A STUDY TO CORRELATE LOW SERUM IRON LEVELS WITH GALLSTONES

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ABSTRACT

Gallstone disease is a common ailment encountered in day-to-day practice affecting the adult population of both sexes. The common belief that a typical gallstone disease affects a fat, fertile, female of fifty, is only partially true, as the disease is found in both the sexes of varying age groups and also in underweight and thin people. Recent studies have demonstrated the role of iron deficiency and defective pH in the formation of gallstones.

AIMS

To establish the role of iron deficiency in the formation of gallstones.

MATERIALS AND METHODS

One hundred and twenty patients were studied prospectively over a period of two years in Department of General Surgery at Krishna Institute of Medical Sciences, Karad. Serum iron and serum cholesterol levels of patients suffering from cholelithiasis were compared with healthy individuals. Data amongst the two groups were subjected to statistical analysis was using students t-test. The P-value <0.05 was considered significant.

OBSERVATIONS AND RESULTS

Most of the patients with gallstones had low serum iron levels. Serum cholesterol levels of patients suffering from cholelithiasis were not significantly different from that of normal healthy individuals.

CONCLUSION

Low serum iron levels lead to bile super-saturation with respect to cholesterol, which leads to gallstone formation.

KEYWORDS

Gallstones, Serum Iron, Serum Cholesterol.


INTRODUCTION

As per the popular belief that a typical gallstone sufferer is a fat, fertile, female of forty, is only partially true, as the disease has been found in women soon after their first delivery and also in underweight and thin people. So while searching the literature for different factors, iron deficiency was found to be a new and interesting etiological factor in the formation of gallstones.[1,2]

Gallstones may produce several symptoms or may remain asymptomatic. Over half the cases are asymptomatic, usually detected by abdominal ultrasound. Today, the incidence of gallstone disease has increased considerably with the invention of ultrasonography.

Three conditions must be met to permit the formation of cholesterol gallstones

1. Bile must be supersaturated with cholesterol.
2. Nucleation must be kinetically favorable.
3. Cholesterol crystals must remain in the gallbladder long enough to agglomerate into stones.

Iron deficiency has been shown to alter the activity of several hepatic enzymes, leading to increased gallbladder bile cholesterol saturation and promotion of cholesterol crystal formation.

Iron acts as a coenzyme for Nitric Oxide Synthetase (NOS), which synthesizes Nitric Oxide (NO) and that is important for maintenance of basal gallbladder tone and normal relaxation. It was found that iron deficiency resulted in altered motility of gallbladder and sphincter of Oddi leading to biliary stasis and thus increased cholesterol crystal formation in the gallbladder bile.

AIM AND OBJECTIVE

To establish the role of iron deficiency in the formation of gallstones.

MATERIAL AND METHODS

One hundred and twenty patients were studied prospectively over a period of two years in Department of General Surgery at Krishna Institute of Medical Sciences, Karad. Serum iron and serum cholesterol levels of patients suffering from cholelithiasis were compared with healthy individuals. Research committee of the institute approved the protocol. Study group included 60 pts. suffering from cholelithiasis admitted in Krishna Hospital, Karad, confirmed by USG. Control group consisted of 60 healthy individuals.

In the control group individuals with liver cirrhosis, hematological disorders, cystic fibrosis, pyruvate kinase deficiency and pts. on long term hepato-toxic drugs and other drugs causing gallstones and pregnant females were excluded.
Serum iron was estimated by Ferrozine kit method.[3] The normal reference values were supplied with the kit, for males (60-160ug/dl) and for females (35-145ug/dl). Serum cholesterol was estimated by CHOD-PAP kit based on cholesterol oxidase/peroxidase method as devised by Allain et al.[4]

RESULTS

<table>
<thead>
<tr>
<th>Sl No.</th>
<th>Serum Iron</th>
<th>Anaemic Cases</th>
<th>Control Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Anaemic No. (%)</td>
<td>Non-A Anaemic No. (%)</td>
</tr>
<tr>
<td>1</td>
<td>&lt; Normal</td>
<td>32 (53.3%)</td>
<td>13 (21.7%)</td>
</tr>
<tr>
<td>2</td>
<td>Normal</td>
<td>6 (10%)</td>
<td>9 (15%)</td>
</tr>
<tr>
<td>3</td>
<td>&gt;Normal</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>Total</td>
<td>38</td>
<td>22</td>
</tr>
</tbody>
</table>

Table No. 1: Shows the following:
1. 75% of the pts. with gallstones have values of serum iron less than normal.
2. 53.3% of the pts. in case group with low serum iron are anemic.
3. 48.3% of healthy individuals have low serum iron.
4. 6.6% of control group who have low serum iron are anemic.
5. Most of the pts. with gallstones have serum iron levels less than normal and they are anemic.

<table>
<thead>
<tr>
<th>Sl No.</th>
<th>Serum Cholesterol</th>
<th>Anaemic Cases</th>
<th>Control Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Anaemic No. (%)</td>
<td>Non-A Anaemic No. (%)</td>
</tr>
<tr>
<td>1</td>
<td>&lt; Normal</td>
<td>14 (23.3%)</td>
<td>7 (11.7%)</td>
</tr>
<tr>
<td>2</td>
<td>Normal</td>
<td>19 (31.7%)</td>
<td>17 (28.3%)</td>
</tr>
<tr>
<td>3</td>
<td>&gt;Normal</td>
<td>3 (5%)</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>Total</td>
<td>36</td>
<td>24</td>
</tr>
</tbody>
</table>

Table No. 2: Shows the following:
1. 23.3% of anemic and 11.7% of non-anemic patients with gallstones have less than normal serum cholesterol levels, which is 1.7% and 30% in normal healthy individuals respectively.
2. 31.7% of anemic and 28.3% of non-anemic pts. with gallstones have normal serum cholesterol levels, which is 3.3% and 63.3% in normal healthy individuals respectively.
3. There is no effect of anemia on serum cholesterol.

DISCUSSION
Iron deficiency has been shown to alter the activity of several hepatic enzymes leading to increased gallbladder cholesterol saturation and promotion of cholesterol crystal formation.[5,6] Iron acts as a coenzyme for Nitric Oxide Synthetase (NOS), which synthesizes Nitric Oxide (NO) important for the maintenance of gallbladder tone and normal relaxation.[7,8] Alteration of motility of the gallbladder and sphincter of Oddi leading to biliary stasis resulting in cholesterol crystal formation has been reported with iron deficiency.[9]

The present study shows that the gallbladder bile cholesterol level was significantly higher in the anemic individuals, as compared to that of the non-anemic patients. Further, no significant variation in the serum cholesterol values was detected between the anemic group and the non-anemic group.

This study suggests that iron deficiency anemia is playing a significant role in the super-saturation of gallbladder bile with cholesterol and may act as an independent factor in formation of cholesterol gallstones. Defective hepatic cholesterol metabolism and stasis of bile because of decreased motility of the gallbladder can lead to more precipitation of cholesterol and hence formation of gallstones.[10,11]

CONCLUSION
Based on the hemoglobin of the pts. and the control group, all cases were divided into non anemic (i.e. Hb>11g%) and anemic (i.e. Hb≤11g%). Serum cholesterol and serum iron of both groups were analyzed and compared with each other.

REFERENCES


