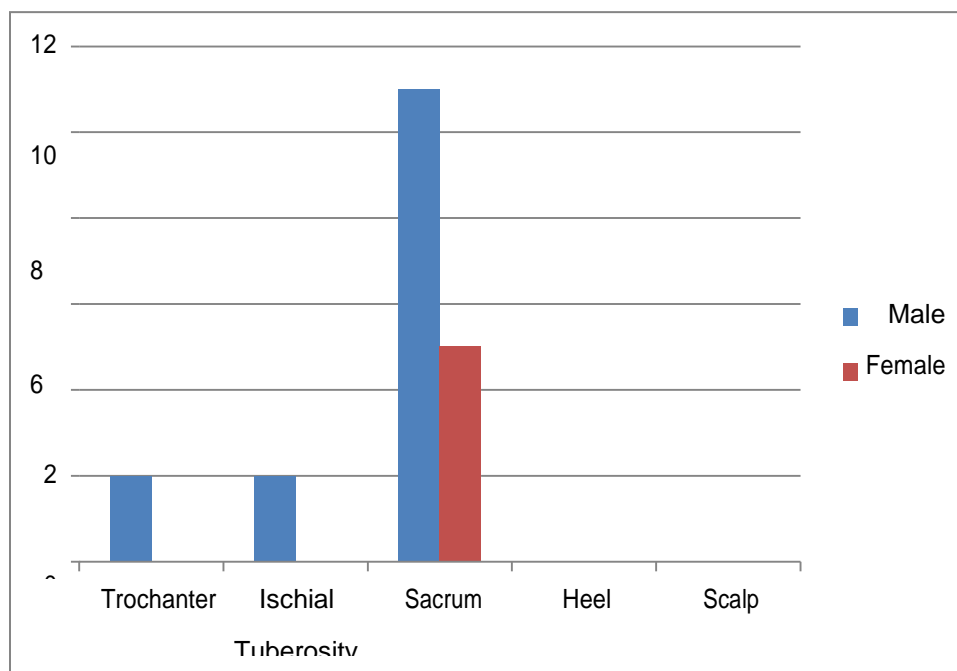


Figure 3: Gender and its relation to the site of Pressure Sore

Most of the cases were in stage II (55%) and we found there is not specific relationship between the stage of pressure sore and the gender of the patient as its show in Fig 4

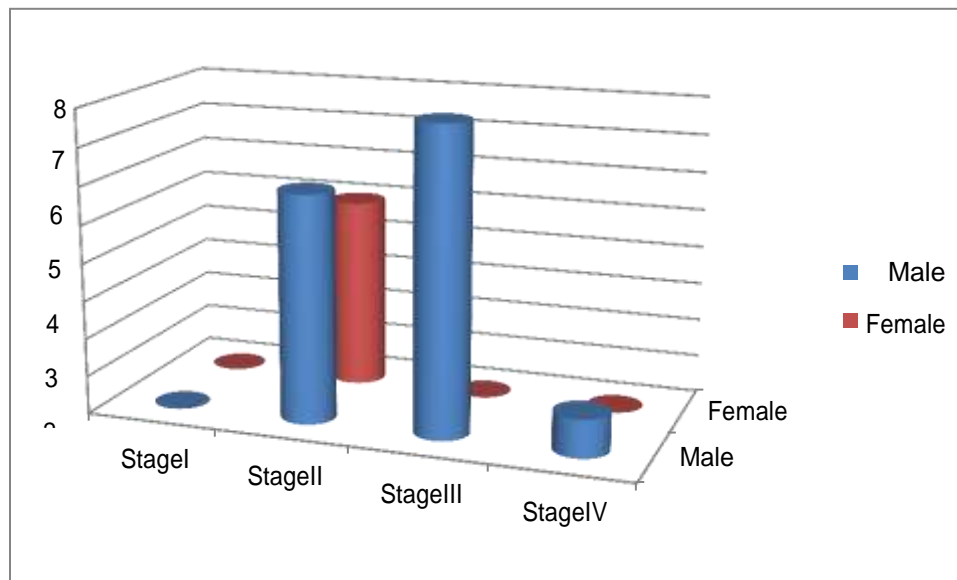


Figure 4: Gender and its relation to the Stage of Pressure Sore

At the table below we look if there is a relationship between the site and the stage of pressure sore we found the sacral pressure sore was more frequent in the both Stage II and Stage III

