ECRONICON OPEN ACCESS

EC GASTROENTEROLOGY AND DIGESTIVE SYSTEM

Research Article

Radioendoscopic Correlation in the Diagnosis and Management of Caustic Ingestion

I Ouchicha[1]*, H Abid[1], H Cherkaoui[1], C Hajjar[2], N Lahmidani[1], M Elyousfi[1], B Alami[2], MY Lamrani[2], A Ibrahimi[1], M Maaroufi[2], N Bouardi[2], M Abkari[1] and DA Benajah[1]

[1]Hepato-Gastroenterology Department, Faculty of Medicine and Pharmacy, Sidi Mohammed Ben Abdellah University, Fez, Morocco

[2]Radiology Department, Faculty of Medicine and Pharmacy, Sidi Mohammed Ben Abdellah University, Fez, Morocco

***Corresponding Author:** I Ouchicha, Hepato-Gastroenterology Department, Faculty of Medicine and Pharmacy, Sidi Mohammed Ben Abdellah University, Fez, Morocco.

Received: December 01, 2022; **Published:** December 08, 2022

Abstract

Caustic ingestion is a medical-surgical emergency associated with relatively high mortality. The upper GI endoscopy is the key examination to evaluate the mucosal lesions of the digestive tract. Nevertheless, it remains an invasive technique. Cervico-thoraco-abdominal computed tomography (CT) is a non- invasive but radiating examination that allows the study of the damage caused to the surrounding tissues by caustic ingestion. Our retrospective descriptive and analytical study aims to evaluate the contribution of cervical-thoracic-abdominal computed tomography in the evaluation of digestive lesions and to study the correlation with endoscopic results.

Keywords: *Caustic Ingestion; CT Scan; Endoscopy; Zargar*

Introduction

Ingestion of caustic substances is one of the emergencies associated with relatively high morbidity and mortality [1]. The severity of tissue damage depends on the type, concentration, volume of the product, and duration of contact [2,3]. The reference tool for the evaluation of mucosal damage is the upper GI endoscopy. Nevertheless, it remains an invasive procedure, and the search for alternative non-invasive tools to detect lesions following caustic ingestion is an area of interest. Cervicothoracic-abdominal computed tomography (CT) has been widely used in cases of caustic ingestion to gather more details about the surrounding tissue involvement.

Aim of the Study

The purpose of the present study is to evaluate the contribution of cervicothoracic-abdominal CT in the evaluation of caustic-induced digestive injuries and to study the correlation with endoscopic data.

Materials and Methods

This is a retrospective, descriptive and analytical study conducted over 11 years (2010 - 2021) and included 34 patients presenting to the emergency department of the HASSAN II University Hospital of Fez after acute ingestion of caustic product and who underwent an upper GI endoscopy and a CT scan without and with contrast injection within 24 hours of hospital admission. The CT images were interpreted without prior knowledge of the patients' endoscopic findings. The endoscopic and CT classification of the lesions of the digestive mucosa was performed according to the attached table 1 and 2.

Grade 0	Normal mucosa
Grade I	Edema and erythema of the mucosa
Grade IIa	Hemorrhage, hemorrhage, false membranes, erosion, superficial ulceration
Grade IIb	Circumferential and hollowing lesions
Grade IIIa	Focal necrosis
Grade IIIb	Diffuse necrosis
Grade IV	Perforation

Table 1: *Zargar classification and corresponding endoscopic description [1].*

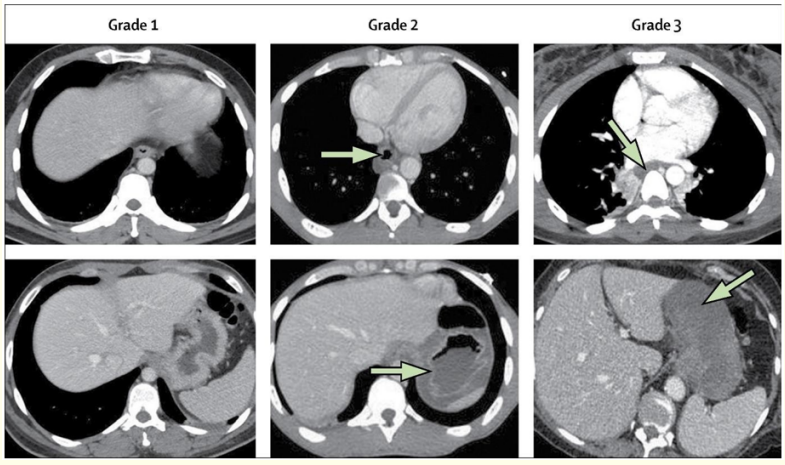


Figure 1: *CT classification of esophageal and gastric injury after caustic ingestion [1].*

