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RESEARCH ARTICLE

Prevalence and Socio-Demographic status correlates of Upper Gastrointestinal Cancers: A Descriptive Cross Sectional Study from a Tertiary Care Hospital in Chennai, Tamil Nadu

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Abstract

Introduction: Upper Gastro Intestinal (UGI) cancers remain significant health concern contributing to chronic diseases burden in India and Globally. Behavioural risk factors like tobacco, alcohol consumption, dietary and lifestyle factors are well-recognized etiological risk determinants for gastric, esophageal cancers. This study aimed to determine the prevalence of UGI cancers and its association with socio-demographic and behavioural risk factors among patients attending a tertiary care hospital in Chennai, Tamil Nadu. **Materials and Methods:** A Descriptive Cross Sectional study was conducted for 5 months (February to June 2025) at Tamil Nadu Government Multi Super Speciality Hospital, Chennai. A cohort of 500 adult cancer patients were assessed for UGI cancers, socio-demographic and behavioural factors using structured validated questionnaire by purposive sampling technique. Socio-economic status was classified using Modified Kuppusamy scale (2022). Statistical analysis was performed using SPSS version 26.0; categorical associations were evaluated with Chi-square/ Fishers exact tests ($p<0.05$). **Results:** Out of the 500 cancer patients screened, 60 cases (12%) were diagnosed with UGI cancers. The prevalence of UGI cancers were significantly higher among males compared to females (63.3% vs. 31.6%; $p<0.001$). Behavioural risk factors demonstrated notable associations: smoking was more common among patients with UGI cancers than those without (23.3% vs. 11.1%; p=0.01; OR=2.43; 95% CI: 1.25-4.74), as was alcohol consumption (45% vs. 12.5%; $p<0.001$; OR=5.73; 95% CI: 3.20–10.25). Additionally, betel nut chewing showed a significant association with UGI cancers (10% vs. 3.2%; p=0.02; OR=3.38; 95% CI: 1.25–9.17). **Conclusion:** Upper Gastrointestinal cancers constituted 12% of all cancer cases in this tertiary care setting. Male gender and behavioural factors such as alcohol consumption, smoking and betel nut chewing were significantly associated with UGI cancers. These findings highlight the need for targeted behavioural interventions and awareness programs to reduce risk of UGI cancers in vulnerable population.

Keywords: Upper Gastro Intestinal cancer- Prevalence- Socio-demographic factors- Smoking- Alcohol- Betel Nut chewing

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Introduction

The Global Burden of Diseases (GBD) study indicate millions of new cancer cases and deaths in India, related to lifestyle, socio economic status and behavioural risk factors [1]. Incidence of cancer cases ranges around 20 million cases alongside 9.7 million deaths from cancer, according to GLOBOCAN 2022. This estimate suggests that 1 in 5 men or women develop cancer in a lifetime, whereas 1 in 9 men and 1 in 12 women die from it [2]. In India, the cancer burden is simultaneously increasing according to national cancer registry estimates, with an estimated

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1.46 million incident cases in 2022. Gastrointestinal cancers including stomach and esophageal malignancies, contribute notably to this burden says ICMR [3]. Upper Gastrointestinal (UGI) Cancers including Esophagus, Stomach, Pancreas, Gallbladder and Liver, represent more than a quarter of all cancers globally; moreover their incidence and prevalence rate is continuously increasing [4]. UGI cancers have distinct epidemiological patterns and risk determinants with gastric cancer being the most common cancers worldwide and is caused by various factors like environmental, lifestyle and infectious factors. Helicobacter pylori infection has been strongly linked to gastric cancer risk factor while behavioural determinants such as tobacco smoking and chewing, alcohol intake and ultra-processed and sodium rich diet remains a major risk factor, particularly in South Asian population [5-7] .

Despite the recognized importance of these determinants, recent hospital based evidence on the prevalence and correlates of UGI cancers within the subset of South Asian population particularly Tamil Nadu, Chennai is limited. This remains a critical need for descriptive epidemiological study that interprets the local patterns of UGI cancers in association with risk factors to depict and create awareness programs, screening and prevention strategies, and tailored public health interventions. This study aims to document the prevalence of UGI cancers and describe associated socio-demographic and lifestyle factors among cancer patients at a tertiary care centre in Chennai, Tamil Nadu, thereby filling a critical gap in South Indian epidemiology in this clinical cohort.

