Trends of Malignancies Among The Geriatric Population: A Year-Long Retrospective Analysis in the PET-CT Division of NINMAS

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ABSTRACT

Introduction: The world's population is agiug rapidly and cancer has a high prevalence in older age, nearly 60%. There are currently over 760 million people worldwide above the age of 65 years, representing over 9% of the global population. Positron Emission Tomography-Computed Tomography (PET-CT) is a crucial imaging modality in the diagnosis, staging, and management of various malignancies, particularly in the geriatric population. At NINMAS, a year-long study was conducted to evaluate the distribution of different cancers in patients aged 65 years and above, with a focus on understanding the patterns and prevalence of malignancies in this demographic.

Patients and Methods: This retrospective observational study analyzed PET-CT data of geriatric patients referred to the PET-CT division of NINMAS from January 2024 to December 2024. Data were categorized based on the type of malignancy. The proportion of cases for each type of cancer was calculated, and demographic details were analyzed to identify trends and patterns.

Results: A total of 166 cases were analyzed, which represented 15.79% of total referrals. The mean age was 70.45 ± 4.67 years, and the male-to-female ratio was 2.01:1. The most common malignancy was lymphoma, accounting for 22.28%, followed by gastrointestinal (GIT) cancers (16.86%), breast cancer (13.85%), lung cancer (8.43%), female reproductive system cancers (8.43%), prostate cancer (7.83%), and head-neck cancers (7.22%). Less frequent cancers included renal carcinoma (4.81%), while cancers of unknown primary (CUP) 3.01% and urothelial cancer each comprised 2.40%. Other malignancies constituted 4.81%. A significant gender-based distribution of malignancies was observed, with lymphoma accounting for 81.08% of cases in males and breast cancer for 91.3% of cases in females.

Conclusion: This study highlights the significant burden of cancer among the geriatric population, with lymphoma and gastrointestinal cancers being the most prevalent.

Keywords: Geriatric oncology; PET-CT; 18F-FDG; malignancy trends.

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INTRODUCTION

The global population is aging at an unprecedented rate. According to the United Nations, there are currently over 760 million people worldwide above the age of 65 years, representing more than 9% of the global population, a figure projected to reach 1.6 billion by 2050 (1). Cancer incidence increases sharply with age, and it is estimated that approximately 60% of all newly diagnosed cancers occur in individuals aged 65 years and above (2). This demographic phenomenon places a growing burden on healthcare systems worldwide, necessitating age-adapted diagnostic and therapeutic strategies. In low- and middle-income countries (LMICs) such as Bangladesh, population aging is accelerating alongside epidemiological transitions, resulting in rising cancer rates among older adults (3). National cancer registry data from Bangladesh suggest a high prevalence of hematological malignancies, gastrointestinal cancers, and female reproductive tract cancers in the elderly population, though systematic data from advanced imaging modalities remain sparse (4).

Positron emission computed tomography (PET-CT) has transformed the oncological management of numerous malignancies by enabling simultaneous anatomical and functional characterization of disease (5). The most widely used radiotracer, 18F-fluorodeoxyglucose (^{18}F-FDG), exploits the Warburg effect, the propensity of malignant cells to preferentially utilize aerobic glycolysis, thereby detecting areas of aberrant glucose metabolism with high sensitivity and specificity (6, 7).

More recently, ^{18}F-labelled prostate-specific membrane antigen (^{18}F-PSMA) PET-CT has emerged as a superior modality for staging and restaging prostate carcinoma, particularly in the elderly male population (8). ^{18}F-FDG PET-CT has been operational at the National Institute of Nuclear Medicine and Allied Sciences (NINMAS), Dhaka, since 2016, with ^{18}F-PSMA PET-CT added to the repertoire in 2023. As the sole public-sector center offering PET-CT imaging in Bangladesh, NINMAS serves a diverse patient population from across the country, including a substantial cohort of geriatric patients referred for oncological evaluation (9).

