



The Change in Upper Gastrointestinal Disease Pattern in Sudan

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Abstract

Objectives: Data on Gastrointestinal (GI) disease from developing countries are lacking. In addition, the pattern of GI disease is changing over time.

The objectives of this study were to identify the main indications and associated endoscopic findings in patients presenting for elective upper GI endoscopy at a major teaching hospital, thus identifying the current pattern of GI disease and the changes that occurred over the past decades.

Methods: This is a descriptive analytic study. We analyzed data collected prospectively over a period of 12 years (2007-2019). These included demographic data of patients, symptoms and endoscopic findings. We compared our findings with past data.

Results: The study included 1859 patients. The mean age was 42.3 years. The male to female ratio was 1.3:1.

Diagnostic and therapeutic endoscopies were done for 1481 patients (77.8%), and 362 patients (19.4%), respectively. The failure rate was (2.8%).

The commonest symptoms were epigastric pain (40%) and haematemesis (27%). These and other symptoms were analyzed according to associated endoscopic findings.

The commonest endoscopic findings were oesophageal varices and gastritis.

Compared with past data, there has been a decrease in duodenal ulcers and oesophagitis but an increase in oesophageal varices and gastritis. There is a trend of increased gastric tumours in young people.

Conclusion: This study shows the current pattern of upper GI disease in Sudan and identifies the changes in the pattern of upper GI disease over the past 4 decades. It provides important data to policymakers. It highlights the importance of endoscopy services, and focuses on areas needing further studies.



Introduction

Data on Gastrointestinal (GI) endoscopies from developing countries are lacking. Over the years, there have been changes in population demography, feeding habits, and pathology.

Modern video-endoscopies are now available as well as expertise. Data build up helps identifying the pattern of GI disease in the community. This could provide benchmarks for endoscopic practice and highlight areas of community-needed research [1].

The objectives of this study were to identify the most common presenting symptoms (indications) and the endoscopic findings in patients presenting for routine upper Gastrointestinal Tract (GIT) endoscopy at Khartoum North Teaching Hospital (KNTH), Sudan. This should allow drawing the current picture of the pattern of gastrointestinal disease and buildup database for the endoscopic unit and health providers. It would allow us to compare and identify changes of disease pattern over the past decades. It would also allow a comparison with regional and international data.

As far as we know, this is the largest data collection in a Sudanese study for decades.

Patients and methods

We analyzed data collected prospectively on consecutive patients, who underwent upper GI endoscopies (Esophago-Gastro-Duodenoscopy or EGD) at KNTH over a period of 12 years (from February 2007 to November 2019). KNTH is one of the 3 major governmental teaching hospitals in the capital Khartoum (Sudan). Its catchment area includes over 2 million inhabitants and is increasing. It has a busy endoscopy unit where 3 experienced endoscopists (2 surgeons and one internist) do diagnostic and therapeutic procedures. A pro-forma was designed to collect patient's biodata which included: Age, gender. In addition data on the type of GIT endoscopy (upper/lower/diagnostic/therapeutic), the main presenting symptoms/ indication(s), as well as the endoscopic findings.

Statistical analysis of the data was done using IBM SPSS Statistics for Windows, version 25 (IBM Corp., Armonk, N.Y., USA).

The video-endoscopes used were Olympus and Pentax (Pentax EPKi digital video processor and Pentax 9.8 mm video gastroscope)

Ethical approval was obtained from the research and ethics committee at the Ministry of Health and KNTH.

Pre endoscope preparation involved fasting overnight, viral screening blood tests for hepatitis B and C, as well as for HIV, standard precaution measures were taken. All patients were consented. Those who refused the procedure were excluded. Patients prepared for diagnostic upper endoscopies received pharyngeal anesthesia with xylocaine (10%) spray. Those for therapeutic interventions received-in addition- intravenous sedation with midazolam (2.5-3 mg), or diazepam (5 mg) when midazolam was not available. All patients were monitored during the procedure and remained under supervision for an hour before they were allowed home. We had no mortality. Only 2 complications were recorded; one had an epileptic fit and the other perforation of duodenum. Both were immediately treated.