CT and endoscopic findings of upper gastrointestinal tract lesions were compared, and CT screening performance characteristics were calculated using R software. The correlation between endoscopic lesions of the esophagus and stomach was calculated using Spearman's rank correlation coefficient. Concordance between CT scan and endoscopic grading was measured using Cohen's Kappa coefficient test (K).

K=0: no Correlation	0.45<K≤0.75: Substantial
0<K≤0.2: Fair	0.75<K≤ 1: Almost perfect
0.2<K≤0.45: Moderate	K=1: Perfect correlation

Table 2: *Cohen's kappa test.*

Results

34 people were admitted for the duration of the study for caustic ingestion. They underwent cervical-thoracic-abdominal-pelvic CTAP and upper GI endoscopy. The mean age was 37.7 years (16 - 85) with a sex ratio of 1. The estimated minimum and maximum volume of the caustic product were 20 and 500 ml respectively with a mean of 95.7ml. Acid was used in 73.5% of cases, based in 20.6%, and oxidants in 5.9%. Ingestion of the caustic was voluntary in 61.7% of cases and accidental in 38.3% of cases.

Variables	Values
Average age y /o	37.7 (16 - 85)
Sex ratio	1
Volume (ml)	95.7 (20 - 500)
Type of product	Acid: 73.5% Base: 20.6% Oxidants: 5.9%

Table 3: *Baseline characteristics of the patients studied.*

All our patients had both an upper GI and a CT scan, with a maximum delay between the two examinations not exceeding six hours with an average delay of three hours.

The endoscopy usually preceded the CT scan unless there were signs of clinical instability or gastric perforation (abdominal contracture, disturbed consciousness, respiratory distress, pneumoperitoneum on standard radiography). The average time to perform a gastrointestinal endoscopy after admission to the emergency department was 15 hours (4 hours-3 days). The upper GI endoscopy was used to classify the nasogastric lesions according to Zargar (See figures).

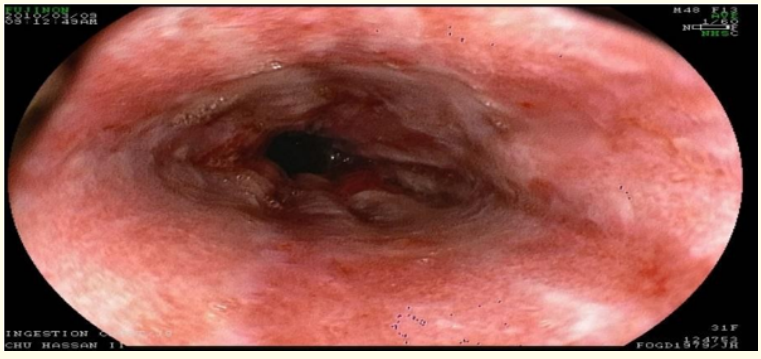


Figure 2: *Erythematous esophageal mucosa with superficial ulcerations classified as IIa according to the Zargar classification.*

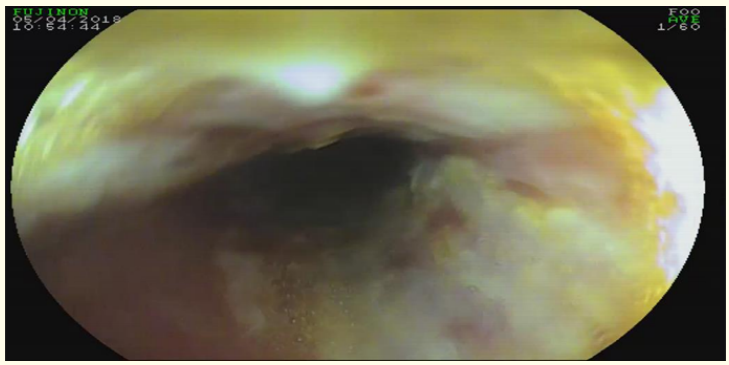


Figure 3: *Esophageal ulcerations occupying ¾ of the circumference are classified as stage IIa according to the Zargar classification.*