Materials and Methods

Study design and setting

A Descriptive Cross Sectional Observational study was conducted for five months (February-June 2025) in a tertiary care hospital at Tamil Nadu Government Multi Super Specialty Hospital (TNGMSSH), Omandurar, Chennai, Tamil Nadu, India.

Study Population

The study included all patients (outpatients and inpatients) diagnosed with cancer undergoing treatment modalities like Radiation therapy, Chemotherapy and Surgical procedure. Patients aged 18 years and above who were willing to participate in the study using a validated demographic questionnaire were included. Patients aged below 18 years, not willing to participate in the study, pregnant and lactating women and those not undergoing active cancer treatment were excluded. The patients enrolled for the study were collected from 3 major Oncology departments (medical oncology, surgical oncology and radiation oncology) of TNGMSSH. The cancer diagnosis was confirmed by the Oncologist through histopathological and radiological reports, thereafter the patients were assessed demographically. In this study, Upper Gastrointestinal cancers were operationally defined to include esophageal, gastric and esophagogastric junction cancers along with hepatopancreatobiliary malignancies (liver, gall bladder and biliary tract cancers).

Sampling technique and Sampling size

Purposive sampling was used to recruit patients meeting the inclusion criteria. A total of 500 patients were enrolled. Based on the prevalence of GI Cancer obtained from previous study[1], the sample size for the present study was calculated using the formula:

$$n=Z^2\ pq/e^2$$

By substituting the values, the sample size obtained was 360. However, to increase the reliability of the study, the sample size was fixed as 500.

Study participants

A total of 500 patients diagnosed with cancer were screened for eligibility using a validated open-ended questionnaire as shown in Flow chart-1. Of these 500 patients, UGI cancers were filtered to find out the prevalence rate. These patients were treated with Radiation therapy/ Chemotherapy or both pre and post-Surgical intervention depending on site and size of tumour and stage of cancer, based on tumour board decision.

Study instrument

A validated structured open-ended questionnaire which includes socio-demographic information (age, gender, literacy level, socio-economic status, occupation, social habits, marital status, number of family members, physical activity level, medical diagnosis, past medical history, past surgical history) were obtained with the help of the questionnaire.

The information pertaining to the history of Social habits like alcohol consumption, smoking, tobacco chewing, betel leaf chewing, betel nut chewing was collected with the help of the questionnaire. Based on patient's occupational history, the Physical Activity Level (PAL) was classified and determined as Sedentary, Moderate and Heavy worker.

Modified Kuppusamy scale (2022) was used to assess the socio-economic status (SES) including education, occupation and monthly income of the family. Based on the total score, the obtained SES were classified into five categories as Upper (I), Upper middle (II), Lower middle (III), Upper lower (IV) and Lower (V) [8].

Statistical Analysis

The collected data was entered in Microsoft Excel. The Statistical analysis was carried out using SPSS (Statistical Package for Social Sciences) software version 26.0. Categorical variables were expressed as n and %. Chi-square test was used to assess the associations and Fisher Exact test was used when any cell of a table had a count of less than 5. Given the relatively limited sample size and the descriptive nature of the analysis, stratification by individual cancer subtypes would have reduced statistical power and limited meaningful interpretation. The level of significance was set as 5% ($p<0.05$) was considered statistically significant. Figure 1 represents

the methodology as flowchart.

Results

This study included 500 patients diagnosed with cancer, undergoing active treatment modality.

Figure 2 represents the Prevalence percentage rates of Upper Gastrointestinal (UGI) cancers. Among the 500 cancer patients, 60 patients were diagnosed with UGI cancers, marking the prevalence rate of 12% among all cancers.

Table 1 represents the socio-demographic characteristics of UGI cancers and other cancers. Age did not have any significant correlation, but higher percentage was found between the age group of 45 years to 65 years among UGI cancers and other cancers.

Gender had a significant role to play in both UGI cancers and other cancers with a male: female ratio of 1:1.8 (n = 440; males = 35.4%, females = 64.6%) in other cancers and 1.7:1 (n = 60; males = 63.3%, females = 36.7%) among UGI cancers. From the results it is evident that male population are more prone than female population in UGI cancers with a p-value<0.001 (statistically significant) compared with other cancers. There was no data recorded with other gender identities.

