UNIVERSITY OF KHARTOUM
FACULTY OF MEDICINE
POSTGRADUATE MEDICAL STUDIES BOARD

CLINICAL CORRELATION TO COLONOSCOPIC
FINDINGS IN PATIENTS PRESENTING TO SOBA AND
IBN-SINA ENDOSCOPY UNITS

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A thesis submitted In partial fulfillment for the degree of
clinical MD in Medicine
April 2005

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بسم الله الرحمن الرحيم

وَفِي الْأَرْضِ آيَاتٌ لِلْمُوقِئِينَ
وَفِي أَنفُسِكُمْ أُقَلَّا تُبْصِرُونَ
وَفِي السَّمَاء رَزَقُكُمْ وَمَا تُوعَدُونَ
فَوَرَبِّ السَّمَاء وَالْأَرْضِ إِنَّهُ لَحَقٌّ مَّثْلَ
مَا أَنْتُكُمْ تَنْطِفُونَ

(سورة الذاريات 20-23)
Dedicated

To:
Those who brought me up.
Those who learned me “la ilaha illa Alla”
My Mother and father
&
Those who supported me to come
and to keep in Sudan
&

To
Mohamed and Sarchil.
Acknowledgment

“All the praises and thanks be to Allah the Lord of Alamin”

I would like to express my greatest thankfulness to my supervisor Dr. Hatim Mohamed Mudawi for his timely correction and his critical suggestions as well as his continuous encouragement and tireless supervision of this work. It was my pleasure to work with Mister Sleman Husein and Dr. Mohamed A. Al Tahir who did the great part of the Colonoscopies. I am very thankful for them for their helps. I can not hide my thankfulness to Dr. Mohamed. Abdul Hameed in Histopathology department of Ibn-Sina Hospital and to Prof. Abdul Fatah Abdul Gadir for their work on the biopsies and to my external examiner of this thesis Dr. Tariq Amir is my best regards.

My gratitude are forward to endoscopy Unit team and histopathology team at Soba University Hospital and Ibn-Sina Hospital. And to my colleagues for their support.

Finally I appreciate the role of my father, Mother, sisters brothers, my wife and their prayers in my work in Sudan.
Abstract

This study is a prospective study of clinical presentation and colonoscopic finding of about 168 patients who presented to Soba University Hospital and Ibn-Sina specialized Hospital. Patients were of various ages (5-85 years) and from various regions in Sudan.

The aim was to find relationships between clinical presentations and Colonoscopic findings to prioritize patients who need Colonoscopy according to that.

Main indications: main indications included change of bowel habit 60 patients (35.9%); bleeding per rectum 36 patients (27.5%); anemia 15 patients (9%); abdominal mass 11 patients (6.6%); constipation 10 patients (6.0%); abdominal pain 7 patients (4.2%); weight loss 5 patients (3.0%).

Patients were categorized to 5 group: malignancy “neoplasm”, polyps “polyps”, colitis in general “IBD”, normal “Normal” and others “others”.

The finding were: IBD (inflammatory bowel disease of any cause): 26 cases making (15.5%), Neoplasms: 18 cases (10.7%), polyps: 24 cases (14.3%), normal: 61 (36.3%), others: 39 (23.2%).

We conclude that Several factors are significant in predicting. Colonoscopic finding and hence prioritizing patients accordingly.

Malignancy is more likely when there is: weight loss; cachexia; pallor; especially when the patients are coming from Eastern Sudan or Southern Sudan.

IBD is more likely when there is: diarrhea; weight loss and fever, especially when the patient is snuffer & / or alcohol consumer.

Polyps are more likely in: male patients; patients who are less than 20 years or more than 60 years especially in the absence of: diarrhea; weight loss and/or pallor.

Normal colonoscopy is more likely in patients who are: females; age of 40-59 years and/or told to have irritable bowel syndrome. But less likely in: patients
with bleeding per rectum; age group less than 20 years. Other conditions are more likely with smoking history.
الملخص

المناظر الفيضون التي يتناسل فيها المرضى علامات وآعراض كانت هذه ضعفاً بعدين يظهر ذلك في علاقة المظهر.

حوالي على الدالة valeuriness 168 وجماعة سودانى السكن من المرضى يمكن أن يكون مع ظهر وعمر تراوح 5 إلى 8 سنة.

الساعات والأعراض بهذا الاتجاه كان: "التام" عادات في التغيير 35,9 (٪) عند السرطان، 27.5 (٪) في الدم الفقر، 9 (٪) بالبطن في مجرى، 6.6 (٪) بالأمراض، 4.2 (٪) في الوزن فقدان، 3.3 (٪) المجاموع الجسدية إلى المريض صنف: بالسودان المصابون "ور" neoplasm الأوزان الزائدة في المريض، "polyps"反腐ه IBD أو "IBD" في المرضى، "others" normal غيرها من الحالات، 36 (٪) 15.5 (٪) في السرطان، 10.7 (٪) الأوزان الزائدة حالات: 24 (٪) 14.3 (٪) في غيرها من الحالات، 39 (٪) 23.2 (٪) في حالات: 61 (٪) 36.6 (٪) في حالات:
العلامات والاعراض المقابلة بعدين تحليلها وللمرشح القولون مناظرة نتائجه مع الأولية الترتيب الزمن من وان نستنتج الحصائيات، الاعمال تلك على بناء مسبقة المريض.

: أعراض الإيجاء المفطرة (الإصابات) وآية الإبهار
. 1 ابتداء المرض أداة أو اجلاء التحقيق في الجريمة فيض أن: المفطرة (الإصابات) وآية الإبهار

 أنت في الحالة والأقسام تحت ما الإنجاب

: المفطرة (الإصابات) في حالة الإبهار

 ذات مدة 60 دقيقة إلى 20 دقيقة تدخل المريض جياحاً في أجا أنك تحسد مفعمة

 لأجل المفطرة (الإصابات) في طب الإصابات

 في أجا المفطرة (الإصابات) إلى أن يصبح فعال

 للكشف عن عدد絲 59 إلى 40 أن جا

 قيAnalyzer لزيادة المفطرة (الإصابات) في طب الإصابات إلى 20 دقيقة

 . كمكيد الإصابات واألاعيب الجراحة الإيجاء
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<tr>
<td>ASGE</td>
<td>American society of gastroendoscopy</td>
</tr>
<tr>
<td>APC</td>
<td>Argon plasma coagulator</td>
</tr>
<tr>
<td>CD</td>
<td>Crohn's disease</td>
</tr>
<tr>
<td>CT</td>
<td>Computerized tomography</td>
</tr>
<tr>
<td>DCBE</td>
<td>Double contrast barium enema</td>
</tr>
<tr>
<td>ESR</td>
<td>Erythrocyte sedimentation rate</td>
</tr>
<tr>
<td>FAP</td>
<td>Familial adenomatous polyposis</td>
</tr>
<tr>
<td>FOBT</td>
<td>Fecal occult blood test</td>
</tr>
<tr>
<td>GIT</td>
<td>Gastrointestinal tract</td>
</tr>
<tr>
<td>HB</td>
<td>Hemoglobin</td>
</tr>
<tr>
<td>HBV</td>
<td>Hepatitis b virus</td>
</tr>
<tr>
<td>HCV</td>
<td>Hepatitis c virus</td>
</tr>
<tr>
<td>IBD</td>
<td>Inflammatory bowel disease</td>
</tr>
<tr>
<td>INR</td>
<td>International normalized ratio</td>
</tr>
<tr>
<td>NAP</td>
<td>Oral sodium phosphate (fleet phospho-soda)</td>
</tr>
<tr>
<td>PEG</td>
<td>Polyethylene glycol</td>
</tr>
<tr>
<td>PT</td>
<td>Prothrombin time</td>
</tr>
<tr>
<td>UC</td>
<td>Ulcerative colitis</td>
</tr>
<tr>
<td>US</td>
<td>Ultrasound</td>
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<td>WBC</td>
<td>White blood cells</td>
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Chapter 1

- Introduction
- Literature Review
- Objectives
Literature review

INTRODUCTION

Colonoscopy is visual examination of the inner surface of the colon by means of a colonoscope; it's Syn: coloscopy. Origin: [colon + G. skopeo, to view] ¹

It enables visual inspection of the entire large bowel from the distal rectum to the cecum. The procedure is a safe and effective means of evaluating the large bowel ². It is usually performed in a hospital under sedation by passing (130 to 180 cm long) flexible endoscopes through the anal canal to examine the entire colon and the terminal ileum.

Cecal intubation is possible more than 90% of the time and more than 98% of colonoscopies when in expert hands ³ with ileal intubation in more than 90% ⁴. It can diagnose potentially curable colonic cancers that would be missed by other techniques, and it can be used for the removal of potentially precancerous adenomatous polyps ⁵.

Endoscopy is appreciably more sensitive and specific than are radiographs. In particular, small lesions (especially under 1 cm) and mucosal changes (such as colitis) are much better evaluated by colonoscopy ⁶. It is being increasingly used for the diagnosis of colonic disease in preference to a double-contrast barium enema ⁷ detecting 90% to 95% of lesions 10 mm or larger (compared with the 80% to 85% detected by double-contrast-barium-enema examination) ⁸. Its high diagnostic accuracy and relative lack of
discomfort for patients make colonoscopy the primary procedure for investigating patients with large bowel symptoms.\(^9\)

The technology for colonoscopy has evolved to provide a very clear image of the mucosa through a videocamera attached to the end of the scope.\(^2\)

The main advantage of colonoscopy is that it allows for intervention, since biopsies can be taken and polyps removed\(^2\), as it contains a channel which permits the passage of a variety of endoscopic tools, such as biopsy forceps, cytology brushes, wash tubes, injecting devices, and electrocautery probes and snares\(^5\).

Beside the diagnostic and therapeutic purpose Colonoscopy is also becoming popular as a screening tool to find colon polyps in symptomless people over the age of 50 years, as early detection can reduce mortality from colorectal cancer\(^10,11\), currently the second leading cause of cancer deaths in the United States with 138,000 new cases and 55,000 deaths per year\(^12\). And colonic cancer also is second most common cause of cancer-related deaths in the UK; about 34,000 new cases are diagnosed each year.\(^4\)

**COLONOSCOPY... PAST AND PRESENT**

Flexible colonoscopy started, in 1958 in Japan with Matsunaga’s intracolonic use of gastrocamera under fluoroscopic control, and subsequently Niwa’s development of the sigmocamera\(^13\). The first commercially available fibrocolonoscope, the Overhott Colonoscope, made by American Cystoscope makers Incorporated, or ACMI, appeared in the early 1960s\(^14,15\). Its limited angulation and angle of view restricted the technique to
a few hardy spirit. The West was surprised by the production in 1969 by Japanese engineers (Olympus Optical and Machida) of remarkably effective colonic instruments combining the well developed and torque–stable mechanics of a gastrocamera with superior fibro optics\textsuperscript{15}.

More recently a “3-D imager” (Olympus Optical Co, Tokyo) has been developed that provide real-time 3-dimentional views of colonoscope shaft configuration and location in abdomen. It will be a significant aid to trainees and other inexperienced endoscopists, as well as experienced endoscopists during difficult cases\textsuperscript{15}.

Also there is “Virtual colonoscopy“ which uses prone and supine helical thin-section CT scans that are rendered into a three dimensional sequences; this non invasive technique may soon become an important new screening modality.\textsuperscript{4}

**THE INSTRUMENT – COLONOSCOPE**

A colonoscope is a thin flexible instrument, usually 160 cm long. An image is transmitted from the tip by either a fiberoptic bundle to a lens on the head of the scope, or by a tiny video camera on the tip to a television. The end can be deflected in a wide arc by manipulating two steering knobs on the endoscope head. Colonoscopes are equipped with a tiny air insufflation channel to permit bowel distension for inspection. Through this channel, automatic water lavage of the scope tip may also be carried out, to keep stool and debris from obscuring the view. Another, larger channel is available for suction or for passing instruments (biopsy forceps, electrocautery forceps, grasping
forceps, cytology brush, polypectomy snare, injection needle, laser
fiber) \(^6\).

The aim of instrument manufactures, working closely with practicing endoscopists, has been to construct an ‘ideal ‘
colonoscope that is flexible enough to conform for to the contours
of the colon, yet sufficiently stiff to maintain torque and not to coil
up uselessly during its passage \(^{16}\). Tip angulation in four directions
to more than 180 degrees allows angulation around more acute
flexures. Retroflection (J-configuration) is possible in proximal colon
or rectum, thus minimizing the risk of missing significant lesions in
capacious areas that could not be seen with older less
maneuverable instruments. \(^{14}\) The tip is made more flexible, which
help to avoid impaction in acute bends such as splenic flexure. \(^{13}\)

**INDICATIONS OF COLONOSCOPY**

According to guidelines of the French Society of Digestive
Endoscopy \(^{17}\) total colonoscopy indications are divided to three
categories:

**Total Colonoscopy as a First Intention**

A total colonoscopy is indicated as first intention in cases of:

\begin{itemize}
  \item[a)] Symptoms indicating altered bowel habit in
  patients over 50 years (patients with an increased risk of
colorectal cancer).
  \item[b)] Clinical signs suggesting bowel pathology.
  \item[c)] Discovery of occult blood in the stools.
  \item[d)] Patients with a high genetic risk for
colorectal cancer, i.e., a first-degree relative (father,
mother, brother, sister) who had colorectal cancer before
the age of 60, or two first degree relatives who have suffered from colorectal cancer regardless of their age.

e) The presence of a very high genetic risk for colorectal cancer risk factor, i.e. in patients belonging to a family with familial polyadenomatous polyposis (FAP), or with hereditary non polyposis colorectal cancer (HNPCC) syndrome, fulfilling three Amsterdam criteria:

- Number criterion (at least three subjects with colon or rectal cancer)
- Kinship criterion (at least one of cancers detected before age 50).

f) History of an emergency resection operation, for example a tumour, without prior operation.

On the basis of current data, a screening strategy for subjects with a first-degree family history of adenomas, even if they are greater than 1cm in size, is not recommended.

Total Colonoscopy as a Second Intention after another Imaging Procedure:

a) Finding during the use of a radiographic contrast medium, of abnormal images suggesting polyp or tumor lesions.

b) The discovery, during the rectosigmoidoscopy, of an adenoma when investigating other colon lesions.

Total Follow up Colonoscopy Indicated in the following situations.
a) When there is a change of clinical symptomatology and/or appearance of clinical signs suggesting bowel pathology.

b) When there is a history of adenomas, excluding hyperplastic polyps.

1) If adenoma is sessile and larger than 2cm or if there are multiple adenomas (more than five) or if the adenoma is considered sufficient (intramucosal carcinoma or invasive carcinoma commensurate with the four accepted criteria; resection and total anatomy and pathology examination, grade I or II cancer well or moderately differentiated, absence of characteristic lymphatic emboli, safety margin greater than 1mm). It is recommended that a follow-up colonoscopy be performed within 3-6 months to check that the outcome of the excision was successful, then after 3 years if findings are normal and then every 5 years.

2) In all other cases, a Colonoscopy is performed after 3 years then every 5 years in case of negative examination, until monitoring does not appear to prolong life expectancy (i.e. 75 years on average). 

c) In cases of cancer of the colon or degenerated invasive polyp treated by surgical resection with a curative aim. Only involving patients capable of withstanding another surgical operation, it is recommended that a monitoring Colonoscopy be performed after 3 years and then every 5 years if findings are normal, until monitoring does not appear to prolong life expectancy (i.e. 75 years average).
If there are multiple synchronous adenomas associated with cancer (three or more), one of which is larger than 1 cm or has a villous appearance, it is recommended that total monitoring be carried out after 1 year, then after 3 years in case of negative findings.

d) In cases of a **high genetic risk of colorectal cancer**. in patients with first degree family history of colorectal cancer, a total investigative Colonoscopy should take place every 5 years after a negative examination.

e) In cases of a **very high risk of colorectal cancer**,

1. for FAP (confirmed by genetic testing or suspected);
   - If colonoscopy at puberty was negative, a full colonoscopy is recommended. Then rectosigmoidoscopy should be **performed every year**. This diagnosis is generally made before age 40.

