

PATTERN OF FINDINGS AMONG PATIENTS UNDERGOING BARIUM STUDIES IN KANO METROPOLIS, NIGERIA

Aliyu Abdullahi Hassan,¹ Mohammed Sidi,² Musa Muhammad Musa,² Umar Mansur,²

¹ Radiology Department, Aminu Kano Teaching Hospital, Nigeria.

² Department of Medical Radiography, College of Health Sciences, Bayero University Kano, Nigeria.

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ABSTRACT

BACKGROUND: Despite technological advancement in gastro-intestinal radiology, barium studies remains the imaging modality of choice and indispensable technique for evaluating variety of morphologic abnormalities in the gastro-intestinal tract (GIT). **AIM:** This study was aimed at evaluating pattern of findings among patients undergoing barium studies in Kano metropolis, Nigeria. **METHODS:** This study was retrospective conducted in Kano metropolis from February, 2020 to February, 2021. A total of 101 radiology request cards and patents reports on barium studies were reviewed. The demographic information, and clinical indications were obtained from patients request card while the findings were obtained from radiologist's report and recorded in the data capture sheet. Data was analyzed using SPSS Version 22.0. **RESULTS:** Barium swallow was the most frequent requested barium examination in adults 20 (50%), while barium enema was the most frequent requested barium examination in pediatrics 34 (55.74%). Dysphagia was the most frequent clinical indication in adults 10 (49.6%). Hirschsprung and constipation were the most frequent indications in pediatrics male and female 11 (36.6%). Normal finding was found to have the higher frequency in both adults and pediatrics 20 (96.2%) and 27 (81.6%) respectively. Achalasia cardia was found to be the most prevalent pathology 7 (38.1%) in adult followed by esophageal stricture 4 (20.5). Hirschsprung's disease was the found to be the most frequent pathology 15 (53.3%) in pediatrics followed by esophageal stricture 4 (19.1%). **CONCLUSION:** The findings of the study showed that normal finding was the most frequent findings.

Keywords: Barium studies, Kano Metropolis, Esophageal stricture

Introduction

Barium studies are special radiographic examinations used to diagnose various pathological conditions of gastro-intestinal tract following introduction of a barium contrast agent either orally or rectally.¹ Barium examinations are classified based on target organ to be examined which includes; barium swallow, barium meal, barium meal & follow through, and barium enema. Barium swallow is special radiographic examination of the throat and esophagus. Its virtually done in conjunction with barium meal.² Barium meal is a special radiographic examination of the stomach

and first part of the small intestine. It usually used double contrast agent in adult to demonstrate the mucosal pattern and single contrast in children and very ill adult. Barium follow through is used to examine the small bowel, while barium enema is used in examine the large bowel.³ Both of these barium study examinations were performed under fluoroscopic guide.

There are many indications for barium examinations which includes; dysphagia, anemia, pain, esophageal carcinoma, neck mass, gastro-esophageal reflux,

Correspondence : Aliyu Abdullahi Hassan
Radiology Department,
Aminu Kano Teaching Hospital,
Kano.
Email: xray2rad16@gmail.com

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disease assessment of trachea-esophageal fistula, assessment of the site of perforation, congenital esophageal stenosis, peptic ulcer, weight lost, upper abdominal mass, pyloric stenosis, vomiting, abdominal distention, gastro-intestinal hemorrhage, constipation, diarrhea, malabsorption, partial obstruction, abdominal mass, Crohn's diseases, fail small bowel enema, change in bowel habit, and ano-rectal mass.^{2,4,5,6} In recent years, barium studies have been gradually replaced to a larger degree by a myriad of advanced imaging modalities like; high resolution ultrasonography, endoscopy, colonoscopy, computed tomography (CT) scan and magnetic resonance image (MRI). Although endoscopy, manometry and 24 hr esophagus pH monitoring are valuable diagnostic procedures for evaluation of esophageal pathologies, but barium swallow excels them over in its evaluation of motility disorders, sub-mucosal lesions and extrinsic pathology.^{7,8} The barium meal and small bowel follow-through have been replaced to a lesser degree by abdominal CT scan and more recently by CT and MR enterography and capsule endoscopy. The double contrast barium enema has been discarded in favor of colonoscopy, abdominal CT scan and most recently by CT colonography for lower GI symptoms and colonic cancer screening.⁷ However, despite these recent development barium studies remains helpful tool for patients with equivocal or uncertain finding on endoscopy and CT.⁴

