Radiological Spectrum of Barium Swallow Findings in Patients with Dysphagia at a Tertiary-Care Hospital in Pakistan: A Cross-Sectional Study

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ABSTRACT

Background: Barium swallow is an accessible, non-invasive test for dysphagia, especially in areas where endoscopy and manometry are less available, but the results are influenced by local factors like corrosive ingestion, and the data from South Punjab, Pakistan is limited.
Objective: To describe the spectrum of barium swallow findings in dysphagia at a tertiary-care hospital and evaluate their association with corrosive ingestion.
Methods: The study was retrospective cross sectional study, in which 120 consecutive patients aged ≥12 years who were referred for barium swallow for dysphagia were analysed from the electronic radiology reports from January to March 2026 at Nishtar Hospital Multan. Proportions are given with 95% Wilson confidence intervals (CI); associations were tested with Fisher's exact test.
Results: Most patients were female (66.7%) and aged ≤45 years (84.2%). Studies were normal in 46 (38.3%; 95% CI 30.1–47.3), showed a definite radiological abnormality in 65 (54.2%; 45.3–62.8) and were inconclusive in 9 (7.5%). The most frequent findings were extrinsic compression by cervical osteophytes (12.5%), caustic oesophageal stricture (12.5%), gastric outlet obstruction (10.0%), oesophageal web (6.7%), non-caustic stricture (5.0%) and suspected neoplastic lesion (5.0%) and suspected motility disorder (2.5%). None of the 24 patients with corrosive ingestion had a normal study (versus 47.9% without; $p=2.2\times10^{-6}$). Oesophageal stricture was seen in 12/12 patients following ingestion of bleach, and gastric outlet obstruction in 9/12 patients following ingestion of acid (p=0.0003). Endoscopy was recommended in 46.7%.
Conclusion: Barium swallow revealed a definite radiological abnormality in more than half of the patients, mainly corrosive injury and compression of the cervical osteophytes, in this predominantly young group. Normal studies do not exclude disease, and further evaluation with endoscopy, with manometry if indicated, is important.

Keywords: Barium sulfate; Deglutition disorders; Oesophageal stenosis; Caustics; Osteophyte; Pakistan

INTRODUCTION

Dysphagia, the subjective sensation of difficulty in swallowing, is a common symptom of structural, inflammatory, neoplastic and neuromuscular disorders of the oropharynx and oesophagus.[1] It impairs nutrition, quality of life and psychological well-being, and may lead to aspiration, malnutrition and death.[2] A meta-analysis estimated the pooled prevalence of oropharyngeal dysphagia at 43.8% (95% CI 33.3–54.9) across heterogeneous populations, rising with age and over time.[3] Identifying the underlying cause promptly is essential for planning management.[4]

Barium swallow (oesophagogram) is a non-invasive, inexpensive fluoroscopic examination that depicts oesophageal morphology, bolus transit and motility. Endoscopy has a central role in the evaluation of oesophageal dysphagia, but barium swallow remains a useful complementary test, particularly for strictures, webs and extrinsic compression, and for defining anatomy before endoscopy or dilatation.[5,6] Where endoscopy and manometry are less accessible, it is often the initial imaging investigation.

The causes of dysphagia differ between populations and care settings, depending on age structure, the burden of corrosive injury and malignancy, and referral pathways, so findings from one region cannot simply be extrapolated to another. Barium swallow also has recognised limitations: it can miss mucosal disease and subtle motility disorders, depends on the protocol and the reader, and cannot provide a tissue diagnosis. Its findings are therefore best interpreted as radiological impressions to be correlated with endoscopy and, where indicated, manometry.[5,6] Describing what barium swallow shows in an unselected local referral population, and how often it prompts further evaluation, can help clinicians use it appropriately.

Data on barium swallow findings in Pakistan are limited. A study from Rawalpindi evaluated its diagnostic accuracy against rigid oesophagoscopy but did not describe the full spectrum of findings,[7] and a Gujranwala series reported the frequency of gastrointestinal diseases on barium studies.[8] Corrosive ingestion is frequently reported from Pakistani tertiary centres and is a preventable cause of upper gastrointestinal injury.[9,10] Cervical osteophytes can also compress the oesophagus and cause

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dysphagia,[11,12] yet, to our knowledge, they have not been systematically described in barium swallow series from Pakistan. We therefore aimed to describe the spectrum of barium swallow findings in patients with dysphagia at a tertiary care hospital in South Punjab, and to examine the relationship between corrosive ingestion and radiological findings. These data may inform referral pathways, diagnostic strategies and prevention.

