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Impact Of Elevated Parathyroid Hormone Levels Inchronic Kidney Disease With Different Scenarios

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Abstract

CKD-MBD is one of the major complications of CKD. This study is a prospective observational study over 6 months inpatient nephrology department. The datawere collected from patients with CKD. A suitable data collection was designed to collect and document thedata.Thestatistical procedurewas donebyusingIBMSPSS version 28.0.1.1(15) to analyzethe data. Our study consisted of 200 patients out of which 68% were males and 32% were females. According to theglomerular filtration rate, the CKD stages are categorized into stages III (1), IV (8), and V (191). Out of 200 patients,193 patients are with elevated intact PTH levels(SHPT), which are further categorized into Hypocalcemia with elevated PTH levels (127) and Hyperphosphatemia with elevated PTH levels (140).Among 127 patients with hypocalcemia, 121 patients are on calcium supplementation, out of 140 patientswith hyperphosphatemia and 100 patients are on phosphate binder therapy and 145 patients are on thevitamin – D supplementation. Both hypocalcemia and hyperphosphatemia are significantly associated with therisk of MBD(OR248.78,P=0.0001;OR58.82andP=0.0001). Hyper parathyroidismis not significantly associated with MBD (OR 8.95; P = 0.135). PTH levels, phosphorus levels and calcium levelsare not significantly associated with risk of CVD (OR 0.829, P = 0.80; OR 1.47, P = 0.23; OR 0.71, P =0.23).CKDis not significantly associatedwith CVD(OR1.26, P =0.74). Hypocalcemia has more risk ofgetting MBD when compared to hyperphosphatemia from our data. So, management should be properly done top reventthe risk of MBD. Abnormalities in anyone of these biomarkers should be taken into consideration as an alarming sign of the risk of CKD-MBD. So, frequent monitoring of these biomarkersis necessary.

Keywords: Chronic Kidney Disease; Chronic kidney disease Bone mineral disorder; Parathyroid hormone; Secondary Hyperparathyroidism; Hypocalcemia; Hyperphosphatemia

Introduction

CHRONICKIDNEYDISEASE-MINERALANDBONEDISORDER

Asrenal functiondiminishes, changesinphosphorus andcalcium, inadditiontocalcitriol and

parathyroid hormones may occur. CKD-MBD leads to metabolic and calcification changes intheCKDpatients, vascular system, and bonetissues.

As a result, there is a risk of fractures and injury to the heart and blood vessels. Any ofthese ailments increases the risk of mortality. One or more of the following types of evidenceare utilized in making a diagnosis: (1) Calcium, phosphorus, PTH, or vitamin-D metabolismabnormalities; (2) calcifications in soft tissues or the vascular system; (3) bone growth ormetabolismanomalies, including linear changes and strength.

PTH responds by moving calcium from the bones, resulting in the weakening of thebones, and leading to an increment in serum calcium levels. Hypocalcemia is caused by thedeficiency of calcitriolproduction by the kidneys.As well as hyperphosphatemia occurswhen the kidneys are unable to eliminate excess phosphorus. The parathyroid gland producesPTH corresponding to high phosphorus levels. This lowers the calcium levels in the bloodevenmore.

2.Methodology:

Studysite

The study was carried out in District Headquarters hospital, Karimnagar and ChelmadaAnandaRaoInstituteofMedicalSciences, Karimnagar.

Studydesign

Ahospitalbasedprospectiveobservationalstudyconducted inthe In-patient department.

Studyduration

Thestudy wasconductedoversix months.

Samplesize

200samples(NephrologyIn-patientdepartment)

Study Criteria

Inclusioncriteria:

1. Age18-88 years.
2. Bothmen andwomen.
3. In the Nephrology department patients with CKD were collected irrespective of thestages.
4. Patients with measurement of intact PTH levels, calcium, and phosphorus levelsduringthestudy period.
5. Patientswithother comorbidconditions.

Exclusioncriteria:

1. Patients who left before the discharge of critically ill patients whose data cannot becollected.
2. Patientswith ahistoryofrenalreplacementtherapy.

Sourceofdata

By communicating with patients, and patient data records (laboratory reports of In-patients inthe Nephrologydepartment).

Parameterstobeconsidered

1. Demographicdetails.
2. Pastmedicalhistory:Hypertension,Diabetesmellitus.
3. 2DECHO(Cardiovascularеffects).
4. Laboratory Investigations: Serum Creatinine, Sodium, Potassium, Calcium,Phosphorous, PTH.
5. Treatment:Calciumsupplements,Phosphatebinders,Vitamindsupplements.

Datacollectionform

Based on inclusion and exclusion criteria, the patients were selected. Data is collected inpredesigned data collection form, which includes- demographic details, past medical history,symptoms,laboratory parameters,and treatment.