There is no comprehensive study that investigate into the pattern of findings for patients undergoing barium studies in Kano metropolis despite large population. The findings of this study will serve as a guide to radiographers, radiologist and referring physicians in the diagnosis and management of patients with gastro-intestinal diseases. This study aimed at evaluating pattern of findings among patients undergoing barium studies in Kano state.

Materials and Methods

The study design was retrospective conducted in Kano metropolis from February, 2020 to February, 2021. Ethical approval to conduct the study was obtained from the Research and Ethics Committee, Ministry of Health Kano, State. Data were obtained from Aminu Kano Teaching Hospital, Murtala

Muhammad Specialist Hospital, and Abdullaahi Wase Teaching Hospital. These were the centers that had functional facilities and performed barium studies during the study period. A total of 101 radiology request cards and reports were retrieved and sorted from the archive of the departments. All barium studies examinations done within the study period were included. All requested barium examinations without indication (s) were excluded from the study. The sex, age, and clinical indication(s) were obtained from the patient's request cards and recorded into the data capture sheet. The findings were obtained from radiologist's report and also recorded in the data capture sheet. Descriptive statistics was used in the data analysis; mean, standard deviation, frequency, and range were obtained. The obtained data was analyzed using Statistical Package for Social Sciences (IBM SPSS) Version 22.0.

Results

Demographic data

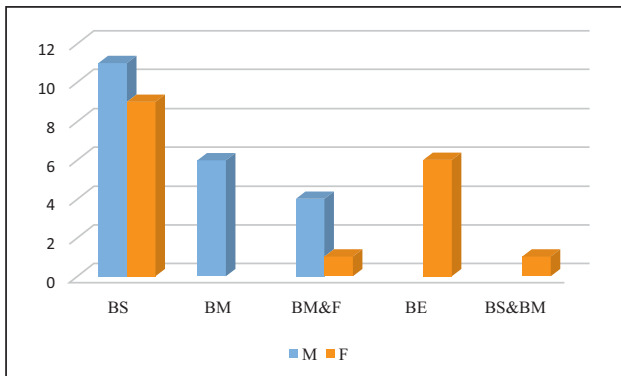
(Tab.1) shows the demographic information of the patients. Ninety-one request cards were adequately filled, and 10 (9.9%) were inadequately filled. Out of 101 reports, 40 (39.6%) were adults and 61 (60.4%) were pediatrics. Sixty-three were male 63 (62.4%) and 38 (37.6%) were female. The mean age and standard deviation of the male adult patients was found to be 39.93 ± 13.75 years, while that of the female was 38.53 ± 13.75 years. For pediatrics male patients it was found to be 4.84 ± 4.01 years, while that of female was 3.59 ± 3.07 years.

Variables	Adult (n=40)		Pediatric (n=61)	
	Male (n = 23)	Female (n = 17)	Male (n = 40)	Female (n = 21)
Age (years)	39.93 ± 13.75 (20-72)	38.53 ± 13.75 (18-62)	4.84 ± 4.01 (0.17-12)	3.59 ± 3.07 (0.25-11)

Data presented as mean \pm standards deviation (range)

Table 1: Age range of the patients.

(Fig.1a) shows that, 11 (47.8%) out of 23 male patients underwent barium swallow, 8 (34.8%) underwent barium meal and 4 (17.4%) underwent barium meal and follow through. Nine out of 17 female patients underwent barium swallow, 1 (5.9%) underwent barium swallow and barium meal, 1 (5.9%) underwent