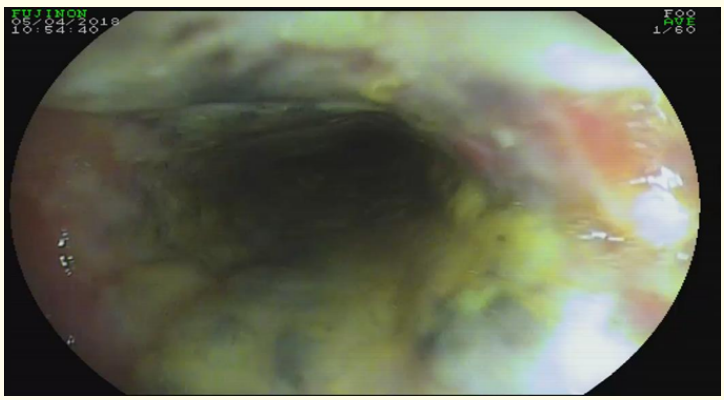


Figure 4: *Circumferential and deepened ulcers in the esophageal mucosa with focal necrosis classified as IIIa according to the Zargar classification.*

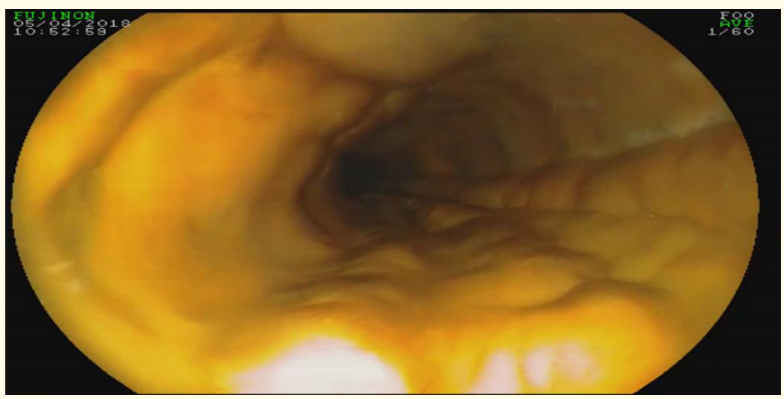


Figure 5: *Diffuse necrosis of the esophageal mucosa classified as stage IIIb according to the Zargar classification.*

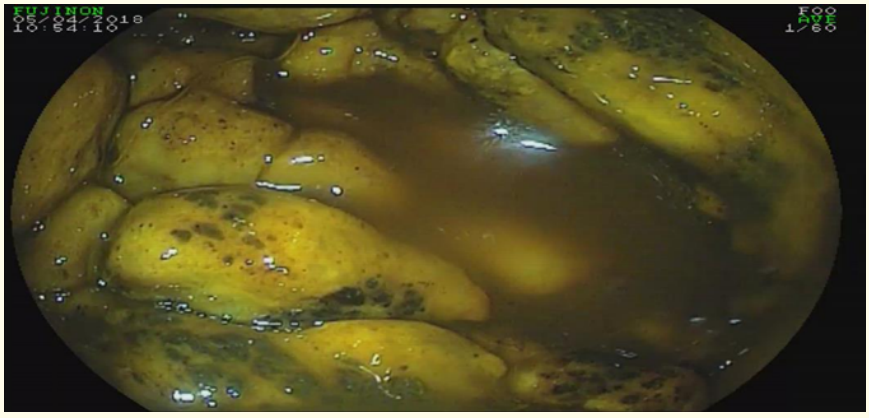


Figure 6: *Diffuse necrosis of the gastric mucosa classified as stage IIIb according to the Zargar classification.*

