Assess the Prevalence of Hypercalcemia among Immobilized Patients

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Abstract

Immobilization hypercalcemia is a diagnosis in which excessive bone metabolism abnormalities and conditions related to reduced movement such as medullar lesions or vascular cases. Investigation needs a more evaluation to find out other causes of hypercalcemia.Incidence rate of immobilization hypercalcemia is 11-22% in spinal cord injury group and 20-30% in immobilized patients secondaryto fractures in 2 case series .Usually itoccurs 4-6 weeks post trauma (1 week-16weeks)may stay elevated for up to 12 months based onmobilization. **Aim-**To determine the prevalence of hypercalcemia among immobilized patients. **Materials and Methods-**An analytical research approach and a cross-sectional research design were used. The study was conducted in Acharya Vinoba Bhave Rural Hospital; Sawangi Meghe Wardha.The samples were selected using purposive sampling technique, sample size was 30 and blood test done for screening after written informed consent.There were total 30 patients, blood samples which were carried out during studyperiod, it was concluded that out of 30 immobilized patients 14 patients is having hypercalcemia in immobilized state. The study found that there was a person suffering from hypercalcemia in their immobilized state. Hence this study helps in treatment of hypercalcemia during their immobilized state of the patients. From this study it is concluded that 46.67 % of the patients suffering from hypercalcemia.

***Key Words**: disabled patients,high level of calcium in the blood,pervasiveness.*

Introduction

Hypercalcemia in immobilization was first discovered by Albright et al. in 1941 and thought that it may occurs due to excessive bone resorption. It is an under-recognized because of increased calcium level in the blood specially in hospitalizedbedridden patients.[1]Immobilization hypercalcemia is a diagnosis in which excessive bone metabolism defects and conditions correlated with reduced mobility like lesions of the medulla or vascular injury. Investigation needs further study to find out certain sources of hypercalcemia.[2]

Incidence rate of immobilization hypercalcemia is 11-22% in spinal cord injury group and 20-30% in immobilized patients secondary to fractures in 2 case series .Usually it occurs 4-6 weeks post trauma (1 week-16weeks) may stay elevated for up to 12 months depending upon mobilization.[3]

Diagnosis of immobilization hypercalcemia was verified by elevated urinary excretion of pyridiniumcrosslink's-urine pyridinoline / creatinine ratio 386 nmol / mmol (NR 5–21.8). The hypercalcemia returned to health within one week with intravenous fluids and intravenous pamidronate (90 mg) and Normocalcaemia was sustained throughout the next several weeks until mobilization started. When analyzing the history and ignoring any factors, the elevated degree of hypercalcemia will seem to be linked with extreme trauma and sustained immobility.[4]

Hypercalcemia with immobilization induces a rise in the resorption of osteoclast bones. The cascade of events associating the lack of mechanical stress on the bone with increased resorption can include altered piezoelectric effects in the bone.The subsequent immobilization attributable to trauma, severe damage to the spinal cord or some other cause in this situation promotes the resorption of osteoclastic bone. Because of this condition increased

calcium in the urine and calcium loss from the bones may occur.Increased calcium level in the bloodoccurs whether calcium efflux becomes increase or the glomerular renal filtration volume becomes decreased. Muscle movement spreads a bone development signal through the osteocyte. With prolonged inactivity of the patients, the mechanical stimulation for bone development triggered byless muscle movement, leaving resorption unopposed. After immobilization the bone resorption occurs within 18 months, even after patients begin remobilization.Ultimately the resorption contributes to osteoporosis; particularly of the appendicular skeleton.The calcium produced by bone remodeling is excreted through the renal tubules. After injury hypercalciuria takes place within the first week and continues for 6-18 months. Calcium release cuts off parathyroid hormone development after few weeks of spinal cord injury. Decreased Para thyroid hormone is related with excessive serum phosphate concentrations and decreased secretion of 1, 25-dihydroxyvitamin D. If the rate of calcium resorption increased the capacity of urinary excretion, hypercalcemia occurs. This problem is mostly common in children and young adolescence and patients with renal diseases. Hypercalcemia typically begins 4-8 weeks after immobilization but may start as early as 2 weeks or as late as 6 months after the injury.[4]

Immobilized hypercalcemia develop due loss of mechanical stress, it leads to excessive resorption of osteoclast bone and reduced the formation of osteoblast bone and then excessive calcium for normal regulatory mechanism of the body.[3]

In symptomatic patients serum calcium level is more than 11.5-12 mg/dl. Clinical manifestation of hypercalcemia include tiredness, weakness, lethargy, pain in abdomen, difficulty to passing feases, loss of appetite, vomiting, excessive thirst, excessive urination, and dryness. Patients may also show behavioral problems, tiredness, lethargy, misunderstanding or an acute psychosis. Earlycarehastobe based onearly mobilization, hydration with intravenous (IV) normal saline, rebuilding of the stabilityamong calcium elimination and resorption and loop diuretics;zoledronic acid has to start if there is no progressive condition. If treatment not given, patients can developdehydration, behavioral disorder, calcium oxalate nephrolithiasis, and chronic kidney diseases.[4]

Aim: To determine the prevalence of hypercalcemia among immobilized patients.