2. For HNPCC syndrome
   - If colonoscopy has revealed a cancer, a total investigative colonoscopy is recommended every year for life.
   - If the initial colonoscopy was negative, a total investigative colonoscopy should be performed every 2 years up to 35 years and then every year.
   - In case of pancolitis developing for more than 15 years, a total colonoscopy is recommended every 2 years.
**According to American Society for Gastrointestinal Endoscopy**  

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**Review Table -1-**

**Indications for Colonoscopy**

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A. Evaluation of abnormality on barium enema likely to be clinically significant, such as filling defect or a stricture

B. Polypectomy

C. Evaluation of unexplained gastrointestinal bleeding (including occult bleeding)

D. Unexplained iron deficiency anemia

E. Clinically significant diarrhea of unexplained origin

F. Chronic inflammatory bowel disease of colon if more precise diagnosis or determination of the extent or activity of disease will influence immediate management

G. Surveillance for colonic neoplasia

H. Intraoperative identification of a lesion not apparent at surgery (e.g., Polypectomy site, location of a bleeding site)

I. Therapeutic colonoscopy

1. treatment of bleeding from such lesions as vascular malformation, ulcerations, neoplasia, polypectomy site, and radiotherapy telangiectasias

2. palliative treatment of stenosing or bleeding neoplasms

3. Dilatation of stenotic lesions (e.g., anastomotic strictures)
4. decompression of acute nontoxic megacolon or sigmoid volvulus
5. foreign body removal

According to the yield of colonoscopy, its indication can be divided to:

I. HIGH -YIELD INDICATIONS:

1) Abnormal Barium Enema X-Ray

The highest diagnostic yield of endoscopic pathology is in patients with tumor, polyps, stricture, or mucosal disease diagnosed on double – contrast Barium enema (DCBE).

However, the limitations of even a high – quality DCBE are well known, and include the ability to miss large lesions because of overlapping loops, to misinterpret between solid stool and neoplasms between spasms and strictures, with particular inaccuracy for lesions, such as angiodysplasias or minor inflammatory change and small (2-5 cm) polyps.

And most patient find Barium enema a more unpleasant experience than colonoscopy, because of the sustained inflation required in the (DCBE) and because of the sedative-analgesic medications given for colonoscopy.

Colonoscopy replaces either repeat X-Ray investigation or laparotomy as the means of Histologic confirmation or confident
exclusion of a questionable abnormality. Thus all filling defects on barium enema merit evaluation by colonoscopy. If the lesion is a pedunculated polyp, it can be removed for histologic examination; if its appearance suggests a cancer, it can be biopsied for histologic confirmation. When a polyp or a carcinoma is found, the remainder of the colon should be examined for additional polyps and synchronous carcinoma.

With the increasing availability of endoscopic skills and improvement in instrument technology, Colonoscopy can often be regarded as a first line procedure not preceded by barium enema.

2) Colon polyps: Benign and malignant

Polyps are slow-growing overgrowths of the colonic mucosa that carry a small risk (<1%) of becoming malignant. However, because polyps are highly prevalent in the general population (especially with increasing age), they confer an important predisposition to colon cancer and are therefore removed when detected.

Colonic polyps are traditionally divided into 3 groups.

**Hyperplastic polyps**

Hyperplastic polyps comprise about 90% of all polyps and are totally benign protrusions. They are usually less than 0.5 cm in diameter. Hyperplastic polyps most commonly occur in the rectosigmoid region during adulthood.

**Adenomas**: Adenomas comprise approximately 10% of polyps. Most (~90%) are small, usually less than 1.5 cm in
diameter, and have a very small potential for malignancy. The remaining 10% of adenomas are larger than 1.5 cm and have about a 10% chance of containing invasive cancer. Adenomas are traditionally divided into 3 types:

**Tubular**

**Tubulovillous**

**Villous**

Tubular adenomas are the most common of the 3 types and can be found anywhere in the colon. Those with a distinct stalk are termed pedunculated; those without a stalk are termed sessile.

The risk of progression to carcinoma is related to the size of the adenoma. Tubulovillous adenomas are most commonly found in the rectal area. The degree of villous component of these adenomas is correlated with the risk of progression to carcinoma.

Villous adenomas most commonly occur in the rectal area; tend to be larger than the other two types; and tend to be nonpedunculated, velvety, or cauliflower like in appearance. Villous adenomas are associated with the highest morbidity and mortality rates of all polyps. They can cause hypersecretory syndromes characterized by hypokalemia and profuse mucous discharge and can harbor carcinoma in situ or invasive carcinoma more frequently than other adenomas.

**Polyposis syndromes**: Polyposis syndromes are hereditary conditions that include familial adenomatous polyposis (FAP), Gardner syndrome, Turcot syndrome, Peutz-Jeghers syndrome, Cowden disease, and familial juvenile polyposis. Progress has been made in understanding some of the genetic factors contributing to the development of
these syndromes. Some of the syndromes have extraintestinal features that help differentiate one syndrome from the other. FAP is best understood in terms of the genetic basis and subsequent pathological and genetic events leading to carcinoma.

Adenomatous polyps, whether sporadic or secondary to familial polyposis syndromes, are the only premalignant type of polyp.

Two other types of benign polyps are hamartomatous polyps, which contain a mixture of normal tissues, and inflammatory polyps, which contain an inflammatory epithelial reaction.

As many as 60-90% of cases of colorectal cancer are believed to develop from colorectal adenomas. The average time for malignant transformation of an adenoma is estimated to be 10-15 years. Uncontrolled cohort and case-control studies indicate that endoscopy screening and polypectomy may reduce the incidence of colorectal cancer by 76-90%. It should therefore be possible to remove an adenoma before it develops into overt cancer.

Colonoscopy is the most sensitive and specific test for detecting cancer and large polyps. The finding of a polyp larger than 1 cm in diameter during sigmoidoscopy is an indication for examination of the entire colon because 30-50% of these patients have additional polyps. Though controversy continues regarding whether colonoscopy is indicated for patients with a polyp(s) smaller than 1 cm, the general belief is that most cancers arise in preexisting adenomatous polyps, which should lead to a full colonoscopic examination, regardless of size.
A polyp seen on barium enema merits colonoscopy for two reasons: It may be an artifact or a cancer, and a second polyp or cancer may have been missed. During colonoscopy, the polyp can usually be excised, with lower morbidity and mortality rates than with surgery. The best way to rule out cancer in a polyp is to remove the polyp completely for histologic examination. Hyperplastic polyps do not become malignant; colonic polyps that show benign neoplasia histologically may become malignant (tubular and villous adenomas). The risk that a neoplastic polyp is cancerous increases with its size. The risk is also higher in villous adenomas. Pedunculated polyps with moderately or well differentiated cancer confined to the mucosa and with an uninvolved stalk can be cured by removal with an electrocautery snare during colonoscopy. Thus, most colonoscopists will remove all polyps greater than 0.5 cm in diameter. Polyps smaller than 0.5 cm in diameter should be biopsied or removed, because more than 50 percent may be adenomatous, and the gross appearance of a polyp does not predict its histology. The wisdom of this course of action is suggested by several studies, including a sigmoidoscopic study in which the removal of all polyps reduced the expected incidence and invasiveness of subsequent cancers. Patients with adenomatous polyps are at increased risk of developing another polyp or cancer and therefore merit a regular screening program. When a polyp is discovered, the entire colon should be examined for synchronous polyps or cancer. This examination should probably be repeated at 3- to 5-year intervals, and more frequently in patients with a history of colon cancer or multiple polyps. If stools are positive for occult blood or symptoms develop, immediate evaluation is indicated. In the average-risk patient
without a known polyp, yearly digital examination and a stool test for occult blood are performed. Beginning at age 50, flexible sigmoidoscopy should be performed every 3 to 5 years.\textsuperscript{5}

3) \textbf{Rectal bleeding of undetermined etiology}

Blood loss, particularly in elderly persons, remains the highest-yield indications for colonoscopy. Rectal bleeding, especially if sustained, dark, or mixed in the stool, is frequently caused by tumor or mucosal pathology. In the subgroup of patients with visible rectal bleeding in whom a barium enema and sigmoidoscopy are normal, about 10% of the referral patients have cancer, 15% to 20% have polyps and up to 50% have some kind of a visible abnormality, including traumatized, inflamed, or ulcerated mucosa.

Total colonoscopy should be performed rather than DCBE in the assessment of rectal bleeding, whether overt or occult, because of the obvious bonus of color view in seeing blood, altered, or bleeding points, which can be flat and totally invisible on x-ray films. It may also be possible to treat the cause of bleeding endoscopically.\textsuperscript{14}

Acute colonic bleeding of overwhelming proportions may require surgery and perioperative bowel irrigation with On-table colonoscopy. Ten percent of patients admitted to an intensive care unit with a tentative diagnosis of acute colonic bleeding will have an upper gastrointestinal source which must be considered in all instances. In most cases of acute bleeding, an attempt at conventional colonoscopy examination is indicated before resorting to angiography scintigraphy, or other investigational techniques.\textsuperscript{14} Colonoscopy should be started as soon as
practicable, because the aim is to examine the bowel while fresh bleeding continues. Expertise is needed in this situation, but a cause of bleeding should be apparent in more than one half of the cases, and treatment may be possible by polypectomy, electrocoagulation, injection therapy, or other means. Postpolypectomy hemorrhage should be managed by immediate colonoscopy without preparation, since the site of bleeding is known. 14

4) Anemia

Occult bleeding from the gastrointestinal tract is widely believed to be the most common cause of iron-deficiency anemia in patients without an obvious source of blood loss. A thorough examination of the gastrointestinal tract, particularly the colon, has therefore become standard practice. 26,27

Iron deficiency anemia or a positive fecal blood test should be evaluated by colonoscopy rather than DCBE, because flat lesions such as angiodysplasias or minor inflammatory change can not be diagnosed radiologically. Even if radiographs appear normal, endoscopy known to find significant numbers of radiologically missed lesions such as cecal carcinoma. In anemic patients, gastroscopy and colonoscopy can be performed at same visit.

The object of endoscopy in anemic patients mainly is to rule out carcinoma or vascular anomalies with certainty; about 80% have negative examinations, but the endoscopic opinion is considerably more certain than a negative x-ray film result 14
5) Chronic diarrhoea

(Few studies have addressed the frequency of neoplasia in symptomatic patients, and none has specifically addressed the prevalence of adenomas in patients undergoing colonoscopy for diarrhoea. However, Neugut and colleagues\textsuperscript{28} showed a prevalence of colonic neoplasms of 27\% in those patients undergoing colonoscopy for a change in bowel habit, a value which approached the yield of 33.6\% in patients with a history of rectal bleeding. A large proportion (approximately 50\%) had neoplasia proximal to the splenic flexure, indicating the need for full colonoscopy rather than flexible sigmoidoscopy in these patients.\textsuperscript{29}

In addition to neoplasia, colonoscopy also has a diagnostic yield for other conditions ranging from 7\% to 31\%, with inflammatory bowel disease and microscopic colitis being most commonly found.

Routine ileoscopy further adds to the value of colonoscopy. While this led to a positive diagnosis in only 2.7\% of asymptomatic patients undergoing surveillance colonoscopy, this increased to 18\% in non-HIV patients who complained of diarrhoea. In patients in whom a diagnosis of inflammatory bowel disease is suspected, the value of ileoscopy and biopsy is further enhanced: 36\% of patients with a normal colonoscopy and diarrhoea had terminal ileal disease. These results are subject to considerable referral bias but when taken together they suggest that in chronic diarrhoea, colonoscopy and ileoscopy with biopsy may lead to a
diagnosis in approximately 15–20% of cases, a value that may approach 40% in those patients with suspected inflammatory bowel disease.

Colonoscopy is also the preferred modality to exclude or confirm microscopic colitis. Lymphocytic and collagenous colitis (collectively called microscopic colitis) are conditions with a similar natural history and often (in 25–30%) overlapping features. These conditions have increasingly been identified as a cause of diarrhoea in patients with macroscopically normal mucosa. Although the diagnosis has often relied on biopsies obtained at flexible sigmoidoscopy, recent studies have pointed to the high false negative yield from rectosigmoid histology (34–43%). These authors recommend samples from the ascending and transverse colon to maximize the likelihood of correct diagnosis.

Colonoscopy is a more sensitive test than barium enema and given this, and the need to obtain histology to exclude colitis, the former investigation is recommended.29

6) Inflammatory Bowel Disease

Although many patients do not require colonoscopy for the diagnosis of inflammatory bowel disease, the procedure is an important aid in the follow-up care and management of patients with ulcerative colitis or Crohn’s disease. Colonoscopy is more sensitive than barium enema in determining the anatomic extent of the inflammatory process and is useful when clinical, sigmoidoscopic, and radiologic studies are inadequate. Colonoscopy with multiple biopsies is indicated to differentiate ulcerative colitis from Crohn’s disease.2
Colonoscopy may help in the initial diagnosis of this condition, especially in differentiating Crohn's colitis from ulcerative colitis.\(^5\) Often, the mucosal appearances are sufficient to make immediate assessment of the extent and type of colitis. Crohn's disease, in particular, shows a rather characteristic pattern of small aphthoid ulcer with intervening normal mucosa quite unlike the generalized redness of early ulcerative colitis. More advanced inflammatory disease of any type, including ulcerative colitis, Crohn's disease, tuberculosis, or amoebic colitis, can be nearly indistinguishable from each other because of the colon's limited range of response to various diseases that affect the mucosal surface. Once the diagnosis of inflammatory bowel disease has been established, there are only a few indications for follow-up colonoscopy besides malignancy surveillance, unless there is a marked change in symptoms.\(^{14}\)

7) **Cancer surveillance or prevention**

The unique tendency of the colonic cancer to be preceded by a long period during which focal adenomatous polyp formation is visible above the normal mucosal surface gives the endoscopist the opportunity for accurate visualization, biopsy, and destruction for precancerous lesions, even at sizes of 1-2 mm. Accuracy is possible, because color makes it easy to distinguish which small excrescences are fecal, which are air bubbles, and which are polyps.

Flat adenomas have a tendency to degenerate into carcinoma while still relatively small in diameter. The visibility of such lesions may be enhanced by dye spraying or “chromoendoscopy” \(^{14}\)

The recommendations of an expert multidisciplinary panel, published in 1997, \(^{14}\) including offering colonoscopy every 10 years
to asymptomatic average risk persons of age 50 years or older, as approximately 70 to 80% of all colorectal cancers occur among people at average risk. In addition, the panel suggested annual fecal occult tests in this population, with colonoscopy as the investigation of choice if the occult blood test is positive. A flexible sigmoidoscopy is recommended every 5 years, followed by colonoscopy to remove polyps, biopsy cancers, and to examine the rest of the bowel should an adenoma or carcinoma be seen.

Colonoscopy is indicated for any patient with positive fecal occult blood test and in those who are at increased risk of polyp and cancer formation, including those with first degree relatives with either colorectal cancer or an adenomatous polyp, in whom screening should begin at age 40. Peoples with a family history of familial adenomatous polyposis whose genetic testing is positive or indeterminate should be offered flexible sigmoidoscopy every 12 months beginning at puberty. Family history of hereditary nonpolyposis colorectal cancer should trigger an examination of the entire colon every 2 to 3 years starting between the age 20 and 30 years.

The interval between surveillance examinations after removal of adenomatous polyps or an operation for colorectal cancer is a matter of debate, but the expert panel has made the following recommendations:

Removal of an adenomatous polyp larger than 1 cm in diameter or of multiple polyps requires repeat colonoscopy 3 years after the initial examination, and if that is negative or reveals only a single tubular adenoma, the surveillance interval can be increased to 5 years. In special circumstances such as polyp with invasive cancer, large sessile adenoma, or numerous adenomas
In patients who have had a colorectal cancer surgically resected with a curative intent, if total colonoscopy had not been performed preoperatively, a complete colon examination should be completed within 1 year of the resection. If this or the preoperative examination was normal, subsequent colonoscopy is indicated in 3 years, and if normal, every 5 years.

The American Cancer Society recommends screening people at average risk for colorectal cancer beginning at 50 years of age by

1) FOBT annually,
2) Flexible sigmoidoscopy every 5 years,
3) Annual FOBT plus flexible sigmoidoscopy every 5 years,
4) double-contrast barium enema every 5 years, or
5) Colonoscopy every 10 years.\textsuperscript{32}

Similar recommendations are issued by the American College of Surgeons, the American College of Obstetricians and Gynecologists, and the American Academy of Family Physicians.\textsuperscript{32} Recommendations vary among the leading organizations in this field, namely the American Cancer Society (ACS), the World Health Organization (WHO), the US Preventive Services Task Force (USPSTF), and the American College of Physicians (ACP). Only the ACP recommends colonoscopy (at 10-y intervals) for routine screening in asymptomatic patients. Others advise annual fecal occult blood testing (FOBT) and periodic flexible sigmoidoscopy with follow-up colonoscopy as indicated.\textsuperscript{2}
Compared with no screening, yearly screening with FOBT prevents 18% of all colorectal cancers, sigmoidoscopy every 5 years prevents 34%, and colonoscopy every 10 years prevents 75%. Colonoscopy also results in more years of life saved. For each year of life saved, FOBT costs $81,678, sigmoidoscopy costs $74,031, and colonoscopy costs $28,143.33.

Colonoscopy every 10 years beginning at 50 years of age is a more effective, and more cost-effective, way to screen for colorectal cancer than FOBT every year or sigmoidoscopy every 5 years.

Interest in colonoscopy has recently grown because of studies demonstrating that sigmoidoscopy fails to identify about half of all proximal neoplasms. The studies that directly compared sigmoidoscopy and colonoscopy did not take into account the safety, cost, and availability of the tests.  

