IJBPAS, January, 2019, 8(1): 174-185

ISSN: 2277–4998

International Journal of Biology, Pharmacy and Allied Sciences (IJBPAS)

'A Bridge Between Laboratory and Reader'

www.ijbpas.com

RELIABILITY OF POSITRON EMISSION TOMOGRAPHY- COMPUTED TOMOGRAPHY (PET-CT) FINDINGD IN PATIENTS SUFFERING FROM LUNG CARCINOMA

ARIF MALIK[2*], BAIDAR BAKHAT[1], ANNUM FARRUKH[2], RIMSHA ARSHAD[1], MUNIHA ABDUL REHMAN[1], ZOBIA BAKHTAWAR[1], ZAKIYAH ZAKAULLAH[1], RABIA RASOOL[2], SAJID SHAHEEN MALIK[1], MUHAMMAD YOUSAF FAROOQ[1], QURBAN ALI[2]

1-University Institute of Radiological Sciences and Medical Imaging Technology, The University of Lahore-Pakistan

2-Institute of Molecular Biology and Biotechnology, The University of Lahore-Pakistan

***Corresponding Author: Arif Malik (Prof.); E Mail: arifuaf@yahoo.com; Cell:0321-8448196**

Received 5th Aug. 2018; Revised 5th Sept. 2018; Accepted 4th Oct. 2018; Available online 1st Jan. 2019

https://doi.org/10.31032/IJBPAS/2019/8.1.4625

ABSTRACT

BACKGROUND: Lung cancer persists to be a foremost worldwide health dilemma. In Pakistan its prevalence is alarmingly high. The PET-CT scan discloses evidences about the morphology and physiology of cells and tissues of the body in same one image presentation. **Aims:** To assess the reliability of PET-CT scan findings in the patients suffering from lung carcinoma. **METHODOLOGY**: The cross-sectional study was conducted at the University of Lahore, Lahore from July 2018 to October 2018.Total 50 samples of lung cancer patients were selected through non-probability convenient sampling technique. PET-CT scan was preferred to all 50 the patients. Patients were assessed through pre-tested questionnaire. For data analysis, SPSS version 21.0 was used. **RESULTS:** Fifty patients were enrolled, out of them 18(36.0%) were diagnosed for Small cell cancer, 28(56.0%) for non-small cell carcinoma and 4(8.0%) for pulmonary nodules. **CONCLUSION:** The computed tomography and Positron emission tomography scan communal offers much highly accurate, effective and feasible diagnosis than the PET or CT alone.

Key words: Lung carcinoma, Positron emission tomography- computed tomography, Small cell lung cancer, Non-small cell lung cancer

INTRODUCTION

Lung cancer persists to be a foremost worldwide health dilemma. More than 1.6 million newly diagnosed lung cancer patients are identified every year. Though, substantial development is ongoing in the prevention as well as treatment of lung carcinoma. Lung cancer therapy has arisen as a role model in the precision medicine related to cancer treatment. During 2015, numerous important therapeutic discoveries occurred. These breakthroughs primarily occurred in the field of immunotherapy and tumor treatments harboring particular oncogenic drivers (Tsao *et al.,* 2016). Out of 108 million newly diagnosed lung cancer cases, 58% of it are estimated to be exist in less developed countries (Chen *et al.,* 2015). Lung cancer is projected to be responsible for nearly 1/5 that is about 19.4% of 1.59 million mortalities that makes lung cancer the most common death reason all over the world. In Pakistan, cancer of lungs also is one of the chief causes of mortality. It is rampantto both gender male and female smokers and non-smoker (lung cancer frequency rate in Pakistan n=6800, 4.6%), (death rate of lung cancer in Pakistan n=6013, 5.9%) (Sarwar *et al.,* 2017).

The geographic and temporal patterns of lung cancer incidence and mortality rates on the population level are primarily determined by consumption of tobacco that is the foremost etiological factor in lung carcinogenesis. Other factors including poorly diet, occupational experiences and air pollution may involve independently or in combination with smoking in influencing the descriptive lung cancer epidemiology. However, it is not compulsory that people having these exposed to these risk factors can develop lung cancer. Some of the diagnosed lung cancer comes with none of any known risk factors indicating the importance of genetical impacts (Malhotara *et al.,* 2016). The symptoms regarding lung cancer were relatively low but the outcome was rather predictable. Some of the most noteworthy symptoms of lung cancer includes cough, chest pain, and dyspnea that mostly unfortunately designates progressive cancer phase (Chen *et al.,* 2012). Majority cases of lung cancer are appeared at the later stages which is associated to the lack of risk factors regarding lung cancer risk, prognosis awareness or symptoms. Lung carcinoma could be treated at initial stages only that made its early detection very important. The better awareness of symptoms is considered to aid in early detection of lung tumor (Robb *et al.,* 2009). Lung cancer can be distinguishing into many types but mostly

