INTRODUCTION
The prevalence of chronic kidney disease has increased worldwide because of the growing numbers of cases of hypertension, diabetes, obesity, in addition to aging of the general population. Chronic kidney disease is a worldwide public health problem, both for the number of patients and cost of treatment involved. Globally, CKD is 12th cause of death and 17th cause of disability, respectively. This is an underestimate as patients with CKD are more likely to die of cardiovascular diseases than to reach end stage renal disease (ESRD). Laboratory findings and clinical symptoms are utilized in the diagnosis of CKD. Radiological examination is an important tool for the differential diagnosis. Plain abdominal radiography, intravenous pyelography, ultrasonography (US), and computed tomography (CT) are commonly used methods. US is a simple, cost-effective, and non-invasive method that is easy to use for renal imaging. Length, volume, echogenicity, and cortical thickness are important parameters in making an ultrasonographic diagnosis. Length is feasible to measure, but is not necessarily diagnostic, as it is not always measured using a standardized approach and is related to body size. In previous studies, kidney volume was used as a direct indicator of kidney size, rather than kidney length, but evaluating renal volume is difficult and requires experience. Renal cortical thickness (RCT) and echogenicity have also been used in the diagnosis of CKD. With the progression of the disease, RCT decreases and echogenicity increases. Laboratory assays play a supportive role tracking the progression of the disease during follow-up, along with the previously mentioned methods. However, echogenicity is mainly based on the evaluation of a specialist, which in turn may yield subjective results; moreover, no established standardized normal range values currently exist for echogenicity, and a normal result for renal echogenicity does not exclude the possibility that the patient’s kidney is damaged. The aim of this study was to evaluate the correlations between laboratory findings and ultrasonographic measurements of renal length and cortical thickness in patients of CKD.

AIMS AND OBJECTIVES
1) To determine whether there is relation between renal cortical thickness and renal size measured on ultrasonogram and degree of renal impairment in chronic kidney disease
2) To determine whether renal cortical thickness is better than renal size as an indicator of renal function in chronic kidney disease.

REVIEW OF LITERATURE
CKD encompasses a spectrum of different pathophysiologic process associated with abnormal kidney function and a progressive decline in glomerular filtration rate (GFR). Previously CKD had been staged solely by the GFR. However the risk of worsening of kidney function is closely linked to amount of albuminuria and so it has been incorporated into classification. The following figure provides a recently updated classification in which stages of CKD are stratified by both estimated GFR and degree of albuminuria, in order to predict risk of progression of CKD.

RISK FACTORS FOR CKD:
- Small for gestational birth weight
- Childhood obesity
- Hypertension
- Diabetes
- Advancing age
- Autoimmune disease
- African ancestry
- Family history of kidney disease
- Previous episode of acute kidney injury
- Presence of proteinuria
- Nephrotoxins
- Structural abnormalities of urinary tract
- Obstructive sleep apnea

LEADING CATEGORIES OF ETIOLOGIES OF CKD:
1) Diabetic nephropathy
2) Glomerulonephritis
3) Hypertension associated CKD.
4) Autosomal dominant polycystic kidney disease
5) Other cystic and tubulointerstitial nephropathy

MATERIALS AND METHODS
STUDY AREA:
KING GEORGE HOSPITAL, VISAKHAPATNAM

SAMPLE SIZE:
50 cases and 50 controls

MODE OF SELECTION:
By simple random method

LABORATORY METHODS:
1) Estimation of serum creatinine by jaffes reaction using alkaline picrate.
2) Ultrasonogram performed using standard gray scale b mode imaging with a 3.5Mhz measurements.

STUDY POPULATION:
50 Patients admitted in department of general medicine, KING GEORGE HOSPITAL from march 2018 to September 2019.

INCLUSION CRITERIA:
1) Cases of chronic kidney disease confirmed by ultrasound and serum creatinine levels
2) Those willing to participate in the study
3) Patients not on dialysis
4) Age 15 to 80 yrs

EXCLUSION CRITERIA:
1) Patient known diabetic
2) Patient on dialysis
3) Adult polycystic kidney disease
4) Chronic pyelonephritis
5) Previous history of acute renal failure
6) CKD due to post renal causes

METHODOLOGY:
Present study is conducted on 50 patients admitted in DEPARTMENT...
OF GENERAL MEDICINE, KING GEORGE HOSPITAL, VISAKHAPATNAM, AP. Patients underwent renal ultrasound and at least three serum creatinine levels during period of hospital stay. The lowest creatinine is used for calculating estimated glomerular filtration rate using both Cockcroft gault formula and modification of diet in renal disease equations. Cortical thickness is measured in sagittal plane over a medullary pyramid perpendicular to capsule. Size will be measured pole to pole. Linear regression is used for statistical analysis. Simultaneously 50 controls matched by age and sex and willing to participate is included in study.