Results

A total 1859 patients were included. Diagnostic procedures were done for 1445 patients (77.8%), while both therapeutic with diagnostic procedures were done for 362 patients (19.4%). The procedures failed or were not completed in 52 patients (2.8%).

The ages showed normal distribution. The mean age was 42.3 years (sd=16.4). There were 1058 males (57.1%) and 794 females (42.9%) giving a male to female ratio of 1.3:1.

The main presenting symptoms (indications for endoscopy) and endoscopic findings

The most common presenting symptoms were: Epigastric pain (dyspepsia) in 720 patients (40 %), followed by upper GI bleeding in 515 patients (28.5%). The bleeders presented with either hematemesis 489 patients (27.1%) or melena 26 patients (1.4%). The 3rd commonest symptom was dysphagia in 123 patients (6.8%), followed by heart burn in 81 patients (4.5%). Patients presenting with a combination of symptoms, such as epigastric pain and hematemesis, pain and heart burn and others formed a large group as well (Table 1).

Table 1: The presenting symptoms of patients who underwent upper GI endoscopy (indications for endoscopy).

Symptom	Frequencies	Percent %
Epigastric pain	720	39.8
Hematemesis	489	27.1
Dysphagia	123	6.8
Heartburn	81	4.5
Epigastric pain + Heartburn	75	4.2
Vomiting	61	3.4
Anemia	59	3.3
PHT	42	2.3
Epigastric pain + Hematemesis	30	1.7
Suspicious of tumor	29	1.6
Melena	26	1.4
Weight loss	11	.6
Others	61	3.4
Total	1807	100.0

Note: Procedure failed in 52 patients (2.8%). (Total 1859).

We further Analyzed the causes (endoscopic findings) of the commonest symptoms:

(i) The main endoscopic finding in epigastric pain was gastritis (38.3%), combinations of gastro- duodenitis and erosions (14.7%), duodenal ulcer (11.3%), gastric ulcer (4.6%), combined gastric and duodenal ulcers (0.14%), Hiatus hernia with gastro-esophageal reflux disease GERD (8.6%), candida esophagitis (0.56%), gastric ulcer (4.6%), gastric tumors (2.5%), esophageal varices (2.8%). There were negative findings in 13.2%.

(ii) The total number of upper GI bleeders was 515 patients, representing (28.5%) of all endoscopy patients. The main cause of upper GI bleeding was esophageal varices in (87.1%)

of Hematemesis cases, and in (34.6%) of melena cases, respectively. This was followed by peptic ulcer disease. This includes gastritis (3%) in Hematemesis versus (7.7%) in melena, gastric erosions (1.6% vs.11.5%), duodenal ulcer (1.2 vs. 15.4%), gastric ulcer (0.8 vs.7.7%), and duodenitis (0.8 vs. 7.7%), respectively. Negative endoscopy occurred in (2.3%) of *all* the cases (Table 2).

It is notable that most of the patients with bleeding due to esophageal varices come from Khartoum state (55.1%), followed by El Gezira state (27.5%), White Nile state (7.2%), as well as one patient from River Nile state which is North of Khartoum state.

(iii) The main cause of dysphagia was esophageal cancer (20.3%), followed by candidiasis (9.8%). Almost a quarter (24.4%) had negative findings. It was noted also that all esophageal cancer patients presented with dysphagia.

(iv) The commonest causes of anemia were gastritis (39.3%) and duodenal ulcers (11.9%), accounting -together-for about half of the cases. Importantly, gastric tumors come third accounting for (6.8%) of patients. Gastric ulcers accounted for (5.1%), esophageal varices (3.4%), and the rest by multiple pathology including gastric erosions and duodenitis.

In (29%) of patients with anemia, no endoscopic findings were found.

Table 2: Showing the causes of upper GI Bleeding, (Hematemesis and Melena).