distributed in two types firstly named as small cell lung cancer (SCLC) that included small cancer cells which spread quickly to form huge tumors, which in return, metastasized to other body regions including brain, lymph nodes, liver and bones. The second form known as non-small cell lung cancer (NSCLC) is the most prevalent lung cancer type and classified into several different sub-types: adenocarcinoma, squamous cell and large cell carcinoma. These all types also are able to spread to other parts of body (Lungcancer, 2018).

The PET-CT scan is aprogressive nuclear imaging procedure that combines PET (Positron emission tomography) and CT (computed tomography) in same place for better diagnosis. The PET-CT scan reveals detailed information regarding structure as well as function of cells and tissues in the body during a single session of imaging. This technique is now become as an important imaging tools for cancer diagnosis and staging and also present prognostic details based on the response. Conventional imaging techniques are built on the basis of difference of tissues morphology. Positron emission tomography (PET) alongwith glucose analogue 2-18F-fluoro-2-deoxy-D-glucose (FDG) function on the increased metabolism of glucose in lung cancer cells. 2-18F-fluoro-2-deoxy-D-glucose (FDG) are taken up same as glucose and after the hexokinase phosphorylation is trapped metabolically and hoarded in cancer cells (Schrevens *et al.,* 2004). PET-CT scan helps to characterize solitary pulmonary nodules and other lung masses as malignant or benign. The current study aids in the examination of lung cancer with PET-CT scan imaging. It will also aim to spot metastatic abrasions that would have not detected by typical conventional imaging or present in clinically problematic and unseen regions and also in the lesions variation that are ambiguous after conventional imaging.

METHODOLOGY

Firstly, written informed consent was taken from the patient then with the help of questionnaire, the data was collected. The current study was conducted at institute of Allied Health Sciences according to the ethical guidelines of Institutional Review Board (IRB), The University of Lahore. The study was cross-sectional including fifty-two (n=52) lung cancer diagnosed patients.

INCLUSION CRITERIA

The subjects selected for the current study were lung cancer diagnosed patients.

EXCLUSION CRITERIA

The patients contraindicated for PET-CT scan were excluded from the current study.

PROCEDURE

Firstly, ensured that the patients have no contraindication related to PET-CT scan including pregnant or breast feeding. Patients should be on fast for atleast 6 hours before the procedure but allowed to drink water or take medications. Patients was instructed to lay still and put arms over their head. PET-CT (General Elected Company (GE) discovery DSTE) scan machine was used to examine the lung cancer patients.

DATA ANALYSIS

Data was both tabular and graphical analysed with the help of SPSS version 21.0. the data was analysed via descriptive and inferential statistics. All quantitative parameter including weight, height, age, blood pressure etc. was evaluated through mean, SD and SE while qualitative parameters using percentages and frequencies.

RESULTS

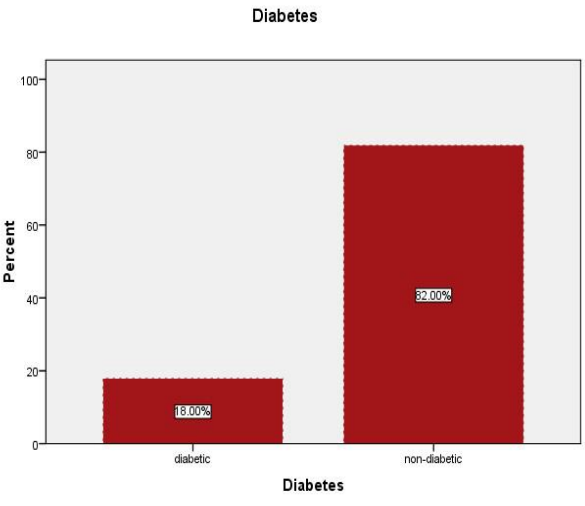
The data related to demographic variables specified in table 01 has depicted that the mean patients' age was 57.64±14.96 years, mean weight of patients was 68.64±14.20 kgs, mean systolic and diasystolic B.P was119.00±12.49mmHg and 72.80±11.78 mmHg respectively. Mean serum creatinine level of patients was 0.94±0.33 and mean dose of pharmaceuticals was 369.96±49.49mEq.

