

FDG PET-CT Performance for the First Five Years at the Institute of Nuclear Medical Physics, Savar.

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ABSTRACT

Context : The Bangladesh Atomic Energy Commission (BAEC) oversees the Institute of Nuclear Medical Physics (INMP), Savar, which opened its first FDG PET CT scan in September 2018 as part of an attempt to strengthen Bangladesh's molecular imaging capabilities. In this essay, we will examine the first five years of FDG PET CT services rendered to patients with cancer at INMP.

Patients and Procedures : Prior to the scan day, the patients were instructed to fast for the entire night. Following an intravenous injection of ¹⁸F FDG, a whole-body PET-CT scan was obtained using the Philips 128-slice Ingenuity TF one hour later. Retrospective inclusion of patients who underwent FDG PET CT scans performed at INMP, Savar, between September 2018 and December 2023 The databases of INMP reports were examined for demographic analysis.

Results : From September 2018 to December 2023, a total of 2879 individuals had FDG PET CT scans for a range of clinical oncological and non-oncological causes. In 2018, the first year of FDG PET CT's introduction at INMP, Savar, saw the scanning of a total of 27 patients. Following that, scans were conducted for 332 in 2019, 469 in 2020, 399 in 2021, 716 in 2022, and 936 in 2023. Twelve patients in all got PET-

CT scans for non-cancer causes; seventy-five of them had tuberculosis. The five most common primary cancers were carcinoma of the breast (21%), carcinoma of the lung (8.8%), carcinoma of the ovary (4.6%), and lymphoma (26.4%). Non-Hodgkin's lymphoma accounted for 58.5% of the 762 patients with lymphoma. Male patients made up the majority of the patient population, with a preponderance of 61 years of age. The prevalence of dyslipidemia was 27% and DM was 34.0%. 78 of the 980 patients with diabetes-related cancer had fasting hyperglycemia and needed insulin injections prior to a PET-CT scan.

Conclusions : From 2018 to 2023, there was a noticeable increase in FDG PET-CT scanning in INMP, despite the COVID-19 pandemic and early uncertainties around FDG supplies. This significant increase is really fulfilling and essential to the nation's cancer care.

Keywords : FDG PET-CT, Oncology, Cancer patients, Institute of Nuclear Medical Physics

INTRODUCTION

Cancer is the top cause of death in the globe. For the best possible clinical care, early diagnosis, pre-therapeutic baseline staging, restaging, treatment response, follow-up, and the identification of unidentified main variables are crucial. Because cancer cells consume large amounts of glucose prior to their morphological transformation, fluorodeoxyglucose Positron Emission Tomography Computed Tomography (FDG PET-CT) provides metabolic information.

Because cancer cells consume a large amount of glucose, an FDG PET scan can detect aberrant tumors. This is due to the Warburg effect, which states that malignant malignancies have higher amounts of an injected radioactive glucose analog termed FDG than do healthy other tissues (1). In a private institution, the first PET-CT scan in Bangladesh was conducted in 2012. FDG PET-CT facilities are now located in three centers run by the Bangladesh Atomic Energy Commission (BAEC).

The Institute of Nuclear Medical Physics (INMP), Savar, which is overseen by BAEC, opened its first FDG PET CT scan using the Philips Ingenuity TF equipment in September 2018 in an attempt to strengthen Bangladesh's molecular imaging capabilities. Patients have been sent to INMP for FDG PET-CT more frequently over the past five years, which is crucial for patient management nationwide and for the country's health care upgrading system.

METHODS AND PATIENTS

Prior to the scan day, the patients were instructed to fast for the entire night. The entire body was scanned with PET-CT. one hour following the intravenous injection of 18F-FDG with a Philips 128-slice Ingenuity TF. Retrospective inclusion of patients who had FDG PET CT scans performed at INMP, Savar, between September 2018 and December 2023 was carried out, and demographic analyses were conducted through a study of INMP report databases.

RESULTS

From September 2018 to December 2023, a total of 2879 individuals had FDG PET CT scans for a range of clinical oncological and non-oncological causes. In the first year of 2018, a total of 27 patients underwent scanning. of the FDG PET CT's debut at INMP, Savar. Following that, scans were conducted for 332 in 2019, 469 in 2020, 399 in 2021, 716 in 2022, and 936 in 2023, as Figure 1 subsequently illustrates. Figure 2 illustrates the results of PET-CT scans for non-oncological purposes in a total of 12 patients: 75% (09) had tuberculosis, 17% (2) had Cushing disease, and 8% (1) had recurrent ascites.