**OBSERVATION AND RESULTS**

**Table 1:**

<table>
<thead>
<tr>
<th>AGE GROUP</th>
<th>FREQUENCY</th>
<th>PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>40-50</td>
<td>18</td>
<td>36.0</td>
</tr>
<tr>
<td>51-60</td>
<td>20</td>
<td>40.0</td>
</tr>
<tr>
<td>61-70</td>
<td>6</td>
<td>12.0</td>
</tr>
<tr>
<td>71-80</td>
<td>6</td>
<td>12.0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>50</td>
<td>100.0</td>
</tr>
</tbody>
</table>

So the majority of cases that is about 40% falls in the age group between 51 to 60 years followed by 36% of individuals between 41 to 50 years, 12% between 61 to 70 yrs and another 12% between 71 to 80 yrs.

**Table 2:**

<table>
<thead>
<tr>
<th>SEX</th>
<th>FREQUENCY</th>
<th>PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>FEMALE</td>
<td>16</td>
<td>32.0</td>
</tr>
<tr>
<td>MALE</td>
<td>34</td>
<td>68.0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>50</td>
<td>100.0</td>
</tr>
</tbody>
</table>

So above table shows gender predilection more for males compared to females contributing about 68%.

**Table 3: Associated Chronic Diseases**

<table>
<thead>
<tr>
<th>DISEASE</th>
<th>NO.OF PATIENTS</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>HYPOTHYROIDISM</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>HYPERTENSION</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>RESPIRATORY</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>CARDIAC PROBLEM</td>
<td>22</td>
<td>44</td>
</tr>
<tr>
<td>PSYCHIATRY</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

The mean age of population included in this study was 55.8 years. The mean renal length 9.972 cms and mean renal cortical thickness is 0.6056 cms with mean MDRD EGFR 35.6736 and CG EGFR 35.0064.

**Table 4:**

<table>
<thead>
<tr>
<th></th>
<th>Age</th>
<th>MDRD EGFR</th>
<th>CG EGFR</th>
<th>Mean Renal Length CM</th>
<th>Mean Renal Cortical Thicknesscm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>55.800</td>
<td>35.6736</td>
<td>35.0064</td>
<td>9.9720</td>
<td>0.6056</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>10.6694</td>
<td>16.06737</td>
<td>19.05109</td>
<td>1.26201</td>
<td>0.19220</td>
</tr>
<tr>
<td>Minimum</td>
<td>40.0</td>
<td>7.35</td>
<td>10.72</td>
<td>7.15</td>
<td>0.28</td>
</tr>
<tr>
<td>Maximum</td>
<td>80.0</td>
<td>66.33</td>
<td>99.38</td>
<td>12.40</td>
<td>1.10</td>
</tr>
</tbody>
</table>

**Correlation of MDRD egfr with renal length:** This shows a statistically significant positive correlation between renal length and egfr calculated by MDRD.

**Table 5:**

<table>
<thead>
<tr>
<th>MDRD EGFR</th>
<th>PEARSON CORRELATION</th>
<th>SIG. (2-TAILED)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>50</td>
<td>.006</td>
</tr>
</tbody>
</table>

**Correlation of MDRD egfr with renal cortical thickness:** This shows a statistically significant positive correlation between renal cortical thickness and egfr calculated by MDRD.

**Table 6:**

<table>
<thead>
<tr>
<th>MDRD EGFR</th>
<th>PEARSON CORRELATION</th>
<th>SIG. (2-TAILED)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>50</td>
<td>.000</td>
</tr>
</tbody>
</table>

**Correlation of CG egfr with renal length:** This shows a statistically significant positive correlation between renal length and egfr calculated by CG.

**Table 7:**

<table>
<thead>
<tr>
<th>CG EGFR</th>
<th>PEARSON CORRELATION</th>
<th>SIG. (2-TAILED)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>50</td>
<td>.000</td>
</tr>
</tbody>
</table>
Correlation of CG eGFR with renal cortical thickness: This shows a statistically significant correlation between renal cortical thickness and eGFR calculated by CG.

