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RESEARCH ARTICLE

STUDY OF HEMOTOLOGICALPROFILE AND SERUM IRON INDICES IN CHRONIC KIDNEY DISEASE IN TERTIARY CARE CENTRE

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Abstract

Background: Chronic kidney disease (CKD) is an emerging public health problem worldwide, with increasing cost of healthcare particularly in developing countries like India. Haematological parameters are generally influenced in CKD and the effect increases with the stage of CKD. Haematologicalprofiles are rarely investigated in CKD subjects in our population. This studywas conducted to determinethehaematological profile and serumiron indices in non-dialysis chronic kidney disease patients.

Materialsandmethods: The present cross-section was conducted at KarapagaVinayaga Medical College, Chengalpattu. A total of 153 patients aged above 18 were recruited by purposive sampling. Thorough clinical examination and investigation complete blood count,reticulocyte,count serumureaand creatininewereanalysed.Datawereanalysed,andstatisticalcalculationswere carriedoutusingSPSSversion19.0.Means,rangeandmedianwerefoundtorepresentthedata appropriately. Chi-Square tests are used for association. A P-value of <0.05 was considered significant.

Results: The mean duration of illness ranged from 3 months to 27 months, with an average of 8.66 months.Nearly34%oftheparticipantshaddiabetesmellitus,29%hadhypertensionand25% were smokers. Our reveals that there were statistically significant differences seen in associationbetweenCKDstagesandHaematologicalparametersHb(gm/dl), PCV%,Platelet count(lakhs/cumm).

Conclusion: Anemia is a leading cause of morbidity in CKD patients, and it worsens with disease stage. The evaluation of Hb and RBC parameters in CKD patients aids in classifying the type of anaemia,aidingintheselectionofappropriatetreatmentmodalities,andavoidingunnecessary iron overload in these patients.

Introduction:-

Chronic kidney disease (CKD) refers to a group of pathophysiologic processes that result in abnormal kidney function and a progressive decline in glomerular filtration rate (GFR). The true cost of chronic kidney disease cannot be calculated. The estimated prevalence of CKD is 800 per million people, with an incidence of end-stage renal disease

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(ESRD) of 150-200 per million people. CKD is a worldwide epidemic with numerous comorbidities, making it a disease with a high mortality rate. [12]

Chronicdiseaseanaemiaisacomplexdisordercausedbyseveralfactors.Althoughtheprimary defect is decreased erythropoietin production by the kidney, several other factors may be involved. Iron, folate, and vitamin B12 deficiency due to nutritional inadequacy or increased blood loss, for example, can result in shortened RBC survival, hyperparathyroidism, mild chronic inflammation, and aluminium toxicity. Anemia in CKD worsens diabetes and hypertension co-morbidities, contributing to poor outcomes and high mortality. Chronic anaemia, if left untreated, causes a variety of physiologic problems, including cardiovascular complications and increased mortality and morbidity. The NKF-K/DOQI guidelines are dividedintofivestages,accordingtoGFRand2006. AnemiausuallymanifestswhentheGFR falls below 60ml/min or when it reaches stage 3. [3,4]

Renal insufficiency is also associated with a proclivity for bleeding, attributed to platelet dysfunction caused by abnormal platelet aggregation and adhesiveness. In uremic patients, white blood cell count may decrease, and anaemia correction is followed by an increase in naturalkillercellsandimprovementinleukocytephagocyticfunction.AnemiainCKDcanbe identifiedandtreatedearly,reducingcardiovascularmorbidityandmortality.[5,6]Earlytreatment of anaemia in CKD may delay ESRD onset and improve survival. The identification, evaluation, and optimal treatment of anaemia in CKD essentially involve a complete blood count, determination of serum ferritin and transferrin saturation to assess iron stores and iron adequacy for erythropoiesis, and iron adequacy for erythropoiesis.[7]

The National Kidney Foundation's Kidney Disease Outcome Quality Initiative (K/DOQI) anaemia guidelines recommend that serum ferritin and transferrin saturation (TSAT) be maintained at >100 ng/ml and 20%, respectively, during erythropoiesis-stimulating agent (ESA) treatment in non-dialysis CKD. [8]

When indicated, treatment of anaemia in CKD may include iron therapy, the use of erythropoietin, and correction of anaemia to a target haemoglobin of 11- 12 gm/dl. Renal replacement therapy imposes a significant financial burden on the family and the healthcare delivery system. The purpose of this study was to determine the haematological profile and serum iron indices of CKD patients who were not on dialysis.