METHODOLOGY

The study was a retrospective cross sectional study carried out in Department of Radiology, Nishtar Hospital, Multan, a tertiary care teaching hospital in South Punjab, Pakistan. It is reported according to the STROBE statement[13] and the Declaration of Helsinki. The Institutional Ethical Review Board approved the study (approval number 4175). The need for individual informed consent was waived as it was only a review of electronic radiology reports.

The inclusion criteria were all consecutive patients referred with dysphagia and who had a barium swallow performed between January and March 2026 and were aged ≥12 years. Patients with a known allergy to contrast media or history of oesophageal surgery were excluded. All 120 consecutive eligible patients were included. No sample size calculation was done and the precision of estimates is given as 95% confidence intervals.

Examinations were carried out as a part of the normal clinical practice in the Department of Radiology and each was interpreted and reported by a consultant radiologist during the examination. When reported, findings in the stomach and pylorus were included. The technical parameters (equipment, barium preparation and volume, positions and projections, use of a solid bolus or tablet) and the number of reporting radiologists were not included in the extracted data set.

Only the electronic radiology reports were used for data extraction, and a standardised data collection form was used, with no effort made to obtain undocumented variables from other clinical records. The following variables were considered: age (grouped as ≤30, 31–45, 46–60 and >60 years), sex, type of dysphagia (solids only or solids and liquids), level of dysphagia (neck or chest), duration (<1 month, 1–6 months or >6 months), history of corrosive ingestion (acid or bleach as recorded in the report), odynophagia, barium swallow finding, site of the lesion, vertebral level of osteophytes (C5–C6, C6–C7 or multiple levels) and whether endoscopic correlation was advised in the report. The results were classified as normal, caustic stricture, non-caustic stricture, extrinsic compression from cervical osteophytes, oesophageal web, gastric outlet obstruction, suspected neoplastic lesion, suspected motility disorder or inconclusive. Radiological diagnosis of suspected neoplastic lesions and motility disorders was not confirmed by histology or manometry. An inconclusive study was a study that failed to provide a definite diagnosis, such as when the patient did not cooperate or technical factors prevented the exclusion of a structural lesion. Any variables that were not documented in the report were categorized as "not documented". A "definite radiological abnormality" was defined as any specific abnormal finding (excluding inconclusive studies) and not as a confirmed cause of dysphagia.

Data were analyzed using SPSS version 28 (IBM Corp., Armonk, NY, USA). Categorical variables are summarized as frequencies and percentages, and 95% Wilson score confidence intervals for the key outcomes are provided.[14] Associations between categorical variables were assessed using Fisher's exact test, with expected cell counts <5, and exact two-sided p values are reported ($p<0.05$ was considered significant). Effect sizes are risk differences in percentage points (Newcombe 95% Cis); odds ratios were not estimated due to zero cells. Responses that were "Not documented" were kept as a separate category and missing data were not imputed.

RESULTS

Patient characteristics

There were 120 patients in total. The commonest age group was 31–45 years (n=53, 44.2%), followed by ≤30 years (n=48, 40.0%) and 46–60 years (n=18, 15.0%); only one patient (0.8%) was aged >60 years. Thus 101 patients (84.2%) were aged ≤45 years. There were 80 females (66.7%) and 40 males (33.3%), a female-to-male ratio of 2:1 (Table 1).

Table 1. Demographic characteristics of the patients (n=120)

Characteristic	Category	n (%)
Age group (years)	≤30	48 (40.0)
	31–45	53 (44.2)
	46–60	18 (15.0)
	>60	1 (0.8)
Sex	Female	80 (66.7)
	Male	40 (33.3)

Values are n (%).

The type was not documented in 59 patients (49.2%), to solids and liquids in 37 (30.8%) and to solids only in 24 (20.0%). Neck was documented as a level of dysphagia in 16 (13.3%) and was not documented in 104 (86.7%) and not documented in the chest. Duration exceeded 6 months in 39 (32.5%), was 1–6 months in 42 (35.0%) and <1 month in 6 (5.0%), and was not documented in 33 (27.5%). Twelve (10.0%) had odynophagia. A history of corrosive ingestion was recorded in 24 patients (20.0%; 95% CI 13.8–28.0), comprising 12 with acid and 12 with bleach ingestion. The radiology report recommended endoscopic correlation in 56 patients (46.7%) and this was not evaluated (Table 2).

