Audit of Investigations in Patients with Iron Deficiency Anaemia

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ABSTRACT

Background: **Patients with iron deficiency anaemia (IDA) are commonly referred to the gastroenterologists for exclusion of gastrointestinal (GI) pathologies. The British Society of Gastroenterology (BSG) has published a guideline for management of IDA. As recommended by this guideline, all patients should have examinations of both upper and lower GI tract with the exception of pre-menopausal women younger than 45 years old. The primary aim of this audit was to determine how thoroughly patients referred to our unit at the Singapore General Hospital had been investigated. The secondary aim was to determine the yield rate of gastroscopy and lower gastrointestinal investigations (colonoscopy or barium enema) in our patients.**

Methods: **We reviewed the case notes of patients who underwent gastroscopy for indication of anaemia between the period from April to December 1999. We classified iron deficiency anaemia as having haemoglobin of lower than reference range with either low ferritin level or iron/TIBC ratio of less than 10%.**

Results: **Of a total of 326 patients reviewed, 172 patients (65 men, 109 women) met the inclusion criteria of IDA. The median age for the group was 59 (Range 16 to 88) years old and there were 107 (62.2%) women. There were 31 female patients younger than 45 years old (group A) and 141 patients in group B which included all the males and females older than 45 years old. Due to the method of data retrieval, all of the patients in group A fulfilled the standard set by the BSG guideline in that they all underwent gastroscopy. In this group, few gastrointestinal pathologies were found (one patient with peptic ulcer and two patients with colonic cancer). In terms of finding potential gastrointestinal causes of IDA, the yield rate of gastroscopy and colonoscopy were 3.2% and 13.6% respectively. In group B, 96 patients (68%) underwent upper and lower gastrointestinal investigations. Evaluation with gastroscopy showed peptic ulcer disease in 31 patients (21.7 %) and gastric cancer in 9 patients (6.3 %). Only 96 patients (68.1%) in group B had lower gastrointestinal investigations. Twenty-six patients were found to have gastrointestinal disorders (12 patients with colon cancer, 10 colonic polyps, one Crohn's disease, one colonic tuberculosis and two haemorrhoids). The yield rate of gastroscopy and colonoscopy were 31.2% and 25% respectively.**

Conclusion: **In this study of patients with confirmed IDA, we found much higher incidence of gastrointestinal disorders in the group of male and postmenopausal women than in the group with premenopausal women. Furthermore, over 30% of patients in this group did not undergo lower gastrointestinal tract investigations as recommended by the BSG guideline. We also found two cases of colonic cancer in the latter group. We would recommend bidirectional endoscopy for postmenopausal women and men with IDA. For premenopausal women, we would recommend similar approach unless there are clinical pointers to dietary iron deficiency or menorrhagia.**

Keywords: iron deficiency anaemia, gastroscopy, colonoscopy

Singapore Med J 2003 Vol 44(10):504-510

INTRODUCTION

Chronic gastrointestinal blood loss is a common cause of iron deficiency anaemia (IDA) in adult men and post-menopausal women[1,2]. In contrast, menstrual blood loss has been shown to be the commonest cause in pre-menopausal women[3]. Patients with IDA are commonly referred to gastroenterologists for exclusion of gastrointestinal (GI) pathologies. However, one study suggested that investigations of most patients with IDA were suboptimal[4]. The British Society of Gastroenterology (BSG) recently published a guideline for management of IDA[5]. This guideline recommends that all patients

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Table I. Clinical characteristics and laboratory data for groups A and B.