Studyprocedure

i. StudyapprovalfromtheInstitutionalReviewBoard(IRB)andtheheadoftheHospitalwas obtained.

ii. The study protocol and data collection form were submitted for review and written/oralconsent was obtained from thehead of theHospital.

iii. AftergettingpermissionfromIRB,patientsmatchingforstudycriteriawereidentifiedbyregularreviewofpatientrecordsduringthestudyperiodanddocumentedin a predesigned data collection form.

iv. ThestudywasconductedatNephrologyIn-patientDepartmentbycommunicatingwithpatients and their representatives.

v. Patientdatawerecollectedbyinterviewswiththepatientsandpatientcaserecordsthatphysicianfills, nurses,pharmacists, andotherhealthcareprofessionals.

vi. Allthedetailswillbekeptconfidential.Later,thedatacollectedwereenteredintotheMicrosoftExcel databaseand subjectedtofurtheranalysis.

Dataanalysis

ThedatawhichiscollectedisenteredintoMicrosoftexcel 2007.IBMSPSSversion28.0.1.1

(15)isusedforstatisticalanalysis.Theriskestimatewasdoneusingbinomiallogisticregressionandby usingMedCalcsoftwareversion[20.106]oddsratiowascalculated.

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Results

Table1.Age-wisedistributionofpatients

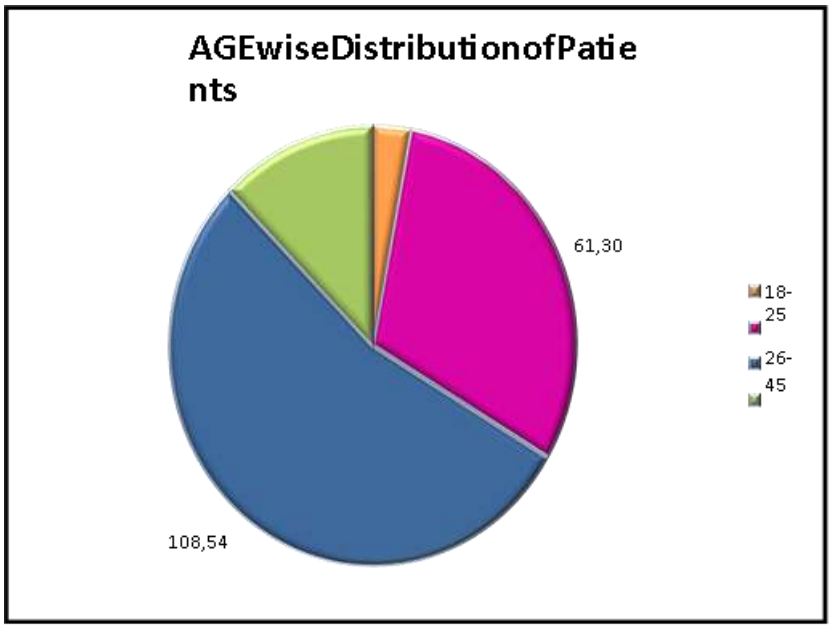

Table2.Distributionofdataaccordingtothegender

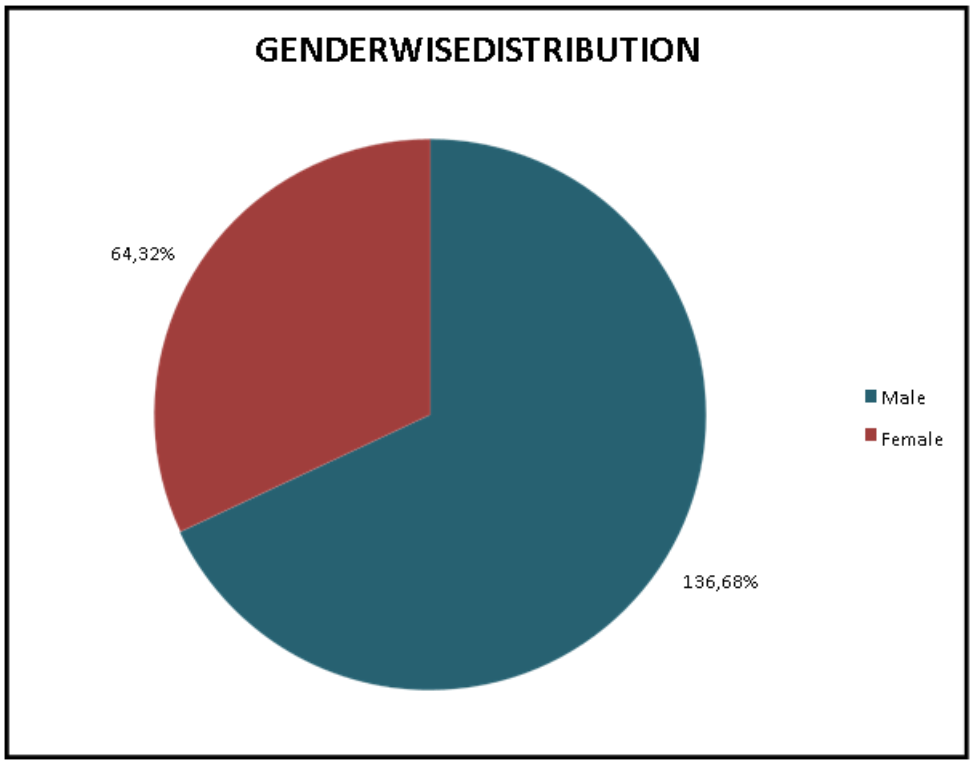

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Table 3. Stages of Chronic Kidney Disease according to Glomerular FiltrationRate