Multiple studies have evaluated the risk of proximal neoplasms in patients found to have distal hyperplastic polyps. A systematic review that included 18 studies estimated that 21 to 25 percent of patients found to have a distal hyperplastic polyp had a proximal neoplasm (including 4 to 5 percent with an advanced neoplasm). The authors concluded that the high absolute risk (i.e., 21 to 25 percent) may justify examination of the proximal colon in patients found to have a distal hyperplastic polyp.

When sigmoidoscopy is used as a screening test, the threshold that should trigger a colonoscopic workup to examine the proximal colon also remains controversial. The choice is important because 25 percent of patients who undergo sigmoidoscopic screening will have at least one polyp, whereas slightly less than
half of these patients will have an adenomatous polyp (the others will have a hyperplastic polyp) and only one fifth of these patients will have a high-risk adenoma.\textsuperscript{35}

<table>
<thead>
<tr>
<th>Review Table -2-</th>
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<tr>
<td>Colonoscopic surveillance intervals in patients at high of colorectal cancer</td>
</tr>
<tr>
<td>▪ Adenoma</td>
</tr>
<tr>
<td>▪ Cancer</td>
</tr>
<tr>
<td>▪ Family history\textsuperscript{1}</td>
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<tr>
<td>▪ Hereditary non polyposis colorectal cancer</td>
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<tr>
<td>▪ Long-standing /extensive colitis\textsuperscript{2}</td>
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1- Two first-degree relatives with cancer or one first degree relative with cancer <50 years of age (commencing 10 years before the index case

2- Disease extending beyond the splenic flexure for more than 8 years; multiple biopsies taken looking for mucosal dysplasia.

Depending on which of these findings is used as the threshold for performing colonoscopy, the yield and costs associated with a screening approach based on sigmoidoscopy will vary considerably. If the goal of screening were to minimize the likelihood of missing any colorectal cancer, then colonoscopy would be favored; if the goal were to reduce the rate of death from colorectal cancer to a large extent but at a lower cost and a lower risk than those associated with colonoscopy, then sigmoidoscopy or fecal occult-blood testing would be appropriate.\textsuperscript{30}

( For persons who present with a colorectal cancer, the statistics for synchronous and metachronous { Not synchronous; multiple separate occurrences, such as multiple primary cancers
Of these patients, 2 to 5 per cent have synchronous colon cancers, 3 to 10 per cent develop metachronous malignancies (more if adenomas coexist with the initial tumour), 25 to 50 per cent have synchronous adenomas, and 20 to 40 per cent sprout adenomas later. Thus patients with colorectal cancer should have a perioperative, preferably a preoperative, colonoscopy.

The same colonoscopy schedule should apply to patients with strong family histories of colorectal cancer or adenoma. Inherited autosomal dominant colonic polyposis syndromes (familial polyposis and Gardner's syndrome), which always lead to cancer when untreated. Hereditary site-specific colon cancer, and cancer family syndrome (Lynch syndromes I and II, i.e. Hereditary nonpolyposis colon cancer (HNPCC)), also autosomal dominant, markedly increase the risk of colorectal cancer, which arises at an uncharacteristically early age and proximal location (making sigmoidoscopy an ineffective screening tool), and with a high frequency of multiplicity. The latter condition is also associated with breast and endometrial cancer. When colon cancer and its precursor polyps are analyzed together, inheritance patterns become even more recognizable. Inherited large bowel neoplasms may, in fact, be quite common. Even sporadic colon neoplasms are genetic to some extent, in as much as first-degree relatives (parents, siblings, and children) of colon cancer patients have three times the average risk for the disease. Thus periodic screening colonoscopy is appropriate possibly for individuals with one first-degree relative harboring a colorectal cancer, and certainly for those with two afflicted first-degree relatives.
Ulcerative colitis certainly predisposes to colon malignancy. The cancer may be multifocal, and is often flat and infiltrating, making recognition difficult, especially if severe mucosal inflammation coexists. Stage-specific survival is the same for ordinary colon malignancies, but diagnosis is often delayed until the cancer is deeply invasive. The cancer risk correlates chiefly with the amount of involved colon and the duration of the disease (not the activity of the disease). In patients with total colitis, the cancer danger becomes appreciable after 8 to 10 years. Thereafter, there is a risk of 0.5 to 1.0 per cent per year of disease duration. For left-sided colitis, the risk is diminished, and for proctitis only there is minimal danger. Colorectal cancer complicating ulcerative colitis is frequently associated with severe mucosal dysplasia. Thus, after 8 to 10 years, yearly screening colonoscopy with diffuse random biopsies should be initiated for those with extensive colitis. If persistent severe mucosal dysplasia is found, especially if a macroscopic abnormality is also present (such as a plaque, nodule, or stricture), the risk of a concomitant malignancy is high and prophylactic colectomy is indicated. Since mucosal changes are patchy, sigmoidoscopy and rectal biopsy alone are insufficient.

Discontinuity is not the only problem with screening for mucosal dysplasia; 10 to 20 per cent of patients who develop carcinomas have no associated mucosal dysplasia, and only about one-third of patients with severe dysplasia get cancer. Accompanying severe mucosal inflammation makes recognition of dysplasia difficult. Furthermore, even under the best of circumstances the presence and degree of dysplasia is difficult to quantify, and pathological assessments may vary. Crohn's colitis
also predisposes to cancer, although to a lesser extent, and screening colonoscopy may be helpful)\textsuperscript{6}.

Thus Surveillance examinations in extensive ulcerative colitis and possibly Crohn’s colitis patients normally start 8 years after onset of disease and are repeated at 1- or 2 year intervals, with 10 or more biopsy specimens taken at representative sites around the colon. The endoscopist is alert for any nodular, indurated or plaque like lesions in the colon, but varying degrees of low – or high – grade dysplasia may be found in relatively normal-looking mucosa.\textsuperscript{14}

Ideally, because differentiating inflammatory changes from premalignant ones can be difficult, colonoscopy for surveillance purposes should not be performed during periods of active colitis, and biopsies from areas of less inflammation should be preferred.\textsuperscript{2}

\textbf{8) Intraoperative Colonoscopy}

The most common indication for intraoperative is to localize the site of a previously endoscopically resected malignant polyp (not necessary when preoperative tattooing is performed). The site may heal completely in 3 weeks, leaving no external sign of its location, but it can often be endoscopically identified as a scar on mucosal surface. Another indication is to assist the surgeon in identifying which colonic segment is the source of massive lower gastrointestinal hemorrhage.\textsuperscript{14}

The surgeon’s search may be aided by transillumination of the bowel wall using the bright light of an endoscope passed into intestinal lumen. The vascular architecture immediately becomes visible, and even small arteriovenous malformations can be detected by this technique. All endoscopists find decreasing need
for intraoperative procedures as they gain in personal experience and expertise. 14

9) Therapeutic indications

Also mentioned in table (1) in brief, herein some detail:

a) Polypectomy:

It has long been believed that colorectal cancer evolves from a precursor lesion, the adenomatous polyp. This concept was based on the elegant pathology studies from the St Mark's Hospital, London, published by Lockhart-Mummery and Dukes in 1928, and culminating in the concept of the polyp-cancer sequence published in 1975 by Muto and colleagues.

The introduction of colonoscopy in the early 1970s, followed by the demonstration of the feasibility of colonoscopic polypectomy, provided the technology for the application of this concept to clinical practice. 36

The entire colon could be examined, polyps identified and removed and, it was believed, colorectal cancer prevented. Evidence for this belief was provided by observations from the prospective National Polyp Study (NPS) in the USA that demonstrated a reduction in the incidence of colorectal cancer by 76-90% following colonoscopic polypectomy 20

Nearly all polyps can be snared – resected during colonoscopy and even some radiologically diagnosed carcinomas prove to be benign lesions that are manageable endoscopically 14.
The following guidelines apply to postpolypectomy surveillance of colorectal adenomatous polyps:

- At the time of polypectomy, the entire colon should be examined, and all synchronous polyps removed. Additional colonoscopy may be necessary after a large (>2 cm) sessile polyp or multiple adenomas are removed to insure complete clearing of the colon.

- Colonoscopy should generally be repeated in three years if one or more adenomas > or =1 cm are found on the previous colonoscopy or if three or more adenomas of any size are detected. A five-year surveillance interval is considered adequate for patients with one to two adenomas each <1 cm in size, on index colonoscopy.

- Multiple adenomas (more than four) or a suboptimal examination at initial colonoscopy may require earlier colonoscopic follow-up (one year).

- Surveillance intervals can be extended to five years if no adenomas are detected at the three year follow-up colonoscopy.

- Modifications to the above recommendations are not necessary if a resected polyp is found to contain severe or high-grade dysplasia.

- Flexible sigmoidoscopy combined with double-contrast barium enema can be used for surveillance if complete colonoscopy is not possible.
• The necessity of surveillance examinations in patients found to have a single tubular adenoma \( \leq 1 \) cm in diameter at initial colonoscopy is not fully established and should be individualized. Co morbid illnesses, age, and the likelihood of continued benefit from follow-up examinations are important factors to consider in assessing the need for further surveillance in these subjects.

• If a resected polyp contains malignant foci extending beyond the muscularis mucosa (a "malignant polyp") and has no risk factors necessitating surgical resection, follow-up colonoscopy should be performed in three months to assess the completeness of polypectomy.

• Standard surveillance intervals (i.e., those used in patients with nonmalignant adenomas) can be considered in patients with a malignant polyp after one negative follow-up colonoscopy.

Patients with colorectal cancer should also have regular colonoscopic surveillance for metachronous adenomas. Surveillance after resection of colorectal cancer yields adenoma recurrence rates of 25 to 30 percent at three years, a figure that is similar to that found in subjects with adenomas.

**Technique:** A number of techniques for endoscopic excision of large polyps have been proposed. The endoscopic approach depends upon characteristics and location of the polyp and the endoscopist's experience.

**Sessile polyps** – Polyps are considered to be sessile if the base of the polyp is attached to the colonic wall. It can sometimes
be difficult to appreciate the extent of such lesions. Some endoscopists use dye (such as 0.1 to 1.0 percent indigo carmine solution) for better identification of the margins.

**Piecemeal excision** – Piecemeal excision using standard electrosurgical techniques continues to be commonly used to remove large sessile polyps.

**Submucosal saline injection** – Injection of normal saline into the submucosa prior to polypectomy has been proposed as a method to raise large sessile polyps, thereby reducing the risk of perforation during subsequent snare excision.

**Laser ablation** – The Nd:YAG laser has been used successfully alone or in combination with other methods principally to ablate large rectal adenomas.

The argon plasma coagulator (APC) has been used as an adjunct to piecemeal excision to remove residual adenomatous tissue.

**Pedunculated polyps** – Most pedunculated polyps are removed by transection of the stalk with a polypectomy snare. The major risk with this approach is post polypectomy bleeding. As a result, many endoscopists use one or more methods to reduce the risk of bleeding, particularly in polyps with wide stalks (those larger than 1 to 1.5 cm in diameter). These methods include injection of the stalk with dilute epinephrine (1:20,000), and ligating devices such as a hemoclips or a detachable snare.

Polyps 3 to 4 mm in diameter or smaller can be completely and easily removed with an enveloping biopsy cautery forceps (hot biopsy). This tool preserves most or the entire lesion unharmed within its jaws for histological analysis, but electrocoagulates any residual polypoid tissue outside its grasp.
Larger polyps are removed with an electrocautery snare. This is a retractable wire loop with a plastic sheath, which is passed through the endoscope and placed around the polyp base or stalk. The snare is tightened as electrocoagulating current is passed through the wire, resulting in separation and haemostasis. Large polyps with a broad base may require multiple snare applications (piecemeal resection). Very large polyps are often best removed surgically, by either transanal excision under direct vision, or segmental colectomy.\(^6\)

Even if previous endoscopy or barium enema suggest that polypectomy is likely to be impossible, an expert may succeed in removing the polyps, if necessary using multiple sessions for “piecemeal polypectomy”\(^3^8\)

\[b) \textbf{Bleeding lesions:}\]

Include localized angiodysplasias in proximal colon or polyp stalks or irradiation telangiectases distally, and can usually be managed by coagulation methods.

\[c) \textbf{Cancer palliation:}\] by laser photodestruction and snare ablation has been described by some center for symptom relief; metal dilating stents are used to maintain patency if required. Preoperative relief of obstruction by partial tumour ablation is also feasible.

\[d) \textbf{Ileus deflation:}\]

Whether postoperative or the ‘pseudo-obstruction’ of Ogilvie’s syndrome, is relatively easy and effective. A drainage tube is carried up alongside the colonoscope and left in position until function re-start.
e) Dilatation:

By ‘through the scope’ (TTS) balloon is effective for short anastomotic strictures, usually those occurring after ileocolic resection for Crohn’s disease. Anastomotic strictures in the distal colon are often more satisfactorily (and more cheaply) managed by passage of a guide wire and bougie dilator. Ideally dilatation is performed under radiologic control, though often prior passage of a small-diameter endoscope or a floppy guide wire makes it safe and convenient by endoscopic means alone. Longer, more fibrous or ulcerated strictures are difficult to dilate and tend to recur rapidly.\textsuperscript{38}

II. LOW-YIELD INDICATIONS
And circumstances when colonoscopy is not indicated

The particular virtues of colonoscopy, accuracy and the ability to take biopsy specimens, are irrelevant to conditions manifesting with functional symptoms such as long-standing constipation, bloating, or chronic abdominal pain, which may be investigated by x-ray examination if there is no occult or colonic bleeding. (Table -3-)

On the other hand, the elderly patient may be unable to cooperate with the need to retain barium, resulting in a poor radiographic examination. Bowel symptoms in patients older than 70 years of age may be better investigated by colonoscopy than barium enema.\textsuperscript{14} Other than surveillance for malignancy, repeated
Colonoscopy for routine follow-up of patients with established inflammatory bowel disease provides little clinically useful information. Colonoscopy need not to be performed in patients with overt gastrointestinal (GI) bleeding in whom an upper GI source has been demonstrated. Similarly, there is no indication for colonoscopy in a patient with an adenocarcinoma where the primary site of the tumor is unknown, the result of colonoscopy will not influence the management of the patient.

**Review Table-3-**

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**diagnostic colonoscopy is usually not indicated or has a low Diagnostic yield in the following circumstances**

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A. Chronic, stable, irritable bowel syndrome or chronic abdominal pain
B. Acute diarrhoea
C. Metastatic adenocarcinoma of unknown primary site in the absence of colonic signs or symptoms when it will not influence management.
D. Routine follow up of inflammatory bowel disease
E. Upper gastrointestinal (GI) bleeding or melena with a demonstrated upper GI source

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➢ Table from 14

**Indications according to colonic symptoms**

- Patients with diarrhoea, recent change in bowel habit, anaemia and dark rectal bleeding require pancelonic
imaging. Colonoscopy is the investigation of choice when mucosal disease (neoplasia, IBD, angiodysplasia) is suspected sigmoidoscopy plus barium enema is an acceptable alternative in those with a change in bowel habit and suspected carcinoma.

- **Bright rectal bleeding**, seen in the toilet paper or in the pan, is common and usually indicates local anal disease (e.g. hemorrhoid, fissure), though even bright-red bleeding may originate from proximal colon. In younger patients, proctoscopy plus sigmoidoscopy may be sufficient, but older patients warrant pan colonic imaging.

- **Colicky lower abdominal pain relieved by defecation**, particularly in younger patients, often indicates irritable bowel syndrome and usually requires only limited investigation.

- Patients with **symptoms suggestive of IBD** or with inflammation extending beyond the reach of the rigid sigmoidoscopy warrant full ileocolonoscopy to document the presence and extent of proximal disease.

- Long standing constipation has many causes, and special investigations such transit studies, defecating proctography and anorectal physiology may be necessary.

**PREPARATION FOR COLONOSCOPY**

**GENERAL**

Discontinue warfarin, aspirin, nonsteroidal anti-inflammatory drugs (NSAIDs), and iron supplements on the days prior to examination. Insulin should not be taken while fasting prior to colonoscopy. Foods to avoid on the day prior to the test include

those that may be misinterpreted during examination (e.g., red or purple foods, jello, or drinks). Patients should drink only clear liquids (no solid foods) on the day prior to colonoscopy and during the night before.  

BOWEL PREPARATION

A successful colonoscopy requires visualization of the entire mucosal surface. Thus, a complete bowel evacuation is always required before colonoscopy

Stimulant Laxatives – Before the early 1980s, stimulant laxatives, such as castor oil, senna, and bisacodyl were the most commonly used form of bowel preparation. These laxatives increase peristalsis and promote fluid secretion into the intestinal lumen. These regimens were harsh and not very effective and have been abandoned by most endoscopists.

Hyperosmotic Laxatives – Hyperosmotic purges with non-absorbable carbohydrates, such as mannitol, sorbitol, and lactulose, were used widely in past decades. It is not favored due to the risk of explosion during electrosurgical procedures.

Oral Gastrointestinal Lavage Solutions – Oral gastrointestinal lavage using balanced electrolyte solutions with polyethylene glycol (PEG) has become the preferred methods for colonoscopy preparation. The first balanced electrolyte solution with PEG (Golytely®) was developed in 1980.