	Whole group (172)	Group A (31)	Group B (141)	p-value
Median age (Range), years	59 (16 to 88)	62.3 (16-88)	55.2 (18-87)	NS
Concomitant medical disorders:	117	1	116	<0.001
Ischaemic heart dis. (%)	42 (24.1)	0 (0)	42 (29.4)	
Chronic renal failure (%)	11 (6.3)	0 (0)	11 (7.7)	
Haemodialysis (%)	4 (2.3)	1 (0)	3 (2.1)	
Cerebrovascular dis. (%)	17 (9.8)	0 (0)	17 (12)	
Diabetes mellitus (%)	39 (22.4)	0 (0)	39 (27.3)	
* COLD(%)	4 (2.3)	0 (0)	4 (2.8)	
Medications:	52	0	52	<0.001
Aspirin (%)	35 (20)	0 (0)	35 (24.5)	
Ticlopidine/Clopidrogel (%)	5 (2.87)	0 (0)	5 (3.5)	
NSAIDs (%)	7 (4)	0 (0)	7 (4.9)	
Warfarin(%)	5 (2.87)	0 (0)	5 (3.5)	
Haematinics:				
Mean Haemoglobin ± SD, G/DL	8.02 ± 1.9	8.3 ± 2.1	7.9 ± 1.9	NS
Mean MCV ± SD, FL	73.0 ± 12.1	70 ± 9.4	73.6 ± 12.5	NS
Mean MCHC	30.1 ± 4.9	28.5 ± 3.8	30.5 ± 4.9	NS
Mean Ferritin ± SD, ng/ml	82.3 ± 211.6	12.8 ± 18.6	96.7 ± 228.5	0.01
Mean Iron ± SD, Umol/L	5.7 ± 6.2	5.6 ± 5.1	5.7 ± 6.4	NS
Mean TIBC ± SD, Umol/L	66.4 ± 14.8	72.2 ± 12.8	65.2 ± 14.6	NS
Mean Iron/TIBC ± SD	9.0 ± 9.1	8.22 ± 8.3	9.2 ± 9.3	NS

*Chronic obstructive lung disease.

should have examinations of both upper and lower GI tract with the exception of premenopausal women younger than 45 years old and post gastrectomy patients. This guideline has set the target of 90% that patients with IDA should have complete examinations for the purpose of audit.

Singapore General Hospital (SGH) is a tertiary referral centre with a bed capacity of 1,500 beds. Over 1,500 endoscopic procedures per year are performed in the endoscopy unit. This audit was undertaken to determine the standard of management for patients with IDA by our institution against the BSG guideline. The secondary aim was to determine the yield rate of gastroscopy and lower gastrointestinal investigations (colonoscopy or barium enema) in our patients.

METHODS

Patients

Patients who underwent gastroscopy for the indication of anaemia were identified from our endoscopy database. In our unit, gastroscopy is the initial investigation of choice for patients with IDA in view of the ease of procedure and high prevalence of gastric carcinoma in our region. Patients who underwent gastroscopy for prior abnormal findings on barium meal were excluded from the study. The study period chosen was between April and December 1999 and the audit was undertaken June 2001, thus allowing a minimum follow up period of at least 18 months. Anaemia was defined by a Hb<12 g/dl for women and <14 g/dl for men according to the reference range from our hospital's laboratory. For the definition of iron deficiency anaemia, we defined it as having haemoglobin of lower than reference range with either a low ferritin level (less than 20µg) or iron/TIBC (Total iron binding capacity) ratio of less than 10%[6-9]. We did not consider low mean corpuscular volume as an indication of IDA because of the high prevalence of thalassaemia in this region[10]. Premenopausal status was defined as an indication in the medical case notes that a woman was still menstruating. Patients with overt gastrointestinal bleeding (melaena, haemetemesis or haematochezia) were excluded since in these cases, the site of pathology and choice of investigations would be obvious to the clinicians. We confined the study to patients who had no hint as to the origin of the IDA. In addition, patients were excluded if they had a known cause for blood loss such as recent surgery, trauma, or acute gastrointestinal bleeding.

Case notes analysis

Patients' case-notes were reviewed for their demographic data, presence of gastrointestinal symptoms, concurrent

medications, laboratory results, endoscopic and radiological findings. Gastrointestinal symptoms included nausea, vomiting, odynophagia, dysphagia, heartburn, dyspepsia, anorexia, weight loss, change in bowel habits, tenesmus and lower abdominal pain.

