Initial Experience with ^{18}FDG PET-CT at INMAS, Mohakhali: Transforming Cancer Diagnosis in Bangladesh

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ABSTRACT

Background: The Institute of Nuclear Medicine and Allied Sciences (INMAS), Mohakhali, Dhaka, under the Bangladesh Atomic Energy Commission (BAEC), launched its first FDG PET-CT scanner in February 2024, marking a significant milestone in enhancing molecular imaging capabilities in Bangladesh. This study examines the initial experience of FDG PET-CT services for cancer patients at INMAS, Mohakhali.

Patients and Methods: Patients were instructed to fast overnight before undergoing a whole-body PET-CT scan, which was performed one hour after intravenous administration of 18F-FDG. Data from February 2024 to November 2024 were retrospectively reviewed from the INMAS report database to analyze patient demographics and scan indications.

Results: A total of 369 patients underwent FDG PET-CT scans during the study period, with 365 scans performed for oncological and 4 for non-oncological indications. The most common primary malignancies included breast carcinoma (38.2%), lymphoma (20.5%), lung carcinoma (9.4%), gastrointestinal carcinoma (8.9%) and head, neck, thyroid malignancy (4.6%). Among lymphoma cases, non-Hodgkin's lymphoma accounted for 55%. Most patients were aged between 41 to 60 years, with a female predominance (63%).

Conclusions: Initial experiences with FDG PET-CT at INMAS, Mohakhali, demonstrate its transformative role in cancer care in Bangladesh. The study reveals diverse malignancies and comorbidities, highlighting the modality's effectiveness in diagnostic accuracy and treatment planning. These findings pave the way for broader applications in non-oncological conditions

Keywords: Carcinoma, INMAS Mohakhali, FDG PET-CT, Molecular Imaging

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INTRODUCTION

Cancer is the leading cause of death worldwide, demanding a robust approach to early diagnosis, pre-treatment staging, restaging, monitoring treatment response, follow-up, and identifying unknown primary malignancies for effective clinical management. Fluorodeoxyglucose Positron Emission Tomography Computed Tomography (FDG PET-CT) plays a transformative role by providing metabolic information, as cancer cells exhibit increased glucose uptake even before structural changes become apparent.

The FDG PET scan leverages the Warburg effect, wherein cancer cells consume glucose at elevated levels, accumulating a radioactive glucose analog, FDG, in malignant tissues far more than in normal ones (1). In Bangladesh, the first PET-CT facility was established in a private hospital in 2012. Currently, five centers under the Bangladesh Atomic Energy Commission (BAEC) provide FDG PET-CT services, contributing significantly to cancer diagnosis and management.

In February 2024, the Institute of Nuclear Medicine and Allied Sciences (INMAS), Mohakhali-operating under BAEC introduced its first FDG PET-CT scan using a Siemens machine, marking a milestone in enhancing the country's molecular imaging capabilities. Since its inauguration, patient referrals to INMAS, Mohakhali, for FDG PET-CT have steadily increased, solidifying its role as a cornerstone of patient management and a critical driver of advancements in Bangladesh's healthcare infrastructure.

PATIENTS AND METHODS

Patients were instructed to fast overnight before undergoing a whole-body PET-CT scan, which was performed one hour after intravenous administration of 18F-FDG. Data from February 2024 to November 2024 were retrospectively reviewed from the INMAS, Mohakhali report database to analyze patient demographics and scan indications.

RESULT

The age distribution of the study patients is shown in Figure 1. It was observed that the majority (47.6%) of patients belonged to 41-60 years, followed by >60 years (24.1%).

