

ALTERNATIONS IN BODY MASS INDEX AMONG HOSPITALIZED PATIENTS WITH BONE FRACTURES

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ABSTRACT

BMI plays a main role in the patient's health condition. Decrease or low level in BMI may leads to serious health issues. Recovery from illness or a bone fracture generally requires a period of bed rest, often lead to consequence of hospitalization for longer duration. A long duration of period (>10 days) of bed rest may induce substantial changes in body composition and may lead to overall metabolic decline.^[1,2] This prolonged physical inactivity has taught us about muscle disuse atrophy, it may be of limited clinical relevance to most patients who are on average hospitalized for <7days.^[3] Recent data shows that few days of disuse substantially reduces skeletal muscle

mass and strength. This may ultimately lead to change in the BMI.

BACKGROUND The change in body mass index (BMI) on Hospitalized patients with Bone fracture.

KEYWORDS: BMI, Muscle disuse atrophy.

INTRODUCTION

BMI is known as BODY MASS INDEX. It is a value derived from the mass (weight) and height of a person. It is defined as the Body mass divided by the square of the body height. Its universal expressed in units as Kg/m^2 , resulting from mass in kilograms and height in meters. BMI was designed to be used as a simple means of classifying average sedentary (physicallyinactive) populations, with an average body composition. For such individuals the

value recommendations are 18.5 up to 25kg/m² may indicate optimal weight, a BMI lower than 18.5 suggests the person is underweight.^[4] A number from 25 up to 30 may indicate the person is overweight, and a number from 30 raises suggests the person is obese.

High BMI^[5]

Being overweight is associated with certain diseases such as

1. Heart diseases
2. High blood pressure.
3. Type 2 diabetes.
4. Gall stones.
5. Breathing problems.
6. Certain cancer.

Low BMI^[6]

Being overweight is associated with certain diseases such as

1. Anorexia.
2. Type 1 diabetes.
3. Hyperthyroidism.
4. Cancer.
5. Tuberculosis.
6. Osteoporosis.
7. Anemia.
8. Irregular periods.
9. Premature births.
10. Slow or impaired growth.

Although BMI can be used for most men and women, it does have some.^[5]

- It may overestimate body fat in athlete's and other who have a muscular build.
- It may underestimate body fat in older persons and other who have lost muscle.

Use the BMI table to estimate your body fat. The BMI score means the following

BMI	Classification
< 18.5	underweight
18.5–24.9	normal weight
25.0–29.9	overweight
30.0–34.9	class I obesity
35.0–39.9	class II obesity
≥ 40.0	class III obesity

Figure 1: BMI table.

Fracture

- A complete or partial break in a bone.
- Causes of bone fracture include trauma, overuse and diseases that weaken bones.

Symptoms

1. Main symptom is pain.
2. There may also be loss of function depending on the area affected.
3. Commonly include Bleeding, Bruising, limping, loss of height, physical deformity, swelling, tenderness.
4. The most common fractures involve the clavicle (collarbone), the fore arm (radius and ulna), the wrist, the ankle and the hip
5. Closed fractures are more common than open fractures (the skin overlying the injury is intact and not damaged)
6. In children, fracture of distal radius is most common.^[8]

Common types of fracture include^[6,7]

1. Stable fracture

The broken ends of the bone line up and barely out of place.

2. Open, compound fracture

The skin may be pierced by the bone or by a blow that breaks the skin at the time of the time of fracture. The bone may or may not be visible in the wound.

3. Transverse fracture

This type of fracture has a horizontal fracture line (straight line across the bone).

4. Oblique fracture

This type of fracture has an angled pattern.

5. Comminuted fracture

In this type of fracture, the bone shatters into three or more pieces.

6. Green stick fracture

Incomplete fracture. The broken bone is not completely separated.

7. Compression fracture

The bone is crushed, causing the broken bone to be wider or flatter in appearance.

8. Segmental fracture

The same bone is fractured in two places, so there is a **floating** segment of bone.

9. Spiral

The break spirals around the bone; common in a twisting injury.

10. Stress fracture

A tiny crack in a bone caused by repetitive stress of force, often from overuse.