Geriatric patients present unique challenges in oncological imaging. Physiological changes associated with aging, including altered glucose metabolism, reduced renal clearance, polypharmacy, and sarcopenia, can influence radiotracer biodistribution and image interpretation (10). Moreover, geriatric patients frequently harbor multiple comorbidities and may present with atypical disease manifestations, rendering accurate staging imperative. Despite these challenges, PET-CT remains indispensable in guiding treatment decisions, including surgery, radiotherapy planning, chemotherapy, and targeted molecular therapy in this population (11).

Epidemiological data on the pattern and distribution of malignancies in the geriatric population undergoing PET-CT in South Asian settings are limited. Understanding the cancer burden and imaging patterns in this demographic is essential for healthcare planning, resource allocation, and the development of evidence-based geriatric oncology protocols (12). The present study was therefore conducted to analyze the distribution, trends, and gender-specific patterns of malignancies among geriatric patients (aged ≥ 65 years) referred to the PET-CT Division of NINMAS over a one-year period (January–December 2024).

PATIENTS AND METHODS

This retrospective observational study was conducted at the PET-CT Division of NINMAS, Block-D, BMU Campus, Dhaka, Bangladesh. All patients aged 65 years and above who were referred to the PET/CT Division of NINMAS between 1 January 2024 and 31 December 2024 were included in the study. Patients with incomplete clinical records or uninterpretable images were excluded. PET-CT examinations were performed using either ^{18}F-FDG or ^{18}F-PSMA tracers, depending on the clinical indication. For ^{18}F-FDG PET-CT, patients fasted for a minimum of six hours prior to tracer injection, with blood glucose levels confirmed below 11.1 mmol/L at the time of administration. Standard uptake periods and acquisition protocols were maintained in accordance with European Association of Nuclear Medicine (EANM) procedural guidelines. For ^{18}F-PSMA PET-CT, prostate cancer patients were prepared and imaged in accordance with current PSMA imaging guidelines.

Data Analysis: PET-CT images were reviewed alongside clinical history and demographic data. The following parameters were analyzed: (i) the proportion of cases attributed to each cancer type; (ii) age group distribution; and (iii) gender-based patterns of malignancy. Data were categorized and expressed as frequencies and percentages.

RESULTS

A total of 166 geriatric patients were analyzed, representing 15.79% of the total PET-CT referrals received at NINMAS during the study period. The mean age of the study population was 70.45 ± 4.67 years. The majority of patients were in the 65–69-year age group. Of the 166 patients, 111 (66.9%) were male and 55 (33.1%) were female, yielding a male-to-female ratio of 2.01:1.

Table 1. Distribution of geriatric patients by age group and gender

Age Group (Years)	Male (n=111)	Female (n=55)	Total (n=166)
65–69	62	29	91
70–74	31	16	47
75–79	12	7	19
≥80	6	3	9
Total	**111**	**55**	**166**

Data presented as absolute case counts.

The overall cancer distribution is presented in Table 2. Lymphoma was the most prevalent malignancy, accounting for 37 cases (22.28% of the study cohort), with 30 cases in males and 7 in females. Gastrointestinal cancers constituted the second largest group with 28 cases (16.86%), of which 23 were male and 5 were female. Breast carcinoma ranked third with 23 cases (13.85%), predominantly occurring in females (n=21). Lung cancer and female reproductive tract malignancies each accounted for 14 cases (8.43% each). Prostate carcinoma was identified in 13 patients (7.83%), all male. Head and neck cancers were documented in 12 patients (7.22%). Less frequent malignancies included renal carcinoma (n=8, 4.81%), cancer of unknown primary (CUP) (n=5, 3.01%), urothelial cancer (n=4, 2.40%), and other miscellaneous malignancies (n=8, 4.81%).