Table 2. Clinical characteristics of the patients (n=120)

Variable	Category	n (%)
Type of dysphagia	Solids only	24 (20.0)
	Solids and liquids	37 (30.8)
	Not documented	59 (49.2)
Level of dysphagia	Neck	16 (13.3)
	Chest	0 (0.0)
	Not documented	104 (86.7)
Duration	<1 month	6 (5.0)
	1–6 months	42 (35.0)
	>6 months	39 (32.5)
	Not documented	33 (27.5)
Odynophagia	Present	12 (10.0)
	Absent	108 (90.0)
Corrosive ingestion	Yes	24 (20.0)
	Acid	12 (10.0)
	Bleach	12 (10.0)
	No	96 (80.0)
Endoscopic correlation advised in report	Yes	56 (46.7)
	No	64 (53.3)

Values are n (%). Not documented: the variable was not recorded in the radiology report.

Barium swallow findings

The study was normal in 46 patients (38.3%; 95% CI 30.1–47.3), showed a definite radiological abnormality in 65 (54.2%; 45.3–

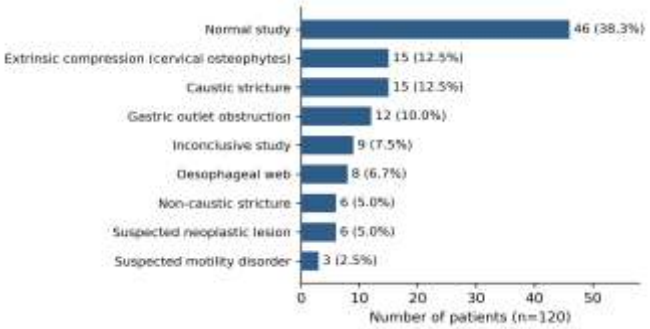
62.8) and was inconclusive in 9 (7.5%; 4.0–13.6); thus 74 studies (61.7%) were not normal. Extrinsic compression by cervical osteophytes and caustic oesophageal stricture were the commonest definite abnormalities, each in 15 patients (12.5%; 7.7–19.6). Gastric outlet obstruction was seen in 12 (10.0%), oesophageal web in 8 (6.7%), non-caustic stricture in 6 (5.0%), suspected neoplastic lesion in 6 (5.0%) and suspected motility disorder in 3 (2.5%) (Table 3, Figure 1).

Table 3. Barium swallow findings in patients with dysphagia (n=120)

Finding	n (%)	95% CI
Normal study	46 (38.3)	30.1–47.3
Extrinsic compression by cervical osteophytes	15 (12.5)	7.7–19.6
Caustic stricture	15 (12.5)	7.7–19.6
Gastric outlet obstruction	12 (10.0)	5.8–16.7
Inconclusive study	9 (7.5)	4.0–13.6
Oesophageal web	8 (6.7)	3.4–12.6
Non-caustic oesophageal stricture	6 (5.0)	2.3–10.5
Suspected neoplastic lesion	6 (5.0)	2.3–10.5
Suspected motility disorder	3 (2.5)	0.9–7.1
Any definite radiological abnormality	65 (54.2)	45.3–62.8

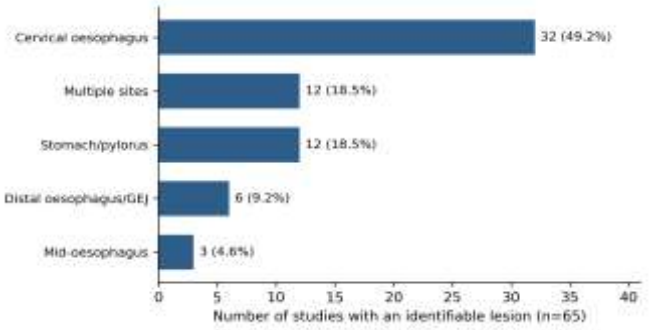
CI, Wilson score confidence interval. Definite radiological abnormality excludes normal and inconclusive studies. Suspected neoplastic lesions and motility disorders were not confirmed by histology or manometry.

Figure 1. Spectrum of barium swallow findings (n=120). Bars show the number of patients; percentages are of all 120 patients.