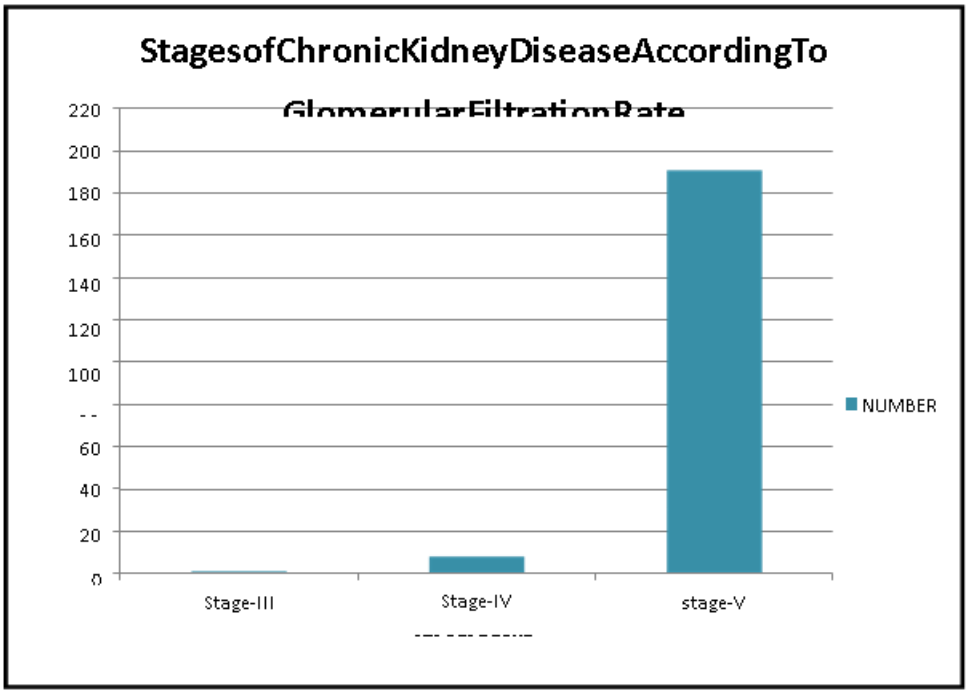

Table4.HypocalcemiainChronickidneydisease

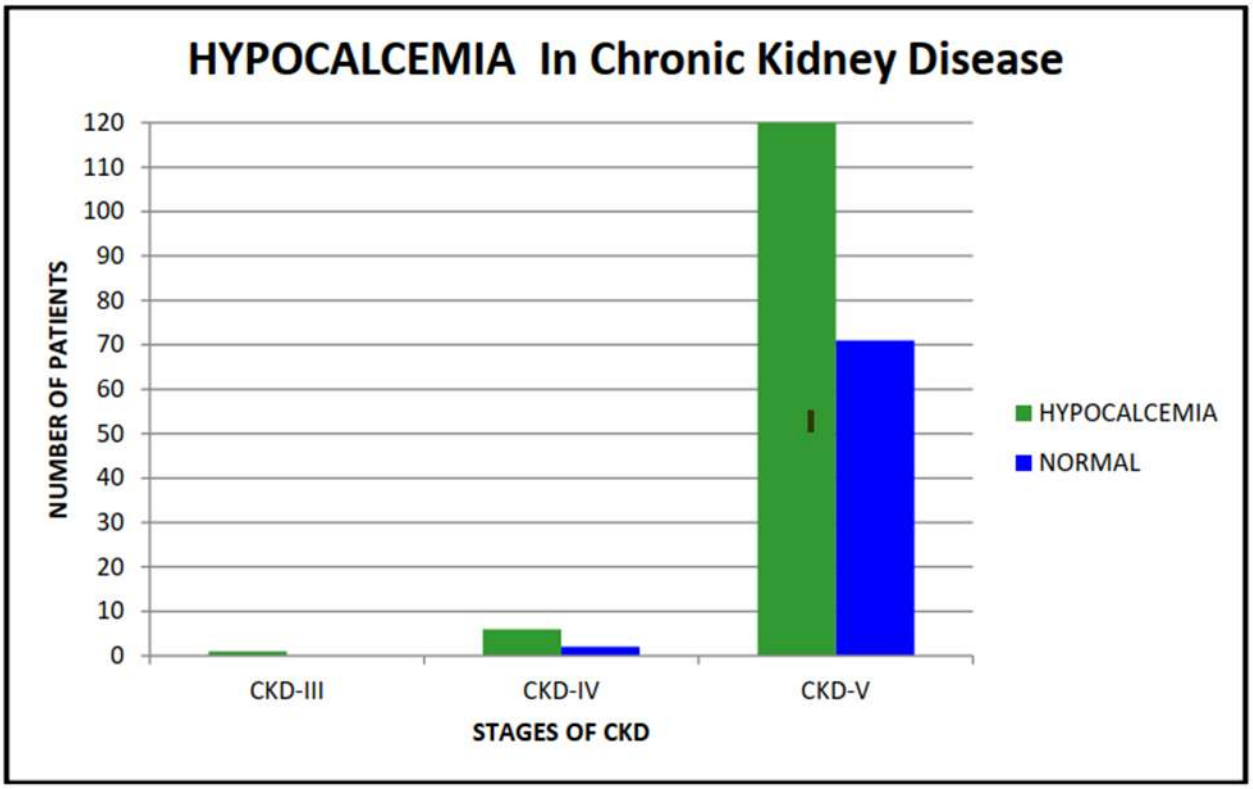

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Table 5. Hypocalcemia in Chronic Kidney Disease with Elevation of intactPTH levels