11. Compression fracture

A compression fracture is typically caused by a loss of bone mass that occurs as part of a ageing. A fall of lifting a heavy object may cause a fracture of the back bones.

12. Avulsion fracture

This is an injury to the bone in a location where a tendon or ligament attaches to the bone. This can occur anywhere in the body.

13. Displaced and non-displaced fracture

Refers to the alignment of the fractured bone. In a displaced fracture, the bone snaps into two or more parts and moves so that the two ends are not lined up straight.

14. Colles fracture

It is a type of fracture of the distal forearm in which the broken end of the radius is bent backwards.

15. Impacted fracture

It occurs when the broken ends of the bone are jammed together by the force of injury.

16. Intraarticular fracture

It is the fracture in which the break crosses into the surface of a joint. This always results in damage to the cartilage. Compared to extraarticular fractures, intraarticular have a higher risk for developing long term complications, such as posttraumatic osteoarthritis.

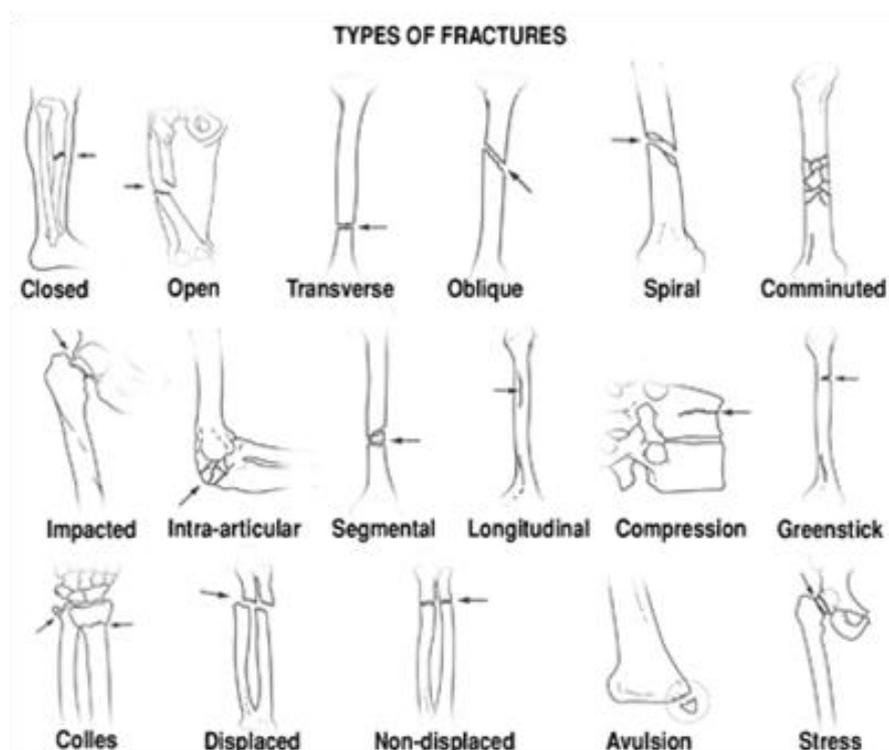


Figure 2: Types of bone Fracture.

Epidemiology^[9]

- A new international report, the Asian Audit, by the international osteoporosis foundation, says over the past 30 years fracture have gone up threefold in Asia, with india and china topping the charts.
- India hobbles to second place in hip fracture with 4.4 lakh people falling every year.
- Currently, india has approximately 26 million osteoporosis patients.
- The correct epidemiology of all bone fractures in india is unclear.

***Etiology^[10]**

1. Extrinsic causes.
2. Intrinsic causes.

***Extrinsic causes**

- Direct violence.
- Indirect violence.
- Bending forces.
- Torsional forces.
- Compression forces.
- Shearing forces.

***Intrinsic causes**

- Fractures due to muscular action.
- Pathologic fractures.

Diagnosis^[11]*1. X-ray**

X-ray imaging produces a picture of internal tissues, bones, and organs.

2. Magnetic resonance imaging (MRI)

MRI may be used to examine bones, joints and soft tissues such as cartilage, muscles and tendons for injuries or presence of structural abnormalities such as tumour, inflammatory disease, osteonecrosis, bone marrow diseases.