Table 2. Distribution of malignancies by type and gender in geriatric PET-CT referrals

Malignancy Type	Total (n)	Male (n)	Female (n)	% of Total
Lymphoma	37	30	7	22.28%
Gastrointestinal (GIT)	28	23	5	16.86%
Breast Carcinoma	23	2	21	13.85%
Lung Cancer	14	10	4	8.43%
Female Reproductive	14	0	14	8.43%
Prostate Cancer	13	13	0	7.83%
Head & Neck Cancer	12	9	3	7.22%
Renal Carcinoma	8	5	3	4.81%
Cancer of Unknown Primary	5	3	2	3.01%
Urothelial Cancer	4	3	1	2.40%
Others	8	5	3	4.81%

GIT: gastrointestinal; CUP: cancer of unknown primary

A significant gender-based predilection was observed. Among male patients, lymphoma was the predominant diagnosis, accounting for 81.08% of all lymphoma cases. Among female patients, breast carcinoma was the most frequent diagnosis, representing 91.3% of all breast cancer cases. All cases of prostate carcinoma (n=13) and female reproductive tract malignancies (n=14) were, as expected, gender-exclusive.

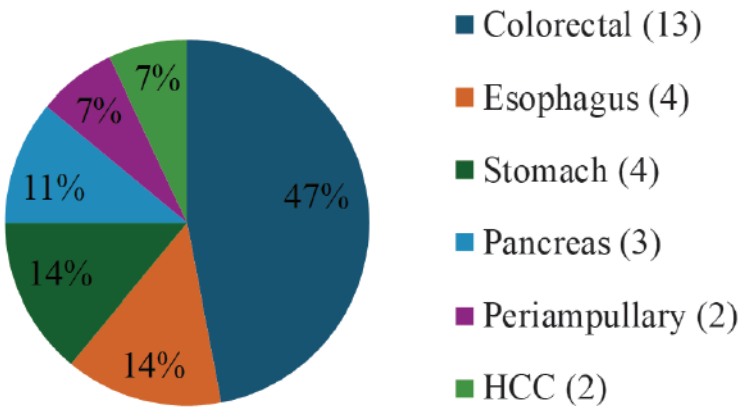

Figure 1: Gastrointestinal malignancy was the second most common malignancy among geriatric population: total cases 28 (23 male, 5 female). Pie chart showing distribution of GIT malignancy with number of cases and percentages.

DISCUSSION

This retrospective analysis of geriatric PET-CT referrals at NINMAS provides valuable epidemiological insight into the cancer burden among elderly patients in Bangladesh. The finding that geriatric patients comprised 15.79% of total PET-CT referrals underscores the significant and growing contribution of this age group to the overall oncological workload. This proportion is consistent with global estimates suggesting that cancer disproportionately affects older adults, with approximately 60% of all cancers occurring in individuals aged 65 years and above (2, 13).

The mean age of 70.45 ± 4.67 years and the predominance of patients in the 65–69-year age group reflect trends observed in similar South Asian studies, where the oldest-old (≥80 years) are often underrepresented in tertiary imaging referrals due to frailty, comorbidity, and limited access to healthcare (14). The male predominance (M:F ratio of 2.01:1) in this cohort likely reflects higher rates of smoking-associated malignancies, occupational carcinogens, and hematological cancers in male patients, as well as possible gender-related disparities in healthcare-seeking behavior (15).

Lymphoma emerged as the single most prevalent malignancy (22.28%), which aligns with established patterns of hematological malignancy in the elderly. The incidence of both Hodgkin lymphoma and non-Hodgkin lymphoma (NHL) increases with advancing age, and PET-CT is recognized as the gold-standard imaging modality for staging, interim response assessment, and end-of-treatment evaluation in lymphoma (16). The Lugano Classification and the EANM/EORTC recommendations unequivocally endorse 18F-FDG PET-CT as the definitive staging and restaging tool for FDG-avid lymphomas, further reinforcing its clinical utility in geriatric patients (17).