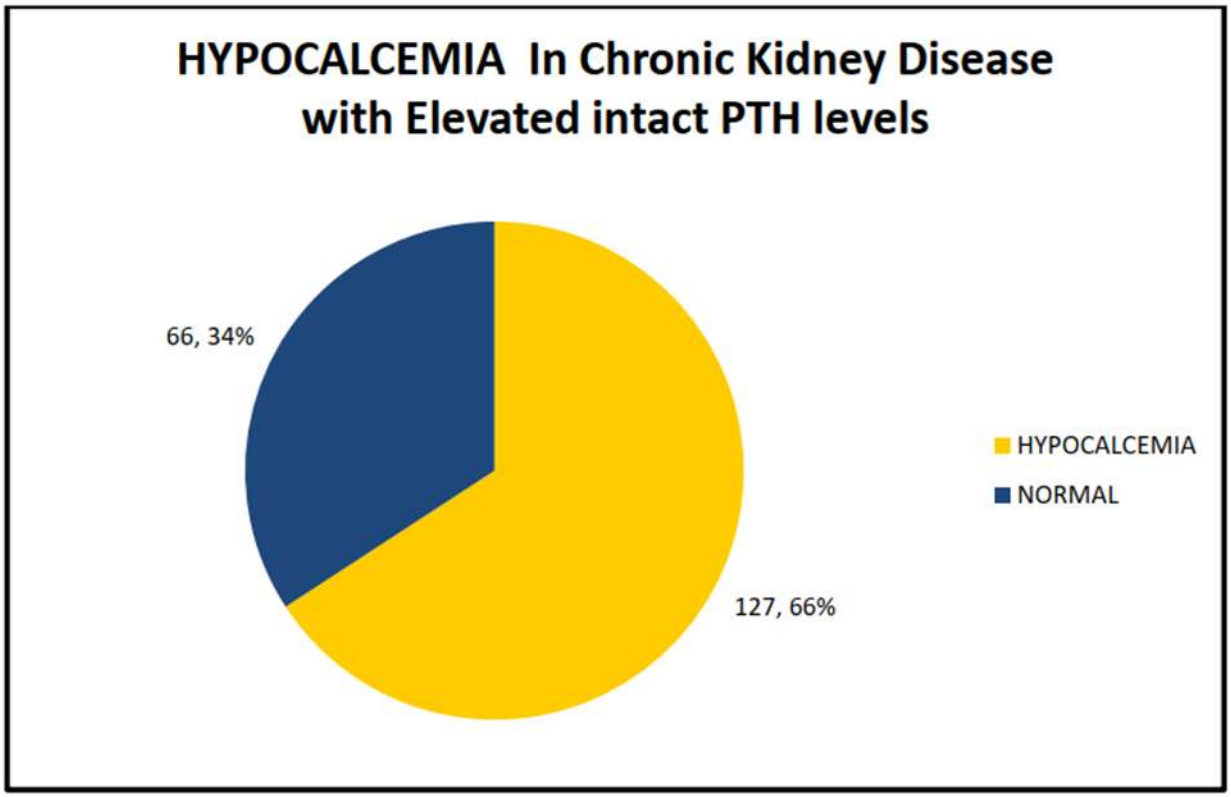

Table6.HyperphosphatemiainChronicKidneyDisease

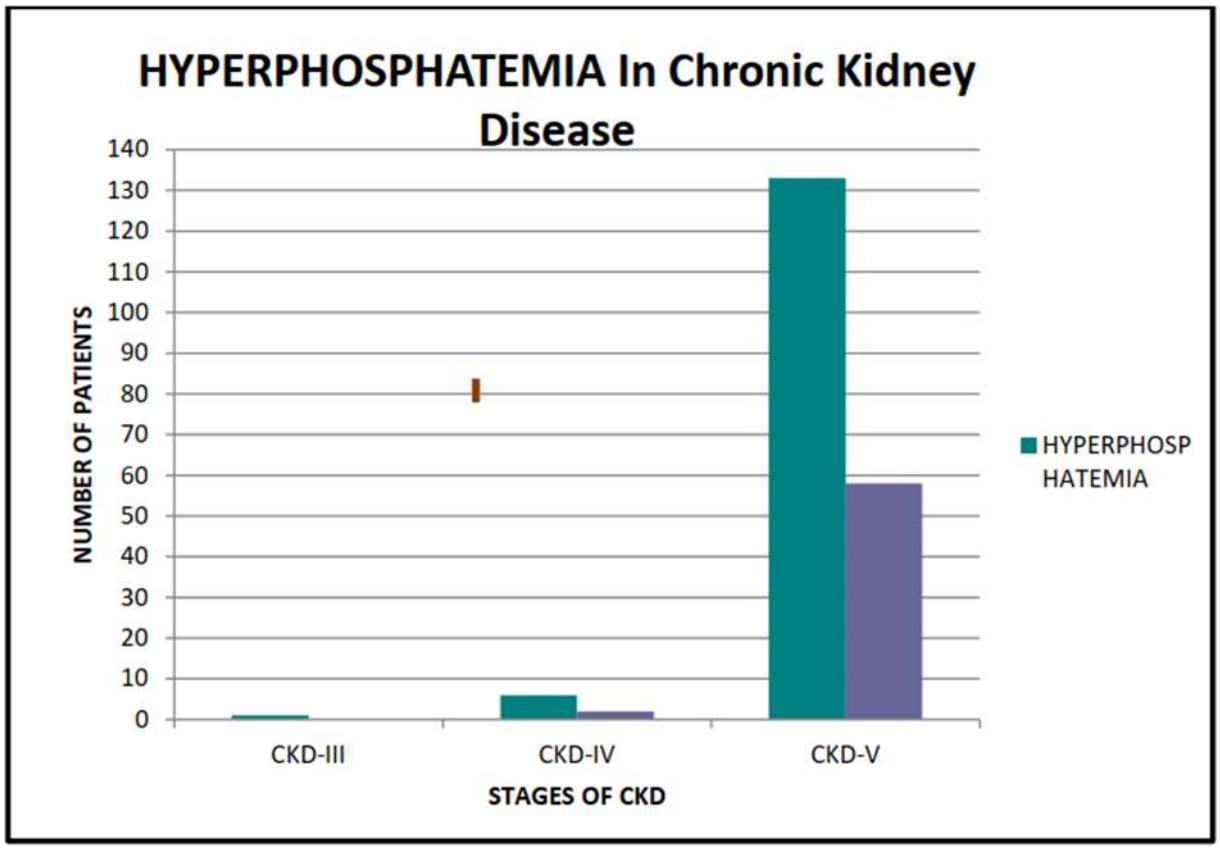

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Table 