For the purpose of our study, we considered the following diagnoses to be potential causes of IDA. "Diagnosis" was defined as the finding of any lesion that could be considered definitely or probably the cause of a patient's IDA[11]. These lesions were: peptic ulcer disease (gastric or duodenal ulcers of more than 10 mm, more than five gastric erosions defined as mucosal breaks), gastrointestinal malignancies, inflammatory bowel disease, colonic polyp, vascular malformations and bleeding haemorrhoids of more than three times per week for six months. This is in line with the definition adopted by one recent study[11]. The findings of oesophagitis, hiatus hernia, gastric polyps, gastritis, duodenitis, and colonic diverticula were not considered as significant gastrointestinal pathologies. These conditions are generally not considered a source of chronic blood loss severe enough to cause IDA.

Follow-up of patients

Patients' case notes were reviewed for their clinical course and response to iron supplements. Patients who were no longer on follow-up were contacted through telephone interview for any new illness or diagnoses made since their discharge. Diagnosis of dietary lack of iron as the cause of anaemia was made as a diagnosis of exclusion after complete evaluation in patients who gave history of deficiency dietary intake of iron and who showed response to iron replacement therapy i.e. improvement of haemoglobin to the normal range[6]. Patients were considered to have complete evaluation if they had undergone both gastroscopy and colonic investigations with either colonoscopy or barium enema. Menorrhagia is defined as duration of menstrual flow of longer than seven days or if there is presence of clots[12]. The label of "Undiagnosed" was given to those patients who had incomplete evaluation and whose case notes did not reveal a possible cause of iron deficiency such as dietary history or menorrhagia.

RESULTS

Three hundred and twenty-six patients were identified to have undergone gastroscopy for investigations of anaemia during the study period. Of these patients, 174 patients (53.4%) met the inclusion criteria of IDA. Two patients who met the inclusion criteria of IDA were excluded as they had presented with oesophageal variceal haemorrhage in the months preceding the study

Table II. Findings from gastrointestinal investigations in the two groups.

	Whole group (172)	Group A (31)	Group B (141)
Gastroscopy (%)	172 (100)	31 (100)	141 (100)
Normal	85 (49.4)	25 (80.6)	60 (42.6)
Oesophagitis	0 (0)	0 (0)	0 (0)
Gastritis/duodenitis	42 (24.4)	5 (16.1)	37 (26.3)
Peptic ulcer disease	32 (18.6)	1 (3.2)	31 (22)
Oesophageal cancer	1 (0.6)	0 (0)	1 (0.7)
Gastric cancer	8 (4.7)	0 (0)	8 (5.7)
Vascular malformations	3 (1.7)	0 (0)	3 (2.1)
* CMV oesophageal ulcer	1 (0.6)	0 (0)	1 (0.7)
Colonoscopy/barium enema (%)	118 (68.6)	22 (71)	96 (68)
Normal	86 (50)	18 (58.1)	68 (48.2)
Haemorrhoids	3 (1.7)	1 (3.2)	2 (1.4)
Colonic polyp	10 (5.8)	0 (0)	10 (7.1)
Colonic/rectal cancer	14 (8.1)	2 (6.4)	12 (8.5)
Inflammatory bowel disease	2 (1.2)	1 (3.2)	1 (0.7)
Diverticular disease	2 (1.2)	0 (0)	2 (1.4)
Colonic tuberculosis	1 (0.6)	0 (0)	1 (0.7)
Small bowel radiology	24 (14)	7 (22.6)	17 (12)
Normal	20 (11.6)	6 (19.4)	14 (10)
Small bowel cancer	3 (1.7)	0 (0)	3 (2.1)
Inflammatory bowel disease	1 (0.6)	1 (3.2)	0 (0)

*Cytomegalovirus infection

Table III. Final diagnoses made as the potential cause of IDA in groups A and B.