Effectiveness – Several studies have demonstrated that balanced electrolyte solutions containing PEG are associated with good cleansing efficacy and reasonable patient tolerance.
• A study identified the following as independent predictors of an inadequate colon preparation later colonoscopy starting time, failure to follow preparation instructions, inpatient status, a procedural indication of constipation, use of tricyclic antidepressants, male gender, a history of cirrhosis, stroke, or dementia. A procedural indication of previous polypectomy was a predictor of a good preparation.

**Advantages** – Although patient tolerance can be an issue, PEG-containing lavages have certain advantages compared to other methods of bowel cleansing:

An unexpected benefit is that they do not damage the colonic mucosa. One group recommends that sodium-phosphate containing regimens should not be used as a colonoscopy preparation in patients with inflammatory bowel disease because of the potential of misinterpretation of aphthous lesions induced by the preparation. For similar reasons, sodium-phosphate preparations may not be desirable when evaluating patients with diarrhoea of unknown etiology.43

**Disadvantages** – The obvious disadvantage of balanced electrolyte solutions is the large volume of fluid (4 L) that patients must swallow, and the unpalatable taste, which is only partially camouflaged by flavoring. Metoclopramide may be helpful in selected patients by decreasing nausea or vomiting and promoting bowel motility.

Oral lavage is **contraindicated** in patients with an ileus, significant gastric retention, suspected or established mechanical
bowel obstruction, severe colitis, or neurological impairment that prevents safe swallowing. A nasogastric tube may be necessary to safely administer the solution in patients with swallowing dysfunction or inability to drink.

**Saline Laxatives** – Laxatives containing magnesium cations or phosphate anions are commonly termed saline laxatives.

**Oral Sodium Phosphate (Nap)** (Fleet Phospho-Soda) is one of the most commonly used saline laxatives for colonoscopy preparation. Oral NaP is a buffered oral saline laxative containing 2.4 gm monobasic sodium phosphate and 0.9 gm dibasic sodium phosphate in a stable, buffered aqueous solution and is prepared in a ginger-lemon flavored or unflavored formulation.

**Sodium Phosphate Tablets** – A relatively recent addition to the bowel preparation armamentarium is sodium phosphate dibasic anhydrous tablets (Visicol®). Multicenter controlled trials comparing Visicol® to balanced electrolyte solutions (PEG) found that they had similar cleansing efficacy.

**Safety** – Oral NaP preparations are safe in most healthy individuals. However, they can cause fluid shifts, precipitating intravascular volume depletion. As a result, they should not be used in patients with congestive heart failure, renal failure, decompensated cirrhosis, or baseline electrolyte abnormalities. Another potential concern is the development of
hyperphosphatemia. Although serum phosphate concentrations increase, the rise is clinically insignificant in most patients who adhere to the recommended regimen. Exceptions are patients with renal insufficiency (a glomerular filtration rate of <50 percent of normal) who can develop severe hyperphosphatemia.

**Cost** – An advantage of the NaP compared to the PEG-containing preparations is their lower cost. However, both are inexpensive.

The most commonly used preparations include (1) 1.5 ounces of Fleet Phospho-Soda liquid mixed into half a glass of water followed by a full glass of water at 3 pm and again at 7 pm on the day prior to examination or (2) 4 liters of polyethylene glycol (PEG) solution administered orally over a 1- to 3-hour period on the evening prior to colonoscopy.

**ANTIBIOTIC PROPHYLAXIS**

According to the most recent American Heart Association recommendations (1997), the rate of bacteremia associated with colonoscopy is 2-5%, and the typically identified organisms are unlikely to cause endocarditis. The rate of bacteremia does not increase with mucosal biopsy or polypectomy. For this reason, prophylaxis for colonoscopy, with or without biopsy, is only recommended as optional for high-risk patients (eg, those with prosthetic valves, previous history of endocarditis, complex cyanotic congenital heart disease, surgically constructed pulmonary shunts/conduits, and joint replacements); the need for prophylaxis must be determined on an individual basis by the physician. The most commonly used preprocedure and
postprocedure prophylaxis regimens are ampicillin/amoxicillin (2 g IV/IM or 1.5 g PO), gentamicin (1.5 mg/kg), or vancomycin (1 g IV).

**SEDATION**

Administration of sedative drugs at colonoscopy has drawbacks, including an increased rate of complications, higher cost, and longer recovery periods for patients. Some studies have demonstrated that routine use of conscious sedation does not seem to be necessary because some participants found the examination to be only modestly or not at all uncomfortable. However, some investigators have proposed that without conscious sedation, the rate of intubation of the cecum may decrease and the risk of missing adenomas and cancer may increase.

Intravenous benzodiazepines are the usual premedications used for colonoscopy, either alone or with a narcotic. Midazolam (2-5 mg) and diazepam (5-10 mg) are most commonly used. Meperidine (25-100 mg) may be added as needed. The combination of benzodiazepines and narcotics may achieve sedation more smoothly but is associated with a greater risk of respiratory depression. Monitor patients (eg, blood pressure, pulse, oxygen saturation) for the duration of the procedure, and watch for adverse effects of these medications.

**CONTRAINDICATIONS AND RISKS**

Colonoscopy is a relatively stressful physiologic experience and a strong vagal stimulus that can produce dysrhythmias,
minor electrocardiographic disturbances, and a degree of hypotension; therefore, it is contraindicated for several weeks after myocardial infarction.

Both the air pressure involved in distention of the colon and the unavoidable stretching during passage around loops and bends have the potential to increase any existing risk of perforation. Colonoscopy therefore is contraindicated in acute or abscess phase of diverticulitis. Severe acute episodes of ulcerative colitis, Crohn’s, ischemic, or infective colitis have generally been considered a contraindication for colonoscopy, but recent reports suggest that, with due experience and care, it is safe and may be of value in therapeutic decision making in these situations.\textsuperscript{14}

COMPLICATIONS

Colonoscopy is generally a safe procedure and complications are rare.

Perforation The most important complications of colonoscopy are perforation and bleeding. Both are quite infrequent unless endoscopic surgery has been done. Perforation, the most serious complication, is fortunately rare\textsuperscript{45}. Perforation accompanies a diagnostic procedure in 0.1 to 0.5 per cent of cases.\textsuperscript{6} and 0.3-1.0\% with polypectomy. A higher rate (4.6\%) is associated with hydrostatic balloon dilatation of colonic strictures.\textsuperscript{2}

Polypectomy can result in perforation by cutting through the bowel wall, or by applying sufficient thermal energy to burn through and necrose the full thickness of the colon, resulting in perforation delayed for several minutes to many hours after the polypectomy.\textsuperscript{18}
Perforation is more common (1) in patients who are oversedated or under general anesthesia, (2) in the presence of poor bowel preparation, or (3) with acute bleeding, and generally results from mechanical or pneumatic pressure or from biopsy techniques.  

Mechanical perforation by the tip of the instrument occurs at sites of weakness of the colon wall (eg, diverticula, transmural inflammation) and proximal to obstructing points (eg, neoplasms, strictures). Pneumatic perforation of the colon or ileum results from distension by insufflated air.

Free perforation into the peritoneal cavity may be recognized during the procedure if abdominal viscera become visible. A laceration so large that it can be observed directly through the colonoscope is a surgical emergency. In less severe situations, marked persistent abdominal distension or pain should prompt the ordering of radiographs; this imagery may reveal free air in the peritoneum. These symptoms may be delayed for several days if the leak is tiny and well localized. Retroperitoneal perforation, usually a pneumatic injury, can give rise to subcutaneous emphysema. Fever and leukocytosis may eventually develop with many of these perforations. When plain abdominal or chest radiographs show pneumoperitoneum, gross extravasation should be assessed; if present, surgical intervention is required. In the absence of leakage, treatment with intravenous antibiotics and close observation may be considered.  

Bleeding: Bleeding complicates approximately 1 of every 1000 colonoscopic procedures. Most cases resolve
spontaneously. It is most frequent complication of endoscopic resection of large polyps, which has been observed in up to 25 percent of polypectomies in some series. Following polypectomy, bleeding may occur immediately, but, in 30-50% of cases, it is delayed from 2-7 days until the eschar sloughs. Immediate bleeding can be treated by resnaring the remaining stalk and tightening the snare for 10-15 minutes, usually without further electrocoagulation. Another procedure that may be helpful is the injection of 5-10 mL of a 1:10,000 epinephrine solution into the stalk or the submucosa to achieve vasoconstriction. In the vast majority of cases, hemostasis can be achieved endoscopically; transfusion is rarely needed. However, arterial bleeding can quickly obscure the view, making hemostasis difficult.

Delayed bleeding usually stops spontaneously, although transfusions, endoscopic therapy, angiography, and even laparotomy may be required in more severe cases.

**Infection** Although endoscopic equipment has been implicated in transmitting infection, it appears as if virtually all transmissions have been due to errors in the process of cleaning and disinfecting the equipment. The risk has been estimated to be one in $1.8 \times 10^6$ procedures.

Infectious agents that can potentially be transmitted during gastrointestinal endoscopy:

- **Hepatitis B** – Hepatitis B virus has been transmitted to a single person following endoscopy. Several reports before and after
1980 suggest that with proper cleaning and disinfection, hepatitis B is adequately removed from the endoscopes.

Hepatitis C – Transmission of hepatitis C, an RNA virus, during endoscopy has been demonstrated in case reports. Transmission occurred following colonoscopy in two patients. Proper disinfection of endoscopes contaminated with hepatitis C virus can effectively eliminate the risk of transmission.

HIV – No case of HIV transmission by endoscopy has been published.

Bacteria – In the hierarchy of relative resistance to cleaning and disinfection, vegetative bacteria such as Pseudomonas sp. and Salmonella sp. are the most susceptible to disinfectants while the mycobacteria are less susceptible and bacterial spores (from B. subtilis and C. difficile) are the most difficult to eliminate. Although salmonella and pseudomonas are ubiquitous and have been associated most frequently with endoscopic transmission, they are both sensitive to multiple agents, including glutaraldehyde, phenols, and iodophors.

Mycobacteria – While mycobacteria transmission has been associated with bronchoscopy, there are no reports of mycobacteria infection following gastrointestinal endoscopy. Peracetic acid eliminates mycobacteria from bronchoscopes, Colonoscopes, and endoscopes.

Abdominal distension Colonic distension during colonoscopy can cause notable discomfort and may also impair mucosal blood flow. Carbon dioxide rather than air insufflation
during colonoscopy may offer some advantages, i.e. it is absorbed from the colon, it is nonexplosive, and mucosal blood flow is less affected, thus decreasing the risk of colonic ischemia. 2

**Postpolypectomy coagulation syndrome**

Postpolypectomy electrocoagulation syndrome refers to the development of abdominal pain, fever, leukocytosis, and peritoneal inflammation in the absence of frank perforation that occurs after polypectomy with electrocoagulation. Recognition of postpolypectomy syndrome is important to avoid unnecessary exploratory laparotomy since it resolves with conservative treatment in the majority of patients. Postpolypectomy syndrome was estimated to occur in 0.5 to 1.2 percent of patients undergoing polypectomy in two reports from the same author 49.

Postpolypectomy syndrome develops when electrical current applied during polypectomy extends past the mucosa into the muscularis propria and serosa, resulting in a transmural burn without perforation. Serosal irritation leads to a localized inflammatory response that appears clinically as a localized peritonitis.

It occurs most often after the removal of large (>2 cm) sessile polyps, which usually require large amounts and long duration of thermal energy. Inadvertent capture of a piece of normal adjacent mucosa within the snare loop during snare placement over a polyp can result in this condition when cautery transects both portions of tissue (mucosa and polyp). The saline "cushion" increases the thickness of the submucosal layer, preventing transmural thermal injury.
Treatment is conservative, consisting of intravenous fluids, nothing by mouth, bedrest, and antibiotics (combination of ciprofloxacin (500 mg PO BID) plus metronidazole (500 mg PO TID) for up to five days, until symptoms improve; thus patients should be reassured of an excellent prognosis. Patients whose symptoms have not responded or have worsened during this interval should be immediately reevaluated. In the presence of free intraperitoneal air, treatment is directed toward the perforation.49

**Splenic rupture** Although a very uncommon complication, the presumed mechanisms of splenic rupture during colonoscopy are direct trauma to the spleen, excessive splenocolic ligament traction, and decrease in the relative mobility between the spleen and the colon50. Hemodynamic instability, clinical features of acute abdomen, leukocytosis, and/or acute anemia in patients with persistent abdominal pain after colonoscopy demand immediate attention. Intestinal perforation or bleeding must first be excluded, after which CT scans can be used for further evaluation. 

**Small bowel obstruction** Small bowel obstruction is another rare complication of colonoscopy, although it is perhaps more common in patients who have a history of abdominal surgery and postoperative adhesions. The mechanism is uncertain, but it may occur secondary to air insufflation into the small bowel as a result of an incompetent ileocecal valve causing distension and entrapment of the small bowel by adhesions. Colonoscopists should be aware of this possible complication, particularly as skills improve and the ileum is intubated more frequently. Patients with a
history of abdominal surgery or bowel obstruction should be informed of this complication when consent is given.

Medication effects Sedatives used during colonoscopy may cause complications from allergic reactions or, more importantly, from doses that may be excessive for certain individuals and lead to respiratory depression. Serious events may complicate up to 0.5% of procedures. More than 50% of deaths associated with endoscopy are related to cardiopulmonary events.

Adverse effects of benzodiazepines, other than respiratory depression, include anxiety and occasional injection-site reaction; the latter are more frequent with diazepam than with midazolam. Other adverse effects of narcotics include nausea, vomiting, and hypotension. Naloxone and flumazenil readily reverse the adverse effects of narcotics and benzodiazepines, respectively, within minutes. The proper technique and sequence of administration of these drugs, together with continuous monitoring of the sedated patient, can help minimize complications.

COMPARISON WITH BARIUM ENEMA

Colonoscopy has become a procedure of first choice for most colonic investigations SINCE instrumentations have advanced technically. Allowing rectal colonic intubation in more than 90% of cases. Nevertheless, the problem in colonoscopy is in the mechanical aspects of insertion technique; the procedure is dependent on the dexterity of the operator. Endoscopic interpretation is easy because of the close-up color view backed by the ability to take pathologic specimens when necessary. However Colonoscopists can be quite unaware of the lesions in
blind spots behind acute colonic bends, or of submucous, or extracolonic pathology, which may be visible to the radiologist. It is estimated that it is unusual to miss polyps of 1 cm or greater in diameter during colonoscopy.

DCBE requires different skills. Whereas insertion of a liquid barium column is easy, considerable judgment and experience are needed to introduce the correct quality of barium and air to coat and distend all parts of the colon and its mucosal surfaces adequately, and to take the necessary radiographs. Even having obtained good-quality films, the radiologist may have difficulty in interpretation. Poor preparation, convoluted bowel loops, circular muscle spasm, diverticular disease, or air bubbles may modify the view. The radiologists' assessment of fine mucosal detail, including the smallest polyp and lesser degree of ulceration or inflammatory change, is considerably inferior to that of endoscopist, who views intraluminal appearances directly and in full color. The ability of barium enema to diagnose advanced cancer is comparable to that of colonoscopy but it is less accurate in earlier cancer, unfortunately, patients with very long and mobile colon or with advanced diverticular disease who are difficult to endoscope are also difficult for the radiologist. Barium enema can be performed following failed or difficult colonoscopy, but endoscopy is impossible in the presence of barium, it is therefore logical to attempt colonoscopy first in most circumstances, providing that each technique is equally available and that the criteria of performing primary colonoscopy are present.

Technical difficulty in patients with severe constipation and megacolon make the best managed by modified barium technique,
some times with no bowel preparation, whereas patents who have reduced mobility, rectal incontinence, prolapse, or stomas are best examined by colonoscopy, because of technical difficulty in obtaining proper filling and coating with x-ray contrast material. Barium enema is particularly effective in assessing the configuration and gross morphology of the colon, especially when there are multiple strictures or fistulas that may be impassable or invisible to the endoscopist. The colon in idiopathic or acquired megacolon or Hirschprung disease may be almost impossible to prepare and offensive and difficult to endoscope, whereas radiology gives a perfect assessment of colon configuration. In elderly patients with symptoms suggestive of diverticular disease, x-ray can exclude serious pathology in most cases; in the same patients, unless the endoscopist is expert, Colonoscopy can be relatively slow, traumatic, and more hazardous, although the endoscopic examination may be more diagnostic.