3. CT scan

A CT scan can be performed to assess bones, soft tissues and joints for damage, lesions, fractures, particularly when other type of examination such as X ray are not conclusive.

4. Physical examination

By physically examining the area.

5. Bone Scintigraphy^[18]

A Bone scan or bone scintigraphy is a nuclear medicine imaging technique of the bone. It can help diagnosis a number of bone conditions, including cancer of the bone or metastasis, location of bone inflammation and fracture, and bone infection.

TREATMENT

Treatment often involves resetting the bone in place and immobilising it in a cast or splint to give it time to heal. Sometimes, surgery with rods, plates and screws may be required.

1. Medical Procedures

Reduction^[12]

Surgery to fix a broken or dislocated bone by putting it back into place.

The pieces of bone must be put in close proximity to one another so that healing can occur.

Reduction is essential to heal the bone properly to avoid permanent function loss.

2. Devices

- **Elastic bandages**^[13]

Stretchy bandages used to wrap sprains and strains. Provides support and compression during recovery.

- **Splints**^[14]

A rigid accessory used to stabilise and protect an injured joint.

- **Orthopaedic cast**^[15]

A protective device applied to an injured joint or limb to limit motion and promote healing.

- **Traction splint**^[16]

A splint used for leg fracture to relieve pressure on the injured limb.

3. Surgery^[17]

- **Surgery to connect broken bones (internal fixation)**

A surgery to repair a broken bone using implants.

- **Surgery to stabilise broken bones (External fixation)**

Using a splint or a cast to hold broken bone in place so it can heal properly.

4. Therapies

- **Joint manipulation**^[19]

Stretching a joint past its current restricted range of motion to restore movement and reduce pain.

- **Physical Therapy**^[20]

Exercises may restore muscle strength and function.

5. Medications

To relieve pain Ibuprofen, Acetaminophen or both in combination.

-Alendronate.

-Bazedoxifene.

-Calcitonin.

-Denosumab.

-Estrogen.

-Ibandronate.

-Raloxifene.

-Risedronate.

MATERIALS AND METHODS

The present study was a one-year prospective study that evaluated 106 (>18years) patients during 2019 -2020 at GBR Hospitals, Narasaraopet, Guntur, Andhra Pradesh, India. These patients were advised for a surgical intervention and were followed. The patients were followed and the follow up details were recorded. The study was conducted after getting proper informed consent from patient. We collect the data and calculate it and it again collected during the time of discharge calculated and compare It with the initial values.

Inclusion criteria

All Adults with different types of fractures were included for the study of BMI alterations.

Exclusion criteria

Patients associated below the age of 18 years.

Follow up

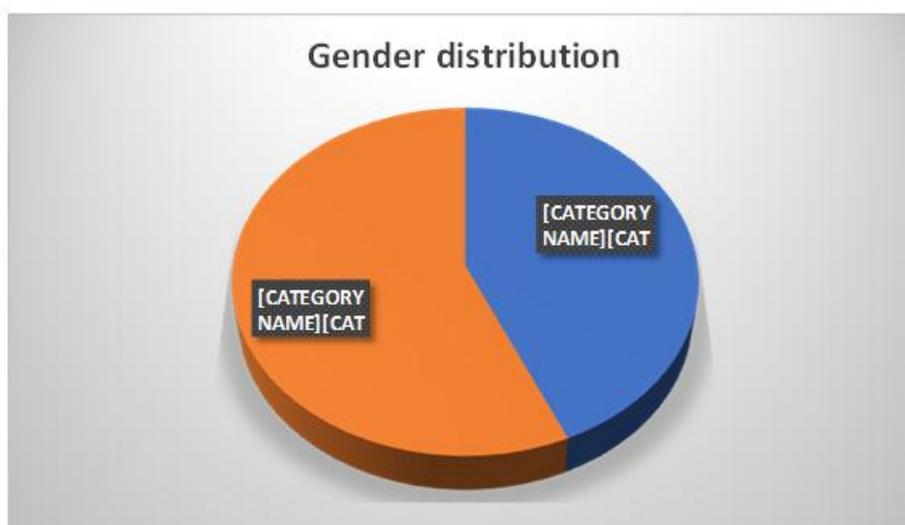
The patients were followed up and the patients were clinically assessed for local pain, swelling, restriction in movement, abnormalities in mobility, any other deformities. Diet chart was explained based on the condition of the patient. Daily regular walking sessions are conducted to improve the mobility and the recovery rate. X ray examination follow up was done for assessing the wound infection, bone loosening, nailing, position of implant, Screw loosening, wound recovery.