	Whole group (172)	Group A (31)	Group B (141)
Upper gastrointestinal disorders (%)			
Peptic ulcer disease	32 (18.6)	1 (3.2)	31 (22)
Oesophageal cancer	1 (0.6)	0 (0)	1 (0.7)
Gastric cancer	8 (4.6)	0 (0)	8 (5.6)
Vascular malformations	3 (1.7)	0 (0)	3 (2.1)
CMV oesophageal ulcer	1 (0.6)	0 (0)	1 (0.7)
Small bowel and colonic pathologies			
Small bowel cancer	3 (1.7)	0 (0)	3 (2.1)
Colonic polyp	10 (5.8)	0 (0)	10 (7)
Colonic/rectal cancer	14 (8.1)	2 (6.4)	12 (8.5)
Haemorrhoids	3 (1.7)	1 (3.2)	2 (1.4)
IBD	3 (1.7)	2 (6.4)	1 (0.7)
Colonic tuberculosis	1 (0.6)	0 (0)	1 (0.7)
Dietary iron deficiency	34 (19.8)	16 (51.6)	18(12.7)
Menorrhagia	20 (11.6)	7 (22.6)	13 (9.2)
Urological/gynaecological malignancies	4 (2.3)	0 (0)	4 (2.8)
Chronic illness	11 (6.3)	0 (0)	11 (7.8)
Loss of follow up	8 (4.7)	1 (3.2)	7 (4.9)
Undiagnosed	16 (9.3)	2 (6.4)	14 (9.9)

Table IV. Colonoscopic findings in patients who had abnormal gastroscopy.

Gastroscopic findings	Normal colonoscopy	Abnormal colonoscopy	Colonoscopy not performed
Peptic ulcer disease (32 patients) (%)	15 (46.8)	2 (6.3)	15 (46.8)
Gastritis (42 patients)	23 (54.8)	6 (14.3)	13 (31)
Carcinoma (9 patients)	3 (33.3)	0 (0)	6 (66.4)
Total (83 patients)	41 (49.4)	8 (9.6)	34 (40.9)
Percentage of total	49.4	9.6	41

Table V. Types of gastrointestinal tract examinations and their findings of potential causes in the groups A and B.

	Group A (n = 31)	Group B (n = 143)
Number of gastroscopy performed	31	141
Number of patients with potential causes:	1	44
Peptic ulcer dis.	(1)	(31)
Malignancies	(0)	(9)
Vascular malformations	(0)	(3)
* CMV ulcer	(0)	(1)
% yield of gastroscopy	3.2	31.2
Number of colonoscopy and/or barium enema	22	96
Number of patients with potential causes:	4	26
Haemorrhoids	(1)	(2)
Polyps	(0)	(10)
Carcinoma	(2)	(12)
** IBD	(1)	(1)
GI tuberculosis	(0)	(1)
% yield of colonoscopies	18.2	27.1
Number of patients with small bowel radiology	7	17
Number of patients with potential causes:	1	3
Carcinoma	(0)	(3)
IBD	(1)	(0)
% of yield of small bowel radiology	14.2	17.6

* Cytomegalovirus
**IBD is inflammatory bowel disease

period. The median age for the group was 59 (Range 16 to 88) years old and there were 107 (62.2%) women. We divided these patients into two groups according to the age and sex as recommended by the BSG guideline age. There were 31 female patients younger than 45 years old (group A) and 141 patients in group B (women older than 45 years old and all the male patients). Table I shows the clinical characteristics and laboratory data for these two groups.

Co-morbid illnesses were mostly present in group B apart from one patient who had chronic renal failure requiring haemodialysis in group A. The use of low dose aspirin and anti-platelet agents was therefore restricted to patients in group B for their cardiovascular or cerebrovascular disease. There was no significant difference with regard to the severity of anaemia as judged from the values of haemoglobin, iron and TIBC in the two groups. However, the mean ferritin was significantly higher for patients in group B. There was marked variation in the value of ferritin with the range from one to 1,397 ng/ml. This is most likely due high ferritin in patients with chronic illness as it also serves as acute phase reactant[13].