Materialsandmethods:-

The present cross-sectional was conducted at KarapagaVinayaga Medical College, Chengalpattu, over a period of 18 months from March 2021 to November 2021, after the due approval of the ethical committee. A total of 153 patients aged above 18 were recruited by purposive sampling at the outpatient of the General medicine department. Patients above 18 years of age diagnosed as chronic kidney disease patients were included. Evidence of acute infection or trauma in the last four weeks, history of blood transfusion in the last one-month, Chronic infections like tuberculosis, Bleeding disorders, previously diagnosed anemia and treatment, Hemoglobinopathies, malignancy and Recent overt blood loss were excluded from the study. Informed consent was obtained from study subjects. Detailed clinical history for symptoms, previous hospitalizations were recorded, and a requisite medical examination was done thoroughly. Thorough clinical examination and investigation Complete blood count, Absolute reticulocyte count, Serum total iron and TIBC (Total iron binding capacity), Serum ferritin to assess iron stores, Serum transferrin saturation or content of Hb in reticulocytes (CHr) to assess the adequacy of iron for erythropoiesis, serum urea and creatinine were analysed.

Statisticalanalysis:

Data were analysed, and statistical calculations were carried out using SPSS version 19.0. Means,range andmedian werefound torepresent thedataappropriately.Chi-Square testsare used for association. A P-value of <0.05 was considered significant.

Results:-

Table1:- Durationofillness

Parameter	DurationofCKDinmonths
Range	3-27

Mean	8.66
SD	4.7

The mean duration of illness ranged from 3 months to 27 months, with an average of 8.66 months

Table2:- Riskfactorsfor CKD.

Risk Factors	Noof cases			
	PRESENT		ABSENT	
	No	%	No	%
DiabetesMellitus	52	33.98	101	66.02
Hypertension	45	29.41	108	70.59
Smoking	39	25.49	114	74.50

Nearly 34% of the participants had diabetes mellitus, 29% had hypertension and 25% were smokers.

Table3:- Haematologicalprofileamongourstudyparticipants:

Variable	**Study group** Mean	SD	p-value
Hb(gm/dl)	8.39	1.33	**P=0.001 Significant**
RBC count (million/cumm)	4.35	0.7	**P=0.001 Significant**
PCV%	23.47	4.55	**P=0.001 Significant**
Plateletcount (lakhs/cumm)	3.33	0.66	**P=0.001 Significant**
MCV (fL)	80.83	13.22	P=0.832
MCH (pg)	26.15	6.12	P=1.238
MCHC(g/dl)	31.38	4.88	P=0.384
RDW%	15.92	5.71	P=0.863
ESR(mm/hr)	26.81	14.29	**P=0.001 Significant**

Our reveals that there were statistically significant differences seen in Haematological profile among our study participants Hb (gm/dl), RBC count (million/cumm), PCV %, Platelet count(lakhs/cumm), ESR (mm/hr). ($p<0.005$)

Table4:- AssociationbetweenCKDstagesandotherquantitativeHaematologicalparameters.