RESULTS AND DISCUSSION**Gender distribution**

In our study among 106 patients 46 (43.396%) were Males and 60 (56.604%) were Females.

Table 1: Gender Distribution.

S.NO	Gender	No. of patients	Percentage
1	Male	46	43.396%
2	Female	60	56.604%
Total		106	100%

**Figure 3: Pie diagram showing Gender distribu.****Age Distribution with Gender**

S.NO	AGE GROUP	NO. OF PATIENTS	MALES	%	FEMALES	%
1	20-30	24	12	26.086%	12	20%
2	30-45	27	14	30.434%	13	21.666%
3	45-60	21	6	13.043%	15	25%
4	60-70	19	8	17.391%	11	18.333%
5	70-80	15	6	13.043%	9	15%

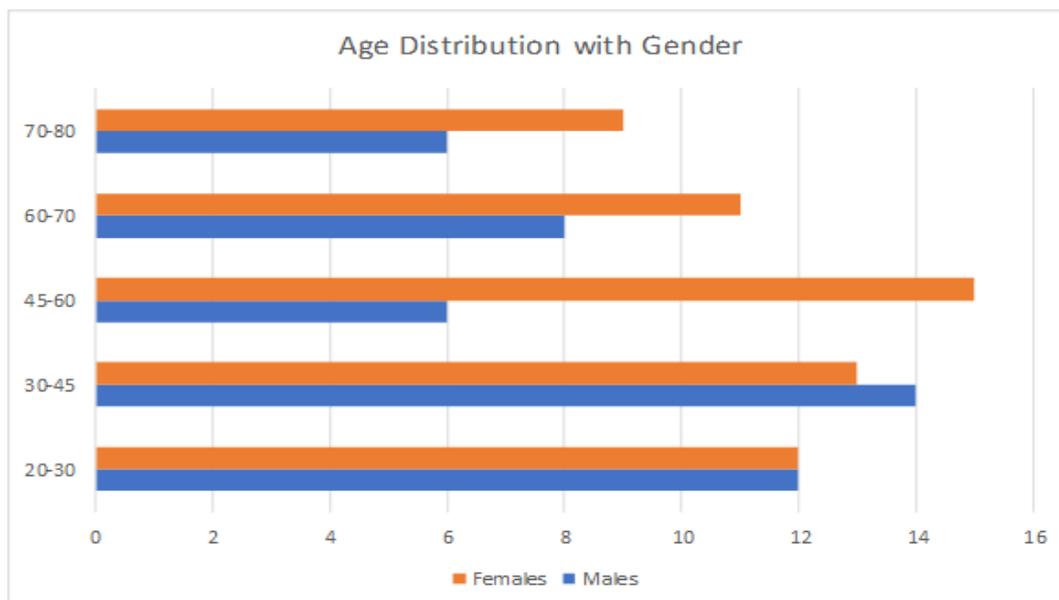


Figure 4: Age distribution with gender.

***Clinical presentation of patients**

Among the signs and symptoms of the fractures are Pain, Inflammation, Redness, Immobility, Tenderness and others.