It is possible to compromise between colonoscopy and DCBE. For instance when endoscopist is not available and Colonoscopy proves unreasonably difficult, endoscopy can be abandoned, aspirating residual air as far as possible and proceeding to immediate DCBE. Using co2 rather than using air insufflation is an advantage, because in 15 minutes, there is total absorption of residual co2 leaving the radiologist an undistended bowel that is easy to fill and coat with barium. Endoscopic biopsies can be performed safely before DCBE. And all probability hot biopsies and snare removal of small stalked polyps safely precede the x-ray examination.
Barium enema films are easily stored and retrieved for comparison for subsequent examination, a feature not available for colonoscopy. Videotapes can be recorded continually or intermittently during colonoscopy, but there is no method of endoscopic photographic mapping of the large bowel. Watching 20 to 40 minutes of colonoscopic videotape is a tedious task that is not likely to be a standard part of any endoscopic review.  

LIMITATIONS OF COLONOSCOPY

The endoscopist is capable of gross errors in localization and occasionally of missing large lesions. Blind spots for the endoscopist occurs in certain areas, such as rectal ampulla and flexures (especially the mobile sigmoid-descending colon junction), behind acute bends, and in regions of spastic muscle contractions. Adhesions and strictures can render the endoscopic tip immobile and make a proper view for targeted biopsy impossible. Large polyps on long stalks can be missed by endoscopist because they move around and may spring out of the field of view as the colonoscope is pulled back. Poor preparation and redundant or mobile colons also make the endoscopic examination less accurate. It can be assumed that 5% to 10% of the mucosa is not seen during the colonoscopy. This explains the significant pickup of lesions of up to 5 to 10 mm in diameter during the check colonoscopies usually performed within one year (or even on the same day) of previous colonoscopy and polypectomy to establish the "clean colon" that is free of adenomas. It has estimated that 27% of adenomas in sizes ranging from 1 mm to 5 mm are missed on colonoscopy, as are 13% of adenomas in the range of 6 to 9 mm, and 6% of those
over 10 mm. misses of colonic neoplasm can occur in intramucosal lesions of chronic ulcerative colitis, within strictures or where there is submucosal involvement by extrinsic neoplasm or metastasis. 

Because of the minor inflammatory changes of microscopic colitis or collagenous colitis that can occur despite normal mucosal appearance, biopsies are taken in any patient with diarrhoea, even if the appearances are normal.

In addition of diagnostic difficulties, mechanical limitations are relevant, an expert manages up to 98% to 99% total colonoscopy, especially if there is no stricture or stenosing lesion to prevent insertion. Less expert endoscopists achieves only up to 70% to 75% total colonoscopy and are more likely to be slow, inaccurate in diagnosis and localization, and more traumatic and liable to complications. The lack of proper means of teaching colonoscopy skills limits its clinical application worldwide.

VIRTUAL COLONOSCOPY

Virtual colonoscopy is a new method of imaging the colon in which thin-section, helical computed tomography (CT) is used to generate high-resolution, two-dimensional axial images. Three-dimensional images of the colon simulating those obtained with conventional colonoscopy are then reconstructed off-line. Studies suggest that this technique may be an attractive alternative to existing screening tests for colorectal cancer, since it is relatively safe and minimally invasive.
Since its description in 1994, virtual colonoscopy has emerged as a promising method of colorectal evaluation. Data from some preliminary studies suggested a sensitivity of more than 75 percent and a specificity of more than 90 percent for large colorectal polyps (those more than 10 mm in diameter) and cancers. These studies also demonstrated several technical advantages of virtual colonoscopy over conventional colonoscopy, including visualization of the colon next to an obstructing lesion and ease of inspection of both ante grade and retrograde sides of haustral folds, resulting in the identification of large lesions missed on endoscopy. As demonstrated in the in vitro models, the threshold for the reliable detection of small lesions was approximately 5 mm. However, the rate of detection of larger polyps, and adenomatous polyps in particular, was much better and approached the reported rate for the detection of adenomatous polyps 6 mm or larger by conventional colonoscopy. The lower sensitivity for the detection of hyperplastic polyps may reflect the tendency of these polyps to be effaced when the colon is distended with air.

Virtual colonoscopy is relatively simple and is less invasive than conventional colonoscopy. Although full preparation of the colon is required, the procedure takes considerably less time than conventional colonoscopy and does not require sedation. Most patients experience some abdominal discomfort as a result of air insufflation, but the examination may be more acceptable to patients than conventional colonoscopy.\(^5^4\)

(A study by Cotton, et al. (2004)\(^5^5\) reported that the accuracy of CT colonography (virtual colonoscopy) for the detection of colorectal cancer is less reliable than previously thought. CT
Colonography involves the examination of computer-generated images of the colon constructed from data obtained from an abdominal computed tomographic examination. Several studies have suggested a high degree of sensitivity for CT colonography; however, those results were obtained at single, specialized centers. Cotton reported on a new study that was designed to evaluate the accuracy of CT colonography in routine practice at nine major hospital centers.

In this study, researchers assessed the accuracy of CT colonography in 615 patients aged 50 years or older who were referred for routine, clinically indicated colonoscopy (Cotton, et al., 2004). Colonoscopy was performed within 2 hours of the colonography and results were compared. The sensitivity of CT colonography for detecting one or more lesions sized at least 6 mm was 39 % and for lesions sized at least 10 mm, it was 55 %. These results were significantly lower than those for conventional colonoscopy, with sensitivities of 99 % and 100 %, respectively. CT colonography missed two of eight cancers. The accuracy of CT colonography varied considerably between centers. At the one center that had “substantial” prior experience with CT colonography, the sensitivity was 82 % for lesions of 6 mm or more. Sensitivity at all of the other centers combined was 24 %, with no improvement in accuracy as the number of cases at each center was increased. Preference questionnaires after both procedures were performed showed that 46 % of the patients preferred CT colonography versus 41 % who preferred conventional colonoscopy.
The authors stated that “even if the results of CT colonography continue to be good in the hands of experts, it has yet to be proven that this expertise can be taught and disseminated reliably into daily practice”. The authors concluded that CT colonography is not yet ready for widespread clinical application; techniques and training need to be improved. This is in agreement with the update of the clinical guidelines on colorectal cancer screening and surveillance that were prepared by a panel convened by the U.S. Agency for Health Care Policy and Research and published in 1997 under the sponsorship of a consortium of gastroenterology societies (Winawer et al, 2003). It stated that promising new screening tests (virtual colonoscopy and tests for altered DNA in stool) are in development but are not yet ready for use outside of research studies. In addition, the American College of Gastroenterology does not recommend virtual colonoscopy for screening colorectal cancers. It states that more research is needed to verify the validity and generalizability of the 3-D approach to polyp detection. It will also be necessary to develop recommendations for training in CT colonography as well as requirements of hardware and software systems and specification of methods for technical performance. Systems that allow same-day polypectomy on patients with positive CT colonography studies are not yet widely available (Rex, 2004).

The assessment concluded, however, that CT colonography can be considered for diagnostic purposes in patients in whom performing colonoscopy is clinically contraindicated or for those patients who had incomplete colonoscopy because of stenosis or obstruction of the colon (Ontario Ministry of Health and Long-Term Care, 2003). In support of this conclusion, the assessment
reasoned that CT colonography is able to visualize the entire colon in most patients with occlusive tumors or stenosing lesions, and that CT colonography may be preferable to barium enema in terms of the extent of the proximal colon that can be visualized and in terms of detecting extracolonic lesions.

An American Gastroenterological Association (AGA) Task Force Report (Van Dam, et al., 2004) concluded that, although virtual colonoscopy has significant promise, the technology is still evolving and results of virtual colonoscopy for screening are highly variable.⁵⁷

Objectives

➢ The purpose of this study is to find the relationship between various signs and symptoms to the colonoscopic findings of patients suspected to have colonic and terminal ileal disease.
To evaluate the yield of Colonoscopy in various presentations and prioritize patients as either needing urgent colonoscopy e.g. those suspected of having cancer or those who could be delayed when suspecting benign conditions.
Chapter 2

Patients
And
Methods
Chapter 2

Patients And Methods

Data was collected in the two Khartoum state public hospitals, namely Soba University and Ibnsina Specialized Hospital, the only two public hospitals where Colonoscopies are performed for patients. During January through October 2004.

We included any patient referred to the endoscopy unit with various indications for colonoscopy, both in and out patients, all ages, from any part of Sudan.

Patients intended for sigmoidoscopy, were excluded. Beside patients with known diseases coming for follow up Colonoscopy.

Bowel preparation was done by fasting from eating but only drinking fluids - avoiding milk and its products with guava juice – beside taking either of the following preparations :-

1. taking laxatives in the form of castor oil (100 ml bid for two days) plus Enemax® (120 ml of hypertonic solution of sodium phosphate) the night before +/- the morning of colonoscopy procedure.

2. polyethylene glycol PEG solution (4 Coloclean sachets each composed of: 50gm polyethylene glycol; 5.68 g sodium sulfate anhydrous; 1.68 g sodium bicarbonate;1.46 g sodium chloride; 0.75g k cl ) in two way:
All the 4 sachets were given on the day before the procedure.
4 sachets divided on two days, 2 sachets were given each day. Each of the sachets were solved in 1 liter of water and taken by the patient over two days.

3. some patients were prepared by receiving tablets of cascara for 3-5 days plus Enemax®.

Patients were interviewed and examined by the investigator, or his colleagues in endoscopy departments and questionnaires containing data about history and clinical examination were filled for each patient, before undergoing colonoscopy.

Colonoscopies were performed by experienced endoscopists, both physicians and surgeons. The colonoscopies were done by means of Colonoscopes of OLYMPUS brand (Optoelectronic OLYMPUS CF-0240L and Fiberoptic OLYMPUS CF-40L) with video, monitor and printer support.

After the procedure the findings were recorded in the questionnaires and questionnaires for patients having biopsy were labeled, to follow up the result of histopathology.
Patients were monitored for about one hour, after the procedure, until the effect of sedatives had subsided. Then they were allowed to leave to the wards or to return to their home, in case no complication had occurred.

**DATA PROCESSING**

The data were entered to SPSS data sheet as raw information. Then answers of each variable were categorized, and missed values were excluded.

Relation between indications, symptoms and signs with the “5 diagnosis” categories and subcategories were analyzed with all other related issues. Significant relations have been taken out.

More detail would be given in results and discussion. Data and results then presented on tables, charts, and figures. Beside the Statistical analysis which was performed by “**SPSS for windows release 10.0.1 (27 Oct 1999 ) standard version**”.
Chapter 3

Results
Chapter 3

RESULTS

Data was collected from 168 patients.

Age range was from 5 year to 85 years, Mean age was 47 years.

Age group: - as shown in table1 and figure1 the highest percentage was of “40-59 year age” group; 61 patients (37% ). Of interest that 3 patients (1.8%) were 10 years old or younger. Number of patients aged 50 year age or less was almost equal to those 50 or older age (50.6 : 49.4 ).

Sex distribution: 107 patients were males (63.9% ) and 61 were females (36.1%). M: F =1.8: 1.0. (fig.2)

Type of follow up: 127 patients (84.1%) were out patients, and only 24 of the patients (15.9% ) were inpatients. fig 3 )

Tribes: tribes that had the highest rate of Colonoscopy in our study in decreasing frequency were : Jaali; Shayqi; Dungulawi; Mahasi; Kawahla; Bderi and Nubawi etc. Table 2 and Fig 4

Residence : Number of patients has residence in center of Sudan was 90 (67%),West was 16 (12%) , East 13 (10%) and North 13 (10%) and South 3 (2.2%). Figure 5
Main indications: “main indication” s included change of bowel habit 60 patients (35.9%); bleeding per rectum 36 patients (27.5%); anemia 15 patients (9%); abdominal mass 11 patients (6.6%); constipation 10 patients (6.0%); abdominal pain 7 patients (4.2%); weight loss 5 patients (3.0%).

Other indications with fewer frequencies included: rectal mass 3 cases (1.8%); screening 3 cases (1.8%); barium enema abnormalities 2 cases (1.2%); possible fistula 2 (1.2%); abnormal abdominal ultrasound 2 cases (1.2%) and CT scan abnormality 1 case (0.6%). Table 3 and Figure 6

The Colonoscopic findings and final diagnosis were divided to five groups to study the relation of indications and clinical presentations to each group, the groups were classified as follow:

1. normal: totally normal findings 61 cases (36.3%)
2. neoplasms: when colonoscopic finding suggest malignancy and histopathological confirmation was done. 18 cases (10.7%)
3. polyps: including all types of polyps, of various numbers and sizes, as main Colonoscopic finding. 24 cases (14.3%)
4. IBD: 26 cases (15.5% of total) including
   a. Non specific colitis 8 cases (4.8% of total).
   b. Proctitis 5 cases (3% of total).
   c. Crohn’s disease 7 cases (4.2%).
   d. Ulcerative colitis 5 cases (3% of total).
   e. Microscopic colitis 1 case (0.6% of total).
5. **Others**: 39 cases (23.2% of total) including (diverticulosis 5 cases (3% of total), piles 19 cases (11.3%), solitary rectal ulcer 1, portal colopathy 1, colo-vesical fistula 1, anal fissure 2). Also included in this category, 10 cases of ill defined colonoscopic abnormalities like “irregular mucosa, possible adhesions, vascular abnormality, and extracolonic masses”.

According to this classification the colonoscopic finding was as follow:

**IBD**: 26 cases making (15.5%), **Neoplasms**: 18 cases (10.7%), **polyps**: 24 cases (14.3%), **normal**: 61 (36.3%), **others**: 39 (23.2%).

*Table 4. and Figure 7a.*

**Site of lesions**

**Crohn’s disease**: of 7 patients with crohn’s disease 4 (57.1%) were at ileocecal valve, and 3 (42.9%) were at terminal ileum. So all were beyond the reach of left colonoscopy.

**Ulcerative colitis**: of 4 UC patients 2 (50%) of them the lesion was in descending colon, 1 (25%) in rectum and 1 (25%) was extensive.

Nonspecific colitis: of 7 patients with this diagnosis; 2 (28.6%) had the lesion in sigmoid colon; 2 (28.6%) had it all over colon; 1 (14.3%) were in each of cecum, descending colon and transverse colon. So 42.8% were beyond the reach of left colonoscopy.

**Significant Polyps** (equal and larger than 10 mm)

9 of the polyps were of such a size (5.4% of total colonoscopies), of these 4 (44%) were in descending colon; 2 (
22.2%) in rectum; 1 (11.1%) were in each of ascending colon, ileocecal valve and sigmoid colon. So 22.2% were beyond the reach of left colonoscopy.

**Diverticular disease:** of 7 diverticular cases, 4 (57.1%) of them had the lesion localized in sigmoid colon, 2 (28.6%) in descending colon and 1 (14.3%) in transverse colon. So 14.3% were beyond the reach of left colonoscopy.

**Malignant cases:** of 18 malignant cases the distribution was as follow: 9 (50%) in rectum; 2 (11.1%) in each of sigmoid, cecum and ascending colon; 1 (5.5%) in each of anus, descending colon and ileocecal valve. Thus 27.8% of them were beyond the reach of left colonoscopy.

In general, 29.2% of all lesions mentioned previously were beyond the reach of left colonoscopy.

**Geographical distribution of malignant cases**

Malignant cases distributed as: 6 cases Central Sudan (37.5%), 4 (25%) cases East Sudan, 3 cases (18.7%) West Sudan, 2 cases (12.5%) South and 1 case (6.2%) in North.

**Geographical distribution of Polyps**

Central Sudan 12, Northern Sudan 3, West Sudan 2 and Eastern Sudan 2 cases. **Figure 7b**

**Age groups of Malignant cases**

- 20-39 years 8 cases (44.4%)
- 40-59 years 6 cases (33.3%)
- 60-79 years 3 cases (16.7%)
- less than 20 years 1 case. (5.6%)
11 cases (61.1%) were less than 50 years and 7 cases were 50 years or more.

**Geographical distribution of IBD**

Central Sudan 6 IBD cases, Eastern Sudan 4 cases, West Sudan 3 cases, South Sudan 2 cases, Northern Sudan 1 IBD case. **Figure 7c.**

**Relation of the “main indication” to the colonoscopic findings**

**Change of bowel habit**

In 59 patients (35.1% of total) the “main indication” was change of bowel habit (either diarrhoea or diarrhoea alternating with constipation), of them 15 patients (24.4%) found to have IBD, 7 (11.9%) had polyps, 6 (10.2%) had neoplasm and 20 cases (33.9%) found to be normal. **Figure 8.**

**Bleeding per rectum**

46 patients (27.4% of total) has “bleeding per rectum” as main indication, of them: 8 cases (17.4%) had IBD, 10 cases (21.7%) had polyps, 2 cases (4.3%) had neoplasm, 12 cases (26.1%) were normal, and 14 cases (30.4%) had “others”. **Figure 9.**

Of interest that one of the patients had overwhelming bleeding per rectum (hematochezia) with mild gastric erosion not explaining such severe bleeding the colonoscopy did not find the source of bleeding and after laparotomy it turned to be mesenteric vein thrombosis.
Anemia was the indication of 15 cases (8.9%), 10 cases (66.7%) had normal colon, 2 cases (13.3%) had malignancy and 3 (20%) had “others”.

Abdominal mass 11 patients had this as indication the yield was: 2 IBD, 3 malignancies, 2 normal, 1 polyp and 3 “others”.