	Hematemesis N=489 (27.1%)	Melena N=26 (1.4%)	Total GI Bleeders N=515 (28.5%)
Esophageal varices	426 (87.1%)	9 (34.6%)	434(84.3%)
Gastritis	14 (3.0%)	2 (7.7%)	16 (3.1%)
G Erosion s	8 (1.6%)	3 (11.5%)	11(2.1%)
D.U	6 (1.2%)	4 (15.4%)	10 (2.0%)
G.U	4 (0.8%)	2 (7.7%)	6 (1.2%)
Duodenitis	4 (0.8%)	2 (7.7%)	6 (1.2%)
hiatus hernia	3 (0.6%)	1 (3.9%)	4 (0.8%)
GERD	3 (0.6%)	0	3 (0.6%)
esophagitis	2 (0.4%)	0	2 (0.4%)
Gastritis + DU	2 (0.4%)	0	2 (0.4%)
Gastric tumor	1 (0.2%)	0	1(0.2%)
Others	7 (1.5%)	0	7 (1.4%)
Negative findings	9 (1.8%)	3 (11.5%)	12 (2.3%)
Total	489 (100%)	26 (100%)	

Generally: The most commonly affected anatomical site was the esophagus 620 patients (34.3%), followed by the stomach 585 patients (32.4%) and duodenum 181 (10%). Pathology in combined sites was found in 172 patients (9.5%).

The most common endoscopic findings in those with positive findings (n=1807) were: esophageal varices in 494 patients (27.3%) followed by gastritis in 409 patients (22.6%), duodenal ulcer in 125 patients (6.9%), gastric erosions in 82 patients (4.5%) and gastro-esophageal reflux disease GERD in 50 patients (2.8%), Upper GI malignancies in 63 patients (3.5%). There were negative (macroscopic) findings in 294 patients (13.8%). Biop-

sies were taken when neoplasia was suspected and when infection with H. pylori was suspected in symptomatic patient with negative macroscopic finding.

The pattern of the upper GI disease described above is shown in (Table 3).

Table 3: The pattern of upper GI disease pathology (endoscopic findings).

Pathology	Frequencies	Percent %
esophageal varices	494	27.3
Gastritis	409	22.6
D.U	125	7.0
G Erosions	82	4.5
hiatus hernia	60	3.3
Duodenitis	56	3.1
GERD	50	2.8
G.U	47	2.6
gastric tumor	38	2.1
Gastroduodenitis	33	1.8
esophagitis	28	1.6
Ca esophagus	25	1.4
gastritis+DU	24	1.3
Candidiasis	20	1.1
chronic gastritis	8	0.4
GU+DU	1	0.1
Others	58	3.2
Normal	249	13.8
Total	1807	100.0

Esophageal and gastric tumors were found in (63) patients (3.5%) with male to female ratio of almost 1:1. Of those 63 patients, there were 38 (60.3%) gastric and 25 (39.7%) esophageal cancers.

Of those upper GI tumor patients, (27.1%) were under the age of 50 and alarmingly (6.4%) below 30 years (Figure 1). The commonest presentation of stomach cancer was epigastric pain (42%), weight loss (13%) and anemia (10.5%).

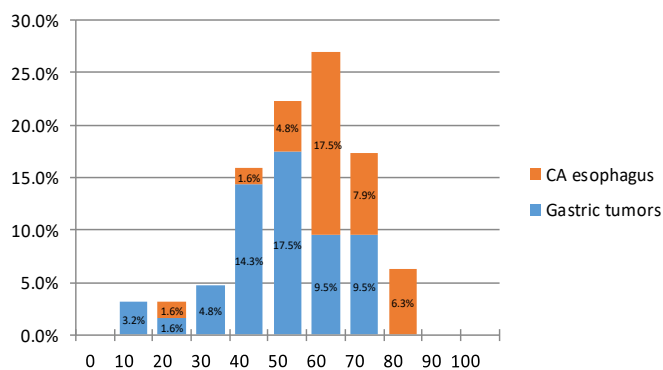


Figure 1: The age distribution of patients with gastric and esophageal cancers.