Table 4: Site of Pressure Sore and its relation to the stage of pressure Sore

Stage	Site					Total
	Ischial Tuberosity	Trochanter	Sacrum	Heel	Scalp	
Stage I	0	0	0	0	0	0
Stage II	1	0	10	0	0	11
Stage III	1	2	5	0	0	8
Stage IV	0	0	1	0	0	1
Total	2	2	16	0	0	20

The most common co-morbidity in the ICU patients where hypertension 20 % followed by diabetes mellitus 14 % and there were 8% who have more than one co-morbidity as it shown in Fig 5.

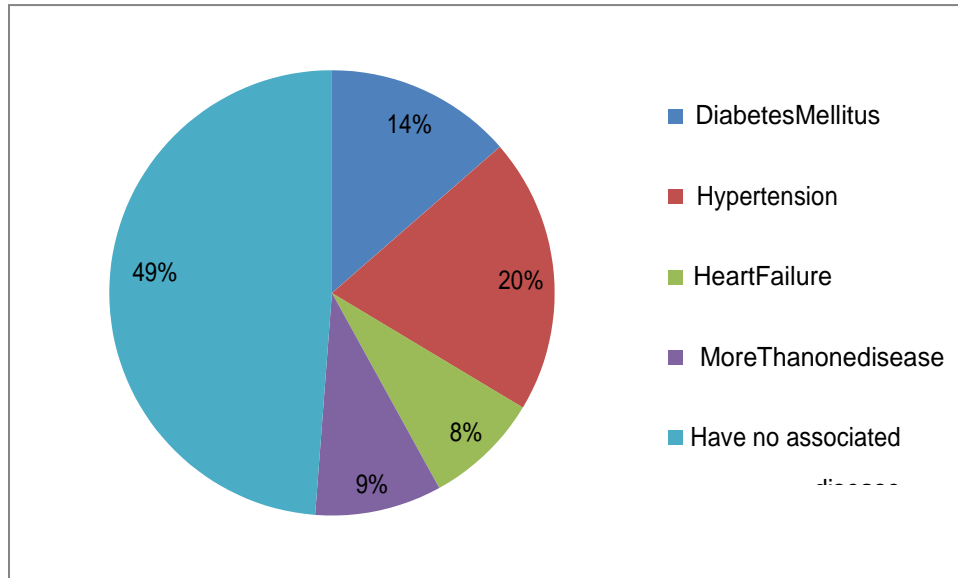


Figure 5: Co-morbidities of ICU patients

The majority of patients (50.8%) were stayed between 2 and 4 days as its shown in Fig 6.