Due to our method of data retrieval, all the patients in group A fulfilled the standard set by the BSG guideline in that they were investigated with gastroscopy. Twenty-two patients (71%) also underwent lower gastrointestinal investigations (colonoscopy or barium enema). However, only 96 patients (68%) in group B were investigated for their lower gastrointestinal tract.

The most common findings from gastroscopy were gastritis/duodenitis (42 patients) and peptic ulcer disease (32 patients). Most of these ulcers were most likely associated with either aspirin or NSAIDs as they were predominantly present in group B (one patient in group A in contrast to 31 patients in group B). Twenty-two patients (71%) from group A

underwent colonoscopy and two cases of colonic cancer (6.5%) were found. They were aged 35 and 42 years old; both patients did not have any underlying risk factor such as Familial Adenomatous Polyposis or family history of colonic cancer. Small bowel follow through was performed in seven patients and one 39-year-old woman was found to have small bowel Crohn's Disease.

There were 141 patients in Group B patients with 78 females older than 45 years old and 65 males of all ages. Eight patients were found to have gastric carcinoma and they were all from group B. Three patients had vascular malformation in the body and antrum of their stomachs and all the three of them had underlying chronic renal failure on haemodialysis. One patient was diagnosed to have oesophageal ulcer caused by cytomegalovirus; he had underlying infection with human immunodeficiency virus. Ninety-six patients (68.1%) in this group underwent either colonoscopy (68 patients) or barium enema (28 patients). Two patients had haemorrhoids with bleeding deemed severe enough to cause IDA. Colonic polyp was diagnosed in 10 patients and 12 patients were found to have colonic cancer. One patient was found to have caecal ulcer from gastrointestinal tuberculosis. Consent for colonoscopy could not be obtained from relatives of three patients due to advanced age and underlying dementia. One patient defaulted his appointment for colonoscopy and was lost to follow up. IDA in one patient was attributed to previous gastrectomy and colonoscopy was not offered to the patient. Out of the total 16 patients (9.0%) who underwent small bowel series, small bowel cancer was diagnosed in three patients (2.1%). One of these patients had normal gastroscopy and colonoscopy that showed several adenomatous polyps.

Overall, 22 (12.7%) patients had gastrointestinal symptoms, 20 had upper gastrointestinal tract symptoms and two had lower gastrointestinal tract. Three of 20 patients with upper gastrointestinal tract symptoms had upper gastrointestinal tract disorder that could potentially be the cause of IDA. None of the patients with lower gastrointestinal symptom was found to have concomitant lower gastrointestinal pathologies.

Follow-up was available in all apart from eight patients (Table III). All patients with malignancy were managed with a multidisciplinary approach in conjunction with surgeons and oncologists. Dietary iron deficiency was implicated as the cause of IDA in 37 patients (21.5%). Menorrhagia was implicated in 20 (11.6%) of female patients as the cause of the anaemia in the final diagnosis. Thirteen female patients had their IDA attributed to menorrhagia as they were still menstruating. IDA had resolved in these two groups of patients at follow up. Other potential causes of IDA were urological and gynaecological malignancies in four patients and chronic illness in 11 patients. One elderly patient from the chronic illness category died from myocardial infarction.

In view of the nature of the data retrieved, all patient had undergone gastroscopy as the investigations of their anaemia by default. Subgroup analysis on patients who had abnormal gastroscopic findings was performed (Table IV). Of the patients who had peptic ulcer disease, two patients were subsequently found to have colon cancer on their colonoscopy. In the group of patients diagnosed to have gastritis, five patients were diagnosed to have colon cancer and one patients with Crohn's disease involving the caecum. In this group, small bowel radiology also diagnosed a case of terminal ileal Crohn's disease and two patients with small bowel carcinoma. None of the patients diagnosed to have oesophageal or gastric carcinoma were subsequently found to have colonic pathology. Overall in this group of patients with abnormal findings on gastroscopy, only 60% of patients underwent colonoscopy.