Materials and Methods

An analytical research approach and a cross-sectional research design were used. The study was conducted during December 2019 and the setting was selected in AcharyaVinobaBhave rural hospital Sawangi (M) Wardha city after getting ethical permission (Ref. no: DMIMS (DU)/IEC/Aug-2019/8206 ON DATED 03 /10/2019, Byusing purposive sampling technique, 30 immobilized patients were Selected from the Acharya VinobaBhave Rural Hospital Sawangi (M) Wardha based on the calculation.

Statistical Analysis

The demographic data, collected and descriptive analysis was done in terms of frequency and percentage. For statistical analysis SPSS version 16.0 was used.

Method of data collection:

Section A: Consist of demographic characteristics of sample such as age, gender, diagnosis, and calcium level.

Section B: blood test done for checking calcium level.

Methodology

Target population (Immobilized patients)

Accessible population (Immobilized patients in AVBRH Sawangi (M) wardha)

Purposive sampling technique used and sample size was 30

Data collection

Result

Table no. 1 showed that*3.33*% of the patients were in the age group of 20-29 years, 13.33% of them wereintheagegroupof30-39years, each 30%ofthepatientswereintheagegroup of40-49years and 60-69 year,13.33%wereintheagegroupof50-59years and 10% of them were belonging to the age group of more than 70 years.

Table no.2 showed that73.33% of the patients were males and 26.67 % of them were females.

Table no.3 showed that each 6.67% of them patients had cellulites, ulcer over foot, and fracture of patella, 10% of patients had sub arachnoidshemorrhage and each 3.33% of the patients had brain tumor, traumatic cervical spine respectively.

Table no.4 showed that 53.33 % of theimmobilized patients were having normal calcium level and 46.67 % of the immobilized patients were having abnormal calcium level.

Table 1: Distribution of patients according to their age

(n=30)

Age Group(yrs)	No of patients	Percentage
20-29 yrs	1	3.33
30-39 yrs	4	13.33
40-49 yrs	9	30
50-59 yrs	4	13.33
60-69 yrs	9	30
≥70 yrs	3	10
Total	30	100
Mean±SD	51.93 ± 15.26	
Range	20-87 years	

Table 2: Distribution of patients according to their gender

(n=30)

Gender	No of patients	Percentage
Male	22	73.33
Female	8	26.67
Total	30	100

Table 3: Distribution of patients according to diagnosis

(n=30)

Diagnosis	No of patients	Percentage
Cellulitis	2	6.67
Brain Tumour	1	3.33
Cerebro vascular episode with SDH	1	3.33
CKD	1	3.33
Colonic ulcer with diselectrolytimia	1	3.33
Compound grade fracture left tibia and fibula	1	3.33
Compression fracture l1	1	3.33
D12 fracture with neonadeficit	1	3.33
Fracture of patella	2	6.67
Head trauma	1	3.33
Hemmorage contusion	1	3.33
Hepatomegaly with ascites	1	3.33
Hypertension	1	3.33
Hypertention With CerebelarHemmorage	1	3.33
Intertrochantric Fracture Right Femur	1	3.33
Neurologous Disorder With Bedsore	1	3.33
Pathological Fracture	1	3.33
Pontine Abscess	1	3.33
Prolapsed Interventral Disc	1	3.33
Proximal 3rd Tibia Right Side	1	3.33
PsoriatriArthiritis Affecting Both Hip	1	3.33
Spondyiosisthesis	1	3.33
Sub Arachnoid Hemorrahge	3	10.00
Traumatic Cervical Spine	1	3.33
Ulcer over foot	2	6.67
Total	30	100

Table 4: Distribution of patients according to calcium level

(n=30)

Calcium level	No of patients	Percentage
Normal(8.5-10.5 mg/dl)	16	53.33
Abnormal(>10.5)	14	46.67
Total	30	100
Mean±SD	8.30±0.70(6.60-9.40 mg/dl)	