Constipation: 10 cases had this indication, 5 were normal, 3 had polyps and 2 were of “others” category.

Abdominal pain: 7 cases had this indication 5 (71.4%) were normal and 2 cases (28.6%) had polyps.

Other Indications
Of interest is that only 2 cases had barium enema abnormality as an indication with another 2 cases had ultrasound abnormality and one had CT scan abnormality as indication of their Colonoscopy. Table 5.

Indication of cases found to have malignancy:
Of 18 patients (10.7% of total) with malignancy, Change of bowel habit, abdominal mass, bleeding per rectum, rectal mass and anemia were the main indications of colorectal malignancies in decreasing frequency. Figure 10.

Indications of cases found to have inflammatory bowel disease:
IBD constituted 15.5% of total (26 cases) their indications were change of bowel habit, bleeding per rectum, abdominal mass and weight loss, in decreasing frequency as shown in figure 11:

Indications of cases found to have various polyps:
Polyps constituted 14.3% of total (24 cases) their indications were “bleeding per rectum; change of bowel habit; constipation; abdominal pain; abdominal mass and weight loss” in decreasing frequency. figure 12.

All polyps 1.5 cm or larger (28.6% of all polyps) had rectal bleeding while 53.3% of polyps less than 1.5 cm had rectal bleeding.

**Indications of cases with normal colonoscopic finding**

Of 61 patients (36.3% of total) indications of their Colonoscopy were:
Change of bowel habit; bleeding per rectum; anemia; constipation; abdominal pain; abdominal mass; weight loss; screening; ultrasound abnormality and barium enema abnormality in decreasing frequency. Figure 13.

**Indications of cases with “Others” diagnosis category**

In the “Others” diagnosis category there were 19 cases of piles and 5 cases with diverticulosis both making 61% of this category. The indications of Colonoscopies with this category finding were (bleeding per rectum; change of bowel habit; “anemia, abdominal mass”; constipation; “rectal mass, screening, ultrasound abnormality and fistula possibility”) in decreasing frequency. Figure 14

**The rate of cecal intubation (full colonoscopy):** was 78.8% (130 colonoscopy of total 165) is as shown in figure 15. Highest rate of full Colonoscopy (88.5%) was in patients found to
have “normal” diagnosis while lowest rate (61.1%) was of “neoplasm” diagnosis category.

**Terminal ileum intubation:** In 24 cases of total 165 (15.2%), terminal ileum was intubated. And in 24 /130 (18.5%) of those who had cecal intubation terminal ileum was intubated.

**Causes of failure of full colonoscopy:**
Poor preparation was the most frequent cause of incomplete Colonoscopy (31.3%), then presence of mass (21.9%), difficult colonoscopies making 36.7% of failure causes. Table 6, figure 16

**Complications of colonoscopy**

- **Postpolypectomy bleeding:** 1 case (0.65%); Restlessness: 1 case (0.65%);
- **Perforation following polypectomy:** 1 case (0.65%);
- **Shock:** 1 case (0.65%);

**No remarkable complication:** 149 cases (97.4%)

**Bowel preparation methods and efficacy of preparation:**

Reviewing results of 4 main regimen of preparation used in this study, namely

1. **polyethylene glycol (PEG) “Coloclean” in form of 4 sachets (each one solved in 1 lire) given over two days (4/2).**
2. **polyethylene glycol (PEG) “Coloclean®” in form of 4 sachets given over one day(4/1).**
3. castor oil 100 cc twice daily for 3 days followed by
“enemax ®” which is hypertonic solution of sodium
phosphate, ready made enema, 120ml.
4. tablets of Cascara Sagrada (irritant or stimulant laxative).

It appears that PEG solution 4 in one day (second regimen) had best preparation efficacy with statistical significance of 0.036.

Figure 17.

Relations and their significance

Relation of patients’ residence to final diagnosis category:

It appears from table 7,8,9 that Rate of malignant cases are less in central Sudan with statistical significance of 0.01. While the Rate of malignancy cases are higher in south and east with statistical significance of (p=0.036 and p=0.048) respectively.

There was no statistically significant difference between different regions of Sudan for “polyps”, “IBD”, “Normal”, “others” in our study group.

Relations of “neoplasm” category

Relation of abdominal pain with finding of neoplasm:

Finding of neoplasm were less frequent in patients having abdominal pain 8 out 108 (7.4%) when compared with those
without abdominal pain 8 out of 36 (22.2%), this difference is significant statistically (P = 0.02). Figure 18

**Relation of weight loss with finding of neoplasm:**
Finding of neoplasms were more frequent in patients having weight loss 14 out of 83 (16.9%) when compared with those without weight loss 2 out of 51 patient (3.9%) this difference is significant statistically (P = 0.02). Figure 19

**Relation of cachexia and presence of neoplasm:** 5 of 17 (29.4%) of patients with cachexia had neoplasm in comparison to those without cachexia of whom neoplasm was found in 11 of 127 (8.7%) the relation was positive and significant (P = 0.024). Figure 20

**Relation of pallor with neoplasm:** 12 of 52 (23.1%) of patients with pallor had neoplasm while only 4 of 93 (4.3%) of those without pallor, had neoplasm. 12 of 16 cases (73%) of neoplasm cases found to be pale, while those without neoplasm only 40 of 129 (31.0%) had pallor, a difference of statistical significance (P = 0.001). Figure 21.

**Relation of smoking with finding of neoplasm:** No relation found between smoking and finding of neoplasm:
Same thing is true for relation of snuffing, alcohol intake with finding of neoplasm, as no relation was found between them.

**IBD**
Relation of indications to IBD: 15 patients of 45 (25%) who had change of bowel habit as indication of their Colonoscopy found to have IBD in comparison to 11 of 109 patients (10.1%) with other indications. A statistically significant result (P = 0.014).

**Figure 22**

History of diarrhoea and IBD: 23.7% of those with diarrhoea (18 of 76 cases) found to have IBD while 9.6% (7 of 73 cases) of those without diarrhoea had IBD, a statistically significant difference (P = 0.028).

**Figure 23**

Relation of weight loss to IBD: 18 patients of 21 (85.7%) of IBD patients had weight loss in comparison to 65 of 113 (57.5%) of those without IBD who had weight loss. And in another way 21.7% of cases with weight loss found to be IBD in comparison to 5.9% who did not have weight loss. A statistically significant result (P = 0.015-0.011).

**Figure 24**

Fever and IBD: Half of IBD cases had fever while only 16% of other cases had fever. Or 12 of 31 (38.7%) cases with fever found to have IBD in comparison to those without fever as 12 of 112 (10.7%) had IBD. A difference of high statistical significance (P = 0.001).

**Figure 25**

Alcohol intake history and IBD: 5 of 22 (22.7%) of IBD cases found to have history of alcohol intake, while only 2 out of 119 (1.7%) of those without IBD had history of alcohol intake.

5 of 7 (71.4%) of patients who had history of alcohol intake found to have IBD while 17 of 117 (12.7%) of IBD cases had no history of alcohol intake. A result which is statistically highly significant in both sides (P = 0.001).

**Figure 26**
Such a difference was not found with either of UC and Non specific colitis separately. But with Crohn’s disease, as 28.6% of alcohol consuming patients had Crohn’s disease in comparison to 3% of those who never consumed alcohol. ( P=0.029). Table10

Snuffing ( smokeless tobacco) and IBD:
6 cases ( 33.3%) of snuffers found to have IBD, 17 ( 13.6%) of non snuffers had IBD. Or 26.1% of IBD had history of snuffing while 10% of other diagnosis had snuffing history .this difference is also of statistical significance ( P = 0.044). Figure 27

Such a difference was not found with either of UC, Crohn’s disease and Non specific colitis separately. The difference is with IBD including all cases of UC, Crohn’s disease, Nonspecific colitis Proctitis, and Microscopic colitis collectively.

POLYPS:
Most of polyps were of (hyperplastic and inflammatory) type 19 cases (76%), in three cases (12%) the polyps were of adenomatous type, 2 cases were hamartomatous type and one was juvenile polyp. Table 11 a, Figure 28-a

Sites of the polyps in decreasing frequency were: sigmoid colon 8 ; descending colon 6; rectum 5; ascending colon 2 and 1 case had multiple polyps in both transverse and descending colon and one cases had polyps allover. Figure 28-b

One of the cases had multiple hamartomatous polyps with duodenal polyps and was diagnosed as Peutz-Jeghers syndrome. Another cases had multiple polyps allover colon and diagnosis was juvenile polyposis ( it is also a hamartomatous type ).
Relation of sex with polyps: Male found to have most of the polyps i.e. 20 cases (83.3%) in comparison to female, only 4 cases (16.7%). This difference is significant statistically (\( p = 0.039 \)). Figure 29

Relation of diarrhoea history with polyps: Of patients who had diarrhoea only 7 of 76 (9.2%) had polyps while those without diarrhoea 15 of 73 (20.5%) had polyps, a difference of statistical significance (\( p = 0.042 \)). Figure 30

Relation of pallor with polyps: Of patients who had polyps only 3 out of 20 (15%) had pallor, on another hand, patients who had pallor only 3 out of 52 (5.8%) had polyps in comparison to those with no pallor who had polyps in 17 out of 93 cases (18.3%).

This suggest negative relation of pallor with presence of polyps of statistical significance (\( p = 0.044 \)). Figure 31

Relation of weight loss with polyps: 8.4% of patients with weight loss had polyps while 23.5% of those without weight loss had polyps, a difference of statistical significance (\( p = 0.021 \)), also suggest negative relation between presence of weight loss and presence of polyps. Figure 32

Relation of age group to ratio of polyp finding: The age group of 60-79 years and “< 20 years” had highest rate of polyp finding in comparison to other age group, a difference of statistical significance (\( P = 0.014 \)). Figure 33.

NORMAL COLONOSCOPY
Normal Colonoscopic finding and sex of patients: 33 of 108 (30.6%) male Colonoscopies’ were normal, while 28 of 61 (45.9%) of females’ were normal, a difference with statistical significance (P = 0.034). Figure 34

Normal Colonoscopy and abdominal pain: 46 of 108 (42.6%) of cases with abdominal pain found to be normal in comparison to 9 of 36 (25%) of those without abdominal pain. Also a statistically significant result (P = 0.044). Figure 35

Normal Colonoscopy and rectal bleeding: 21 of 78 (26.9%) of cases with rectal bleeding history found to be normal while 34 of 70 (48.6%) of those without rectal bleeding found to be normal. i.e. absence of rectal bleeding suggest normal colonoscopy, a result of statistical significance (P = 0.01). Figure 36.

Normal Colonoscopy and history of irritable bowel syndrome:

43 of 141 patients (30.5%) gave history of irritable bowel syndrome. 22 of 43 (51.2%) of patients who had history of irritable bowel syndrome found to be normal while 33 of 98 (33.7%) of those without such history has normal colonoscopy. A difference not significant statistically (P= 0.061).

22 of 55 (51.2%) of cases with normal Colonoscopy gave history of irritable bowel syndrome while 21 of 86 cases (24.4%) with an abnormal Colonoscopic finding gave history of irritable bowel syndrome. A statistically significant difference (p = 0.039 ). Figure 37

Normal Colonoscopy and age group: Relation of age group and rate of normal colonoscopy appears in Figure 38, of note is that, cases below 20 years have the least rate of normal
Colonoscopy (16.7%) and those between 40-59 year have highest rate of normal Colonoscopy (42.6%).

**Normal Colonoscopy and smoking:** Normal colonoscopy was more in nonsmokers 53 of 131 patients (40.5%) when compared with smokers 1 of 10 (10%). But slightly less than statistical significance ( P = 0.051) which may be significant if the sample was larger. **Table 11 b**

“Others”

“Others” finding rate was more in smokers 5/10 cases (50%) than non smokers 25/131 cases (19.1%). Significant (P= 0.036). **Table 12**
Table 1. Age group distribution of patients

<table>
<thead>
<tr>
<th>Age groups</th>
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<th>Percent</th>
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<tr>
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<td>=&gt;80</td>
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<tr>
<td>20-39</td>
<td>42</td>
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</tr>
<tr>
<td>40-59</td>
<td>61</td>
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<td>60-79</td>
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</table>
Age groups

Fig 1. Age group distribution of patients

Patient gender

Fig 2. Sex distribution
Fig 3. Type of follow up distribution

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<td>batahen</td>
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<td>2.2</td>
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<td>bder</td>
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<td>3.7</td>
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<tr>
<td>denka</td>
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<td>1.5</td>
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<td>5.1</td>
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</tr>
<tr>
<td>haraki</td>
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<td>1.5</td>
</tr>
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<td>humr</td>
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<td>1.5</td>
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<td>3.7</td>
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<tr>
<td>mahas</td>
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<td>5.1</td>
</tr>
<tr>
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<td>3.7</td>
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<td>rafaai</td>
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Table 2. Frequency of patients according to their tribe's
Fig 4. chart of patients distribution according to their tribe

Fig 5. residence of patients
### Table 3. Colonoscopy indications

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<thead>
<tr>
<th>Indication of colonoscopy</th>
<th>Frequency</th>
<th>Percent</th>
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<tr>
<td>Change of bowel habit</td>
<td>60</td>
<td>35.9</td>
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<tr>
<td>bleeding perrectum</td>
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<td>27.5</td>
</tr>
<tr>
<td>anemia</td>
<td>15</td>
<td>9.0</td>
</tr>
<tr>
<td>abd mass</td>
<td>11</td>
<td>6.6</td>
</tr>
<tr>
<td>constipation</td>
<td>10</td>
<td>6.0</td>
</tr>
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<td>abd pain</td>
<td>7</td>
<td>4.2</td>
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<td>1.8</td>
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<tr>
<td>screen</td>
<td>3</td>
<td>1.8</td>
</tr>
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<td>barium enema abn</td>
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<td>1.2</td>
</tr>
<tr>
<td>fistula</td>
<td>2</td>
<td>1.2</td>
</tr>
<tr>
<td>ultra sound abn</td>
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<td>1.2</td>
</tr>
<tr>
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Fig 6. chart of Colonoscopy indications
### Table 4a. Diagnosis

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### Table 4b. diagnosis categories

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</tr>
<tr>
<td>other</td>
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<td>7.7</td>
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<td>just polyp</td>
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<td>7.7</td>
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</table>
Fig. 7a. diagnosis categories

Fig 7b- geographical distribution of “polyps” cases
Fig 7 C. Geographical distribution of IBD
### Fig 8. diagnosis of patients with "change of bowel habit" indication

#### Table 5. Main indications and their yields

<table>
<thead>
<tr>
<th>Count</th>
<th>IBD</th>
<th>neoplasm</th>
<th>normal</th>
<th>others</th>
<th>polyps</th>
<th>Total</th>
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<tbody>
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<td>6</td>
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<td>11</td>
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<td>26</td>
<td>18</td>
<td>61</td>
<td>37</td>
<td>24</td>
<td>166</td>
</tr>
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</table>
Ind : bleeding per rectum

Fig 9. diagnosis of patients with “bleeding per rectum” indication

Fig 10. indications of malignant cases
Indication of colonoscopy

Fig 11. indications of IBD cases

Fig 12. indications of cases with “polyps”
Fig 13. Indications of cases with normal Colonoscopic finding

Fig 14. Indications of cases with “Others” diagnosis category
**Table 6. Causes of incomplete colonoscopy**

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<thead>
<tr>
<th>Causes</th>
<th>Frequency</th>
<th>Percent</th>
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<tr>
<td>1. difficult</td>
<td>12</td>
<td>37.5%</td>
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<tr>
<td>a) external adhesions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) external compressions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) excessive looping</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. mass did not allow</td>
<td>7</td>
<td>21.9%</td>
</tr>
<tr>
<td>3. poor preparation</td>
<td>10</td>
<td>31.25%</td>
</tr>
<tr>
<td>4. patient intolerance</td>
<td>3</td>
<td>9%</td>
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</table>

Total: 32 cases = 100%
Fig 16. Causes of incomplete colonoscopy

Fig 17. Bowel preparation methods and their efficacy
<table>
<thead>
<tr>
<th>neoplasm</th>
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</thead>
<tbody>
<tr>
<td>central sudan</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>no</td>
<td>Count</td>
<td>35</td>
<td>85</td>
</tr>
<tr>
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<td>Count</td>
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<tr>
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Table 7. “Central Sudan * number of malignant cases”

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<tr>
<td>Total</td>
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Table 8. “South Sudan * number of malignant cases”

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<tr>
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<tr>
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</tr>
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</table>

Table 9. East Sudan * number of malignant cases
Fig. 18. Relation of abdominal pain with finding of neoplasm

Fig. 19. Relation of weight loss with finding of neoplasm
Fig. 20. Relation of cachexia with finding of neoplasm

Fig. 21. Relation of pallor with finding of neoplasm
indication: change bowel habit

Fig 22. Relation of change of bowel habit to finding of IBD

diarrhoea

Fig 23. diarrhoea and IBD
Fig 24. Relation of weight loss to IBD

Fig 25. Fever and IBD
### Table 10. Alcohol consuming and Crohn’s disease

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<td>5</td>
<td>135</td>
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<tr>
<td>% within alcohol intake</td>
<td>97.0%</td>
<td>71.4%</td>
<td>95.7%</td>
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<td>6</td>
</tr>
<tr>
<td>% within alcohol intake</td>
<td>3.0%</td>
<td>28.6%</td>
<td>4.3%</td>
</tr>
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</table>

**Total**

| Count | 134 | 7 | 141 |
| % within alcohol intake | 100.0% | 100.0% | 100.0% |

**Fig 26. alcohol intake and IBD**
Fig 27. Snuffing and IBD

<table>
<thead>
<tr>
<th>Type of polyps</th>
<th>Number</th>
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<tbody>
<tr>
<td>Hyperplastic and inflammatory</td>
<td>19</td>
<td>76%</td>
</tr>
<tr>
<td>adenomatous</td>
<td>3</td>
<td>12%</td>
</tr>
<tr>
<td>hamartomatous</td>
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<tr>
<td>Juvenile polyposis</td>
<td>1</td>
<td>4%</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>25</strong></td>
<td><strong>100%</strong></td>
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</table>

Table 11a Types and frequencies of polyps
Fig 28-a. Types and Number of cases with polyps

Fig 28-b. sites of polyps
Fig 29. Relation of sex with polyps

Fig 30. Relation of diarrhoea with polyps
Fig 31. Relation of pallor with polyps.