The figure 01 showed that percentage of male gender was72.0% and percentage of female gender was 28.0%. Out of 50 patients 9 were diabetic and 41 were non-diabetic. The injection site percentage for right arm, left arm, right hand and left hand was 10%, 50%, 24% and 16% respectively. In this study, out of 50 patients 19 had previous PET experience and 31patients had no previous PET experience. Percentage of contrast given intravenously was 74%, intravenously and orally was 4% and neither intravenously nor orally was 22%. In this study, out of 50 patients 19 had previous PET experience and 31patients had no previous PET experience. Out of 50 patients, reason of PET-CT for 4 patients was diagnosis, for 20 patients was staging, for 10 patients was monitoring response, for 6 patients was restaging after therapy, for 3 patients was suspected recurrence and for 7 patients was surveillance/follow-up. Percentage of patients diagnosed with small cell lung carcinoma was 36%, non-small cell lung carcinoma was 56% and pulmonary nodules were 8%. Percentage of region involved in patients was right lung 44%, left lung 38%,

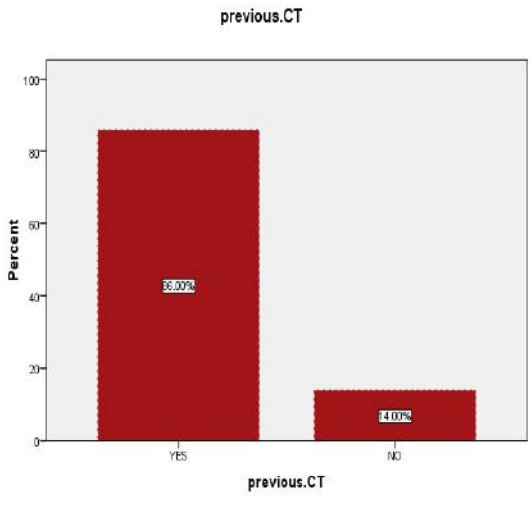
pulmonary region 10% and metastasis 8%. percentage of patients whose lymph nodes were involved is 40% while in those with n lymph node involved is 60%. In this study out of 50 patients, 9 patients were diagnosed with metastasis and 41 were not diagnosed with metastasis. In this study, percentage of patients in which nodules were diagnosed is 26% and percentage of patients in which nodules were not diagnosed is 74%. The pictorial presentations of PET-CT scan for varieties of lung cancer have been shown in figure 02.

Table 01: Demographic Variables

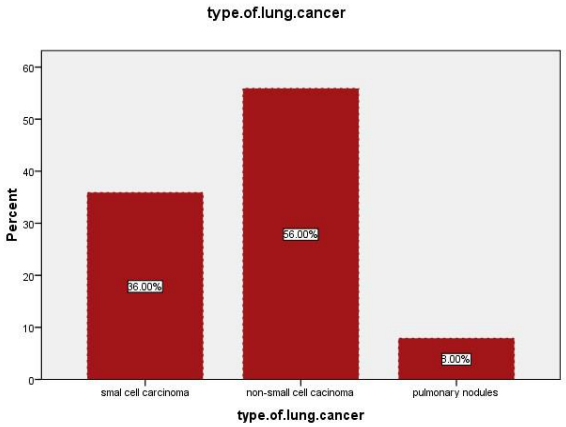
VARIABLES	RANGE	MIN	MAX	MEAN±SD (n=50)
Age (Yrs)	**55**	**25**	**80**	**57.64±14.96**
Weight (Kgs)	**57**	**41**	**98**	**68.64±14.20**
BP Systolic (mmHg)	**60**	**90**	**150**	**119.00±12.49**
BP Diastolic (mmHg)	**70**	**30**	**100**	**72.80±11.78**
Serum Creatinine	**1.80**	**.00**	**1.80**	**0.9492±0.33**
DoseofPharmaceuticals (mEq)	**262**	**203**	**465**	**369.96±49.49**



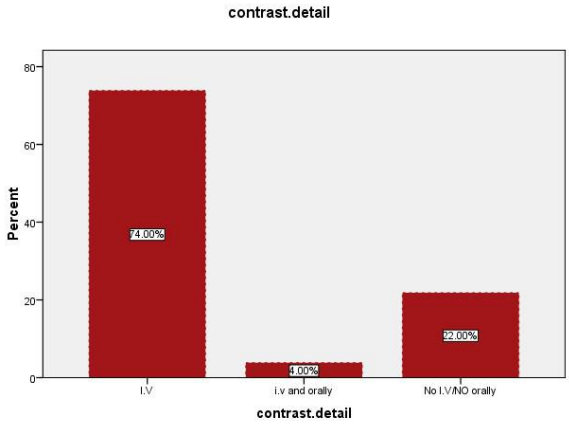
(A)