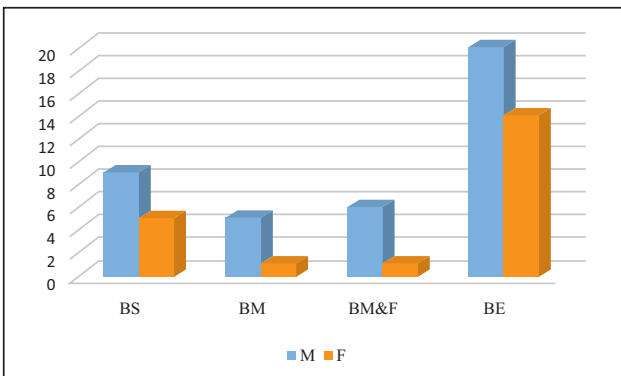


KEYS:
 BS: Barium swallow
 BM: Barium meal
 BM&F: Barium meal & follow through
 BE: Barium enema
 BS&BM: Barium swallow and barium meal
 M: Male
 F: female

Figure 1a: Type of barium studies performed on adult patients

barium swallow, meal and follow through 6 (35.3%) underwent barium enema.

(Fig.1b) shows that, 9 (22.5%) out of 40 male pediatric patients underwent barium swallow, 5 (12.5%) underwent barium meal, 6 (15%) underwent barium meal and follow through and 20 (50%) underwent barium enema. Five out of 21 female pediatric patients underwent barium swallow, 1 (4.8%) underwent barium meal, 1 (4.8%) underwent barium meal and follow through, and 14 (66.7%) underwent barium enema.



KEYS:
 BS: Barium swallow
 BM: Barium meal
 BM&F: Barium meal & follow through
 BE: Barium enema
 M: Male
 F: female

Figure 1b: Type of barium studies performed on pediatric patients

(Tab.2) shows that, the most frequent indication in adults' male and female was dysphagia 6 (26.1%) & 4 (23.5%) respectively. For pediatric patients male patients were vomiting 7 (17.5%) while that of female was constipation 4 (19.1%).

Indications	Adult		Pediatric	
	Male F(%)	Female F(%)	Male F(%)	Female F(%)
D	6 (26.1)	4 (23.5)	5 (12.5)	3 (14.3)
ABD	3 (13.0)		4 (10.0)	1 (4.8)
CP	4 (17.3)	1 (5.9)		
EC	2 (8.7)	2 (11.8)		1 (4.8)
ARM	1 (4.3)			
BO	1 (4.3)		1 (2.5)	1 (4.8)
CD	1 (4.3)			
C	2 (8.7)	2 (11.8)	2 (5.0)	4 (19.1)
H	1 (4.3)	1 (5.9)	7 (17.5)	3 (14.3)
NT	1 (4.3)	1 (5.9)		
PO	1 (4.3)			
CT		1 (5.9)		
DR		1 (5.9)		2 (9.6)
ES		2 (11.8)	3 (7.5)	1 (4.8)
RT		1 (5.9)		
ER		1 (5.9)		
V			7 (17.5)	
MR			5 (12.5)	1 (4.8)
CI			2 (5.0)	
ACI			1 (2.5)	
ARM			1 (2.5)	
GER			1 (2.5)	
PS			1 (2.5)	1 (4.8)
FB				1 (4.8)
RVF				1 (4.8)
PDAS				1 (4.8)
TOTAL	23 (100)	17 (100)	40 (100)	24 (100)

Data presented as frequency and (%).

KEYS:

D: Dysphagia | H: Hirschsprung | ABD: Abdominal distention | CP: Chest pain | DR: Diarrhea | EC: Esophageal carcinoma | ARM: Ano-rectal mass | V: Vomiting | BO: Bowel Obstruction | ES: Esophageal stricture | CD: Crohn's disease | NT: Neck Tumor | PO: Post-operative | CT: Colonic tumor | RT: Rectal tumor | ER: Esophageal reflux | MR: Mal rotation | CI: Chest infection | PS: Pyloric stenosis | FB: Foreign body | ACI: Accidental corrosive ingestion | GER: Gastro-esophageal reflux | RVF: Recto-vaginal fistula | PDAS: Patent ductus arteriosus

Table 2: Clinical indications for barium studies

(Tab.3) shows that, the most frequent abnormal findings in adult male and female was achalasia 2 (8.7%) & 5 (29.4%) respectively. For pediatrics male and female it was found to be hirschprung disease 8 (20.0%) and 7 (33.3%) respectively. The least findings in adult male includes, pyloric tumor 1 (4.4%), while that of female includes rectal tumor 1 (5.9%). For pediatrics male it was found to be congenital mega colon 1 (2.5%), while that of female includes recto-vaginal fistula 2 (9.5%).