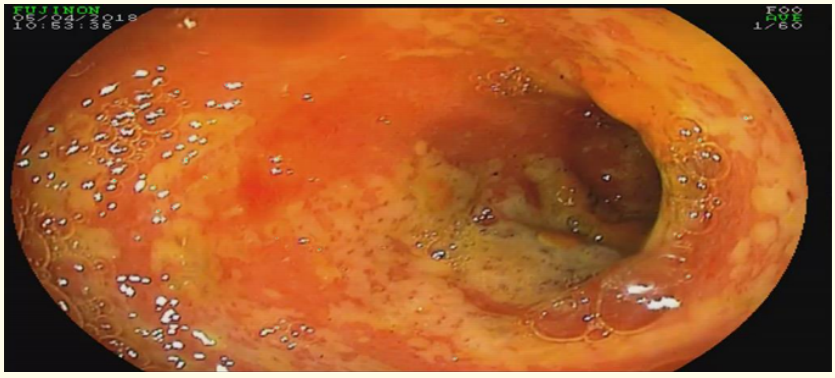
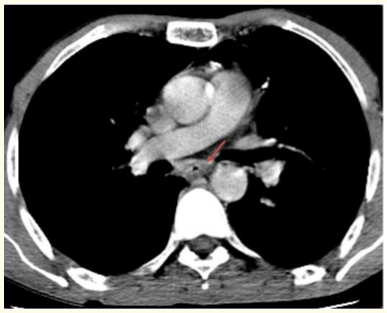


Figure 7: *Erythematous bulbar mucosa with superficial ulcerations classified as IIa according to the Zargar classification.*

The radiological work-up followed a simple and rapid protocol, the first acquisition in spontaneous contrast, then a second one after injection of iodinated contrast medium at the venous time at 80 seconds, according to a flow rate of 4 cc/min, and a concentration of 1 cc/kg.

The scan was performed by the radiologist on duty and then by the specialist radiologist blind to the endoscopic result so as not to influence their final interpretation.

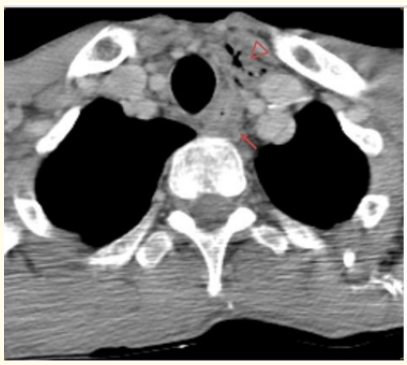
This is a brief workup to evaluate the digestive lesions and to detect complications, in particular, to look for: parietal thickening, sub-mucosal edema, peri-lesional fatty infiltration, enhancement defect, pneumomediastinum, pneumoperitoneum, parietal pneumatosis, and intraperitoneal effusion (See figures).



- 27 years old; Voluntary ingestion of caustic products bleach in a suicide attempt.

- Chest CT scan in axial section showing an enlarged esophagus with internal contrast; classified 2a Salon de Chirica classification (red arrow).

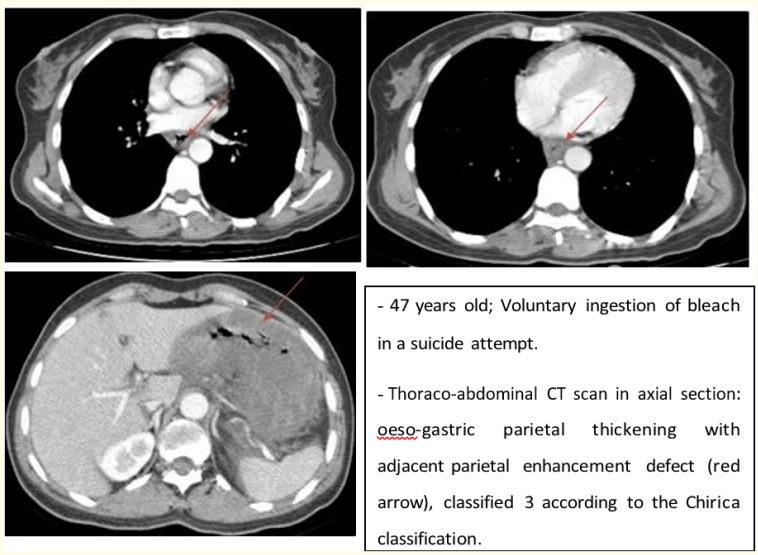
Figure 8: *Esophageal damage is classified as 2a according to the CHIRICA classification.*



- 57 years old; Voluntary ingestion of caustic products in a suicide attempt.

- Thoracic CT scan in axial section objectifying an enlarged esophagus without any contrast, classified 3 Salon the classification of Chirica (red arrow), associated with a pneumo upper mediastinum (head of red arrow).