<table>
<thead>
<tr>
<th>CG EGF</th>
<th>MEAN RENAL CORTICAL THICKNESS CM</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>50</td>
</tr>
<tr>
<td>THICKNESS CM</td>
<td>.815**</td>
</tr>
<tr>
<td>SIG (2-TAILED)</td>
<td>.800</td>
</tr>
</tbody>
</table>

** CORRELATION IS SIGNIFICANT AT THE 0.01 LEVEL (2-TAILED).

DISCUSSION

The burden of CKD has dramatically increased and is consuming the resources of both developed and developing economies. For this reason, efforts to reduce the cost of managing this disease are always welcomed. CKD encompasses a spectrum of different pathophysiologic process associated with abnormal kidney function and a progressive decline in glomerular filtration rate (GFR). Although serum urea and creatinine concentrations are used to measure the excretory capacity of the kidneys, accumulation of these two products themselves do not account for many symptoms and signs that characterize the uremic syndrome in advanced renal failure. A host of metabolic and endocrine functions normally performed by kidneys is also impaired or suppressed, and this results in anemia, malnutrition and abnormal metabolism of carbohydrates, proteins and fats. Furthermore, plasma levels of many hormones, including PTH, FGF-23, prolactin, and renin, increase in chronic kidney disease (CKD), but metabolite and hormone levels can vary in CKD patients. The study population included a study population of 50 patients admitted in the department of medicine. The current study excludes patients who are known diabetic and patients who are on dialysis. Patients underwent renal ultrasound and at least three serum creatinine levels during period of hospital stay. Lowest creatinine is used for calculating estimated glomerular filtration rate using both Cockroft formula and modification of diet in renal disease equations. In the present study mean age of patients is 55.8 years and mean MDRD eGFR 35.6736 and mean CG eGFR is 35.0064. Mean renal length measured at ultrasound 9.972 cm and mean renal cortical thickness 0.6056 cm. Patients on dialysis were not necessarily excluded but were not included. Examining the relationship between renal function on the basis of serum creatinine and cortical thickness would be inherently flawed in this group because the creatinine used for calculation would be a measure of dialysis efficacy rather than native renal function. Statistical analysis of the data is made using linear regression. The present study demonstrated a statistically significant positive relationship between renal length and CG eGFR. Both the equations used for measuring eGFR in this study showed a statistically significant positive relationship with renal length with CG formula showing more statistical correlation when compared to MDRD formula. In addition to this, the present study demonstrated a more statistically significant positive relationship for renal cortical thickness than renal length with CG formula. In the present study, it appears that cortical thickness measured at ultrasound may be more closely related to eGFR than renal length in patients with chronic renal failure. Prior studies have also evaluated imaging measurements as surrogate markers of renal function. The present study demonstrated a statistically significant negative correlation between serum creatinine and cortical thickness. Based on the current study, it seems that cortical thickness measured using US may be more closely related to eGFR than renal length in patients with nephropathy, amyloidosis. Based on the current study, it seems that cortical thickness measured using US may be more closely related to eGFR than renal length in patients.
larger patient samples may include development of a predictive range of renal function given a particular cortical thickness. Alternatively, a determination of a threshold cortical thickness above which renal function is preserved may be identified.

**SUMMARY**

From the present study

1) The mean age of population included in this study was 55.8 years.
2) The mean renal length 9.972 cms.
3) Mean renal cortical thickness is 0.6056 cms.
4) Mean MDRD EGFR 35.6736 and CG EGFR 35.0064.
5) Both MDRD and CG equations correlated EGFR with both renal length and renal cortical thickness.
6) But statistically the amount of correlation is more with renal cortical thickness than with renal length.
7) statistically CG equation showed better correlation than MDRD equation with both renal length and renal cortical thickness.

**CONCLUSION**

In summary the present study recommends routine measurement of not only renal length on ultrasound abdomen but also renal cortical thickness should be measured because renal length which can vary with height of the individual and BMI, unlike cortical thickness, which has more positive correlation with renal function measured in terms of eGFR with CG and MDRD formula. As mentioned above, various studies have demonstrated varying results in terms of renal length and renal cortical thickness measurement in terms of renal function. But the present study had proved that both renal length and renal cortical thickness had positive correlation with eGFR with renal cortical thickness being more significant than renal length and so must be done for every case of CKD to minimize economic burden, to have good follow up, to decrease radiation to patient.

**REFERENCES**

1) Lederer E,ouseph R.CHRONIC KIDNEY DISEASE.am j kidney disease 2007;49 162 71.
2) Veerappan I, Abraham G. Chronic kidney disease: current status, challenges and management in India. Ch. 150, Sec.: 17. apiindia.org/medicine_update 2013,g:93.