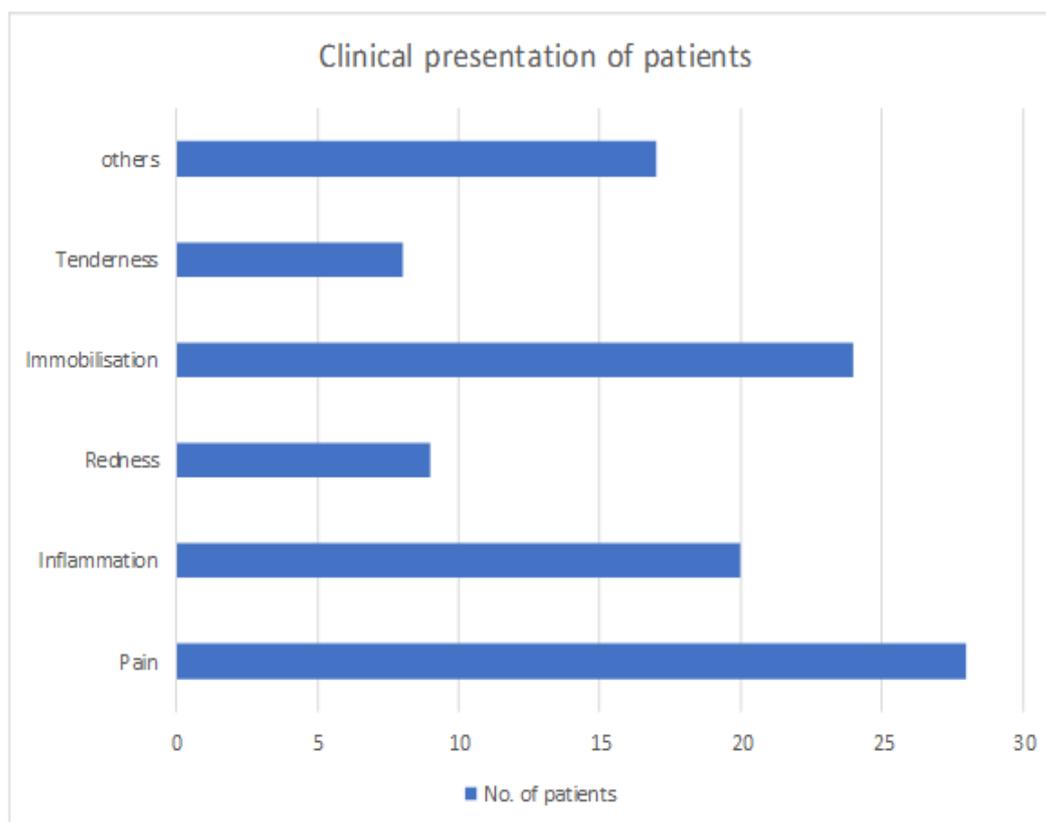


Figure 5: Clinical presentation of patients.

Types of Fractures

In our study the total number of patients are 106. The highest number of cases observed were Radius and ulnar fracture (23.584%). Others are Tibia and fibular fractures 24(22.64%), Femur fracture 21 (19.811), Intertrochanteric (IT) fracture 16 (15.094%), Clavicle 11 (10.377%), TKR 9 (8.490%).

S.NO	TYPE OF FRACTURE	NO. OF PATIENTS	PERCENTAGE (%)
1	Tibia, Fibula	24	22.64%
2	Femur	21	19.811%
3	IT	16	15.094%
4	Radius, Ulna	25	23.584%
5	Clavicle	11	10.377%
6	TKR	9	8.490%