The yield rate for finding potential causes of IDA from gastroscopy was 3.2% for group A and 31.2 % for group B (Table V). One hundred and eighteen patients underwent colonic examination, 22 patients from group A and 96 patients from group B. In terms of colonic examination, the yield rate was 13.6% and 25% respectively for group A and B. Small bowel radiology (barium follow through or enteroclysis) was performed in 24 patients. One case of terminal ileal Crohn's disease was diagnosed from group A and three cases from group B with small bowel carcinoma.

DISCUSSION

IDA often is a silent condition, as patients hardly notice any symptoms until there is profound anaemia[14]. IDA has many causes, including menstruation, pregnancy, inadequate iron intake, malabsorption, intravascular haemolysis and gastrointestinal blood loss. The principal management aim of IDA patients is to detect early gastrointestinal pathology, especially malignancies[5]. Dietary lack of iron is a diagnosis of exclusion after the other two other major causes of gastrointestinal blood loss and menstruation have been considered and response to iron replacement has been demonstrated[6,11]. Celiac disease commonly leads to iron deficiency but it is a rare disorder in the Oriental population[15].

In this audit, we found a high incidence of significant pathologies in upper (45 patients, 26.2%) and lower (27 patients, 15.6%) gastrointestinal tract in patients with confirmed IDA. Our figures are

lower than those reported from other published retrospective studies with findings of 38% to 75%[16-18]. This could be due to exclusion of benign pathologies such as oesophagitis, gastritis and duodenitis as potential causes of IDA. The inclusion by some authors of these lesions as possible causes of IDA would increase the diagnostic yield of investigations for IDA. A recent quantitative study showed that the chronic blood loss from these lesions was minimal[19]. The yield rate for significant pathologies in group B (for the male and postmenopausal women) was even more striking: 31.2% for upper gastrointestinal tract and 25% for lower gastrointestinal tract. These results suggest that gastrointestinal evaluation for upper and lower tract is strongly indicated for this group of patients with IDA as gastrointestinal blood loss is of prime concern. This is in line with the BSG guideline[2]. In this audit, only 68% of patients in group B underwent lower gastrointestinal evaluations with either colonoscopy or barium enema as recommended by the BSG guideline.

Premenopausal women are generally viewed as young and healthy and therefore have been excluded from endoscopic studies of patients with IDA[11,20]. Often iron deficiency anaemia in these women is attributed to monthly loss through menorrhagia and no gastrointestinal evaluation is pursued[21]. Menstrual blood loss is an important cause of IDA in our cohort affecting 22.5% of patients in group A and 14.2% in group B.

Although the yield from gastrointestinal evaluation is much lower for premenopausal females (3.2% for upper gastrointestinal and 13.6% for lower gastrointestinal tract), two patients were diagnosed to have colonic cancer. Other studies have also reported similar findings of clinically significant gastrointestinal lesions (gastric and colonic cancer) in up to 12% of premenopausal women with IDA[22]. However, the BSG guideline does not recommend lower gastrointestinal investigations for premanopausal women younger than 45 years old without clinical symptoms[5]. This recommendation needs further review as we did not find gastrointestinal symptoms to be predictive for gastrointestinal lesions. Similar to our findings, various investigators have not found good correlation between gastrointestinal symptoms and the locations of gastrointestinal lesions[21,23]. This discrepancy may be explained by poor localisation of visceral stimuli within the abdomen. A more appropriate approach would be to perform bidirectional endoscopy (gastroscopy and colonoscopy) for premenopausal women who do not have dietary history for lack of iron intake, blood loss from recent pregnancies or menorrhagia.