7. Hyperphosphatemia in Chronic Kidney Disease with Elevation of PTHlevels

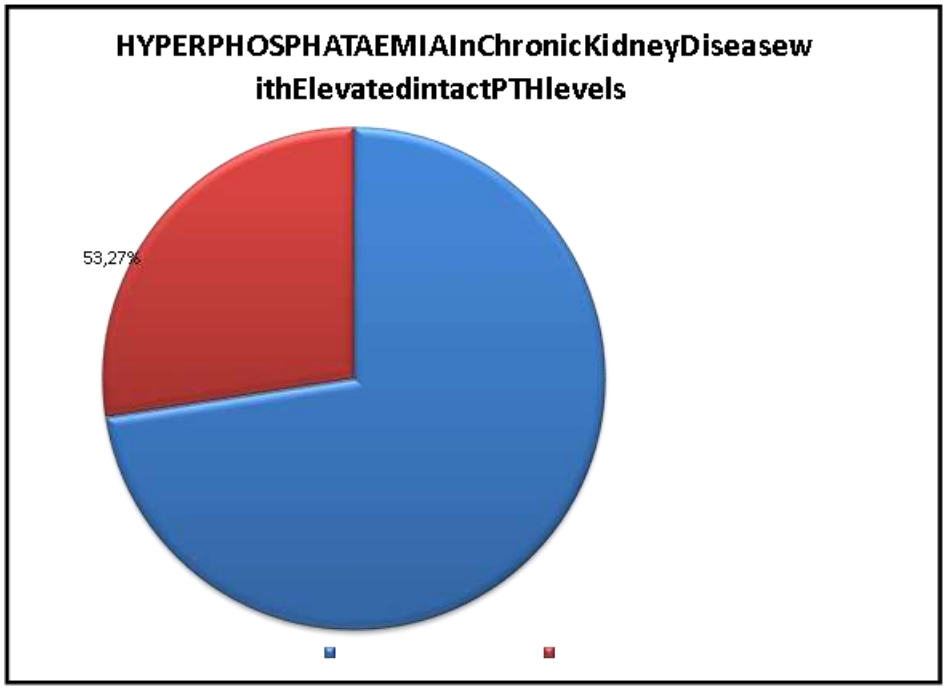

Table8.Hyperparathyroidismin ChronicKidneyDiseasepatients.