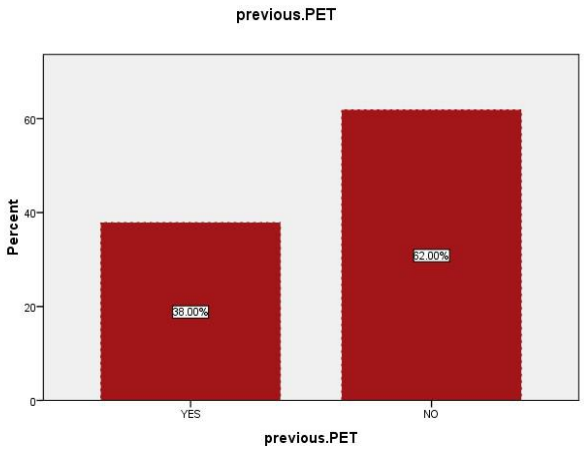
(B)


type.of.lung.cancer
Percent
36.00%
56.00%
8.00%
smal cell carcinoma
non-small cell cacinoma
pulmonary nodules
type.of.lung.cancer

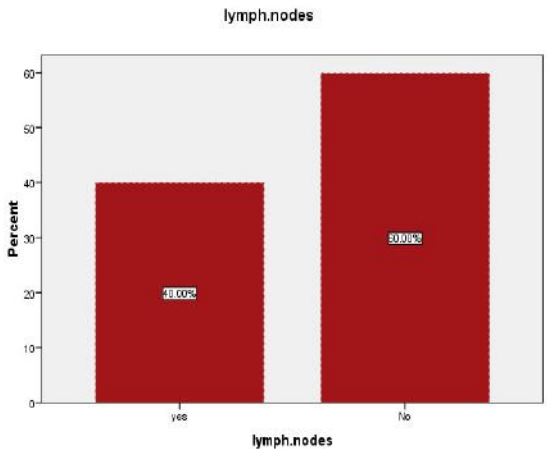
(C)


contrast.detail
Percent
74.00%
4.00%
22.00%
I.V
I.v and orally
No I.V/NO orally
contrast.detail

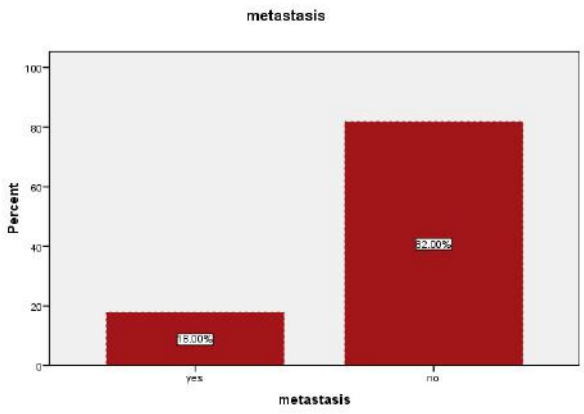
(D)


previous.PET
Percent
38.00%
62.00%
YES
NO
previous.PET

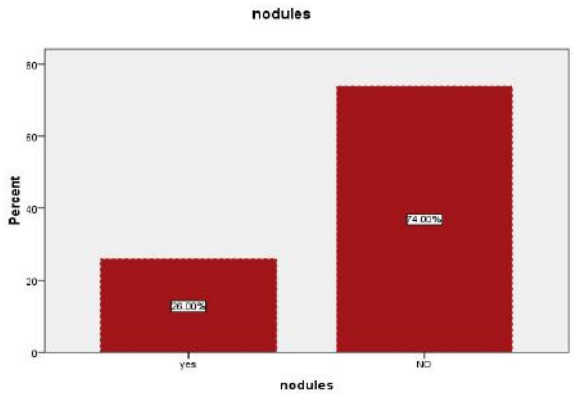
(E)