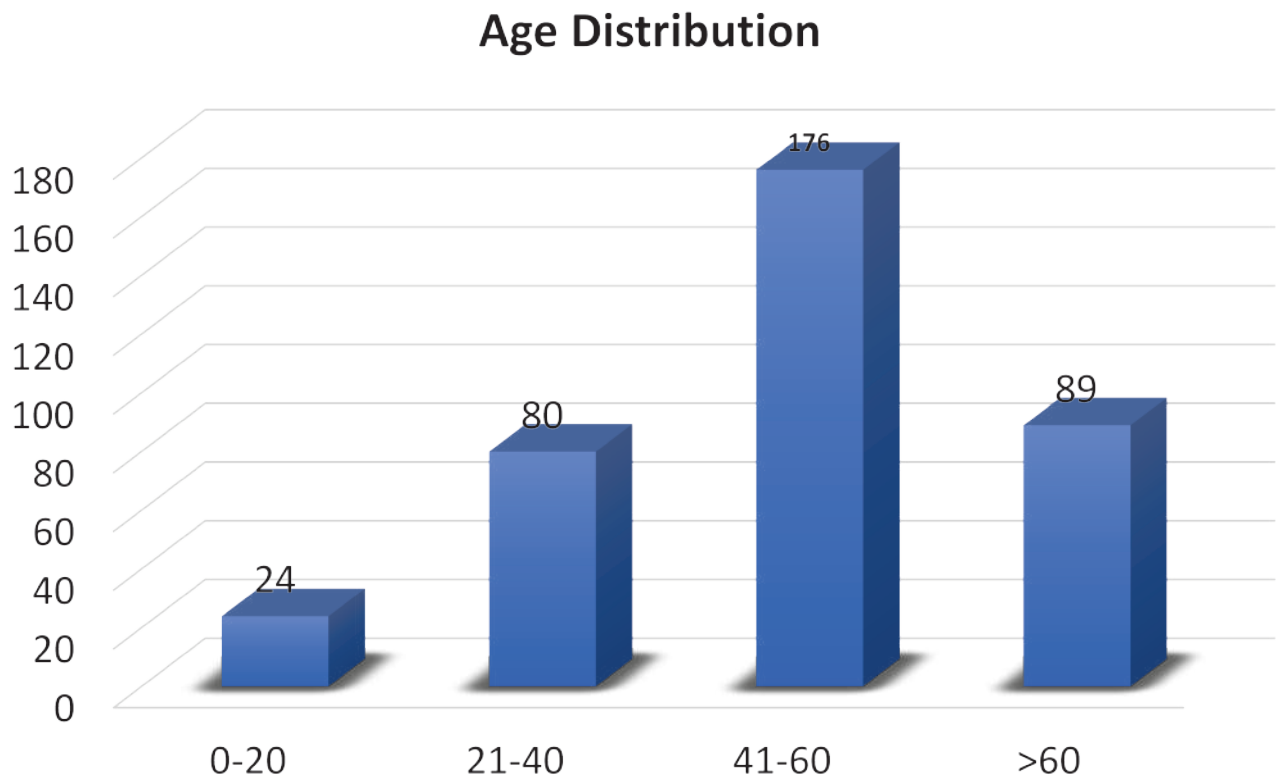

Figure 1: Age range of the total patients (n=369) according to age. The study found that 47.6% of patients were aged 41-60, with the remaining 24.1% aged over 60.

The gender distribution of the study population is shown in Figure 2, with a female predominance 63% (n= 232).