Fig 32. Relation of weight loss with polyps.
Fig 33. Relation of age group to Number of patients with polyps

Fig 34. Colonoscopic finding and sex
Fig 35. Colonoscopic finding and abdominal pain

Fig 36. Normal Colonoscopy and rectal bleeding
Fig 37. relation of “normal” Colonoscopy with irritable bowel syndrome

Fig 38. Normal Colonoscopy and age group
### Table 11b. Smoking and Normal Colonoscopy

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<td>70</td>
<td>37</td>
</tr>
<tr>
<td>yes</td>
<td>53</td>
<td>54</td>
</tr>
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</table>

### Table 12. Smoking and "Others"

<table>
<thead>
<tr>
<th>Indications</th>
<th>normal</th>
<th>abnormal</th>
<th>Diagnostic yield (Abnormality%)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change of bowel habit</td>
<td>25</td>
<td>33</td>
<td>56.90%</td>
<td>0.3</td>
</tr>
<tr>
<td>Bleeding per rectum</td>
<td>19</td>
<td>26</td>
<td>57.80%</td>
<td>0.3</td>
</tr>
<tr>
<td>Abdominal pain</td>
<td>5</td>
<td>2</td>
<td>28.60%</td>
<td>0.17</td>
</tr>
<tr>
<td>Anemia</td>
<td>13</td>
<td>2</td>
<td>13.30%</td>
<td>0.001</td>
</tr>
<tr>
<td>Constipation</td>
<td>4</td>
<td>5</td>
<td>55.60%</td>
<td>0.58</td>
</tr>
<tr>
<td>Abdominal mass</td>
<td>2</td>
<td>9</td>
<td>81.80%</td>
<td>0.047</td>
</tr>
<tr>
<td>Rectal mass</td>
<td>0</td>
<td>3</td>
<td>100%</td>
<td>0.149</td>
</tr>
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</table>

### Table 13. General Diagnostic Yield of Each Indications
Fig 39. number and sizes of the polyps.

Table 14. rectal bleeding and polyp sizes cross table
<table>
<thead>
<tr>
<th>Factors</th>
<th>Diagnosis categories</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>neoplasms</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>male</td>
<td>Ns</td>
</tr>
<tr>
<td>female</td>
<td>Ns</td>
</tr>
<tr>
<td>Residence</td>
<td></td>
</tr>
<tr>
<td>Central</td>
<td>- ve</td>
</tr>
<tr>
<td>Eastern</td>
<td>+ve</td>
</tr>
<tr>
<td>Southern</td>
<td>+ve</td>
</tr>
<tr>
<td>Age groups</td>
<td></td>
</tr>
<tr>
<td>&lt; 20 years</td>
<td>Ns</td>
</tr>
<tr>
<td>40-59 years</td>
<td>Ns</td>
</tr>
<tr>
<td>60-79 years</td>
<td>Ns</td>
</tr>
<tr>
<td>Symptoms</td>
<td></td>
</tr>
<tr>
<td>Rectal bleeding</td>
<td>Ns</td>
</tr>
<tr>
<td>Abdominal pain</td>
<td>- ve</td>
</tr>
<tr>
<td>Fever</td>
<td>Ns</td>
</tr>
<tr>
<td>Weight loss</td>
<td>+ve</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>Ns</td>
</tr>
<tr>
<td>History</td>
<td></td>
</tr>
<tr>
<td>Irritable BS</td>
<td>Ns</td>
</tr>
<tr>
<td>Habits</td>
<td></td>
</tr>
<tr>
<td>Alcohol</td>
<td>Ns</td>
</tr>
<tr>
<td>Smoking</td>
<td>Ns</td>
</tr>
<tr>
<td>snuffing</td>
<td>Ns</td>
</tr>
<tr>
<td>Signs</td>
<td></td>
</tr>
<tr>
<td>Cachexia</td>
<td>+ve</td>
</tr>
<tr>
<td>pallor</td>
<td>+ve</td>
</tr>
</tbody>
</table>

Table 15. summary of correlations
Ns = No statistically significant correlation, +ve = positive correlation, -ve = negative correlation

Figure 40. Sex distribution of colorectal cancer
Figure 41. Colorectal cancer age distribution

Table 16. The yield of rectal bleeding for colorectal cancer.

Table 17. Polyp sizes and presence of pallor
### Table 18. Polyp sizes and history of diarrhea

<table>
<thead>
<tr>
<th></th>
<th>size of largest</th>
<th></th>
<th></th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>in between</td>
<td>large</td>
<td>small</td>
<td></td>
<td></td>
</tr>
<tr>
<td>diarrhoea no</td>
<td>2</td>
<td>4</td>
<td>10</td>
<td>16</td>
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<td></td>
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<td>66.7%</td>
<td>66.7%</td>
<td>69.6%</td>
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<tr>
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<tr>
<td></td>
<td>33.3%</td>
<td>33.3%</td>
<td>30.4%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td>6</td>
<td>15</td>
<td>23</td>
<td>100.0%</td>
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<td></td>
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<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
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</tr>
</tbody>
</table>

### Table 19. Polyp sizes and weight loss history

<table>
<thead>
<tr>
<th></th>
<th>size of largest</th>
<th></th>
<th></th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>in between</td>
<td>large</td>
<td>small</td>
<td></td>
<td></td>
</tr>
<tr>
<td>weight loss no</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>12</td>
<td>100.0%</td>
</tr>
<tr>
<td></td>
<td>100.0%</td>
<td>66.7%</td>
<td>50.0%</td>
<td>60.0%</td>
<td></td>
</tr>
<tr>
<td>yes</td>
<td>2</td>
<td>6</td>
<td></td>
<td>8</td>
<td>33.3%</td>
</tr>
<tr>
<td></td>
<td>33.3%</td>
<td>50.0%</td>
<td>40.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td>6</td>
<td>12</td>
<td>20</td>
<td>100.0%</td>
</tr>
<tr>
<td></td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td></td>
</tr>
</tbody>
</table>
Chapter 4

➢ Discussion
➢ Conclusions
➢ Recommendation
➢ References
➢ Appendices
Chapter 4

Discussion

As it was mentioned in the objectives, we aimed at categorizing patients according to their Colonoscopic and histopathological findings, so that differences in their indications and clinical presentation could help to suggest one of the categories and then to prioritize their need to Colonoscopy according to that.

Ages were between 5 years to 85 years, so that different age groups were represented in the study. “Age group of 40-59” had highest percentage of all Colonoscopies 37%. Age groups of “< 20 years” and “> 80 years” had minimal representations of 7.1% and 1.8% respectively.

This is possibly reflecting less prevalence of colonic disease in child and adolescence, also reflecting less prevalence of peoples older than 80 years.

Of note that “< 20 years” age group had minimal “normal” Colonoscopy as only 2 of 12 (16.7%) found to be normal, and 1 “IBD”, 1 “Neoplasm”, 4 “polyps” was found (2 multiple hamartomatous polyps, one juvenile polyposis).

Males constituted 63.9% and female 36.1% of all Colonoscopies.
This result is close to a study that was in Al-Amiri Hospital in Kuwait City, a total of 3000 colonoscopic examinations were done between January 1995 and December 1999, by Mohammed A et al.\textsuperscript{58} in which females constituted (38\%) and male (62\%) of patients who underwent colonoscopy.

\textit{Out patients constituted majority of our-patients (84.1\%) while in- patients constituted minority (15.9\%).} A result which is also close to that of Mohammed A et al. \textquoteleft 86\% were from the outpatients and (14\%) from outpatients\textquoteright.

Seven “main indication” included change of bowel habit (35.9\%); bleeding per rectum (27.5\%); anemia (9\%); abdominal mass (6.6\%); constipation (6.0\%); abdominal pain (7.2\%); weight loss (3.0\%).

In Mohammed A et al. lower abdominal pain had the highest frequency as an indication (53.6\%) but a minimal diagnostic yield (7\%) while \textit{in our study abdominal pain was the main indication in (7.2\%) of patients with the diagnostic yield of (28.6\%).}

As its known that chronic abdominal pain is a low yield indication\textsuperscript{14, 59} This result in our study reflects a more strict patient selection for Colonoscopy.

In Mohammed A et al study the diagnostic yield was 40\% for iron deficiency anemia. \textit{We had 33.3\% diagnostic yield for anemia and 2 patients (13.3\% of all anemic) had malignancy.}
Chak et al. found that 5.3% of patients over age 55 with iron deficiency anemia had colorectal cancer.

Iron deficiency anemia is a high diagnostic yield indication. But it is known that about 80% of anemic patients could have negative colonoscopic examinations.

The diagnostic yield for abdominal mass and rectal mass on PR examination was high: 81.8%, 100% respectively, although the number of patients with rectal mass was only 3 patient made it non significant statistically. Table 13

Siles –s (1997) found that a mass on digital rectal examination to be one of the significant predictors of neoplasm. Thus a mass in abdomen examination or rectal examination should be considered priority for colonoscopy.

In 36.3% of our cases no abnormality was detected, so the over all diagnostic yield was 63.7%.

In our study (14.3% of all cases.) had “polyps” constituting 22.4% of abnormal colonoscopic finding. In our study we found negative relation between finding of only “polyps” and symptoms like weight loss and pallor and diarrhea.

It is known that many polyps are found incidentally at endoscopy & symptoms are unlikely to be caused by the polyps. As most of adenomatous polyps are asymptomatic.

Siles-s et al., in his study found polyps in 19% of colonoscopies.
In another 2 series by (Haslar & Dubin) polyps were found in 28% of new patients undergoing colonoscopy. 65

- 3 polyps (12%) of polyps were adenomatous type, so the yield of adenomas was 3 out of 168 cases (1.8%). And the prevalence of cases with non adenomatous polyp was 13.3%. This reflects the prevalence of adenomas in patients with colonic symptoms undergoing Colonoscopy.

- We found that 60% of all the polyps to be 0.5 cm or less, 8% (< 1.5 cm) and 32% (> 1.5 cm).

Pichardt et al (2004) 66 found that the prevalence rate of non adenomatous polyps to be 8.8% (6 mm) and 2.0% (10 mm). 82.3% of the polyps were diminutive (0.5 cm).

Helwig E B noted that incidence of adenomatous polyps was 10.4% in white people with a progressive increase with age reaching 25.8% for males and 20.5% for females in eighth decade. 67

Ang YS. et al (2002) 68 found that The overall yield of adenomas was 5.8% in patients with average risk and non specific colonic symptoms. The yield of distal adenomas in patients > or= 50 years of age was 8.2% (37 out of 450) versus 0.2% in the <50 years group.
It is established that incidence of adenomatous polyps increase with aging in countries with high and intermediate risk of colorectal cancer. In US the prevalence is 30-40% of individuals older than 60 years.

It is epidemiology is similar to that of colorectal cancer so, its uncommon when the incidence of colorectal cancer is low. Its prevalence varies from almost zero among black South Africans to 10% in Japan and colombia.  

Malignant cases were 18 cases (10.7% of all cases who underwent Colonoscopy). Indications with decreasing yield for malignancy were CT abnormality 1/1, rectal mass 2/3 (66.7%), barium enema abnormality 1/2, abdominal mass 3/11 (27.3%), weight loss 1/5 (20%), anemia 2/15 (13.3%), change of bowel habit 6/59 (10.2%). It appears that the former indications are more specific for malignancy and should be considered seriously.

Siles-S (1997) found neoplasm in 19% of all patients who underwent Colonoscopy.

The yield of “bleeding per rectum” was: 2 cases (4.3%) neoplasm, 10 polyp cases (21.7%), and 14 cases (30.4%) “others”. In “others” group sole anorectal causes for rectal bleeding were 9 cases (19.6% of all rectal bleeders).

Of the 10 cases who mainly had polyps: 6 cases had polyps 1.5 cm or larger (28.6% of all polyps), all of them (100%) had rectal bleeding. They made up 3.6% of total cases (16.7% of all rectal
bleeders), while 53.3% (8 cases) of polyps less than 1.5 cm had rectal bleeding making up 4.7% of all cases (22% of rectal bleeders).

Table 14 figure 39

Gane E J & Lane M R (1992) in their Colonoscopic study on 240 patients with lower GIT bleeding found that lesions explaining the bleeding were active colitis 9%, large polyps 10% and colorectal cancer 12% of patients. 69

Helfand et al. reported that 6.5% of patients with self reporting histories of visible rectal bleeding detected by systemic reviews had colorectal cancer. 70

Neugut et al (1993) found that 8.6%, of those who underwent Colonoscopy for lower GIT bleeding, had cancer and 25% had adenomatous polyps. 28

Mulcahy et al. 71 reported the yield of Colonoscopy in non-acute rectal bleeding of 1766 patients for colorectal cancer to be 4% and advanced polyps (>1 cm) to be 8.2%. In our study advanced polyp (1.5 cm and larger) made up 4% of all rectal bleeders.

- In 26.1% patients with indication of “rectal bleeding” the Colonoscopic finding was "normal" and the source of the bleeding was not found.

In a study by Bhargava Dk. et al (1995) (on patients with unexplained lower G1 bleeding underwent colonoscopy. A source of bleeding was identified in 74% of patients (source was not found in 26%). Predominant
lesions in adults were nonspecific colitis and ulcers (58%), polyps (19%), cancer (10%), rectal varices (4%) and tuberculosis (3%).

In our study Factors with significant correlation with the 5 diagnostic categories were:

1. Geographical factor (residence of patients)

*Malignant cases on Colonoscopy were less in central Sudan patients who underwent Colonoscopy (mainly Khartoum and Al Jazeera) in comparison to East and South Sudan (6.6% of all cases were malignant versus 30.8% and 66.6% respectively).*

*Malignant cases distributed as: 6 cases Central Sudan (37.5%), 4 (25%) cases East Sudan, 3 cases (18.7%) West Sudan, 2 cases (12.5%) South and 1 case (6.2%) in North.*

It had been reported by El-masri et al (1975) that the colorectal cancer is showing increasing frequency in Northern part of Sudan and it is relatively uncommon in Southern.

It was also reported by Babikr, F A (1987) that 78 cases of colorectal cancer geographical distribution was: 25(32%) cases from Khartoum, 15 cases (19.2%) from Northern, 12 cases (15.4%) from Middle region, 11(14.1%) from Darfur, 11(14.1%) from Kordofan and 3 (3.8%) from Eastern region.
Knowing that majority of colorectal cancers are diagnosed by methods other than Colonoscopy\(^{68}\). Our results are not essential to reflect more prevalence of colorectal cancer in these areas. It may due to higher rates of other benign conditions that bring patients for Colonoscopy with easier and earlier access to that in Central Sudan. Geographical and socioeconomic factors are filtering patients with benign lesion in peripheries to reach center and have Colonoscopy.

2. Patients sex

*Male patients had less “normal” Colonoscopy rate than females (36.6% versus 45.9%) but, more “Polyps” (18.5% versus 6.6%).*

*Sex had no significant effect on predicting IBD, Neoplasm and “Others”*

*Although*

\[
\begin{align*}
M:F \text{ ratio of neoplasm} & \text{ was } 11:7 \ (1.57: 1.0) \\
M:F \text{ of colon cancer} & \text{ was } 7: 1(p=0.088) \\
M: F \text{ of rectal cancer} & \text{ was } 4: 5(1: 1.25) \\
M:F \text{ ratio of IBD} & \text{ was } 17: 9 \ (1.9: 1.0) \\
M:F \text{ ratio of “Others”} & \text{ was } 27:12 \ (2.25: 1.0)
\end{align*}
\]

*These differences do not constitute statistical significant differences for 95% confidence interval. Figure 40*
3. age group of patients:

- Age group “<20 years” had the least rate of “normal” colonoscopy (16.7%) while age group “40-59 years” had highest normal Colonoscopy rate (42.6%)
- Highest rate of “polyps” was in “<20 years” and “60-79 years” age groups (33.3% and 26.1% consecutively).
- No other effect of statistical significance was found on predicting IBD, Neoplasm and others.