lymph.nodes
Percent
40.00%
60.00%
yes
No
lymph.nodes

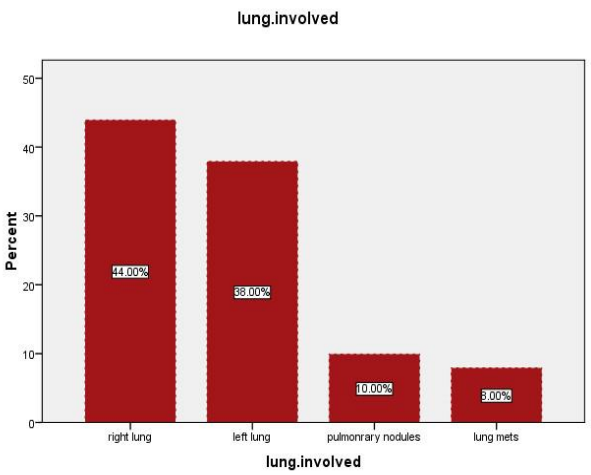
(F)


metastasis
Percent
18.00%
82.00%
yes
no
metastasis

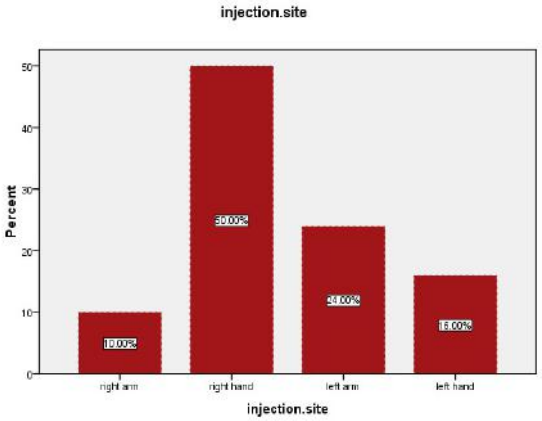
(G)


nodules
Percent
26.00%
74.00%
yes
NO
nodules

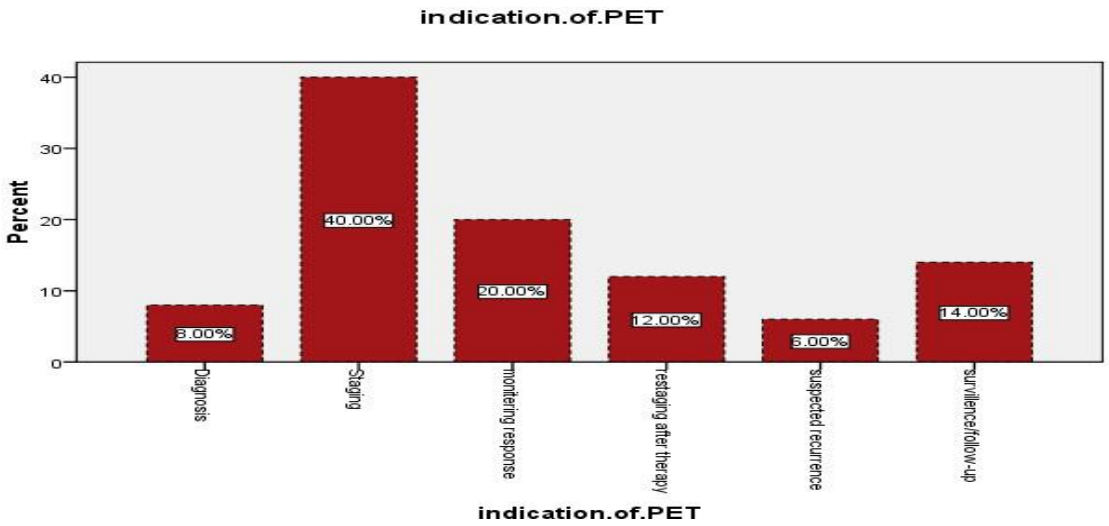
((H)



(I)



(J)



(K)