According to Modified Kuppusamy Scale [2022] [8], 90.1% were from lower class and 9.9% from upper lower among other cancers and 100% were from lower class in UGI cancers, which when compared had no statistically significance.

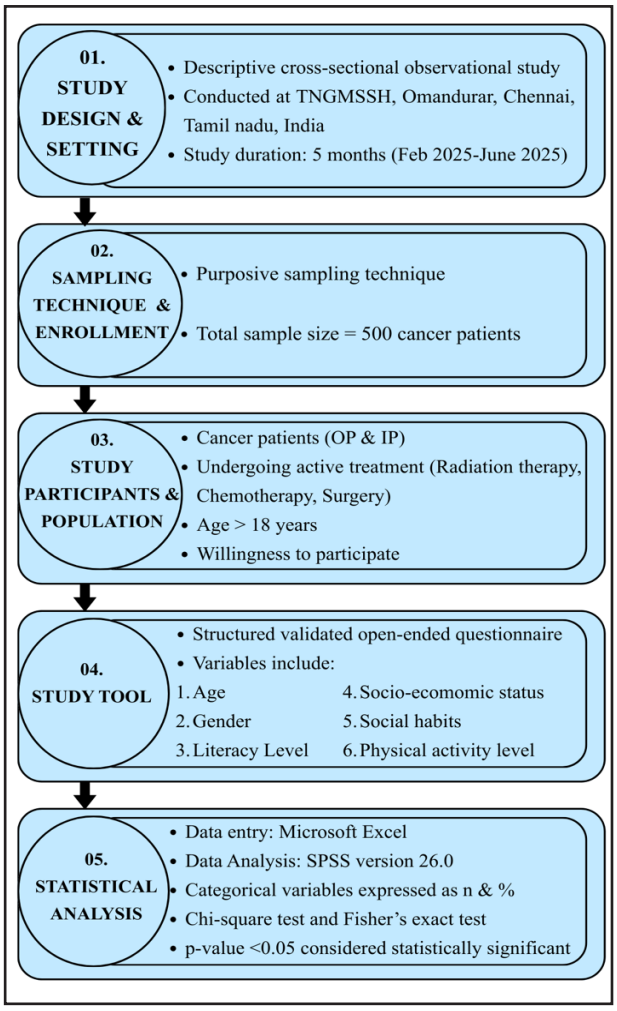


Figure 1. Methodology Flowchart

Table 1. Association between Socio-Demographic Characteristics and UGI Cancers

Variable	Category	Other cancers n (%)	UGI cancers n (%)	p-value
Age	18-25 years	4 (0.9)	0 (0)	0.84
	25-35 years	16 (3.6)	2 (3.3)	
	35-45 years	70 (15.9)	13 (21.7)	
	45-55 years	155 (35.2)	19 (31.7)	
	55-65 years	134 (30.5)	19 (31.7)	
	>65 years	61 (13.9)	7 (11.7)	
	Total	440 (100)	60 (100)	
Gender	Male	139 (31.6)	38 (63.3)	<0.001*
	Female	301 (68.4)	22 (36.7)	
	Total	440 (100)	60 (100)	
Education	Literate	30 (6.8)	1 (1.7)	0.09
	Illiterate	410 (93.2)	59 (98.3)	
	Total	440 (100)	60 (100)	
Socio economic status	Upper	0 (0)	0 (0)	0.59
	Upper middle	0 (0)	0 (0)	
	Lower middle	0 (0)	0 (0)	
	Upper lower	4 (9.9)	0 (0)	
	Lower	436 (90.1)	60 (100)	
	Total	440 (100)	60 (100)	
Occupation	Employed	54 (12.3)	6 (10)	0.39
	Unemployed	386 (87.7)	54 (90)	
	Total	440 (100)	60 (100)	

Chi square test/Fischer Exact test; *p-value<0.05-statistically significant

Table 2 presents the association between social habits and UGI cancers. The percentage of smokers among patients diagnosed with Upper Gastrointestinal cancers and other type of cancers were 23.3% and 11.1% respectively. From the results, it is evident that on comparison with others cancers, UGI cancers were significantly higher among smokers with a p-value=0.01. Similarly, the percentage of alcohol users among patients diagnosed with UGI cancers and other cancers were 45% and 12.5% respectively. This is evident that UGI cancers were significantly higher among alcoholics with a p-value<0.001. On the other hand, betel nut chewers among patients diagnosed with UGI cancers and others cancers were 10% and 3.2% respectively stating UGI cancers had a significantly higher p-value=0.02 among betel nut chewers when compared to other cancers.