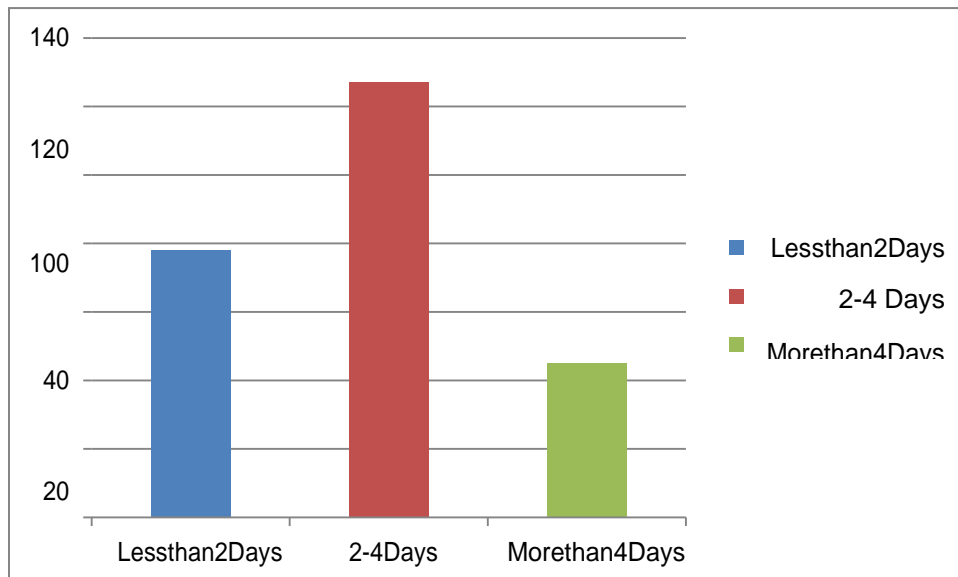


Figure 6: Duration of Stay in ICU patient

According to the relationship between the duration of stay and the development of pressure sore we found that the patients who stayed more than 4 days develop pressure sore as its shown in the table below .

Table 5 : the relationship between the duration of stay and the development of pressure sore.

Duration	Presence of Pressure Sore?		Total
	Yes	No	
Less than 2 Days	2	76	78
2-4 Days	4	123	127
More than 4 Days	14	31	45
Total	20	230	250

Discussion

The aim of this study was to determine the incidence of PS in the ICUs of Al-Imiamians Al-Kadhimin teaching hospital at Baghdad /Iraq. The findings showed that 8.0% of patients developed PS (Stage I to IV) during their stay in the ICU. Generally, ICUs are units with the highest risk of adverse events due to the patient's clinical instability, besides multiple clinical interventions. PSs are the most common adverse events with the highest prevalence and incidence in ICUs⁽⁴⁾. The incidence rate of PS was 39.3% in Saudi Arabia ⁽⁵⁾, 29.6% in Greece⁽⁶⁾, 8.1 16% in Spain ^(7,8) 11-13.6% in Brazil [9,10]. Iranmanesh et al. found that the incidence of PS for ICU's patients was 13.4% in Iran ⁽¹¹⁾. The discrepancy in the results can be attributed to the characteristics of the study populations, inclusion criteria, methodology (direct observation or review of medical records), data collection methods, and different preventive methods in hospitals. The highest frequency of PS (55%) was related to stage 2 sore. The findings of studies from Portugal ⁽¹²⁾, Belgium ⁽¹³⁾, and Norway⁽¹⁴⁾, .The low rate of grade III and IV sores may be related to preventative measures, used by the ICU staff to prevent the progress of PS in the first stage⁽¹⁵⁾.

Of the PSs identified in this study, 55% were found to be stage II, while 40% were stage III and only 5 % were Stage IV. Not Consistent with findings from previous research ^(16,17) were Stage I and Stage II were more prevalent and almost zero patient were in Stage III and IV, this may be explained by the lack of staff experience in managing ICU patient, the most common anatomical areas for PS development in the present study were the sacrum and the heels. The majority of the patients were positioned in a semi-fowler's position with no heel elevation or off-loading of pressure, leading to increased pressure points on the heels and the sacrum. This was compounded by the reduced frequency of patient repositioning. Santamaria *et al.* ⁽¹⁸⁾ found that the prophylactic use of a soft silicone multi-layered foam dressing is effective in the prevention of sacral and heel PSs in trauma and critically ill patients.

According to the duration of stay in the ICU the majority of patient (50.8%) stayed more than 2 days and less than 4 days and in the relationship between the duration of stay and the development of pressure sore we found there is a positive correlation between the length of the stay and the development of pressure sore and the studies above agree with this study.

Conclusion

The conclusion of this study stated that the pressure sore is the most common complication in the intensive care unit and there is many factors that affect the developed and the progress of pressure sore including age, site of pressure sore ,the length of stay in the ICU and if there is an association co-morbidity

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