Discussion

The age distribution of our patients showed that the majority are below the age of 50 years (and 50% below 40 years). The prevalence of GI disease in this young sector of the community would have adverse socio-economic effects on the individual, community, and country as a whole.

Most of our upper GI endoscopies were diagnostic. Therapeutic endoscopies accounted only for 20% of cases. This was simply due to the lack of the required (and requested) intervention instruments such as dilators and balloons. Therapeutic endoscopies carried out in our unit were mostly injection sclerotherapy and banding of esophageal varices.

The commonest presenting symptom was epigastric pain (dyspepsia). This conforms to most studies in the world [1]. The main endoscopic findings in patients presenting with epigastric pain were gastritis and duodenal ulcers. Generally peptic ulcer disease is the main cause of epigastric pain. However one should not discount gastric tumors, particularly if the dyspepsia was associated with anemia and weight loss. It was noted that about 13% of endoscopies were negative (macroscopically). This is much lower than reported by other investigators. It is usually attributed to functional (rather than organic) dyspepsia. However we found that when taking a biopsy for *Helicobacter pylori*, up to 50% of such cases were found positive. We would, therefore, propose taking a biopsy from the pre-pyloric area in symptomatic patients with macroscopically normal appearance on endoscopy.

The study showed that in Khartoum the 2nd commonest symptom (indication for endoscopy) was upper GI bleeding (hematemesis and/or melena), and the most common endoscopic finding in those patients was esophageal varices. In Sudan schistosomiasis is the main cause of esophageal varices [2, 3]. In the past this infectious disease was endemic to El Gezira state/area due to the presence of a great irrigation/agricultural scheme [3, 4]. However, it seems that in recent years the infection has swept Northwards with the flow of the Nile despite the efforts

of governments to keep it under control. This study showed that patients are affected in areas of Khartoum state and even more Northwards (River Nile State). More effective and serious efforts should be done to control the spread of Schistosomiasis in Sudan.

Our study showed that dysphagia is a serious symptom. One in 4 of the patients with dysphagia had esophageal cancer, and all patients with oesophageal cancer presented with dysphagia. Also, the finding that almost a quarter of patients with dysphagia had negative findings on endoscopy highlights the importance of doing a contrast swallow before endoscopy to diagnose functional problems. A contrast swallow would also provide the endoscopist with a road map and allow him/her to prepare the set up for a therapeutic intervention at the same session if need be. Thus saving the time and cost of doing 2 endoscopies for both the patient and endoscopist.

Anemia is also a symptom that requires undergoing both upper (and lower) GI diagnostic endoscopies. Peptic ulcer disease was the commonest cause of anemia. Gastric tumors were found to be the 3rd common cause of anemia in upper GI patients. It is to be noted that in our other study, Colorectal tumors and polyps were the commonest cause of anemia in patients presenting for lower GI endoscopy.

Upper GI endoscopy for anemia was negative in 29% of cases. This could be because the cause of anemia is not in the upper GI tract. Therefore, a patient with anemia and negative findings on upper GI endoscopy will need a colonoscopy done as well. If still negative other investigations under the care of physicians should be carried out. In addition to endoscopic surveillance may be needed.

The changing trend of Upper GI disease pattern (in Khartoum)

Upper GI disease pattern seems to have been changing over the past decades. Our results are compared with previous studies (Table 4).

Table 4: Pattern of upper GI disease in Khartoum over the years (1983-2019).