Figure: 01: Pet-Ct Scan Variables

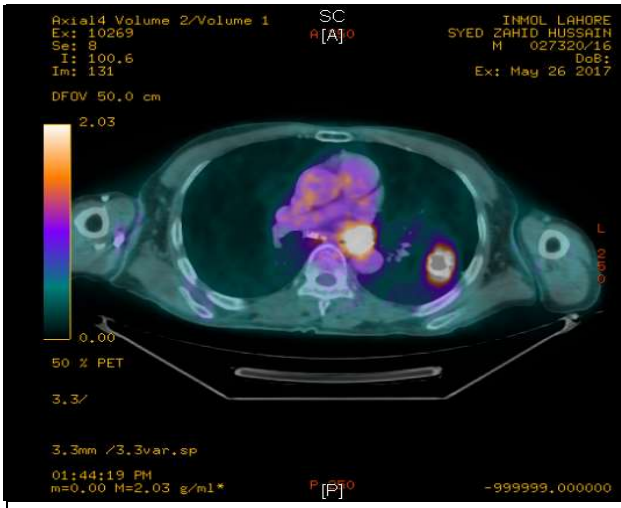


IMAGE 1: SMALL CELL LUNG CARCINOMA

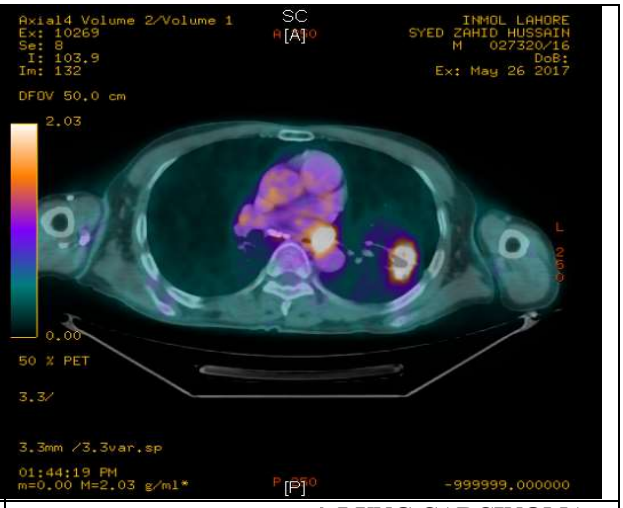


IMAGE 2: SMALL CELL LUNG CARCINOMA

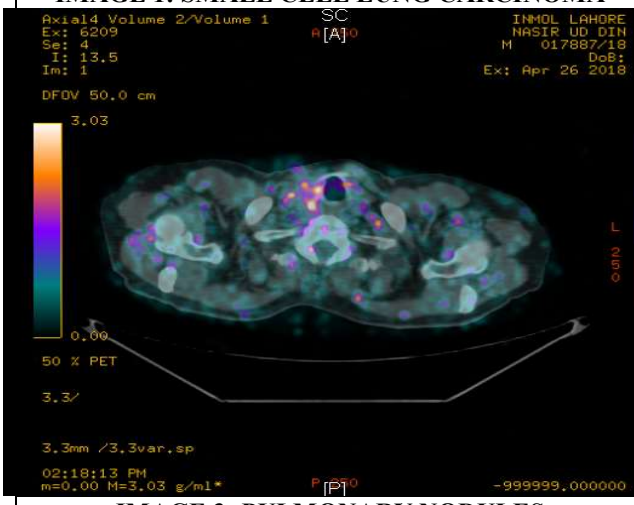


IMAGE 3: PULMONARY NODULES

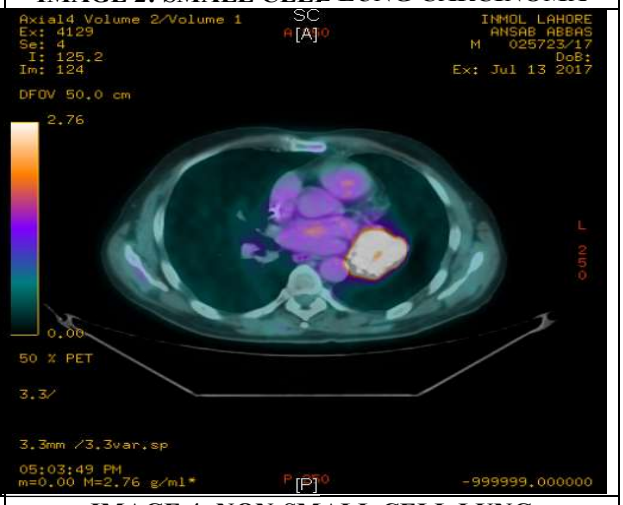


IMAGE 4: NON-SMALL CELL LUNG CARCINOMA

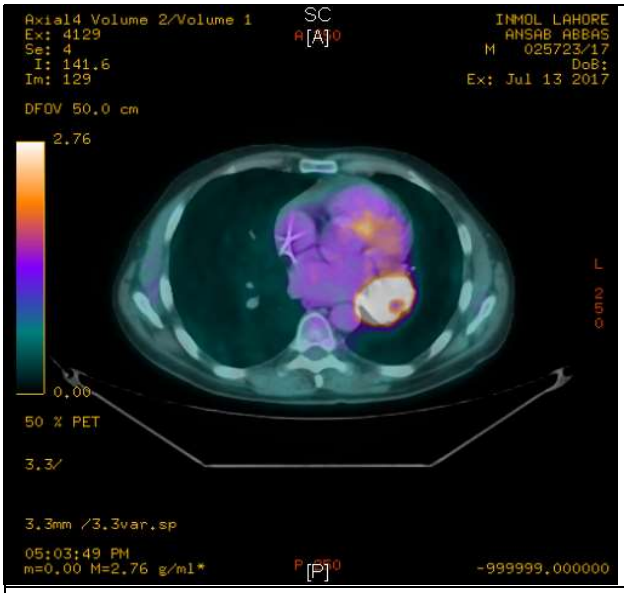


IMAGE 5: NON-SMALL CELL LUNG CARCINOMA

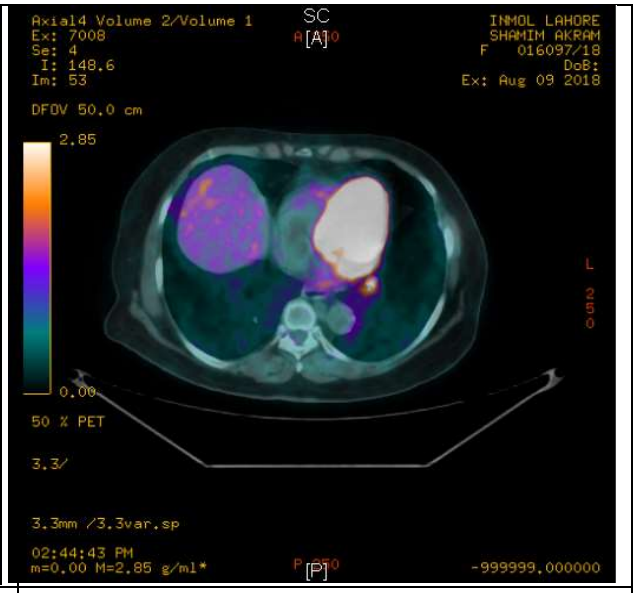


IMAGE 6: ADENOCARCARCINOMA

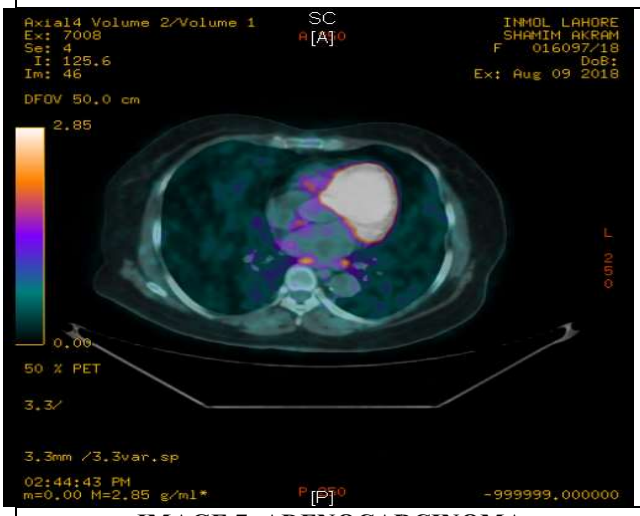


IMAGE 7: ADENOCARCINOMA

Figure 02: Pictorial Presentation Of Different Types Of Cancer

DISCUSSION

Lung tumor is the principal cancer death cause in all over the world. The prevalence of lung cancer comes just after to breast cancer in females while second to prostate cancer in male (Molina *et al.,* 2008). Lung carcinoma as categorized into two main types including small cell lung cancer and non-small cell lung cancer which is the leading cause of death regarding cancer among both male and female gender all over the world (Molina *et al.,* 2008). It has been reported that the prognosis of disease is linked to the stages of clinical diagnosis with

the ratio of 38% to 67% 5-year survival rate at the stage-I while it is found to be only 1% at stage IV (Jemel *et al.,* 2007). if the patient is diagnosed at earlier stage and accept surgery, the ratio of survival rate above 10 year is reported to be 88% (Mazzone *et al.,* 2007). Therefore, the early diagnosis and timely treatment for lung cancer patients can create significant change.