The high prevalence of gastrointestinal malignancies (16.86%) in our cohort is consistent with global epidemiological data demonstrating that colorectal cancer, gastric cancer, hepatocellular carcinoma, and cholangiocarcinoma disproportionately affect older adults (18). In Bangladesh specifically, gastrointestinal cancers represent a significant public health concern, compounded by late presentation and limited endoscopic screening programs. The use of PET-CT in GIT malignancies assists in detecting distant metastases, evaluating recurrence, and guiding surgical planning (19).

Breast carcinoma was the third most common malignancy (13.85%), consistent with its global status as the most prevalent cancer in women worldwide (20). The predominance of female patients in this subgroup (91.3%) was expected. In older women, breast cancer tends to present with a more indolent biological profile, typically estrogen receptor (ER)-positive, HER2-negative, yet metastatic disease remains common at presentation in low-resource settings due to limited screening uptake (21). PET-CT plays a pivotal role in staging metastatic breast cancer, detecting skeletal metastases, and monitoring treatment response (22).

Lung cancer (8.43%) and head and neck cancers (7.22%) are strongly associated with tobacco exposure, which may explain the male predominance observed in these categories (23). Prostate carcinoma accounted for 7.83% of the geriatric cohort and, notably, was the clinical indication driving PSMA PET-CT utilization since its introduction at NINMAS in 2023. The addition of 18F-PSMA PET-CT has significantly enhanced diagnostic accuracy in the detection of biochemically recurrent and metastatic prostate carcinoma in elderly males, offering superior sensitivity compared to conventional imaging and 18F-FDG PET-CT (8, 24).

Female reproductive tract malignancies (including cervical, endometrial, and ovarian cancers) accounted for 8.43% of cases, all in female patients. These tumors are known to be FDG-avid, and PET-CT is increasingly used in initial staging as well as detection of recurrence (25). The presence of cancer of unknown primary (CUP) in 3.01% of cases highlights the diagnostic challenge in elderly patients who may present with metastatic disease in the absence of an identifiable primary tumor, a scenario where PET-CT provides invaluable diagnostic guidance (26).

From a broader health policy perspective, the significant cancer burden identified in the geriatric cohort at NINMAS underscores the urgent need for structured geriatric oncology programs in Bangladesh.

Older patients exhibit distinct physiological and pharmacokinetic profiles that affect radiotracer biodistribution, requiring modified imaging protocols and tailored image interpretation criteria (10). Additionally, the clinical utility of PET-CT must be integrated within a multidisciplinary geriatric oncology framework that accounts for performance status, comorbidities, and life expectancy in treatment decision-making (27).

The present study has several limitations. As a retrospective single-center observational analysis, selection bias may be present, as only patients referred for PET-CT imaging were included. This excludes patients managed on clinical or histopathological grounds alone, thereby potentially underestimating the true incidence of certain cancer types. Furthermore, subtype-level classification (e.g., Hodgkin versus non-Hodgkin lymphoma; histological grade of GIT cancers) was beyond the scope of the current analysis. Future prospective multicenter studies with larger sample sizes would be beneficial in establishing comprehensive geriatric cancer epidemiology data for Bangladesh (28).

CONCLUSION

This year-long retrospective analysis from the PET-CT Division of NINMAS demonstrates that geriatric patients constitute a substantial and clinically important subgroup of the oncological imaging population in Bangladesh. Lymphoma and gastrointestinal cancers emerged as the most prevalent malignancies, followed by breast carcinoma, lung cancer, and female reproductive tract tumors. A significant male predominance was observed overall, with gender-specific cancer patterns closely mirroring global epidemiological trends. The majority of patients presented in the 65–69-year age bracket, reflecting the youngest stratum of the geriatric spectrum. ^{18}F-FDG and ^{18}F-PSMA PET-CT played complementary roles in the comprehensive oncological evaluation of this population, enabling accurate staging, response assessment, and detection of recurrence across a diverse spectrum of malignancies.

These findings provide a foundational epidemiological dataset for geriatric oncology in Bangladesh and highlight the critical need for expanded PET-CT capacity, dedicated geriatric imaging protocols, and multidisciplinary cancer care pathways for older adults in resource-limited settings.

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