Some authors have suggested that it was not necessary for a second endoscopic procedure once an aetiology for IDA is found as patients are seldom found to have lesion on both gastroscopy and colonoscopy[21]. There are problems of attribution of cause of anaemia and dual pathology. Quite often patients are found to have gastritis or oesophagitis, but it is hard to tell whether this is the cause of the anaemia. One study showed that 60% of patients had second causes of anaemia if full investigation was carried out[1]. In our series, there was a small but significant number of patients (eight patients) who had dual pathologies on both upper and lower gastrointestinal tract. This is especially so for patients who had been found to have gastritis on upper gastrointestinal evaluation. Even when a significant pathology is found on the upper gastrointestinal tract, the incidence of finding a second pathology on the lower gastrointestinal tract can be as high as 40%, especially in the elderly group[1,20]. There were two patients who had peptic ulcer disease and colon cancer. It is therefore important, especially in the elderly, not to accept the finding of an upper gastrointestinal lesion as the cause of the anaemia, especially if the findings are gastritis or oesophagitis, without considering a more sinister cause in the colon. However, such approach needs careful consideration of comorbidity. In the event of comorbid diseases, care must be taken over the suitability of investigations for patients. There is little point in performing invasive investigations or endoscopic procedures if they will not alter management.

BSG guideline recommends duodenal biopsy for IDA patient to exclude celiac disease. In Western population, the incidence of coeliac disease in patients with IDA has been reported to vary between 2% to 6%[5,24]. However, celiac disease is an exceptionally rare condition among the Oriental population and endoscopists do not commonly perform duodenal biopsy. Of the 24 patients (13.9%) in our cohort who were evaluated with small bowel series, one case of Crohn's disease and three small bowel cancers were diagnosed. The decision has to be taken whether it is worthwhile to examine the small bowel when no abnormality has been found in the upper and lower gastrointestinal tract. The diagnostic yield of barium examination of the small bowel is extremely disappointing[25]. The principle that identification of small bowel pathology should be part of the overall strategy for investigations of IDA is one which is being increasingly acknowledged to ensure that the risk of overlooking small bowel tumours[26,27]. Although small bowel radiology has been found to be disappointing[24,25] by some authors, it was however the modality in our study that diagnosed the three cases of small bowel cancer and one case of small bowel Crohn's disease. We agree that small bowel

investigation has an undoubted place in the investigation of IDA for cases that remain undiagnosed after routine endoscopy[28]. Enteroscopy is useful in identifying small bowel vascular malformations but it is not widely available[27]. All these pathologies are rather uncommon and as recommended by the BSG guideline[5], exclusion of small bowel lesions should be performed if the IDA is transfusion dependent and response to iron therapy is poor at follow-up. The haemoglobin concentration should rise by 2 g/dl after three to four weeks[5].

Occasionally urinary tract tumour may present with IDA. A simple test of urinary microscopy may reveal the presence haematuria if renal cell or bladder carcinoma is present.

Over 60% of our patients had IDA attributed to dietary deficiency after complete evaluation. We would like to emphasise that inadequate intake is a diagnosis of exclusion in accords with most published series. Follow-up and evaluation of respond is mandatory as recommended by the BSG guideline. About 10% of cases remain undiagnosed in our series. Even after extensive investigations, as many as 40% of patients aged over 50 years old may have no identifiable cause of iron deficiency[29]. All of the patients remained well at follow-up and it is likely that the cause of IDA is dietary in origin.

The decision to know just how far to investigate these patients can be difficult especially in the elderly and infirm group. Our audit has several limitations: the data obtained is retrospective and the findings should be limited to hospital patients. It cannot be extrapolated to the primary care setting. Nevertheless, the findings from our audit showed that the prevalence of gastrointestinal pathologies was high in patients with documented IDA, especially in the group of men and postmenopausal women. Lower gastrointestinal evaluation was also found to be inadequate for many patients in this group. Symptom was not found to be predictive for location of lesion as many asymptomatic patients harbour gastrointestinal lesions capable of causing chronic blood loss.

In accordance with the BSG guideline, we would recommend bidirectional endoscopy for postmenopausal women and men with IDA. We would recommend upper endoscopy as the first investigation due to the ease of the procedure and the high yield rate. For premenopausal women, we would recommend similar approach unless there are clinical pointers to dietary iron deficiency or menorrhagia. Small bowel radiology should be considered if the response to iron supplement is poor. Enteroscopy, Meckel's scan or mesenteric angiogram can be considered for diagnosis of vascular malformation but patients with these lesions usually would present with overt gastrointestinal bleeding.

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