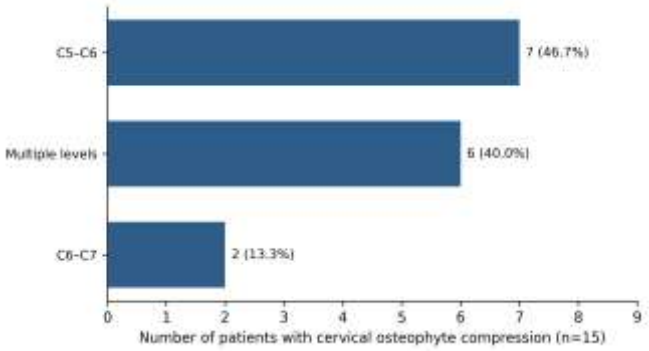
Among the 65 studies with a definite radiological abnormality, the commonest site of abnormality was the cervical oesophagus (n=32, 49.2%), followed by multiple sites (n=12, 18.5%), stomach or pylorus (n=12, 18.5%), distal oesophagus or gastro-oesophagus (n=6, 9.2%) and mid-oesophagus (n=3, 4.6%) (Figure 2). The site could not be specified in the 9 inconclusive studies.

Figure 2. Site of lesion among studies with a definite radiological abnormality (n=65). Percentages are of these 65 studies. GEJ, gastro-oesophageal junction.



Of the 15 patients with extrinsic compression by cervical osteophytes, 7 (46.7%) had isolated C5–C6 involvement, 6 (40.0%) had multiple levels and 2 (13.3%) had C6–C7 involvement, with no other levels involved (Figure 3).

Figure 3. Vertebral levels involved in extrinsic compression by cervical osteophytes (n=15). Percentages are of these 15 patients.



Corrosive ingestion and radiological findings

All 24 patients with a history of corrosive ingestion had an abnormal study, 15 (62.5%, 95% CI 42.7–78.8) of whom had an oesophageal stricture and 9 (37.5%) had gastric outlet obstruction. None had a normal study, compared with 46 of 96 patients (47.9%) without such a history (difference 47.9 percentage points, 95% CI 31.0–57.8; $p=2.2\times10^{-6}$). There were no cases of ingestion history in 96 patients, and all 15 caustic strictures were recorded in patients with ingestion history ($p=2.8\times10^{-13}$). This history is partly definitional, as the "caustic" label was likely influenced by it.

The pattern varied among agents (Table 4). The proportion of patients with oesophageal strictures was higher in all 12 patients with bleach ingestion (100%; 95% CI 75.8–100.0) than in 12 with acid ingestion (3; 25.0%; 8.9–53.2; difference 75.0 percentage points, 95% CI 37.8–91.1; p=0.0003), while the proportion with gastric outlet obstruction was higher in 12 with acid ingestion (9; 75.0%; 46.8–91.1) than in all 12 with bleach ingestion (0; 0.0%; 0–25.0; difference 75.0 percentage points, 95% CI 46.8–91.1; p=0.0003). Of the 12 patients with gastric outlet obstruction, 9 (75.0%) had a history of acid ingestion.

Table 4. Barium swallow findings by type of corrosive agent ingested (n=24)

Finding	Acid (n=12), n (%; 95% CI)	Bleach (n=12), n (%; 95% CI)	p value
Oesophageal (caustic) stricture	3 (25.0; 8.9–53.2)	12 (100.0; 75.8–100.0)	0.0003
Gastric outlet obstruction	9 (75.0; 46.8–91.1)	0 (0.0; 0.0–24.2)	

CI, Wilson score confidence interval. The p value is from Fisher's exact test of a 2 × 2 comparison of oesophageal stricture versus gastric outlet obstruction between agents. No patient with a corrosive history had a normal study or any other finding.

DISCUSSION

Principal findings

Of the 120 patients with dysphagia, 54.2% had a definite radiological abnormality on barium swallow, 38.3% had a normal swallow and 7.5% had an inconclusive swallow. Extrinsic compression by cervical osteophytes and caustic oesophageal stricture were the commonest findings (12.5% each), followed by gastric outlet obstruction (10.0%). A history of corrosive

ingestion was recorded in one in five patients, and the radiological pattern was very different for acid and bleach.

Demographic profile

The majority of patients (84.2%) were ≤45 years old, significantly younger than in an Indian endoscopic series of patients with dysphagia (mean age 53.8 years).[15] This is likely due to the younger age structure of the region and the influence of corrosive injury and local referral patterns, but these factors were not directly investigated. The proportion of females (66.7%) was higher than in the same series (59.0%).[15] A series of patients with corrosive ingestion from Rawalpindi was also predominantly female (68.6%) and 46/70 patients had swallowed the corrosive in a suicide attempt.[10] Findings were not analysed by sex and intent was not recorded, so it is not possible to determine if corrosive ingestion played a role in the female predominance observed here.