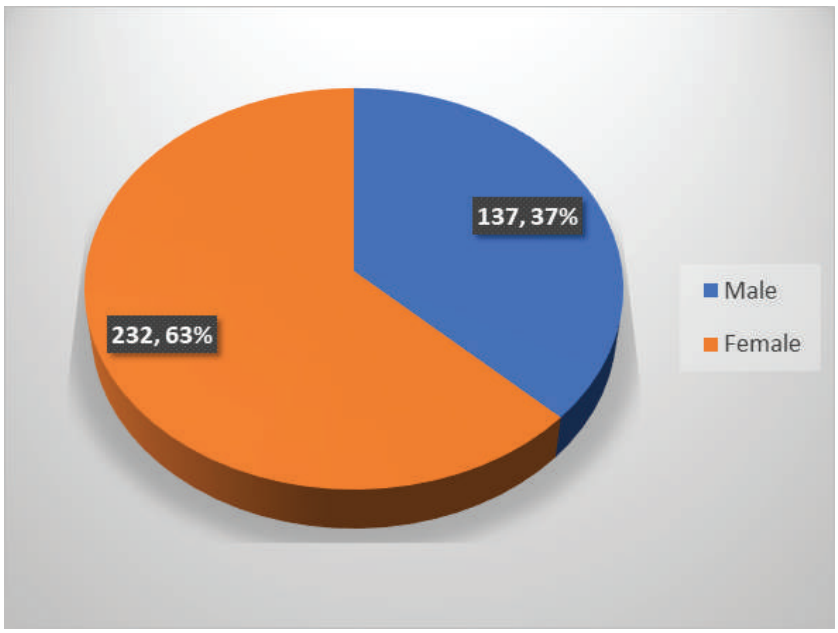

Figure 2: Pie diagram showing the total patients with a gender distribution

The distribution of the different carcinoma patients is shown in Figure 3. It was observed that breast carcinoma was the most prevalent malignancy (141, 38.2%). Following breast carcinoma, the other four most common primary malignancies were lymphoma (76, 20.5%), lung carcinoma (35, 9.4%), gastrointestinal malignancy (33, 8.9%), and head, neck, and thyroid malignancy (17, 4.6%). Other malignancies were carcinoma of unknown primary (CUP), renal cell carcinoma, prostate, testis, female reproductive system, sarcoma, malignant melanoma, and hepatobiliary system.

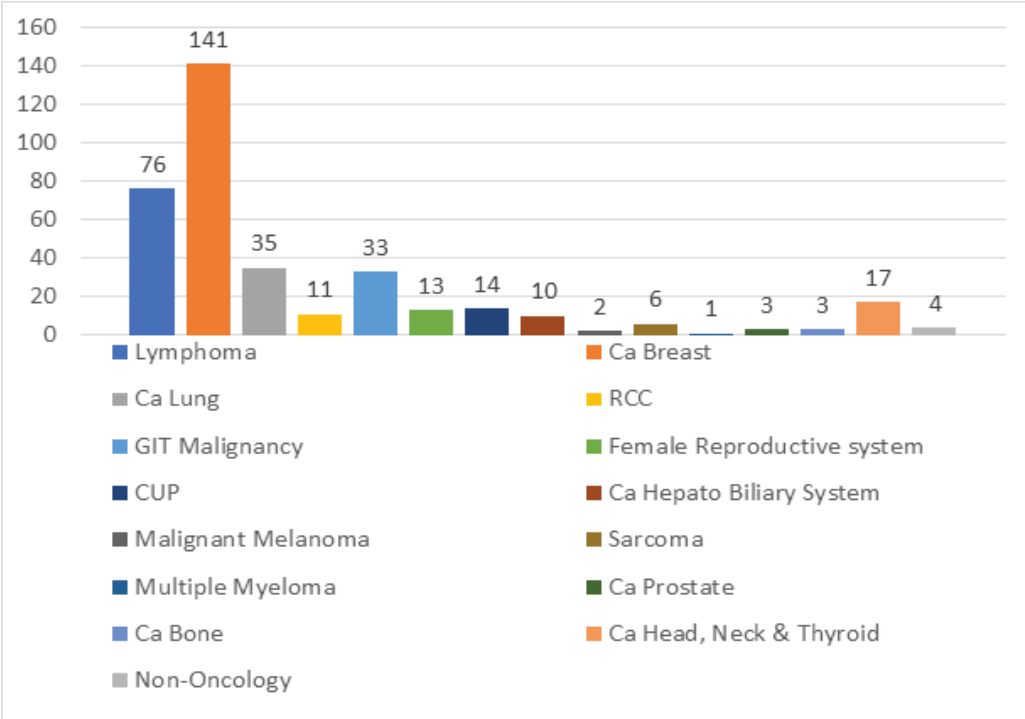

Figure 3: Bar chart showing the frequency of total referred patients according to indications

Figure 4 shows the distribution of comorbidities among carcinoma patients. It was observed that the majority of 68 (18.4%) patients had both diabetes mellitus (DM) and hypertension (HTN), followed by 64 (17.8%) patients with HTN alone. The prevalence of DM alone, bronchial asthma, and thyroid disorders is also detailed in Figure 4.