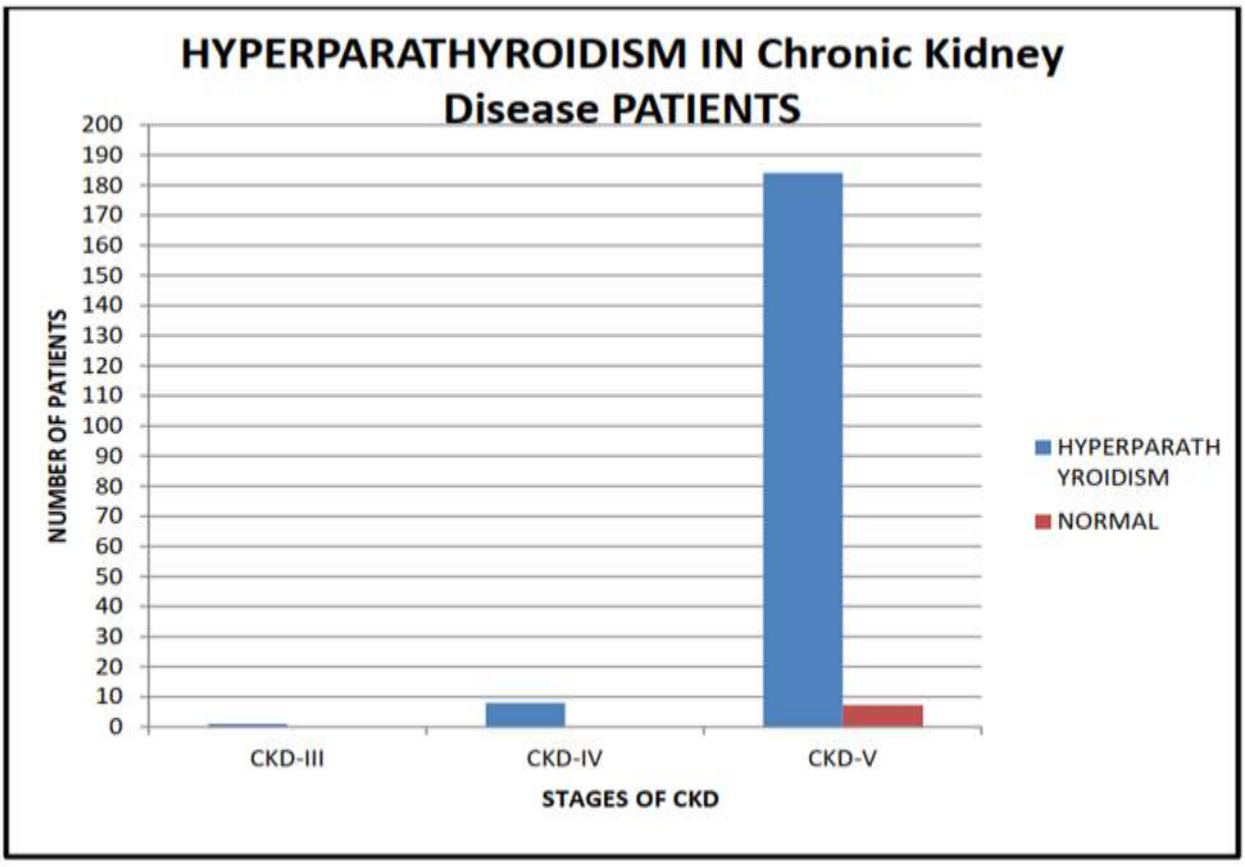

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Table 9: Hyperparathyroidism in Chronic Kidney Disease Stages - III, IV, andV withclassintervalsofintactPTHlevels.