Study	Esoph. Varices %	Esophagitis %	Hiatus Hernia %	Gastritis %	Gastric ulcer %	Duodenal Ulcer (DU) & duodenitis %	Pyloric obstruction %	Cancer Esophag Gastric %	Normal %
Fedail et al 1983 (KRT) N=2500	9	8	5	6	0.7	DU 17 Dtis 3	2	E 1 G 1 T 2	42
Salam et al 1988 (KRT) N=5000	10	4	2.7	3.1	0.9	DU 23% Dtis 2.9	-	E 3.2 G 1.5 T 3.7	44
Adam & Doumi 2008 (Obeid/West Sudan) N=1150	2.7	29.7	7.1	36.9	1.9	DU 5.6 Dtis 16.3	-	E 5.9 G 4.5 T 10.4	26
Elhadi 2014 (Omd/KRT) N= 390	13.8	42	-	54.9	-	Peptic ulcer 21%	-	T 13.3	3
Our study (KRT) 2007-2019 N=1807	27.3	1.6	3.3	22.6	2.7%	DU 6.9% Dtis 4.9	0%	E 1.4 G 2.1 T 3.5	14

KRT: Khartoum State, E: Esophagus; G: Gastric; T: Total; Dtis: Duodenitis.

It is noted that there has been a steady increase in the proportion of patients with esophageal varices from the year 1983-88 when they attributed to only (9%-10%) of all endoscopy patients to (14%) in 2014, reaching (27%) in our study [5, 6, 7]. This increase is both statistically as well as clinically significant (Table 5). This conforms with the observed Northward spread of schistosomiasis along the Nile valley in Sudan where in the past it was almost confined to Al Gezira irrigation scheme [3].

This finding should alarm policy makers to lose no time in putting into action the primary and secondary preventive measures against the spread of Schistosomiasis infection.

Although our study showed a significant decrease in oesophagitis and gastro-oesophageal reflux disease compared to Fedail's et al study conducted in (1980-1982), it conforms with El Salam study (1988). All 3 studies included large numbers of patients. El hadi and Adam and showed significant increase in these pathologies [7, 8] as has observed world-wide and attributed to ageing, Western fatty diet and obesity [9, 10].

Table 5: Showing time trend of upper GI disease 1980-2019.

Endoscopic Findings	Fedail (1980-1982) (n=2500)	El Shallaly (2007-2019) (n= 1857)	χ^2	P value
Esophageal varices	9%	27%	10.9756	0.000923
Esophagitis +GERD	13%	5%	3.972	0.04808
Gastritis	6%	23%	11.655	0.00064
G. ulcer	1%	3%	1.020	0.312 (Not sign)
D. ulcer	17%	7%	4.7348	0.02955
Upper GI Tumors	2%	4%	0.6873	0.407 (not sign)
Normal	42%	14%	19.4444	0.00001

It has been observed also that there is a significant decrease in duodenal ulcers ($p < 0.05$), but a highly significant increase in gastritis ($p < 0.001$). Gastritis is the commonest finding in our patients who complained of epigastric pain. The increase in gastritis may be attributed to the high prevalence of *Helicobacter pylori* among Sudanese, particularly gastritis patients with prevalence of 80% [11]. It may also be due to the increase in the use of Non- Steroidal Anti-Inflammatory Drugs (NSAIDs) for headaches and other types of pain. Another possible explanation may be attributed to the change in Sudanese (African) diet towards a Western style one.

In contrast to the observed rise of gastritis over time, there is a decrease in the number of patients with duodenal ulcers. In addition, no pyloric stenosis (or obstruction) cases were encountered in this study, in contrast to the situation 30 years ago. The wide spread of Proton Pump Inhibitors (PPIs) use (or abuse) could possibly explain this trend. These changes were also noticed globally in developed and developing African countries [12].

Regarding Esophageal and gastric tumors, there have been doubling of the proportion of patients affected compared to Fedail's study. Although the increase has not been statistically significant ($p = 0.4$), we believe it to be clinically highly significant. Particularly, the finding that (27.1%) of the patients were below the age of 50 years, and almost 7% were below the age of 30 years (Figure 2). An interesting study from El Obeid (Mid-West of Sudan) showed a similar age distribution pattern and similar gastritis ratio. However, they found a significantly higher proportion of patients with upper GI cancers [8].