To quantify the strength of association between behavioural risk factors and UGI cancers, odds ratios (OR) with 95% confidence intervals (CI) were calculated. Smoking was significantly associated with UGI cancers (OR = 2.43; 95% CI: 1.25–4.74), indicating that smokers had more than twice the odds of developing UGI cancers compared to non-smokers. Alcohol consumption demonstrated a strong association (OR = 5.73; 95% CI:

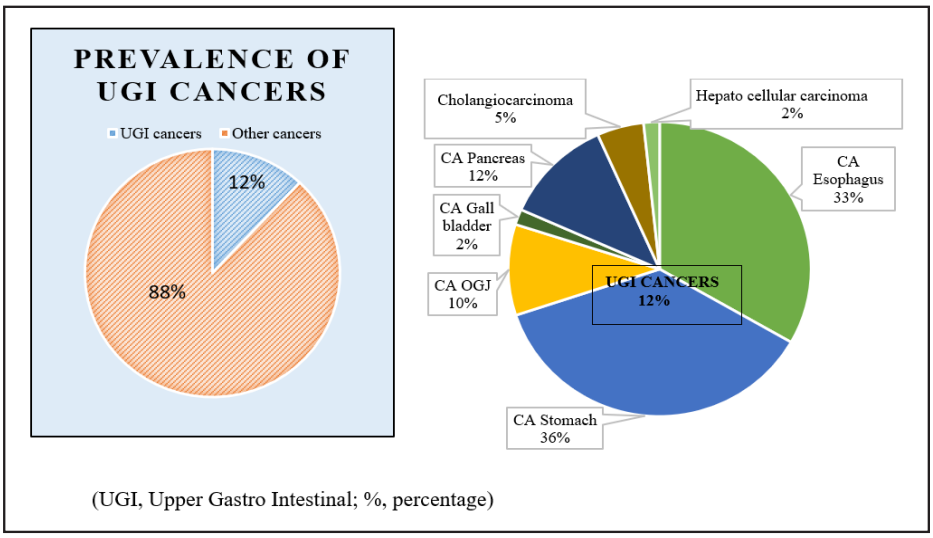


Figure 2. Prevalence of UGI Cancers among Cancer Patients Admitted to a Tertiary Care Hospital

3.20–10.25), suggesting a substantially increased risk among alcohol users. Similarly, betel nut chewing was significantly associated with UGI cancers (OR = 3.38; 95% CI: 1.25–9.17), indicating increased odds among users. These findings reinforce the role of modifiable behavioural risk factors in the development of UGI malignancies.

It is also evident from Table 2, that physical activity level did not have a significant impact of both UGI cancers and other cancers but majority of them were sedentary workers [9, 10].

Discussion

This descriptive cross sectional study was assessed to determine the prevalence and socio-demographic correlates of UGI cancers among patients attending a tertiary care hospital in Chennai, Tamil Nadu. This study aimed to collect data from 500 cancer patients undergoing active treatment, in which 60 patients were diagnosed with UGI cancers, yielding a prevalence rate of 12%. This indicates that UGI cancers contribute to a substantial proportion of cancer burden in the tertiary care setting, emphasizing their clinical and public health significance. This frequency aligns with broader regional patterns noted in recent epidemiological analyses of Gastrointestinal cancers in South Asia, where stomach and esophageal cancers remain a major element of cancer statistics [3].

A notable key finding of this study is the significant association between gender and UGI cancers. Males constituted 63.3% of UGI cancer cases and the difference was statistically significant when compared with other cancer types ($p<0.001$). This male predominance is consistent with epidemiological evidence suggesting higher exposure of men to behavioural risk and occupational exposures and lifestyle patterns contributing to carcinogenicity among men [11]. There was no data observed on others gender making sure that this study did not follow any gender stereotyping. Although the age distribution did not show a statistically significant association, the highest proportion of UGI cancers was observed in 45-65 years age group, indicating middle aged and older adults as vulnerable risk group. This age related findings suggest that cancer risk increases with age due to cumulative cellular damage and exposure to carcinogens over time.