Figure 9: *Esophageal involvement is classified as 3 according to the CHIRICA classification, complicated by pneumomediastinum.*



- 47 years old; Voluntary ingestion of bleach in a suicide attempt.

- Thoraco-abdominal CT scan in axial section: oeso-gastric parietal thickening with adjacent parietal enhancement defect (red arrow), classified 3 according to the Chirica classification.

Figure 10: *Esophageal involvement is classified as 3 according to the CHIRICA classification, without signs of complications.*

- 30 years old; Ingestion of caustic products (HCl) in a suicide attempt (1 Glass)
- Thoraco-abdominal CT scan in axial section showing a gastric parietal thickening with a parietal enhancement defect (red arrowhead) creating a virtual wall extending beyond the pyloric orifice without pneumoperitoneum (red hollow triangle); classified 3 according to the Chirica classification.

Figure 11: *Gastric lesion classified as 3 according to the CHIRICA classification, complicated by pneumoperitoneum.*

In the light of the results of these two examinations, we have collected the statistics summarized in the following table (Table 4).

	Endoscopy results according to the Zargar classification		**CT findings according to the Chirica classification**	
Esophagus	Normal	3.23%	Normal	13.33%
	Grade I	3.23%	Grade I	30%
	Grade IIa	29.02%	Grade IIa	20%
	Grade IIb	22,58%	Grade IIb	16.67%
	Grade IIIa	16.13%	Grade III	20%
	Grade IIIb	22.58%		
	Grade IV	3.23%		
Stomach	Normal	3.23%	Normal	16.67%
	Grade I	6.45%	Grade I	30%
	Grade IIa	9.68%	Grade IIa	16.67%
	Grade IIb	12.89%	Grade IIb	10%
	Grade IIIa	25.81%	Grade III	26.66%
	Grade IIIb	41.94%		

Table 4: *Correlation of CT and endoscopy findings.*

On the basis of endoscopy, there was a significant correlation between esophagus and gastric grading of mucosal lesions (r = 0.44; p = 0.008). On the basis of CT findings, there was a significant correlation between esophagus and gastric mucosal lesion grading (r = 0.73; p = 5, 697.10-7). Concordance between CT and endoscopy regarding lesion grade was moderate for the esophagus (K = 0.32; p = 0.0039) and substantial for the stomach (K = 0.53; p = 5.86.10-6).

	Test	P-Value
Esophagus	K = 0.32	P = 0.0039
Stomach	K = 0.53	P = 5.86

Table 5: *Correlation between CT and endoscopy regarding lesion grade.*

The sensitivity of CT for the detection of esophageal and gastric lesions was 43.03% and 72.91%, respectively, while its specificity was 86.91% for esophageal and 85.11% for gastric lesions. The PVP and NPV of CT were 75.9% and 85.8% for esophageal lesions and 52.5% and 85.2% for gastric lesions, respectively.

	CT Scan	
	Esophagus	Stomach
Sensibility	43.03%	72.91%
Specificity	86.91%	85.11%
Positive predictive value PPV	75.9%	52.5%
Negative predictive value NPV	85.8%	85.2%

Table 6: *Characteristics of the screening performance of CT in detecting upper gastrointestinal tract lesions following caustic ingestion.*

Discussion

Endoscopy is an invasive diagnostic tool, and the search for non-invasive alternatives for the detection of likely lesions after a caustic ingestion is an area of interest for researchers. While digestive endoscopy assesses the extent of esophageal and gastric mucosal lesions with good accuracy, it does not accurately assess the extent of deep burns, which alone is predictive of complications such as perforation or death [6]. Bhoil's study showed that TC99m pertechnetate is very close to upper GI endoscopy for the detection of gastric lesions, but this method is not affordable and available in all health centers, including ours [7]. Some more recent studies have mentioned various advantages of CT, such as its availability, feasibility, cost-effectiveness, and ability to specify the extension of lesions beyond the intestinal tract [8-10]. CT can be used in the early grades of corrosive lesions to assess the degree of the lesion [11]. In the study by Motlagh., *et al*. the sensitivity and specificity of CT in detecting esophageal lesions were 96.29% and 57.14% respectively [12]. Another study by Lurie., *et al*. showed that CT had high specificity (> 90%) and low sensitivity (~30% to 40%) in predicting the need for surgery as well as potential mortality [13].