	(Mean+SD)			**P-value**
Parameters	**CKD3**	**CKD4**	**CKD5**	
Hb(gm/dl)	7.56 +1.78	8.32 +1.7	7.0 +1.54	**0.0002 Significant**
RBC (million/cumm)	2.56 +0.93	3.22 +0.72	3.01 +0.73	0.0892 Notsignificant

PCV%	26.72 +3.02	26.61 +4.29	23.52 +3.89	**0.0059 Significant**
MCV (fL)	79 +7.3	82.4 +9.3	81 +11.8	0.9704 Notsignificant
MCH (pg)	26 +4	25.7 +5.7	25.9 +4.8	0.5124 Notsignificant
MCHC(g/dL)	29.2 +3.4	31.2 +4.5	32.1 +4.0	0.3517 Notsignificant
RDW%	16.1 +4.6	16.5 +5.5	15.3 +3.1	0.7476 Notsignificant
Duration (inmonths)	6.25 +3.28	8.47 +3.92	9.87 +4.44	**0.0264 Significant**

Our reveals that there were statistically significant differences seen in association between CKD stages and other quantitative Haematological parameters Hb (gm/dl), PCV %, Platelet count(lakhs/cumm), Duration. ($p<0.005$)

Discussion:-

Chronic renal failure has gained prominence due to the significant morbidity and mortality associated with it and its impact on lifestyle. The haematological changes associated with chronickidneyfailureareth eleadingcontributors to morbidity andmortality.Chronickidney diseaseisamajorpublichealthissueaswellasamajorcauseofmorbidityandmortalityaround theworld.TheactualprevalenceoftheearlystagesofCKDismuchhigherthanthatofthelate stages. However, in clinical practise, the prevalence of stages 4 and 5 appears to be higher because the early stages are asymptomatic and people present when the severity of their symptoms worsens. Our study aims to understand the haematological profile and serum iron indices in non-dialysis chronic kidney disease patients.

Risk factors plays an important role in the developing various chronic diseases. In our study Nearly 34% of the participants had diabetes mellitus, 29% had hypertension and 25% were smokers. Our findings are similar to various studies conducted in various settings. [9,10,11]

Levinetal[12]investigatedtherelationshipbetweenanaemiaandcardiacdiseaseinCKDintheir study. In 175 patients who attended a renal insufficiency clinic, echocardiograms were performed.LVHwasdiscoveredin38.9percentofpatients.TheprevalenceofLVHincreased withdecreasinglevelsofrenalfunction,with26.7percentofpatientshavingCrClgreaterthan 50 mL/min, 30.8 percent having CrCl of 25 to 49 mL/min, and 45.2 percent having CrCl less than25mL/min.Each1g/dLdropinHbwasassociatedwitha6%increaseintheriskofLVH. Furthermore, these researchers performed two echocardiograms on 246 patients with early stagesofCKDoneyearaparttodeterminefactorsresponsibleforsubsequentLVHworsening. Worsening anaemia was found to be a significant predictor, with Hb dropping 0.85 g/dL in patientswithventricular growthcomparedto0.11g/dLinpatientswithstableLVH.therewere statisticallysignificantdifferencesseeninHaematologicalprofileamongourstudyparticipants Hb (gm/dl), RBC count (million/cumm), PCV %, Platelet count(lakhs/cumm), ESR (mm/hr). ($p<0.005$)

TherewasasignificantdecreaseinPackedCellVolumeasthestageofChronicKidneyDisease progressed. The same linear relationship between Hb and GFR was discovered by Afshar et al[13]and Khanam et al[14]. Khanam et al[14] discovered a decrease in PCV with decreasing GFR. Ijoma et al[15]discoveredthat meanhaemoglobinlevelsinstage 3chronic kidneydiseasewere 10.57gm/dl,8.84gm/dlinstage4,and7.33gm/dlinstage5chronickidneydisease.Thisstudy found that anaemia is highly correlated with the severity of chronic kidney disease.

Conclusion:-

Anemia is a leading cause of morbidity in CKD patients, and it worsens as the disease progresses.Themostcommontypesofanaemiaarenormocyticnormochromicanaemiacaused by EPO deficiency and microcytic hypochromic anaemia caused by iron deficiency. The evaluationofHbandRBCparametersinCKDpatientsaidsinclassifyingthetypeofanaemia, aiding in the selection of appropriate treatment modalities, and avoiding unnecessary iron overload in the patients.

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