Most patients in both the groups belonged to low socio-economic status and were predominantly uneducated. However, these factors were not statistically significant in association with UGI cancers, the majority of patients

Table 2. Association between Behavioral Risk Factor and UGI Cancer

Variable	Risk factors	Other cancers n (%)	UGI cancers n (%)	OR (95% CI)	p-value
Social habits	Smoking	49 (11.1)	14 (23.3)	2.43 (1.25-4.74)	0.01*
	Alcohol	55 (12.5)	27 (45)	5.73 (3.20-10.25)	<0.001*
	Tobacco chewing	22 (5)	2 (3.3)	0.66 (0.15-2.86)	0.43
	Betel Nut chewing	14 (3.2)	6 (10)	3.38 (1.25-9.17)	0.02*
	Gun powder	1 (0.2)	0 (0)	NA	0.88
	Betel leaf chewing	4 (0.9)	1 (1.7)	0.54 (0.06-4.92)	0.47
Physical activity	Sedentary	428 (97.5)	59 (98.3)	1.65 (0.21-12.95)	0.56
	Moderate	12 (2.5)	1 (1.7)		
	Total	440 (100)	60 (100)		

Chi square test/Fischer exact test; *p-value<0.05-statistically significant; OR, Odds Ratio; 95% CI- 95% Confidence Interval

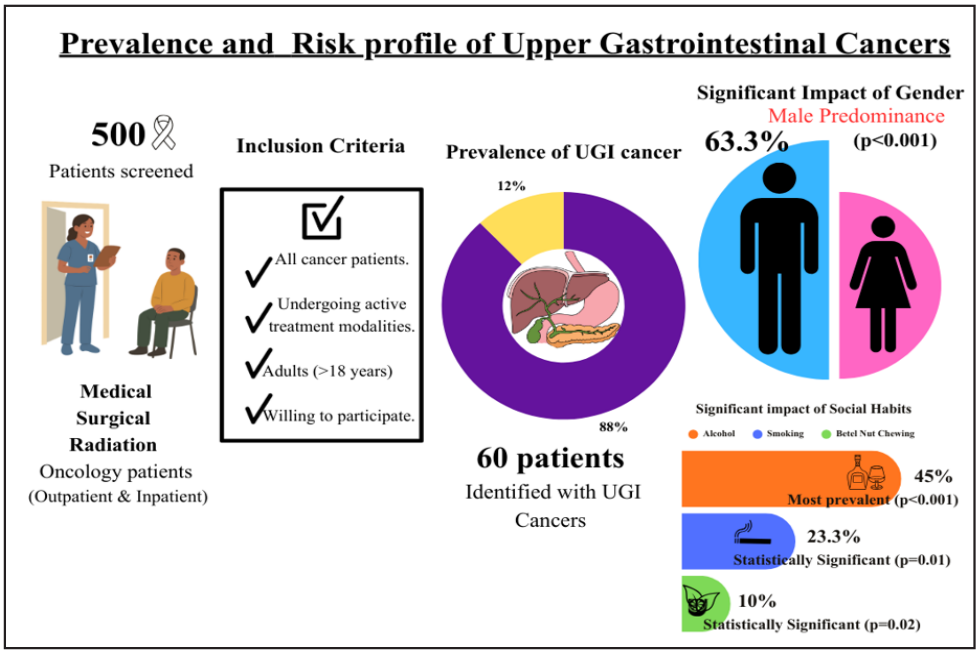


Figure 3. Illustration of the Study

attending the government tertiary care hospital may belong to economically lower backgrounds and needs strengthened cancer awareness, early screening and diagnostic care among those population.

A major strength of this study is the identification of significant behavioural risk association between UGI cancers and other cancers. Alcohol consumption showed a strong association with UGI cancers compared other cancers showing a statistical significance ($p<0.001$). Alcohol contributes to carcinogenesis by inducing mucosal damage, increasing permeability and promoting inflammation. Smokers was significantly higher among UGI cancers compared to other cancers ($p=0.01$).

Smoking is known to contribute to UGI carcinoma through mucosal irritation, oxidative stress and exposure to carcinogenic compounds (active and passive smoking). Nicotine and ethanol use are known to cause direct mucosal damage, promoting chronic inflammation and enhance carcinogenic activities in UGI tissues [12, 13].