In a recent study by Chirica., *et al*. 2016, CT was found to be superior to endoscopy in screening, evaluation, and detection of endoscopic GI perforation requiring urgent surgical intervention [14]. Ryu., *et al*. have shown that CT has high sensitivity and specificity in predicting complications such as esophageal stricture in patients who have ingested caustic substances [15]. In our study esophageal stricture was observed in (26.5%) In our study, the sensitivity of CT for the detection of esophageal and gastric lesions was 43.03% and 72.91% respectively, while its specificity was 86.91% for esophageal lesions and 85.11% for gastric lesions, all grades combined. Thoracoabdominal-pelvic CT thus represents an interesting alternative to emergency digestive endoscopy. In addition to being a less invasive, easy, and

quick method, CT can give important information in the field of pulmonary infiltration, surrounding thoracic soft tissue involvement, and look for possible anatomical vascular variants as a substitute for surgery [12].

Conclusion

Based on the results of the present study, CT could be considered a sensitive tool to rule out upper GI mucosal injury following caustic ingestion. However, the correlation between endoscopy and CT findings regarding the classification of primarily esophageal lesions is not high enough to eliminate the need for endoscopy.

Bibliography

1. Quingking CG., *et al*. "Predictive Factors of Gastrointestinal Caustic Injury According to Clinical and Endoscopic Findings". *Asia Pacific Journal of Medical Toxicology* 2.1 (2013): 19-22.

2. Cheng H-T., *et al*. "Caustic ingestion in adults: the role of endoscopic classification in predicting outcome". *BMC Gastroenterology* 8.1 (2008): 31.

3. Alipour Faz A., *et al*. "Epidemiologic Features and Outcomes of Caustic Ingestions a 10-Year Cross- Sectional Study". *Emergency* 5.1 (2017): e56.

4. Zargar SA., *et al*. "The role of fiberoptic endoscopy in the management of corrosive ingestion and modified endoscopic classification of burns". *Gastrointestinal Endoscopy* 37.2 (1991): 165-169.

5. Chirica., *et al*. "Computed Tomography Evaluation of Esophagogastric Necrosis After Caustic Ingestion". *Annals of Surgery* 264.1 (2016): 107-113.

6. F Fieux., *et al*. "Ingestion de produits ménagers (caustiques essentiellement): évaluation de la gravité et du prognostic". Toxicologie: Comment mieux évaluer le pronostic d'une intoxication. Chapitre 21. URGENCES (2013).

7. Bhoil A., *et al*. "Meckel's scan for triage in caustic injury patients: Alternative to endoscopy". *Journal of Nuclear Medicine* 53.1 (2012): 2128.

8. Keh SM., *et al*. "Corrosive injury to the upper gastrointestinal tract: Still a major surgical dilemma". *World Journal of Gastroenterology* 12.32 (2006): 5223-5228.

9. Ananthakrishnan N., *et al*. "Acute corrosive injuries of the stomach: a single unit experience of thirty years". *ISRN Gastroenterology* (2011): 914013.

10. Contini S and Scarpignato C. "Caustic injury of the upper gastrointestinal tract: a comprehensive review". *World Journal of Gastroenterology* 19.25 (2013): 3918-3930.

11. Rohan Kamat., *et al*. "Corrosive injuries of the upper gastrointestinal tract: A pictorial review of the imaging features". *Indian Journal of Radiology and Imaging* 29.1 (2019): 6-13.

12. Bahrami-Motlagh H., *et al*. "Diagnostic Accuracy of Computed Tomography Scan in Detection of Upper Gastrointestinal Tract Injuries Following Caustic Ingestion". *Emergency (Tehran)* 5.1 (2017): e61.

13. Lurie Y., *et al*. "The role of the chest and abdominal computed tomography in assessing the severity of acute corrosive ingestion". *Clinical toxicology (Philadelphia)* 51.9 (2013): 834-837.

14. Chirica M., *et al*. "Caustic ingestion". *Lancet (London, England)* 389.10083 (2017): 2041-2052.

15. Ryu HH., *et al*. "Caustic injury: can CT grading system enable prediction of esophageal stricture?" *Clinical Toxicology* 48.2 (2010): 137-142.

Volume 9 Issue 12 December 2022