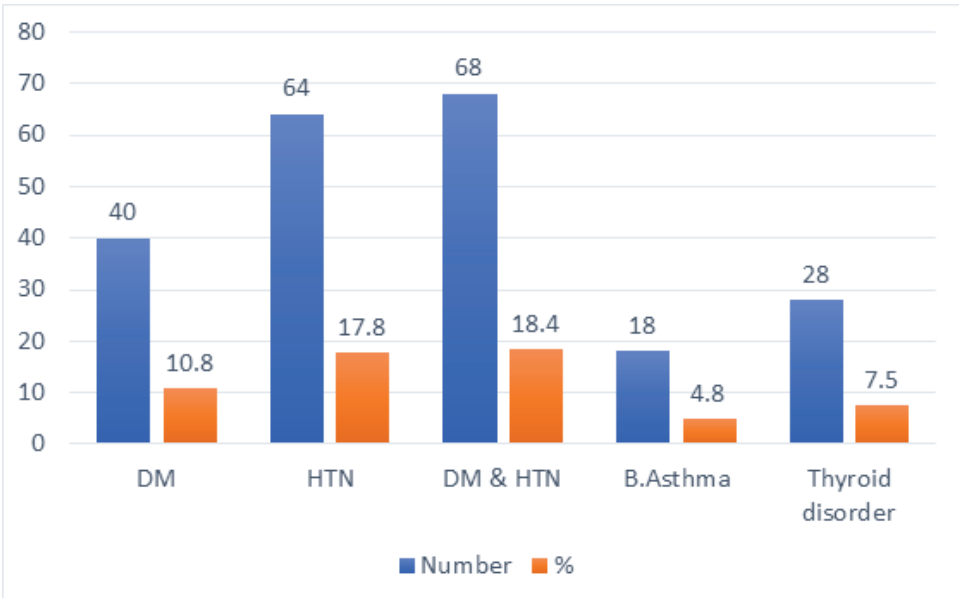

Figure 4: Bar chart showing the total oncological patients according to co-morbidity

Figure 5 shows the distribution of histopathological classifications of cancer patients. Ductal cell carcinoma is the most prevalent histopathology, accounting for 36 % of cases followed by adenocarcinoma of 30%. Other histological types are shown in the figure 5.