Although its known that incidence of colorectal cancer is increasing at age of 50 years and rises sharply at 60 years with each succeeding decade the risk doubles reaching a peak by 75 years.  

Siles-S et al (1997) found age to be significant factor in predicting Neoplasm in patients undergoing Colonoscopy.

In another study in a Swedish country age and gender were not significant factors in detection of Neoplasm.

But the situation here is not like western world.

El Masri S H et al (1976) found that 33% of colorectal cancers were below the age of 30 years in Sudan.

Babiker F A (1987) found that 60% and 90% of all colon and rectal cancers respectively were below 60 years.

We found that 9 cases of 18 (39%) of cases of colorectal cancer to be below 40 years and (83.3%) to be below 60 years. 100% of rectal cancers were below 60 years and 75% of colonic cancers were so. Figure 41.
Nwafo D C et al (1980) reported that colorectal cancer is rare and affects younger patient in Igbo ethnic group in Nigeria in contrast to western world.79

4. Rectal bleeding

“normal” Colonoscopy rate was less in patients with bleeding per rectum (26.9% versus 48.6%). This will not differentiate different causes of bleeding but its a sensitive predictor of finding an abnormality by Colonoscopy.

Blood loss, particularly in elderly persons, remains the highest-yield indications for colonoscopy. Rectal bleeding, especially if sustain, dark, or mixed in the stool, is frequently caused by tumor or mucosal pathology. In the subgroup of patients with visible rectal bleeding in whom a barium enema and sigmoidoscopy are normal, about 10% of the referral patients have cancer, 15% to 20% have polyps and up to 50% have some kind of a visible abnormality, including traumatized, inflamed, or ulcerated mucosa.

Siles - S et al. 61 found that bleeding per rectum was one of the predictive value of neoplastic conditions found at colonoscopy.

In the study of Swedish country no factor was predictive for cancer but sensitivity for colorectal cancer was higher when the indication was bleeding per rectum.76

5. Abdominal pain

- Neoplasm rate were less in patients with history of abdominal pain (7.4% versus 22.2%)
“normal” Colonoscopy rate was more in patients with abdominal pain (42.6% versus 25%)

Fernandez E et al (1996) mentioned that No differences were found among patients with disordered bowel frequency or abdominal pain in relation to the colonoscopic findings.

Neugut Al et al (1993) “If one looks at significant neoplasia (cancer or adenomas > 1 cm), then the findings in rectal bleeders were 14.5%, whereas the abdominal pain, change in bowel habits, and both groups had 7.1%, 7.1%, and 13.6%, respectively.

He concluded that yield of significant neoplasm in both rectal bleeding and abdominal pain are almost equal and there were some correspondences about his results.

We found a yield of 7.4% for colorectal cancer in patients with abdominal pain, versus (22.2%) in those without abdominal pain and but the yield in rectal bleeding (11.5%) was same to the yield in non bleeders. For other relations see Table.15

In Our study the yield of bleeding per rectum for cancer was 11.5%, when comparing it with Neugut et al. result (14.5%) it does not look to be significantly different. Table 16

Also when comparing yield of abdominal pain for cancer (7.4%) with that of Neugut (7.1%) both are close and not different significantly, this is as one of the symptoms but non of abdominal pain as the “main indications” had malignancy.

6. Factors related to IBD

- History of diarrhea and change of bowel habit as indication of Colonoscopy.
Higher rate of IBD was found when there was diarrhea than when diarrhea was not present (23.7% versus 9.6%)

- **Fever**
  - IBD rate was higher in those who had fever than those who did not have it (38.7% versus 10.7%)

- **Alcohol consumption**
  - IBD rate was more in those who had Alcohol consuming history than those who were not consuming alcohol (71.4% versus 12.7%)
  - Crohn’s disease was more in alcohol consumers than non consumers (28.6% versus 3%). Significant \( p = 0.029 \) Table 10

- **Snuffing**
  - Snuffers had higher rate of IBD than non snuffers (33.3% versus 13.6%)

- **Smoking**
  - Normal Colonoscopy and smoking:
    - Normal colonoscopy was more in nonsmokers (40.5% versus 10%). But slightly less than statistical significance \( P = 0.051 \) which may be significant if the sample was larger.
  - “Others”
    - “Others” finding rate was more in smokers (50% versus 19.1%). Significant \( P = 0.036 \).
• None of UC cases were smoker. Not significant (p=0.68)

It's known that the major symptoms of UC are bloody diarrhea but constipation rather than diarrhea may be present.\(^5\)

Diarrhoea may be caused by colorectal neoplasia. In addition to neoplasia, colonoscopy also has a diagnostic yield for other conditions ranging from 7% to 31%, with inflammatory bowel disease and microscopic colitis being most commonly found. Routine ileoscopy further adds to the value of colonoscopy. While this led to a positive diagnosis in only 2.7% of asymptomatic patients undergoing surveillance colonoscopy, this increased to 18% in non-HIV patients who complained of diarrhoea. In patients in whom a diagnosis of inflammatory bowel disease is suspected, the value of ileoscopy and biopsy is further enhanced: 36% of patients with a normal colonoscopy and diarrhoea had terminal ileal disease. These results are subject to considerable referral bias but when taken together they suggest that in chronic diarrhoea, colonoscopy and ileoscopy with biopsy may lead to a diagnosis in approximately 15–20% of cases, a value that may approach 40% in those patients with suspected inflammatory bowel disease.\(^29\)

Because of the minor inflammatory changes of microscopic colitis or collagenous colitis that can occur despite normal mucosal appearance, biopsies are taken in any patient with diarrhoea, even if the appearances are normal.\(^14\)
7. weight loss

- Neoplasm cases were more in patients with weight loss (16.9% versus 3.9%).
- IBD were more in patients with weight loss (85.7% versus 14.3%).
- Polyps were less in patients with weight loss (8.4% versus 23.5), in patients with pallor (5.8% versus 18.3%), and in patients with diarrhea (9.2% versus 20.5%).

Really when the polyps were large (1.5 cm or larger) 33.3% of them had weight loss, 33.3% had pallor and 33.3% had diarrhea. And patient with these symptoms had less polyps because most of polyps were not large and they were possibly an incidental finding not explaining the symptoms of the patients. Table 17.18,19.

Symptoms such as hematochezia, abdominal pain, or a change in bowel habit are not reliable clinical indicators of the presence of colonic adenomas because of the relatively high prevalence of adenomas in the general population and the low rate of symptoms caused by these lesions.

Less polyp rate in patients with diarrhea could due to more occurrence of polyps in low fiber diet patients who are more likely to be constipated.

“Dietary fiber appears to afford protection against colonic polyps and invasive cancer of the colon. The mechanisms involved are complex and speculative. Public education on the avoidance of identified risk factors for cancer and the encouraging of healthy habits were among early efforts in cancer prevention and control.”

8. pallor
- Rate of neoplasm were more in patients with pallor than those without pallor (23.1% versus 4.3%)

9. cachexia
- patients with cachexia had more neoplasm than non cachectic (29.4% versus 8.7%)

10. History of IBS
- Normal Colonoscopy rate was more in patients who gave history of Irritable Bowel Syndrome (51.2% versus 33.7%)

Siles-S et al (1997) mentioned “6 variables showed statistically significant differences in terms of the absence or presence of malignant disease: age, absence of previous similar episodes, weight loss, rectal bleeding, lack of improvement and the presence of a mass on digital rectal examination."

We did not find pallor and cachexia as predictor of neoplasm in the literatures but our patients who present with neoplasm looks to have more advanced disease. As it was recorded by El Masri et al.(1976)

Alcohol and snuffing (smokeless tobacco) which had positive relation with IBD collectively could not be traced in literatures as none had grouped all inflammatory conditions of colon namely (UC, Crohn's disease, Nonspecific colitis, proctitis and microscopic colitis) in one group “IBD” to find its difference with neoplasm and other groups.

What is known is that chewing tobacco is a carcinogen linked to dental caries, gingivitis, oral leukoplakia, and oral cancer. The systemic effects of smokeless tobacco may increase risks for other cancers.

Although the number of Crohn's disease cases were small, but the relation with alcohol consuming was significant.
Some studies have examined margarine use, coffee and alcohol consumption and diet rich in fish or fruits and vegetable but the data from previous studies were not consistent and conclusive.\textsuperscript{83} In a study on the association between oral moist snuff use and inflammatory bowel disease the relative risk (RR) associated with ever use of moist snuff was 2.1 for Crohn's disease and 2.2 for ulcerative colitis.\textsuperscript{84}

More research needed to trace and consolidate such relations.

**Conclusions**

and
Recommendations

Conclusions

Several factors found to be significant in predicting Colonoscopic finding and hence prioritizing patients according to that.

Malignancy is more likely when there is

- weight loss
- cachexia
- pallor

especially when the patients are coming from
- Eastern Sudan.
- Southern Sudan.

**IBD** is more likely when there is

- diarrhea,
- weight loss and
- fever

especially when the patient is

- snuffer &/or
- alcohol consumer.

Polyps are more likely in

- male patients
- patients who are
  - less than 20 years
  - more than 60 years
- in the absence of
  - diarrhea
  - weight loss
  - pallor.

Normal colonoscopy is more likely in patients who are
- females
- age of 40-59 years
- had been told to have irritable bowel syndrome.

But less likely in

- patients with bleeding per rectum
- age group less than 20 years
- smokers (?)

Other conditions are more likely with smoking history.

**Recommendations**

- More and larger scale researches are needed to clarify the relation of alcohol and snuffing with IBD. And to find out more predictive factors especially simple laboratory investigations.
- The previously mentioned factors to be put in the request form of Colonoscopy to prioritize
patients according to that. And to stress of
filling that, as many of the request forms in
this study were deficient of indications and
symptomatology of the patients.

- To stick to recommended method of giving
PEG solution coloclean® as (all 4 sachets in
one day) had best preparation efficacy which
is essential for lesion detection and
completeness of Colonoscopy, with special
considerations to patients who have fluid
overload states.
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1. Byers T, Levin B, Rothenberger D, Dodd GD, Smith RA. American Cancer Society guidelines for screening and


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Appendix 1

The Questionnaire
Appendix 1

The Questionnaire
Questionnaire

Clinical correlation to colonoscopic findings

In patients presenting to Soba and Ibn Sina endoscopy units

<table>
<thead>
<tr>
<th>Name</th>
<th>Age</th>
<th>sex</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>residence state/city</th>
<th>Tribe</th>
<th>job</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>telephone /mobile number</th>
<th>in patient</th>
<th>out patient</th>
</tr>
</thead>
</table>

indication/stated by referring doctor

<table>
<thead>
<tr>
<th>symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. diarrhea</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>mucoid</td>
</tr>
<tr>
<td>other...</td>
</tr>
</tbody>
</table>

| 2. constipation | duration |
| number of bowel motion per week |
| alternating with diarrhea |

| 3. anal pain with defecation | |

4. feeling of incomplete evacuation of bowel

5. abdominal pain duration nature

                         site of pain :

6. rectal bleeding duration
               red blood with stool blood without stool
               dark tarry stool (melena)
               other

7. flatulence

8. loss of appetite

9. loss of weight

10. fever

11. other symptoms

past medical history

known diseases :

- hemorrhoid
- irritable bowel syndrome
- inflammatory bowel disease
- peptic ulcer disease
- other diseases, specify

drug history

radiation exposure

family history

- colonic cancer
- colonic polyp
- other cancers specify
social habit : smoking □ alcohol consumer □ snuffer □

examination findings

vital signs  BP : PR: temp:

general examination
1. cachexia □
2. pallor □
3. jaundice □
4. clubbing □
5. leukonychia □ koilonychia □
6. other abnormality of finger and hand

7. oral lesions :
   • ulcers □ smooth tongue □
   • angular stomatitis □ telangiectasia □
   • other oral lesions
   • lymphadenopathy □ generalized □ localized to _____

8. leg edema □ pitting □
9. rashes □ specify
10. other signs ..................................................

abdominal examination
1. abdominal swelling : □ ascites □ gas □ obesity □
2. scaphoid abdomen □ visible bowels □
3. tenderness □ with deep palpation □ superficial palpation □
4. palpable organs [ ] specify [ ] size [ ]

5. abdominal mass [ ] size in cm [ ] *
   location: specify [ ]
   movement move with respiration? [ ]
   mobile manually: horizontally? [ ] vertically [ ] all directions [ ]

other characteristics [ ]

investigations already done

• Hb: [ ] TWBC: [ ]
• PLT [ ] ESR: [ ] occult blood [ ]
• Total Serum protein [ ] albumin [ ] globulin [ ]
• Prothrombin time PT [ ] Bleeding time [ ]
• other investigations [ ]
• upper GIT endoscopy [ ]
• Barium enema abnormality [ ]
• plain abdominal X-Ray [ ]
• Abdominal ultra sound abnormality: [ ]

PR examination

1. hemorrhoid? [ ] number [ ] site [ ]
bleeding? □ thrombosed? □ grade □

2. masses? □

3. other findings ____________________________________________

**Colonoscopy**

**Preparation** poor □ satisfactory □ good □

Prepared by ____________________________________________

Drugs received ____________________________________________

________________________________________

**Level reached** full colonoscopy □ incomplete □ why □

Terminal Ileum □ caecum □ ascending colon □ hepatic flexure □

Transverse colon □ splenic flexure □ descending colon □ sigmoid colon □

**findings of colonoscopy**

________________________________________

________________________________________

________________________________________

________________________________________

________________________________________

**Conclusion**

________________________________________

**Procedures done** : Polypectomy □ number removed □

Biopsy □ from ? □
Complication □ specify __________________________

Histopathologic diagnosis

______________________________

______________________________

______________________________

Colonscopy done by ____________

Date / /2004

In ____________ Hospital

Dr. Shahrayar Mamand  Under supervision of Dr Hatim Mudawi
### Appendix 2

**SOME OF IMAGED LESIONS AND THEIR DIAGNOSIS**

<table>
<thead>
<tr>
<th>Image Number</th>
<th>Diagnosis of the lesion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>moderately differentiated invasive adenocarcinoma</td>
</tr>
<tr>
<td>2</td>
<td>moderately differentiated invasive adenocarcinoma</td>
</tr>
<tr>
<td>3</td>
<td>ulcerative colitis</td>
</tr>
<tr>
<td>4</td>
<td>colonic cancer</td>
</tr>
<tr>
<td>5</td>
<td>chronic nonspecific colitis</td>
</tr>
<tr>
<td>6</td>
<td>punctured sigmoid colon with peritoneal dialysis catheter</td>
</tr>
<tr>
<td>7</td>
<td>moderately differentiated adenocarcinoma</td>
</tr>
<tr>
<td>8</td>
<td>colonoscopic snaring of a benign polyp</td>
</tr>
<tr>
<td>9</td>
<td>benign hyperplastic polyp</td>
</tr>
<tr>
<td>10</td>
<td>Crohn's disease</td>
</tr>
<tr>
<td>11</td>
<td>hyperplastic polyps- bilharizial polyp</td>
</tr>
<tr>
<td>12</td>
<td>well differentiated invasive adenocarcinoma</td>
</tr>
<tr>
<td>13</td>
<td>rectal varices</td>
</tr>
<tr>
<td>14</td>
<td>proctitis</td>
</tr>
<tr>
<td>15</td>
<td>portal hypertensive colopathy with chronic nonspecific colitis</td>
</tr>
<tr>
<td>16</td>
<td>benign hyperplasia</td>
</tr>
<tr>
<td>17</td>
<td>inflammation of IC valve / Intermediate Crohn’s disease</td>
</tr>
<tr>
<td>18</td>
<td>vascular abnormality</td>
</tr>
<tr>
<td>19</td>
<td>chronic nonspecific colitis</td>
</tr>
<tr>
<td>20</td>
<td>terminal ileum / Crohn's disease</td>
</tr>
<tr>
<td>21</td>
<td>hamartomatous polyps</td>
</tr>
<tr>
<td>22</td>
<td>well differentiated squamous cell cancer</td>
</tr>
<tr>
<td>23</td>
<td>colonoscopic snaring of a benign polyp</td>
</tr>
<tr>
<td>24</td>
<td>moderately differentiated invasive adenocarcinoma</td>
</tr>
<tr>
<td>25</td>
<td>small metaplastic polyp</td>
</tr>
<tr>
<td>26</td>
<td>moderately differentiated invasive adenocarcinoma</td>
</tr>
<tr>
<td>27</td>
<td>carcinoma of descending colon</td>
</tr>
<tr>
<td>28</td>
<td>solitary rectal ulcer</td>
</tr>
</tbody>
</table>
References


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