Discussion

The following study supported to the present study by kyung Ae lee and wan he yoo concluded one case report on Immobilization Hypercalcemia-Associated Acute Renal Failure in a Patient with Chronic Tophaceous Gout they reported thatHypercalcemia with immobilization is a uncommon source ofseverekidney dysfunction in patients with immobilized state related to restricted motion. Researcher suggested that immobilization may be a probable source of hypercalcemia-promptedserious kidney problems in patients with chronic Tophaceous gout involving several large joints, and professional preparedness is necessary to avoid excessive evaluations and lethalproblems.[5]

One supporting study on hypercalcemia and spinal cord injury concluded that Immobilization hypercalcemia more commonly impacts the teen age groups associated to the rapid bone turnover that accompanies development. Males are more commonly affected than females because of their more bone build.[4]Present study findings showed that 73.33% of the patients were males and 26.67 % of them were females.

One case report concluded that A 35 year elderly patient had no any priorhistory like diabetic, hypertension and tuberculosis etc.and suffering from a serious hemorrhagic brain damage from a riding crash. Succeeding the primary management of patients with brain damage, she stayed in a prolonged inactivity state and patient developed with hypercalcemia after 32 weeks in critical care unit. Patients who emerged with extreme hypercalcemia had sustained immobilization. This case helps recognize extreme hypercalcemia as a consequence of inactivityand the depiction of bone absorption in this condition. [2]

Anotherresearch study concluded that excessive resorption of osteoclastic bone is the keyincident for developing the immobilization hypercalcemia. The suggested pathophysiological cause is a loss of mechanical tension due to the absence of loading and muscle activity, low vascularity, metabolic changes in bone and bone denervation.[6, 7]

One case report showed that a 19 year elder patient detected with hypercalcemia afterinvestigation by a family doctor. The patient was suffering from quadriplegia because of spinal cord injury after falling insurface water. Patient had remained immobilized for 3 years. At the time presentation, the patient developed specific moresigns related to hypercalcemia likelethargy, sickness, queasiness, and loss of appetite, difficulty to passing the stool and thirst. After inspection bed sore was present in the sacral bone. Reduced hemoglobin level was reported in laboratory workup.In comparison, calcium level wasincreased although intact parathyroid hormone and 25-0H vitamin D was lower than average. Calcium in urine was also elevated in 24 hours .[8]

Another research study showed that a 48-year elderly patient experienced a pronounced and chronic hypercalcemia 3 months after admission for paraplegia arising from extreme peripheral neuropathy most possibly of alcoholic etiology. Serum ionized calcium was increased, and parathyroid hormone levels were low normal by the two separate radioimmunoassay. Urinary calcium excretion was markedly increased and serum 1, 25-dihydroxy vitamin D level was decreased.A comprehensive clinical review of potential occult malignancy, myeloma, and sarcoidosis as a source of

hypercalcemia did not show any promising outcomes. Calcitonin therapy started for the plasma calcium to be rapidly elevated, and its withdrawal culminated in reappearance of hypercalcemia.The patient started intensive physical rehabilitation for relief of the neuropathy and then the physician gradually decreased Calcitonin therapy, and the serum calcium of the patient stayed normal for the next 11 months.[9]

Excessive resorption of the bone marks in hypercalciuria in days and hypercalcemiafewweeks later. If the ability of the renal to eliminate calcium is overdid. Hence kidneyinadequacyraises the threatof prolonged inactivitydue to hypercalcemia. Children and young adults are more common because of their increase bone turnover.[4]

One study showed that a 79-year elderly patient with chronic kidney disease stage four was admitted with a limited-weight-bearing status after right-hip arthroplasty. Patient developed hypercalcemia (11.5 mg/dL) with serum albumin of 2.5 g/dL after four weeks. Despite IV fluids, hypercalcemia worsened (corrected serum calcium, 14.5 mg/dL), and she was rehospitalized.[10]

Recommendation

1. Similar study can be conducted with more study participant to generalize the findings.

2. A study may be conducted on staff nurses to assess the knowledge regarding complication of immobilization.

Conclusion

Immobilization hypercalcemia more commonly impacts the teen age groupsassociated to the rapid bone turnover that accompanies development.Males are more commonly affected than females because of their more bone build. Immobilization hypercalcemia is common in tetraplegia patients than paraplegia.Immobilization hypercalcemia is a diagnosis in which excessive bone metabolism defects and conditions correlated with reduced mobility like lesions of the medulla or vascular injury. Investigation needs further study to find out certain sources of hypercalcemia. Presentstudy findings will helpful for preventing the further complication and based on the above cited findings, it is concluded that it is effective method to determine the calcium levels in patients and reduces the risk for hypercalcemia among immobilized patients.

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Refernces

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