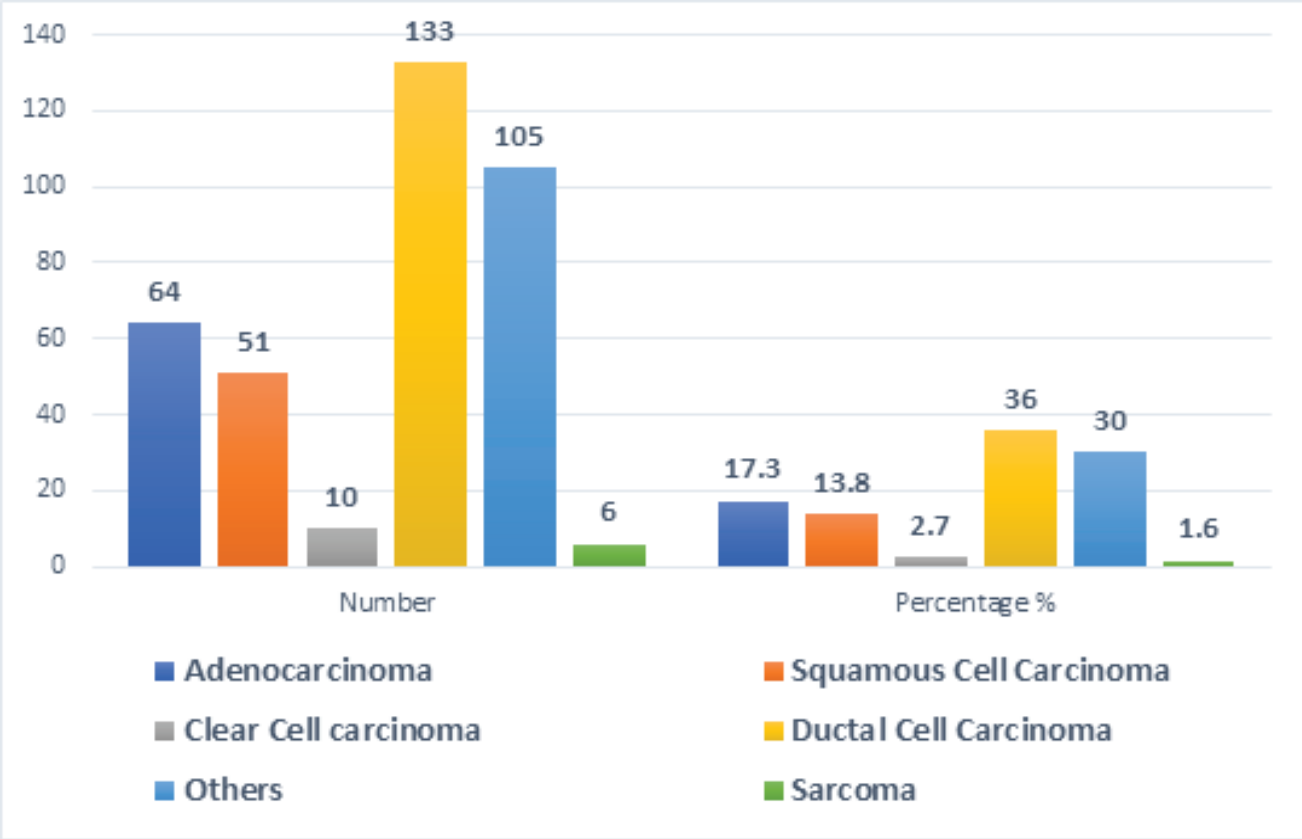

Figure 5: Bar chart showing the histopathological classifications of cancer patients

DISCUSSION

The introduction of FDG PET-CT at INMAS, Mohakhali, represents a transformative step in enhancing cancer diagnostics and patient management in Bangladesh. Over the study period from February to November 2024, significant findings emerged regarding patient demographics, the spectrum of malignancies, associated comorbidities, and histopathological characteristics, underscoring the utility of FDG PET-CT in diverse oncological contexts.

The age distribution revealed that 47.6% of patients were aged between 41 and 60 years, followed by 24.1% over 60 years. This pattern aligns with the global epidemiology of cancer, where middle-aged and older populations exhibit the highest cancer burden due to cumulative exposure to carcinogenic factors and aging-related genetic vulnerabilities (2). The predominance of female patients (63%) further emphasizes gender-specific health behaviors and the importance of FDG PET-CT in managing cancers that predominantly affect women, particularly breast cancer (3). These demographic trends offer valuable insight into patient referral practices and underline the need for tailored screening and diagnostic programs.

Breast carcinoma was the most frequent malignancy in this study (38.2%), reflecting the global prevalence of this cancer type in women and its significant healthcare burden (4). FDG PET-CT is well-recognized for its role in diagnosing breast cancer, evaluating treatment response, and detecting metastatic disease, particularly in advanced stages or recurrent cases (5). Following breast cancer, lymphoma accounted for 20.5% of cases, with

non-Hodgkin's lymphoma comprising 55% of these. This finding is consistent with the established utility of FDG PET-CT in lymphoma management, where it facilitates precise staging, restaging, and therapy monitoring by identifying metabolically active disease that may not be evident on conventional imaging (6).

Lung carcinoma (9.4%), gastrointestinal malignancies (8.9%), and head, neck, and thyroid malignancies (4.6%) were among the other common primary cancers in this cohort. These findings highlight the broad applicability of FDG PET-CT across various malignancies (7). For lung cancer, PET-CT aids in accurate staging and treatment planning, often influencing decisions regarding surgery or systemic therapy (8). Similarly, in renal and gastrointestinal cancers, FDG PET-CT enhances diagnostic precision by detecting both primary and metastatic lesions, improving patient outcomes (9).

A notable aspect of this study was the prevalence of comorbidities, with 18.4% of patients having both diabetes mellitus (DM) and hypertension (HTN), followed by 17.8% with HTN alone. The high prevalence of these conditions underscores the need for multidisciplinary care models that address comorbidities, as they can complicate cancer treatment and prognosis (10). Furthermore, metabolic disorders like diabetes may influence FDG uptake, necessitating careful interpretation of PET-CT results in these populations (11).

Histopathological analysis revealed ductal cell carcinoma (36%) and adenocarcinoma (30%) as the most common subtypes, consistent with their predominance in breast and gastrointestinal malignancies globally (12). These findings validate the role of FDG PET-CT in characterizing tumors and guiding tailored therapeutic strategies based on histopathological profiles.

The increasing number of patient referrals to INMAS, Mohakhali, reflects the growing reliance on FDG PET-CT as a cornerstone of modern oncology. Beyond oncological applications, the study noted a small fraction of scans for non-oncological indications, suggesting the potential for broader diagnostic use, such as in infectious or inflammatory diseases and cardiovascular conditions.

CONCLUSION

Initial experiences with FDG PET-CT at INMAS, Mohakhali, demonstrate its transformative role in cancer care in Bangladesh. The study reveals diverse malignancies and comorbidities, highlighting the modality's effectiveness in diagnostic accuracy and treatment planning. These findings pave the way for broader applications in non-oncological conditions.

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