Only 2.5% of our patients were suspected to have motility disorders. Conventional barium swallow is not sensitive for motility disorders: in a Karachi series only 46/72 patients with achalasia had consistent barium swallow findings.[16] There was no manometric confirmation available and these findings should be interpreted as radiological impressions.[6]

Normal studies

Normal studies were 38.3% as compared to 36.8% in a series of mixed gastrointestinal barium studies from Gujranwala.[8] A normal barium swallow is not a good indicator of functional dysphagia. The test may fail to detect mucosal disease (early neoplasia, eosinophilic oesophagitis or reflux related changes), subtle motility and oropharyngeal disorders.[5,6] Half of the barium studies were normal in a paediatric series of eosinophilic oesophagitis and most of the rings seen at endoscopy were not seen radiologically,[17] and in adults the radiological signs are usually strictures and a ringed oesophagus,[18] which indicates that early inflammatory disease may go undetected. If there is a suspicion of a motility disorder, endoscopy and manometry should be performed in patients with persistent symptoms and a normal study.

Corrosive ingestion

Twenty percent (20.0%) of patients had a history of corrosive ingestion and all of them had an abnormal study. Oesophageal strictures were associated with bleach ingestion and gastric outlet obstruction with acid ingestion. This is analogous to the mechanisms of caustic injury, in which alkaline substances cause liquefactive necrosis and deep oesophageal injury, and acids cause coagulative necrosis, with a tendency to injure the stomach, particularly the antrum and pylorus.[19] Endoscopic series of acid[20] and alkali[21] ingestion have reported the distribution and natural history of injury from each agent, including late oesophageal strictures and gastric outlet obstruction, and our pattern of injury is similar to this. Household bleach is usually alkaline, but the type and concentration of the bleach were not recorded and the mechanism and severity of the injury cannot be determined.

There are three points to consider when interpreting. First, the relationship of ingestion and caustic stricture is definitional, as all caustic strictures were associated with ingestion, and the word "caustic" was probably colored by the ingestion history. It is not an independent epidemiological association. The more informative result is that none of the patients with a corrosive history had a normal study. Second, our denominator was patients with sequelae who were referred for barium swallow, a selection of patients with sequelae. The proportions with strictures therefore do not estimate the risk after ingestion and the 62.5% observed here cannot be compared directly with the 36.4% (8 of 22) who developed strictures in a prospective series of corrosive oesophageal injury in Yemen.[22] Third, the confidence intervals are large (Table 4) and the differences between agents are a pattern that must be verified in larger series.

Cervical osteophytes

In 12.5% of patients, the cervical osteophytes were responsible for extrinsic compression. When large, anterior cervical osteophytes may lead to dysphagia, but symptomatic compression is rare,[11,12] a multidisciplinary work-up has been recommended to establish causality prior to surgery, which resulted in improvement of dysphagia in 79% of 19 patients selected.[11] Anterior cervical osteophytes are reported in about 10% of patients with dysphagia,[23] and are classically described in older men, often in association with diffuse idiopathic skeletal hyperostosis.[24] This is similar in size to our figure of 12.5%, but is exceptionally high given that 84.2% of the cohort was ≤45 years. These factors may be due to referral and selection effects, radiological recognition of osteophytic indentation, and the nature of the study population. Barium swallow reveals a dent but it is not able to prove that it is responsible for the symptoms. The reports did not include any information about neck symptoms or imaging and further evaluation of the cervical spine, so it was not possible to assess whether the compression was clinically significant or incidental. The majority of cases were at C5–C6 or at more than one level. The radiologist should report specifically for cervical level indentation and clinical correlation with cervical spine imaging should be considered.