This study shows a new and significant finding in association with betel nut chewing and UGI cancers ($p=0.02$), although betel nut chewing is strongly linked to oral cancers and head & neck cancers than any other type of cancer [12]. The primary biologically active alkaloid present in betel/areca nut is Arecoline which contributes to about 0.3-0.7% of the nut [13]. Arecoline and related alkaloids like arecaidine, guvacoline, guvacine undergo biochemical changes starting from the oral cavity (mastication process) and down the gastrointestinal tract, generating Reactive Oxygen Species (ROS) and DNA damage promoting mutagenesis, inflammation and carcinogenesis [14]. Arecoline also induces oxidative stress, genotoxic effects and interferes with DNA repair mechanism causing malignant transformation of epithelial cells to cancerous cells [15].

Areca nut derived nitrosamines also plays a carcinogenic role. During the chewing process, nitrosation reaction occurs (especially the presence of nitrite and thiocyanate from saliva) forming nitrosamines (Methylnitrosamino propionitrile, Nitrosoguvacoline). These compounds are carcinogenic and have been deducted in saliva of betel quid chewers [16]. Betel nut chewing also showed significant association, corroborating from systematic reviews in India, where areca nut and betel quid use have been linked with increased risk for oral and esophageal cancers. Emerging systematic reports reinforce the role of betel nut additives like slaked lime (calcium hydroxide) alongside other carcinogens in elevating the risk of upper gastrointestinal tract cancer [17].

Socio-economic status and education level did not have statistically significant association within the cohort, but a high proportion of patients belonged to the low socio-economic strata. Limited access to healthcare, decreased awareness leading to delayed diagnosis among these groups could potentially lead to advanced disease condition being reported in Indian Cancer Registries [18].

The findings of this study as illustrated in Figure 3 highlights the importance of focusing on modifiable social behavioural risk factors such as smoking, alcohol consumption and betel quid chewing. The strong association of UGI cancers with modifiable behavioural risk factors highlights the urgent need for targeted prevention strategies. Community based screening programs focusing on high risk individuals, particularly males with a history of social habits could enable earlier detection and improved outcomes. Implementing targeted awareness campaigns, screening of high risk groups and community based risk reduction strategies could reduce the burden of UGI cancers in similar tertiary care settings.

Strengths, limitations and future directions

This study aids from a structured and detailed assessment of socio-demographic and lifestyle exposure within a well-defined tertiary care cancer population

for understanding the knowledge and social awareness of non-communicable diseases. This study also limits data and we acknowledge the important determinants and risk factors such as Helicobacter pylori infection, dietary pattern, occupational/ environmental exposure, genetic predisposition and dietary salt intake which are known to cause gastric carcinoma. Prospective analytical studies (eg: analytical cross sectional or case control designs) integrating biochemical data, dietary patterns and longitudinal follow-up can be used to elucidate pathways and better quantify etiological and independent risk factors for UGI cancers in South Indian populations. Implementation of region specific prevention and screening framework can help alleviate the observed disease burden.

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General

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Study Registration

This study has been registered as a phase of the first authors Doctoral work under the Clinical Trial Registries of India (CTRI) Registration. No – CTRI/2025/04/084544

Conflict of Interest

The authors declare no conflict of interest.

Availability of Data

The datasets used and/or analysed during this study are available from the corresponding authors per reasonable request.

Author Contribution Statement

Chandini: Data collection and compilation of data, Conceptualization, Manuscript drafting, Prabhavathy Devi: Critical reviewing of manuscript, Sachdev Meenakshi: Supervision of data collection, provided guidance on clinical implications of research findings and Critical Reviewing of manuscript, Karunanidhi: Statistical Analysis of the data obtained, Sivamalar: Guidance during conceptualization.

Ethical Approval

Ethical clearance was obtained from the Institutional Ethics Committee (IEC) of the Tamil Nadu Government Multi Super Speciality Hospital (TNGMSSH), Omandurar Government Estate, Chennai (Reference No. 1577/ TNGMSSH/2024/BMS/010) dated 30.12.2024.

Scientific Body Approval

This research formed part of the doctoral work of the first author under the Meenakshi Academy of Higher Education and Research (MAHER), Chennai Doctoral course.

Consent to participate and publication

The details of the study and its objectives were well explained to the patients and informed consent was obtained.

Originality Declaration for Figures

All Figures included in this manuscript are original and have been created by the authors specifically for the purposes of this study. No previously published or copyrighted images have been used. The authors confirm that all graphical elements, illustrations, and visual materials were generated from the data obtained in the course of this research or designed uniquely for this manuscript.

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