**Introduction**

Gastrointestinal manifestations of uremia are non-specific and include nausea, vomiting, anorexia, epigastric pain, heart burn, hiccups and gastrointestinal hemorrhage. The pathogenesis of these abnormalities is poorly understood. Proposed mechanisms include increased back diffusion of hydrogen ions across the gastric mucosal barrier, hypergastrinemia, hyperacidity, hyperparathyroidism, *H. pylori* infection and impaired defensive mechanisms like gastric bicarbonate secretion. The present study was undertaken to study the effects of uremia on gastric acid and bicarbonate secretion in end stage renal disease (ESRD) patients on maintenance hemodialysis (MHD) and to correlate the bicarbonate secretion with morphological changes in the upper gastrointestinal tract and with the presence of *H. pylori*.

**Patients and Methods**

Twenty eight adults with ESRD on MHD with symptoms of acid-peptic disease were included as cases. Control group comprised of 20 patients with similar symptoms without evidence of kidney disease. After obtaining informed consent, all patients subsequently underwent estimation of gastric secretion and upper gastrointestinal endoscopy (UGIE). Statistical analysis was done by student t-test and paired t-test.

**Results:**

Rate of gastric juice secretion, acid output and volume of parietal cell secretion were significantly less in CKD patients as compared to patients without kidney disease. The non-parietal cell secretion, bicarbonate output and total acid secretion (acid output + bicarbonate output) were also significantly less in CKD patients as compared to controls. The acid bicarbonate output was not significantly different in CKD patients with endoscopic changes on UGIE as compared to CKD patients without significant endoscopic abnormalities.

**Conclusion:**

The study indicates that there is a generalized secretory defect in ESRD patients leading to decrease in both acid and bicarbonate secretion. Symptoms of dyspepsia possibly occur because of an imbalance between acid and bicarbonate secretion rather than an absolute change in the amount of either acid or bicarbonate secretion.
for plasma osmolality at 30 minutes of the start of aspiration. Measurements included

i. Total volume of gastric juice to the nearest 0.5 ml

ii. Osmolality of plasma and gastric juice and

iii. H+ ion concentration of gastric juice.

Osmolality was measured by freezing point depression method with the help of advanced digametic osmometer. Readings were taken in triplicate and the mean (expressed as milliosmoles per kilogram) taken for calculation H+ ion concentration was measured in-vitro by titration of gastric juice to pH 7.0 using 0.1N NaOH with the help of El top digital pH meter. All measurements were taken at room temperature.

Calculations were done by the method described by Feldman et al., two basic equations were used:

I. Measured acid output = Acid secreted - Acid neutralized

II.Measured osmolar output = Osmoles secreted - Osmoles neutralized

III. Bicarbonate secretion = Acid neutralized

UGIE was then performed on all CKD patients for visualization of lesions and taking biopsy (2cm) for rapid urease test (RUT) and histopathological examination for H. pylori.

Statistical analysis

The results were expressed as mean±SD. Statistical analysis was done by Student t-test and paired t-test.

Results

Amongst the case 21 (75%, n=28) were males where as all (100%, n=20) the patients in the control group were males. The mean age of cases was 36.3 years whereas it was 35.2 years for controls.

The rate of gastric juice secretion in CKD patients was 58.7±3.2ml/hr as compared to 83.8±6.1ml/hr in controls (p<0.05). Plasma osmolality in CKD patients was significantly higher (330.4±9.0mOs/m/kg; p<0.01). Gastric juice osmolality followed the same pattern as that of plasma osmolality (CKD 218.2±8.1mOs/m/kg, controls 156.7±10.6mOs/m/kg; p<0.05). There was no difference in the gastric juice acidity, but the acid output and volume of parietal cell secretion were significantly less in gCKD patients as compared to controls (p<0.05) (Table 1). Five patients of CKD had achlorhydria.

The non-parietal cell secretion, bicarbonate output and total acid secretion (acid output + bicarbonate output) were significantly less in CKD patients as compared to controls. The bicarbonate concentration of the non-parietal juice was also less in CKD patients as compared to controls although the difference was not statistically significant (Table 1).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>CKD Patients with Abnormalities on UGIE (n=14)</th>
<th>CKD Patients without Abnormalities on UGIE (n=14)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acid output (mEq/hr)</td>
<td>2.02±0.26</td>
<td>1.87±0.29</td>
<td>NS</td>
</tr>
<tr>
<td>Bicarbonate output (mmol/hr)</td>
<td>3.8±0.42</td>
<td>3.6±0.41</td>
<td>NS</td>
</tr>
<tr>
<td>Total acid output (mmol/hr)</td>
<td>5.82±0.43</td>
<td>5.46±0.61</td>
<td>NS</td>
</tr>
</tbody>
</table>

Discussion

Although involvement of the gastrointestinal tract in CKD occurs frequently [1], its pathogenesis is poorly understood. Although gastric acid secretion and endoscopic studies have been done in uremic patients, data is scant on the correlation of gastric secretory function with endoscopic findings. Therefore, the present study was carried out to quantify both gastric acid and bicarbonate secretion and study their relation to gastric morphology.

In the present study, the basal acid output in ESRD patients was found to be significantly low as compared to subjects with dyspepsia and normal renal function. Earlier studies on acid output in kidney disease patients have shown conflicting results with some studies reporting hyperchlorhydria [2,3] while other showing normal or low acid output [4-6]. We also found that the...
bicarbonate output and bicarbonate concentration in the non-parietal cell secretion were low in CKD patients as compared to controls. These findings point towards a generalized secretory defect in ESRD patients leading to decrease in both acid and bicarbonate secretion. Symptoms of dyspepsia possibly occur because of an imbalance between acid and bicarbonate secretion rather than an absolute change in the amount of either acid secretion [7].

Abnormal findings on UGIE were observed in 50% of ESRD patients in this study. Previously, incidence of endoscopic abnormalities in CKD patients has been reported to be between 41.5-90.7% [8,9]. The reason for this wide variation in the incidence is not apparent but has been proposed to be due to differences in gastric acid status of different racial groups and partly due to subjective variation in interpretation of various inflammatory changes on endoscopy. Notwithstanding, the incidence of peptic ulcers was low (7.1%) in CKD patients, consistent with findings of other series (0-3.3%) [9,10].

The prevalence of H. pylori infection in CKD population reported in literature is quite varied (24%-88%) [10,11], with studies reporting both significantly higher [12] and lower [13] prevalence of H. pylori infection in uremic patients as compared to those with normal renal function. This discrepancy may be partly explained by the use of less sensitive and specific (techniques serologic or breath analysis) for the detection of H. pylori infection. Using rapid urease test and antral biopsies for the detection of H. pylori, we found that the prevalence of H. pylori was less in CKD patients as compared to subjects with normal renal function [14-20].

Conclusion

The findings of the present study point towards a generalized secretory defect in ESRD patients leading to decrease in both acid and bicarbonate secretion. Symptoms of dyspepsia possibly occur possibly because of an imbalance between acid and bicarbonate secretion rather than an absolute change in the amount of either acid secretion.

References