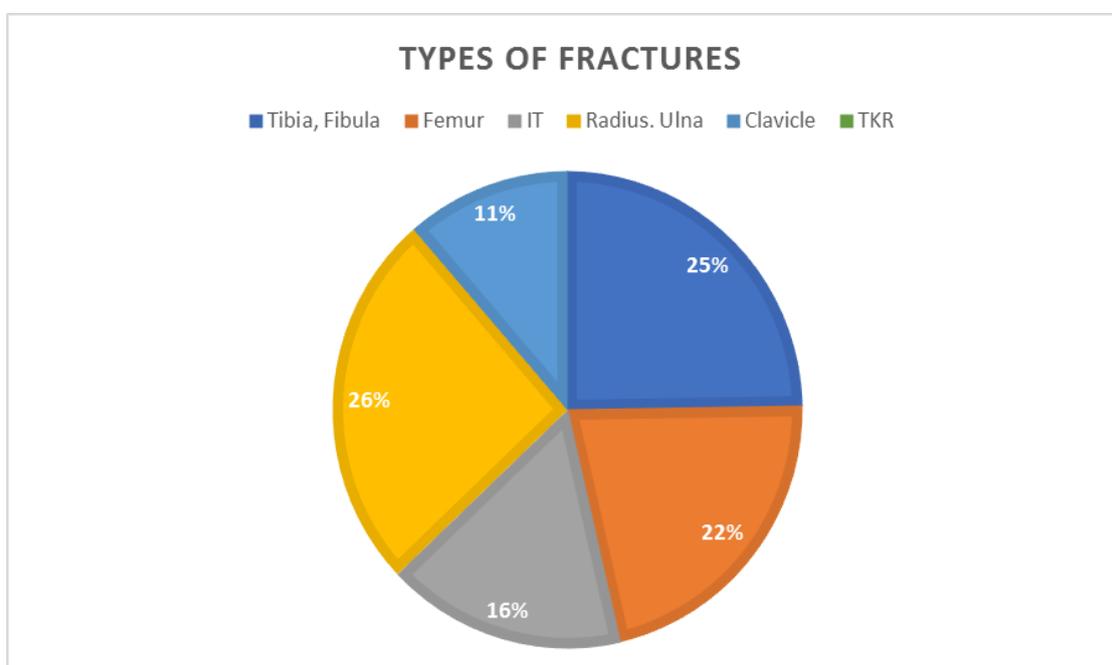


Figure 6: Types of fractures.

Life style of the Patients

In our study the life style of the patients are listed below. It includes patients having No addiction 74 (69.811%), both smock and alcohol addiction 18 (16.98%), smock alone 6 (5.660%), alcohol alone 8 (7.0547%).

	LIFE STYLE	NO. OF PATIENTS	PERCENTAGE (%)
1	No addiction	74	69.811%
2	Smoke, alcohol	18	16.98%
3	Smoke alone	6	5.660%
4	Alcohol alone	8	7.547%

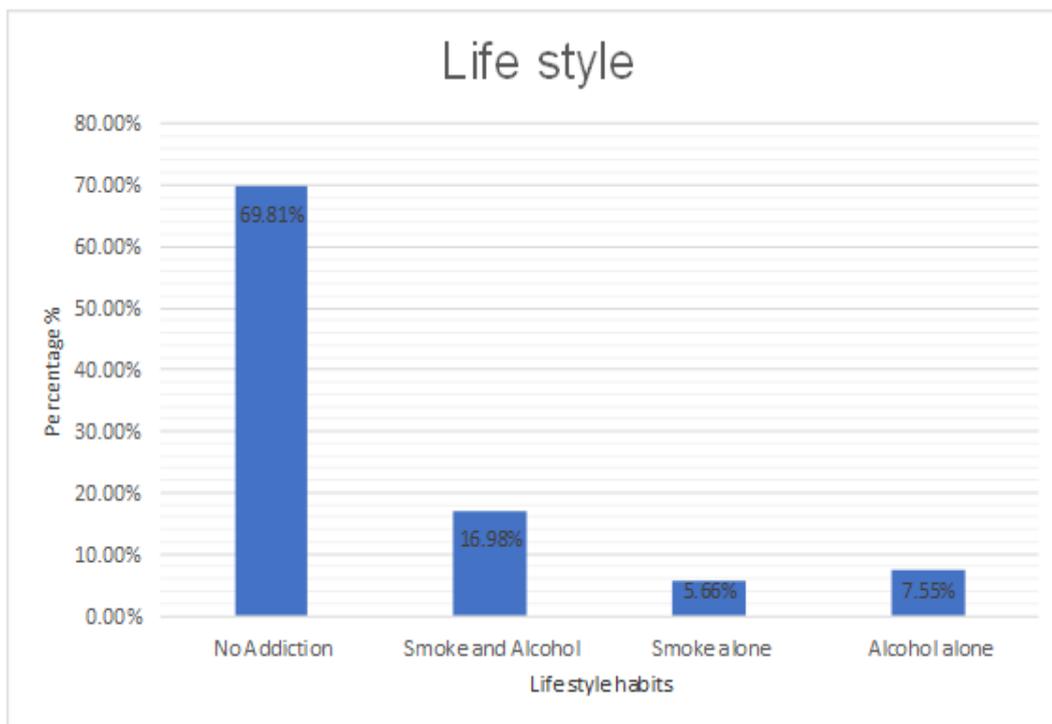


Figure 7: Life style of patient.