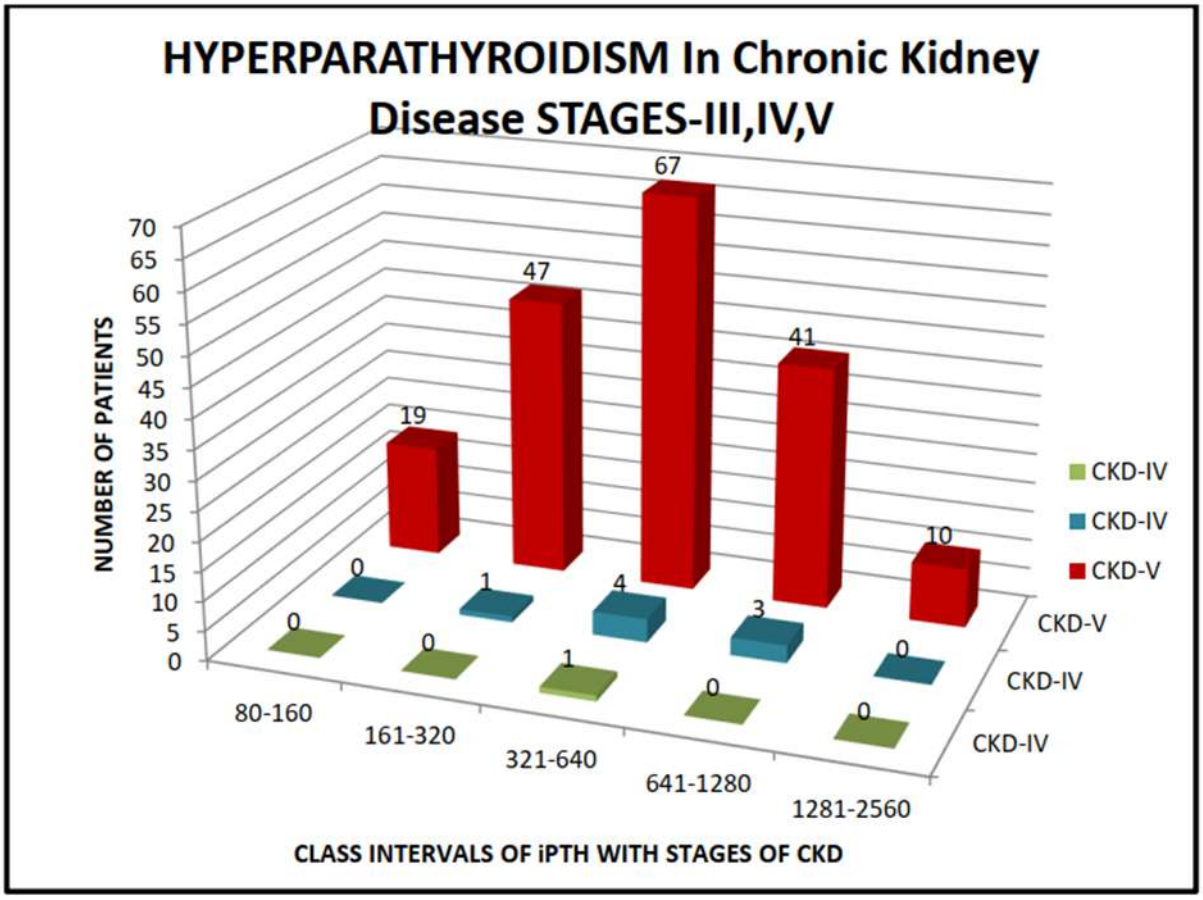

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Table 10. Hypocalcemia, Hyperphosphatemia, and Elevated PTH in ChronicKidneyDisease Patients.