This finding needs to be investigated further. Meanwhile, doctors should keep a high index of suspicion in patients complaining of epigastric pain, weight loss and anemia since they are present in almost two thirds of these patients diagnosed with gastric cancer. Similarly all patients with dysphagia should undergo a contrast study and endoscopy.

Compared to previous studies, there has been significantly

better diagnostic yield of endoscopy over time. In older studies the rate of normal (negative) findings was between (42-44%). This has been reduced to about 14% in our patients. This is attributed to the use of video-endoscopes rather than fibre-optic ones and to the increasing experience and training. It may also be due to a better referrals and good indications for endoscopy. Nevertheless, it was observed that the negative finding rate itself varied from 13.1% in patients with epigastric pain to 24% and 29% in patients with dysphagia and anemia, respectively. This confirms the importance of doing a pre- endoscopy contrast swallow study patients of dysphagia, and colonoscopy for patients of anemia, as discussed before. It must be added, however, that negative findings in expert hands is reliable and could have some positive effects [13]. It alleviates the anxiety of the patient, and is cost effective as it reduces the need for further investigations. Every case, however, should be considered on its own merits, particularly if patient continues to be symptomatic when a biopsy of the apparently normal mucosa may reveal some pathology or *Helicobacter* organism.

Comparing our results to other developing countries particularly African and Middle Eastern countries, we note that there are some similarities between our results and those from Egypt and sub-Saharan African countries such as Uganda and Zambia [14, 15, 16]. The commonest cause of upper GI bleeding in those countries (and ours) is esophageal varices. This is because of the fact that the 3 countries have large irrigation schemes that cause a high prevalence of *Schistosoma mansoni* infection. Results from Uganda show similar high proportion of epigastric pain and gastritis [17]. These results have been attributed to the high *Helicobacter pylori* prevalence in their sample patients that reached 75%. There is, however, a much higher rate of upper GI cancers, (in patients above 40 years of age) that cannot be attributed to *H. pylori* infection alone.

Limitations of the study

This is a one-centre study which may limit the diversity of the sample. Nevertheless the large number of the sample and the time spread of the study minimize this limitation. Financial sup-

port and lack of technical support has always been a problem. Data were entered manually in a logbook because our service is not computerized. Manual entry of information was some of the time not followed strictly by all endoscopists.

Conclusions

This study provides database and shows the current pattern of GI disease and endoscopic practice in Khartoum. It also shows the changing pattern of GI disease towards the picture reported globally indicating a change in the diet and other factors that need further studies.

Upper GI disease has its major (negative) impact on our young population (mean age 42.3 years). This will consequently have a negative impact on the socioeconomic status of the community unless serious steps are taken in the areas of prevention, early detection (screening) and treatment.

Esophageal varices are the major cause of upper GI bleeding reflecting the increased spread of schistosomiasis. It highlights for policy makers the importance of implementing urgent plans for the prevention and early treatment of this disease.

The pattern of upper GI disease has changed in Sudan over the past 4 decades. There has been a decrease in duodenal ulcers, but an increase in gastritis. The use of PPI and the change towards a Western diet, respectively, may partially explain these findings. There is also a significant decrease in esophagitis and GERD, though other studies -albeit of smaller size- has shown the contrary.

Although there has been no significant increase in the proportion of patients with upper GI tumors in general, it was alarming to discover a trend of increased upper GI tumors, (particularly stomach cancers), in younger patients than reported worldwide. We suggest that this is an area that needs urgent and extensive epidemiological research.

All of the above findings would have a strong socio-economic impact on individual, society, and country as a whole.

The study provides endoscopic database that can help in clinical and research purposes. It also provides important data to policymakers. It underscores the need for increased awareness of clinicians and the general public on the importance of endoscopy. It also highlights the importance of establishing a computer-based data network system and databank to collect and document the information obtained from all the endoscopies done in the whole country.

Declaration

This study has been self-funded. We have no intention of gaining financial benefits from this work or its publication.

Ethical approval

The study was approved by the ethical committee at KNTH and the AAU.

Informed consent was obtained from all individual participants included in the study.

"All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards."

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