The lung cancer can be diagnosed on the basis of imaging diagnosis and pathological diagnosis. Firstly, the pictorial lung cancer diagnosis of patients was relied on x-ray examination. Then later with the advances in imaging technology, CT scan had taken the place in the diagnosis of disease. However, PET-CT scan provide the CT scan and the PET picture of the patient, so, the metabolic function, anatomy and pathological morphology of lesions all can be done at a time. Therefore, PET-CT scan took an upper hand over x-ray and CT scan to achieve the initial diagnosis of disease (Robert *et al.,* 2003). Now-a-days, many medical entities recommend PET-CT scan for the diagnosis of lung cancer. PET-CT using a radioactive derivative of glucose 2-18F-fluoro-2-deoxy-D-glucose (FDG) is an advanced imaging tool that is based on the raised glucose consumption of cancerous cell (Orlacchio *et al.,* 2007). PET scan provides information that is not obtainable with other imaging modalities. Positron emission tomography- computed tomography is clinically beneficial for cancer detection, benign and malignant lesion differentiation, cancer staging prior to its treatment, assessment of cancer therapy and evaluating the cancer recurrence after therapy (Detterbeck *et al.,* 2004). Earlier studies have stated that PET-CT scan is extremely subtle and precise technique for the diagnosis of lung carcinoma (Cronin *et al.,* 2008; Gould *et al.,* 2001) which are concurrent with the current study.

CONCLUSION

PET-CT scan is broadly used for the lung carcinoma staging which is expected to be a very promising optimization tool for lymph nodal staging. Small cell lung cancer (SCLC) is a rapidly disseminating cancer with deprived diagnosis. PET-CT scan has already been successfully applied in oncological practice. This technique may give a detailed information in accurate staging and impacts the management of lung cancer at its initial stage to reduce the mortality rate.

ACKNOWLEDGEMENT

The authors are highly thankful to Prof. Dr. Syed Amir Gilani, Institute of Allied Health Sciences (IAHS) and Dr.

Numair Yunis Radiology Department, Inmol Hospital, Lahore to offer the innovative and financial support for the project.

CONFLICT OF INTEREST

Authors declared no conflict of interest.

REFFERENCES

[1] Tsao AS, Scagliotti GV, Bunn Jr PA, Carbone DP, Warren GW, Bai C.2016. Scientific advances in lung cancer 2015. Journal of Thoracic Oncology**11(5)**, 613-38.

[2] Chen W, Zheng R, Zeng H, Zhang S. 2015. Epidemiology of lung cancer in C hina. Thoracic cancer. **6(2),** 209-15.

[3] Sarwar MR, Saqib A. 2017. Cancer prevalence, incidence and mortality rates in Pakistan in 2012. Cogent Medicine. **4(1)**, 1288773.

[4] Malhotra J, Malvezzi M, Negri E, La Vecchia C, Boffetta P.2016. Risk factors for lung cancer worldwide. European Respiratory Journal. 48(3), 889-902.

[5] Chen X, Gorlov IP, Ying J, Merriman KW, Kimmel M, Lu C.2012. Initial medical attention on patients with early-stage non-small cell lung cancer. PloS one. 7(3), e32644.

[6] Robb K, Stubbings S, Ramirez A, Macleod U, Austoker J, Waller J.2009. Public awareness of cancer in Britain: a population-based survey of adults. British Journal of Cancer.**101,**S2-S18.

[7] lungcancer.org. About LungCancer.org and CancerCare®. 2018.

[8] America CTCo. PET/CT scan for lung cancer. 2018.

[9] Detterbeck FC, Vansteenkiste JF, Morris DE, Dooms CA, Khandani AH, Socinski MA. 2014. Seeking a home for a PET, part 3: emerging applications of positron emission tomography imaging in the management of patients with lung cancer. Chest. **126(5)**, 1656-66.

[10] Mazzone P, Obuchowski N, Mekhail T, Meziane M, Ahmad M. 2007. Lung cancer screening: is it time for a change in policy?. Cleveland Clinic journal of medicine. **74(6),**441-8.

[11] Molina JR, Yang P, Cassivi SD, Schild SE, Adjei AA.2008. Non-small cell lung cancer: epidemiology, risk factors, treatment, and survivorship. InMayo Clinic Proceedings. 83(5), 584-594.

[12] Orlacchio A, Schillaci O, Antonelli L, D'Urso S, Sergiacomi G, Nicoli P, Simonetti G.2007. Solitary pulmonary nodules: morphological and metabolic characterisation by FDG-PET-MDCT. La Radiol Med. **112**, 157–73.

[13] Roberts PF, Straznicka M, Lara PN, Lau DH, Follette DM, Gandara DR, Benfield JR. 2003. Resection of multifocal non–small cell lung cancer when the bronchioloalveolar subtype is involved. The Journal of thoracic and cardiovascular surgery. **126(5),** 1597-601.

[14] Schrevens L, Lorent N, Dooms C, Vansteenkiste J. 2004. The role of PET scan in diagnosis, staging, and management of non-small cell lung cancer. The oncologist. **9(6)**, 633-43.