Findings	Adult		Pediatric	
	Male F(%)	Female F(%)	Male F(%)	Female F(%)
NS	14 (60.9)	6 (35.3)	21 (52.5)	6 (28.6)
AC	2 (8.7)	5 (29.4)		
ES	2 (8.7)	2 (11.8)	5 (12.5)	4 (19.1)
HD	2 (8.7)	1 (5.9)	8 (20.0)	7 (33.3)
ECF	1 (4.4)			
PT	1 (4.4)			
EC	1 (4.4)			
L		1 (5.9)		
RT		1 (5.9)		
GDJS		1 (5.9)		
A			3 (7.5)	
PS			2 (5.0)	
IBD				
RVF				2 (9.5)
CMC			1 (2.5)	2 (9.5)
TOTAL	23 (100)	17 (100)	40 (100)	21 (100)

Data presented as frequency and (%).

KEYS:

NS: Norma study | AC: Achalasia cardia | ES: Esophageal stricture | HD: Hirschprung's disease | PT: Pyloric tumor | EC: Esophageal carcinoma | L: Latrogenic | RT: Rectal tumor | A: Agangliosis | PY: Pyloric stenosis | GDJS: Gastro-duodenal junction stenosis | CMC: Congenital mega colon | IBD: Inflammatory bowel disease | RCF: Recto vaginal fistula | ECF: Entero-cutaneous fistula.

Table 3: Findings for barium studies

Discussion

The findings of the current study reported that 10 (9.9%) request cards were inadequately filled. This is against the guidelines for standard practice that clearly suggested that, all radiology request cards should be adequately and legibly completed and indications, clinical history and age of the patient



Figure 1: Barium study in 27 years old patient with dysphagia.



Figure 2: Barium meal examination in 12 years old patient with abdominal distention



Figure 3: Barium enema study in 8 years old patient with suspected Hirschsprung's disease

must be clearly stated.⁹ The findings of this study as shown in Table 1 are contrary to the findings of the study conducted by Enukegwu et al.,¹⁰ that reported more than 80% of patients were above 18 years of age, only 4 (1.9%) patients were between 10 and 17 years of age, whereas 20 (9.3%) patients were below ten years of age. The contrary is probably because, the previous study was done on barium enema only. The findings of the current study indicated that, male presented with gastro-intestinal system disorders are more than the female. This is contrary to the findings of the study conducted by Chandio et al.,¹¹ who found 57.2% females and 42.8% males.

As shown in (Fig.1a), barium swallow was the most frequent type of barium study done in both male and female adult patients. Barium swallow examination can be performed for many reasons which includes; dysphagia, anemia, pain, esophageal carcinoma, neck mass, gastro-esophageal reflux, disease assessment of tracheo-esophageal fistula, and congenital esophageal stenosis.² The findings of the current study as shown in (Fig.1b) indicated that, barium enema was the most frequent type of barium examination done in both male and female pediatrics

with 20 (50%) and 14 (66.7%) respectively. Barium enema is a positive contrast examination of the lower GIT and it's an age-long radiological investigation.¹² In developed countries, barium enema has been largely replaced by CT colonoscopy or virtual colonoscopy, however barium enema still remains the imaging modality of choice in developing countries.¹⁰ The findings of the current study as shown in (Tab.2) indicated that, dysphagia was the most frequent clinical indication in both male and female adults with 6 (26.1%) and 4 (23.5%) respectively. The least indication includes; hirschsprung, neck tumor and post-operative. Dysphagia is a highly prevalent condition that occurs in a broader range of populations.¹³ Without proper assessment and management of patients with dysphagia it can cause serious health implications like aspiration pneumonia which can contribute to morbidity and mortality.^{14,15} Dysphagia has a negative impact on quality of life and contribute to significant medical and large socio-economical costs.¹⁶ As shown in (Tab.2), hirschsprung and vomiting were the most frequent indications for barium study in male pediatric each with 7 (17.5%). Bowel obstruction, accidental corrosive ingestion, ano-rectal mass, post-operative and gastro-esophageal reflux were the least indications among pediatric male each with 1 (2.5%). Hirschsprung's disease (HD) is a congenital bowel motility disorder which occurs in approximately one of every five thousand live births.¹⁷ HD is caused by arrest of cranio-caudal migration of neural crest cells during the 5th to 12th weeks of intra-uterine life.¹⁸ Patients with HD can still develop life-threatening bowel obstruction, colonic perforation, sepsis or severe diarrhea and dehydration before surgical treatment.¹⁹ Vomiting is a common symptom of multiple underlying conditions that can cause tremendous stress for the children and healthcare provider. Vomiting in children is often benign, but it can lead to life-threatening conditions with series of complications like electrolyte abnormalities, dehydration and bowel necrosis.²⁰