Co-Morbid conditions

The co-morbid conditions of the Patients are studied and found to be Hypertension 30 (28.301%), Diabetes mellitus 31(29.245%), other comorbidities 18 (16.98%), no comorbidities 27 (25.47%).

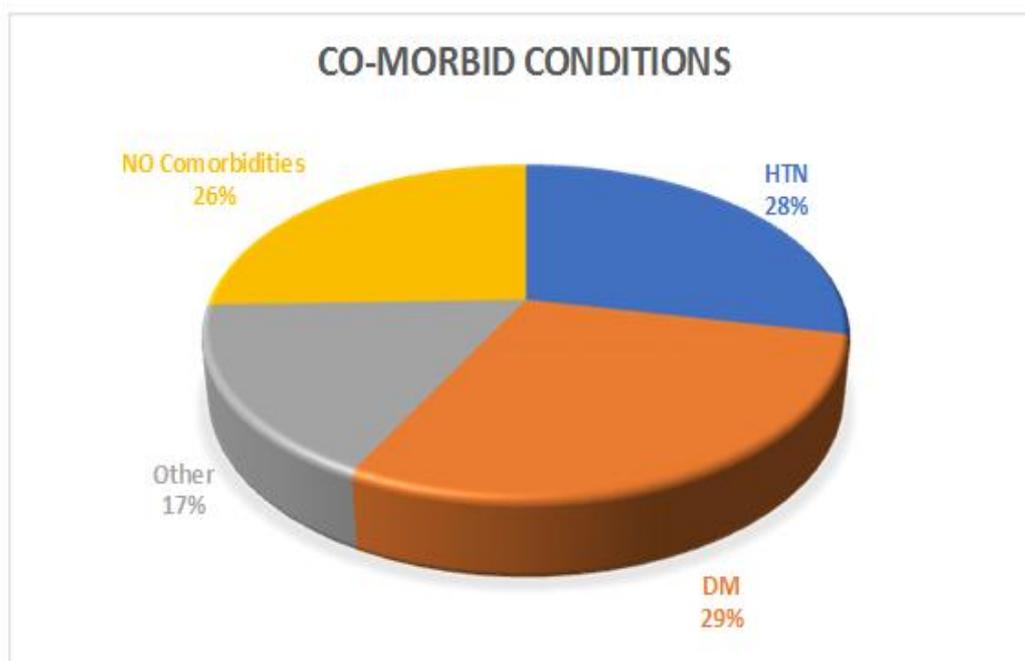


Figure 8: Co-morbid conditions.

List OF Anti biotics used

These are the common drugs prescribed during the course of therapy

S.NO	DRUG	DOSE
1	Ceftriaxone + sulbactam	1.5gm
2	Cefixime	200mg
3	Pantoprazole	40mg
4	Rabiprazole	40mg
5	Piperacillin + Tazobactam	4.5gm
6	Vitamin-B injection	100mg
7	Tramadol	50mg
8	Hyoscine butyl bromide	20mg
9	Amoxicillin + clavulanic acid	1gm
10	Linezolid	600mg
11	Mannitol	10% Or 20% W/V
12	Diclofenac sodium	75mg
13	Ciprofloxacin	500mg
14	Metronidazole	500mg
15	Cefoperazone + sulbactam	105gm

DISCUSSION

- We collected over all data of total 106 patients and recorded initial height and weight and calculated BMI of every individual initially and regular follow up was monitored including the diet of every individual.
- We suggested daily a short period of walking for the patients who undergone surgeries for the lower limb and its associated fractures.
- After completion of the course of the therapy and we observed a better progress regarding the health condition of the patient.
- During the time of discharge, we collected the over all weight and height of every individual patient to calculate BMI. The BMI change is not equal in all the patients. It was changed from every individual to individual. It also depends on the duration of stay in hospital.
- The BMI mainly depends on metabolism, prolong bed rest may lead to impaired metabolic activity
- Impaired in metabolic health following prolonged disuse have been well described and include a decline in glucose tolerance and insulin sensitivity^[11], a decreasing in resting fat oxidation, an increase in mitochondrial reactive oxygen species (ROS) production^[12], and a decline in a basal metabolic rate.