Figure 5 displays the distribution of the various cancer cases. It was found that the most common type of cancer (26.4%) was lymphoma. After lymphoma, the next four most common primary cancers were carcinoma of the breast (21%), carcinoma of the gastrointestinal tract (9.6%), carcinoma of the lung (8.8%), and carcinoma of the ovary (4.6%). Additional cancers included thyroid, hepatobiliary, prostate, testis, cervix, sarcoma, melanoma, and carcinoma of unknown primary (CUP).

The distribution of co-morbidity in cancer patients is depicted in Figure 7. It was shown that dyslipidemia affected 780 (27.0%) of the patients, whereas diabetes affected 980 (34.0%) of them. Figure 7 also showed the distribution of coronary artery disease, hypertension, hypothyroidism, and chronic kidney disease (CKD). The distribution of diabetic patients based on fasting hyperglycemia is displayed in Figure 8. 78 of the 980 patients with diabetic cancer had fasting hyperglycemia and needed insulin injections prior to a PET-CT scan.

According to this study, the number of cancer patients receiving PET-CT scans increased between 2018 and 2023 (Figure 1), with 27 in 2018 and 936 in 2023. Globally, there is a sharp increase in both cancer incidence and mortality. The causes of this increased cancer rate are multifaceted and could be attributed to shifts in the distribution and incidence of the primary risk factors, many of which are connected to socioeconomic development (1, 2). Similar to our current analysis, Global Cancer Statistics 2018 likewise revealed that

the incidence of cancer was rising in 185 different nations (3). Furthermore, it should be mentioned that the FDG PET-CT scans' stability throughout the COVID-19 pandemic year (2020–2022) attests to the dependability and excellent quality of the services provided Cancer sufferers can get from INMP.

According to Figure 2 of the current study, PET-CT scans were performed at INMP for non-oncological reasons, primarily for tuberculosis (75%). A key indicator of active tuberculosis is the absorption of FDG by tuberculous lesions. FDG PET-CT scans have been shown in a study to be useful in the localization, extension, and separation of latent from active tuberculosis. They can also be used to assess the disease status and adjust treatment regimens in non-responders in a cost-effective manner (4). According to another study (5), FDG PET-CT makes it simple to assess early treatment responses in TB patients, especially those with extra-pulmonary TB.

According to the study's findings, the majority of patients (44.2%) were older than 61, with those between the ages of 41 and 60 coming in second (Figure 3). Age is a major factor in cancer risk; in affluent countries, 58% of newly diagnosed malignancies are diagnosed in people 65 years of age or older, whereas in developing countries, the percentage is 40% (6). According to a study (7), the high incidence of cancer in elderly people might just be the result of their longer exposure to toxins. The results of our investigation concur with those of other investigations. Of the 2879 patients included in this study, men made up 52% of the patient population (Figure 4). This was consistent with other recent research (8, 9), which discovered that men have a significantly higher risk of cancer than women do. This can be attributed to variations in hormone levels, body mass index, viral infections, cancer propensity, and health care utilization and availability (9).

According to the results of the current study, lymphoma was the most prevalent cancer among the patients (Figure 5), and NHL patients made up the majority of lymphoma patients (58.5%) (Figure 6). Approximately 85% of all lymphomas are NHLs, making them the most common type of lymphoma (10). Around 260,000 people globally lost their lives to NHL in 2020, according to estimates of 544,000 new cases that were diagnosed (11). Nowadays, FDG PET-CT is frequently utilized to assess baseline staging, re-staging and monitoring the outcome of the treatment (12). The INMP patient database likewise shows the trend of growing NHL prevalence.

34% (980) of the patients in this study had diabetes, and 78 patients with fasting hyperglycemia who needed an insulin injection before to the PET-CT scan were identified among the total number of diabetic cancer patients (Figures 7 and 8). Diabetes is linked to a somewhat elevated risk of all-cancer incidence and death, according to a systematic review and meta-analysis of population-based observational reports of global epidemiologic data (13).

The Journal of Nuclear Medicine

It is believed that diabetes increases the risk of cancer due to insulin resistance and secondary hyperinsulinemia. This is due to the possibility that insulin increases oxidative stress, which has a mitogenic impact and aids in the development of cancer (13, 14). An additional investigation revealed intravenous When obtaining optimal-quality FDG PET-CT scan images on the day of the scan, hyperglycemic diabetic individuals can safely use short-acting insulin (15).

FINAL VERDICT

There has been a noticeable rise in FDG PET-CT scanning in INMP from 2018 to 2023, despite the COVID-19 pandemic and early uncertainties around FDG supplies. This significant increase is very fulfilling and essential to the country's approach to cancer care.

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