The findings of the current study indicated that, constipation 4 (19.1%) was the most frequent indication for barium study among females. This is almost similar to the study conducted by Enukegwu et al.,¹⁰ who reported constipation as the most frequent indication 53 (53%). The possible reason for the agreement between the two studies might be because both

studies were conducted in same country. Mean while bowel obstruction, recto-vaginal fistula, and esophageal reflux were among the least indication in female pediatrics. However, the previous study did not categorize the indications for barium studies based on age groups.

Furthermore, the findings of the current study reported 20 (96.2%) and 27 (81.6%) as normal study in adults and pediatrics respectively as shown in (Tab. 3), this study disagree with the studies conducted by Enukewu et al.,¹⁰ and Chandio et al.,¹¹ who have found that, colonic carcinoma 39 (30%), and diverticular disease 137 (49.2%) as the most frequent pathologies respectively. Hence in the current study, achalasia cardia was found to be the most prevalent abnormal finding which involve 2 (8.9%) and 5 (29.4%) cases in male and female adults respectively as shown in (Tab.3). Achalasia cardia is a primary motility disorder of the esophagus characterize by the absences of esophageal peristalsis and incomplete relaxation of the lower esophageal sphincter.²¹ Patients with achalasia cardia may develop series of complication such as; esophageal diverticular, fistula formation, aspiration pneumonia, esophagitis and esophageal perforation.²² As indicated in (Tab.3). Hirschsprung's disease was found to be the most prevalent pathology consist of 8 (20%) and 7 (33.3%) cases in pediatrics male and female respectively. Patients with HD may develop some complications such as; intestinal obstruction, colonic perforation, sepsis or severe diarrhea and dehydration.⁹ As indicated in (Tab.3) enterocutaneous fistula, pyloric tumor, and esophageal carcinoma were least frequent pathologies in male adults with 1 (1.4%) each. Esophageal carcinoma is considered a serious malignancy with respect to prognosis and mortality. It's the eight most common cancer and six most common cause of cancer related death globally with developing countries making up more than 80% of total cases and death.²³ Furthermore, as shown in (Tab.3), rectal tumor latrogenic, hirschsprung's disease and gastro-duodenal junction stenosis were the least abnormal findings in female adult with 1 (5.9%) each. The findings of the present study showed that, congenial mega colon was the least frequent abnormal findings in pediatrics male 1 (2.5%). Patients with mega colon are at risk of developing some complication such as; colonic perforation, acute entero-colitis, malnutrition, anemia

and hydro-ureter.²⁴ (Tab. 3) indicated that, recto-vaginal fistula and congenial mega colon were the least prevalent pathology in pediatrics female 2 (9.5%). Recto-vaginal fistula may cause emotional distress and physical discomfort, which impact self-esteem. Patients with recto-vaginal fistula experienced physical complications like; fecal incontinence, recurrent vaginal infection, recurrent urinary tract infection.

Conclusion

The current study showed that, barium swallow was the most requested barium examination in adult patients while barium enema was the most requested barium examination in pediatric. Also the study shows that dysphagia, hirschsprung, vomiting and constipation were the most frequent indications for barium studies. The study showed that, normal finding was the most frequent findings followed by achalasia cardia and hirschsprung's disease.

Conflict of Interest: None

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