- As decline in metabolic health predisposes to greater morbidity and mortality of the patient, it is the major clinical relevance to understand the mechanisms responsible for this decline in metabolic health.
- Prolonged disuse has been associated with substantial loss of muscle mass or gain in fat mass.
- However, changes in body composition can only partly explain the observed metabolic decline, as reduced insulin sensitivity has been observed during bed rest before measurable changes in body composition became apparent
- We hypothesize that the substantial muscle atrophy caused by short-term bed rest will contribute to, but not fully explain the vast decline in metabolic health.
- Earlier studies have demonstrated that short period of bed rest impairs glucose tolerance and lowers whole body mass.

Table showing change in BMI.

S.NO	Change in BMI	MALES	PERCENTAGE (%)	FEMALES	PERCENTAGE (%)
1	Large change	8	21.2%	14	23.33%
2	Moderate change	22	47.826%	25	41.66%
3	unchanged	16	45.652%	21	35%

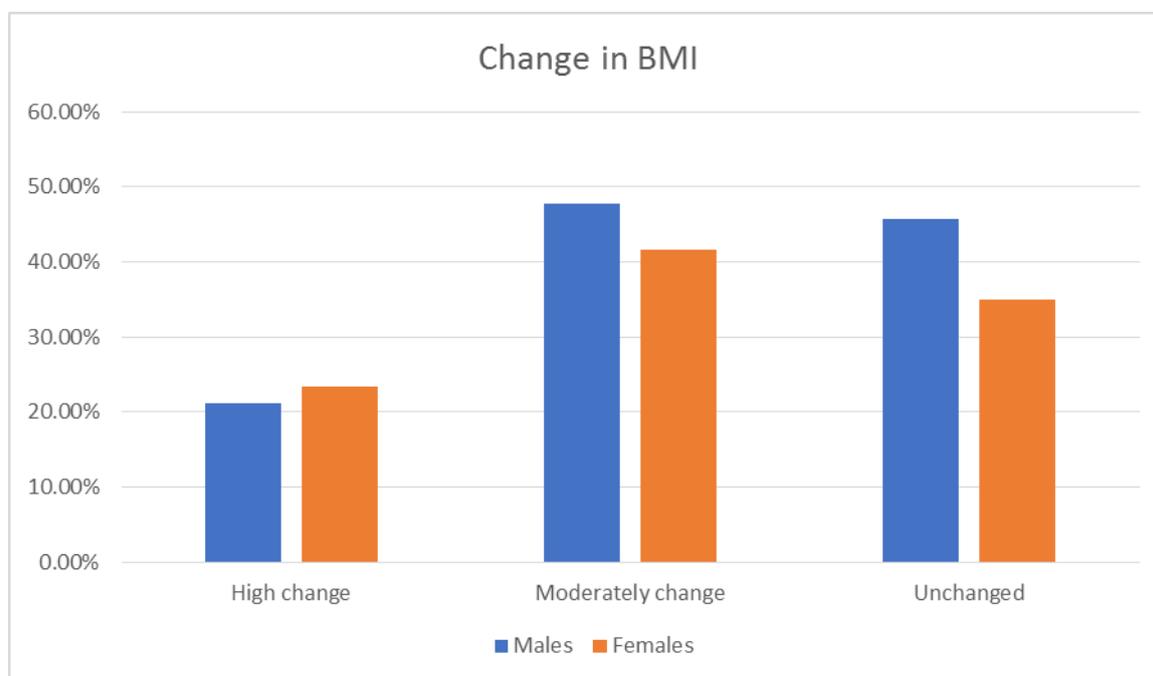


Figure 9: Change in BMI.

CONCLUSION

Here we finally concluded that the change in the BMI during the hospital course of the therapy is not like every individual. It depends on the individuals body type it may include the hereditary factors. Here in the course of this study on BMI some patients may lose their weight and some may gain, it depends on the nature of their body types.

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