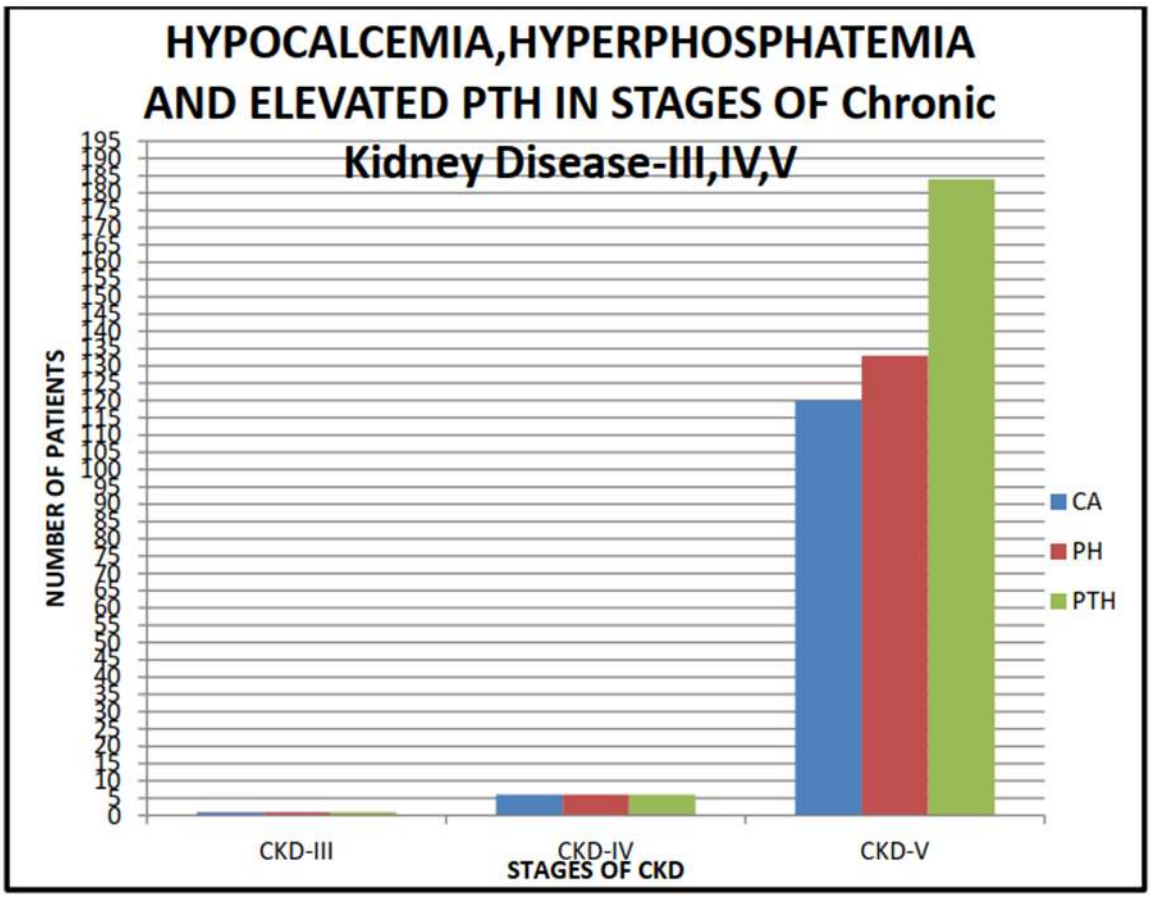

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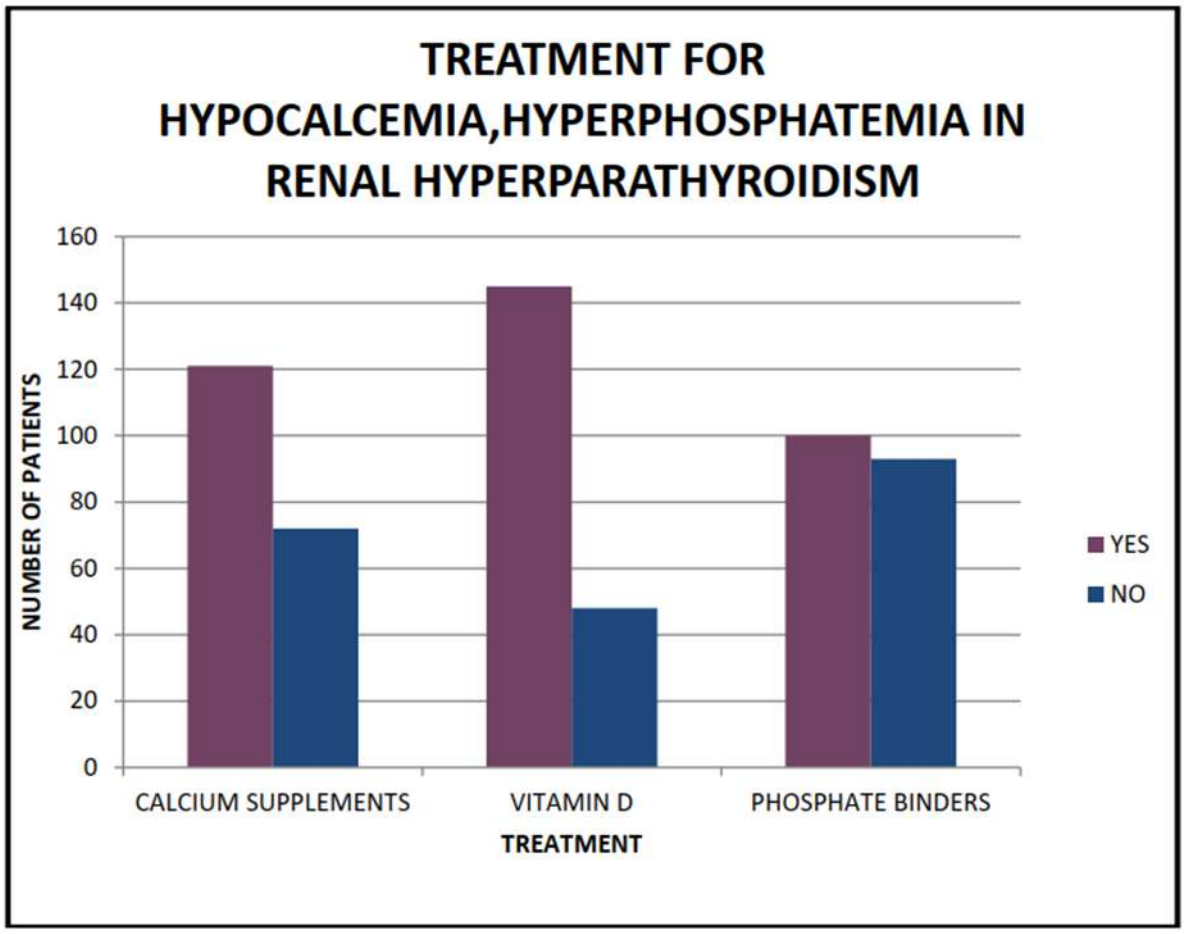
Table 11. Treatment for Hypocalcemia, Hyperphosphatemia in RenalHyperparathyroidism.



Discussion:

The impact of elevated PTH levels in chronic kidney disease with different scenarios includesMineral Bone Disorder and cardiovascular disease. MBD is mainly associated with elevatedPTHlevels, hypocalcemia, and hyperphosphatemia.

The present study was carried out at Chalmeda Ananda Rao institute of medical scienceswhich is in Karimnagar. The study consists of a total of 200 patients who met the inclusioncriteria.In the current study, 32% were females,and 68% were males.From this study, wesaythat males weremore affected than females.

UsingbinomiallogisticregressionandMedCalc risk estimation and odds ratio were calculated.

Conclusion:-

The current study provides useful information about the risk of CKD-MBD in patients withelevated intact PTH levels, an increase in phosphorus, and a decrease in calcium levels. Therisk of getting CKD-MBD is more in patients with hypocalcemia when compared to patientswith hyperphosphatemia and SHPT. CVD is considered an independent risk factor of CKD-MBD. Management of CKD-MBD with respect to different criteria is crucial to prevent therisk of fractures, renal osteodystrophy, CVD, and mortality. According to KDIGO guidelinescalcium supplements, vitamin D, and phosphate binders should be prescribed to prevent andcureCKD-MBD.IthasbeenconcludedthatiPTH,phosphorus,andcalciumlevelsareimportant biomarkers for detection of CKD-MBD. Alterations of any one of these biomarkerswill lead to the risk of CKD-MBD. So, assessment of laboratory parameters is very crucial toprevent the risk ofCKD-MBD

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