Gastric outlet obstruction, webs and suspected neoplasms

Gastric outlet obstruction was found in 10.0%. It is usually associated with vomiting, and is a very rare cause of dysphagia,[25] which is why it is so rare here (9 of 12 cases). It was reported due to stomach and pylorus findings recorded when depicted and lack of examination protocol. In a Turkish paediatric series, caustic ingestion was associated with gastric outlet obstruction in about 5% of children and alkali ingestion was reported to cause gastric outlet obstruction.[26] Similarly, gastric outlet obstruction was seen in 6/61 children admitted after corrosive ingestion, 4 of whom had ingested alkali,[27] and other series have correlated it specifically with acid ingestion in children[28] and with acid ingestion in a South Asian surgical series.[29] This lack of obstruction after bleach ingestion in our small sample should not be extrapolated. It is known that acid pools in the antrum can cause damage to the pylorus.[19]

Oesophageal webs were seen in 6.7% which is less than 25.2% reported in a series from Rawalpindi[7] on barium swallow and less than 5–15% reported in patients with dysphagia who had barium swallow.[30,31] Barium swallow has also been reported to be superior to endoscopy for the detection of webs.30,31 Cervical webs are classically associated with iron-deficiency anaemia and Plummer-Vinson syndrome,[32] but we did not have haematological data to examine this.

Neoplastic lesions were suspected in 5.0% of examinations. This figure should not be interpreted as the prevalence of malignancy as histological confirmation was not available and barium swallow is not sensitive for early mucosal tumours. Limited patient cooperation or technical factors were cited as the cause of inconclusive studies (7.5%) but the number of patients for each reason and the management of these patients were not recorded.

Clinical implications

Barium swallow is a useful complementary test, particularly if endoscopy is not available, and normal and inconclusive results (45.8% combined) should raise the possibility of endoscopy, and manometry if a motility disorder is suspected. Endoscopic correlation was recommended in 46.7% of examinations, but could not be determined from the clinical and radiological data in

the retrospect. The findings emphasize the importance of prevention of corrosive ingestion (by limiting access to concentrated acids and alkalis, safe storage, clear labelling and community education) and for proper follow-up of patients with known corrosive injury.

Strengths and limitations

To our knowledge, the spectrum of barium swallow studies in dysphagia from South Punjab has not been described previously, and those studies have relied on endoscopy or focused on corrosive ingestion. Selection bias was limited as all 120 consecutive eligible patients were included and data were obtained using a standardised form. The Wilson 95% confidence interval was used for the quantification of uncertainty and exact tests were applied for small subgroups. Findings were reported conservatively, radiological impressions were not included with confirmed diagnosis, which is helpful for referring physicians when endoscopy and manometry are not readily available.

This was a retrospective, single centre study, which may have limited generalisability. There was no reference standard (endoscopy, histology or manometry), so diagnostic accuracy cannot be assessed and suspected neoplastic and motility findings are unconfirmed. Reports were made by individual readers who knew the clinical history, and protocol information was not available, while several clinical variables were not recorded. There was no verification of the history, intent and timing of corrosive ingestion, and the agent-specific comparison is based on small numbers. Findings were not analysed by age or sex. Prospective multicentre studies with reference standards are needed.

CONCLUSION

In this single centre, predominantly young cohort from South Punjab, barium swallow revealed a definite radiological abnormality in 54.2% of patients with dysphagia. Caustic strictures and extrinsic compression from cervical osteophytes were the most common findings (12.5% each) and corrosive ingestion was linked to the presence of different oesophageal and gastric patterns by agent. Further evaluation with endoscopy, with manometry if a motility disorder is suspected, is important, as 38.3% of studies were normal and 7.5% inconclusive. The results support the need for prevention of corrosive ingestion and proper post-ingestion care of patients with known corrosive ingestion.

Ethical Approval

The study was approved by the Institutional Ethical Review Board, Nishtar Hospital Multan (approval number 4175), and was conducted in accordance with the Declaration of Helsinki.

Data Availability

Available upon reasonable request.

Author Contributions

Conceptualization: Hira Khan.
Data curation: Hira Khan.
Methodology: Hira Khan and Muhammad Ilyas.
Formal analysis: Hira Khan and Abdullah Ikram.
Software: Hira Khan and Ahmad Farooq.
Investigation: Hira Khan and Muhammad Ilyas.
Supervision: Muhammad Ilyas.
Validation: Muhammad Ilyas and Anas Jahangir.
Visualization: Hira Khan.
Writing – original draft: Hira Khan, Ahmad Farooq, and Abdullah Ikram.
Writing – review and editing: Hira Khan, Muhammad Ilyas, and Anas Jahangir.
Project administration: Muhammad Ilyas.
Resources: Muhammad Ilyas.
All authors have read and approved the final version of the manuscript.

Informed Consent

Written informed consent was not obtained; it was waived because the study involved only the review of anonymised electronic radiology reports.

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No.

Conflict of Interest

No.

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Declaration of AI-Assisted Language Editing

No artificial intelligence tool was used in the preparation of this manuscript.

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