RESEARCH ARTICLE

Study on Association of BMI with Lung Cancer in North Indian Population

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ABSTRACT- Background- Lung cancer is one of the most prevalent types of cancer in India. It is considered as the most commonly diagnosed cancer and constitutes the leading cause of cancer-related mortality. The majority of lung cancer is due to smoking. Tobacco use has been reported to be one of the main causes of lung cancer. It has been observed in previous studies that excess body weight and obesity are protective factors against lung cancer in current and former smokers.

Methods- The present study recruited 235 lung cancer patients. BMI was categorized as underweight (BMI <18.5 kg/m^2), normal weight (BMI 18.5 to <25kg/m^2), overweight (BMI 25 to <30 kg/m^2) and obese (BMI≥30 kg/m^2). The study was conducted to establish the association of BMI with gender, smoking status, and histological subtypes of lung cancer.

Results- Out of 235 patients enrolled, 55.32% were underweight, 40.43% were normal weight, 3.4% of patients were classified as overweight and 0.85% was obese. This study showed a significant association of BMI with smoking status (p<0.0057), while the non-significant association with gender (p=0.75) and histological subtypes (p=0.74).

Conclusion- We were concluded that significant association was found between BMI and smoking status, while non significant association was observed between BMI and gender as well as BMI and histological subtypes of lung cancer patients in the north Indian population in this study.

Key-words- BMI, Histological Subtypes, Lung Cancer, Mortality, Smoking

INTRODUCTION

Lung cancer is one of the most prevalent types of cancer in India and constitutes the leading cause of cancer related mortality worldwide [1]. Lung cancer is defined as the uncontrolled cell growth of lung tissues which may lead to metastasis, invasion of adjacent tissue and infiltration beyond the lungs [2]. The majority of lung cancer cases are due to Tobacco smoking and other environmental pollutants have been recognized as risk factors for cancer. The average five-year survival rate after diagnosis is low [3]. It is essential to emphasize the importance of Lung Cancer prevention, and knowledge of modifiable risk factors such as environmental exposures, tobacco smoking and air pollution is prevalent among good quality epidemiological studies that explain the majority of Lung Cancer incidence [4–7]. The complex interplay of etiological and psychophysical factors is believed to modify the effect of respiratory carcinogens on lung cancer initiation and prognosis [8,9].

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BMI is defined as a person's weight in kilograms divided by the square of height in meters and is often used in epidemiologic studies as an approximate measure of general body fat. In a Meta-analysis, strong associations were observed between BMI and different types of cancers such as esophagus, thyroid, colon, kidneys, and endometrium gallbladder while weaker associations were shown for several other sites [10]. Several observational epidemiological studies have shown that higher BMI correlates with a lower risk of Lung Cancer [11]. Two recent meta-analyses have provided more evidence supporting the idea that excess weight could significantly decrease the risk of Lung Cancer [12,13]. It has been observed that excess body weight and obesity are protective factors against Lung Cancer especially in current and former smokers. Despite this, the inverse association between BMI and Lung Cancer is often criticized due to inadequate adjustment for cigarette smoking [14]. Moreover, BMI has been found to be unrelated to Lung Cancer in non-smokers [15,16] Previous Research has suggested that body-mass index (BMI) is an important predictor of cancer risk [17]. It has been found from the various studies that there is a direct relationship between unhealthy diet and lifestyle with the increased risk of tumor development and cancer. Hence a good nutritional status based on a balanced diet constitutes one of the main preventive factors for tumors. It has been

concluded from various studies that the use of tobacco, cigarette smoking, regular use of alcohol increase risk of lung cancer while regular intake of fruits such as apples, banana, fresh vegetables such as tomato, carrot, and milk products have protective effects against lung cancer. [18,19]. The association between BMI and the risk of Lung Cancer stratified by smoking status has important public health implications. This study aims to establish the association of BMI with the gender, smoking status and histological subtypes of lung cancer patients in north Indian populations.

MATERIALS AND METHODS

The present study was conducted at the Department of Respiratory Medicine King George's Medical University, Lucknow, India. Total of 235 histopathologically confirmed lung cancer patients were enrolled in this study after excluding those having other disorders such as COPD, asthma, tuberculosis, interstitial lung disease. The study was approved by the institutional ethics committee. The patients were recruited after given informed consent. The information regarding the lung cancer risk factors including smoking status and number of cigarettes smoked per day, time since quitting smoking were also recorded on the questionnaire. The Body mass index (BMI) was calculated by dividing the body weight in kilograms by the height in meters square (kg/m^2). According to the WHO international classification, defined body mass was categories as follows: underweight (BMI<18.5 kg/m^2), normal (BMI=18.5–24.9 kg/m^2), overweight (BMI=25–29.9 kg/m^2), and obese (BMI ≥ 30 kg/m^2).

Statistical Analysis- The statistical data was analyzed by graph-pad prism version 5. The data was presented in mean, SD and percentage and chi-square test was used for categorical data. The p-value <0.05 was considered statistically significant in all analyses.

RESULTS

A total of 235 patients were enrolled in this study. The demographic characteristic of the lung cancer patient was represented in Table 1. The study comprises 80.69% (163) male and 35.64% (72) female. Among the histological types, adenocarcinoma was the most common, which comprises 48.51% (114) of lung cancer patients followed by squamous cell carcinoma 45.11% (106) and small cell carcinoma 3.40% (8), while 2.98% (7) of the patients were other subtypes. The majority of patients i.e. 96.60% (227) were in stage III/IV while only 3.40% (8) were in stage I/ II. Current and ex-smokers included in this study were 45.96% (108) and 34.89% (82) while the never-smokers in the patient population were 19.15% (45).

Table 1: Demographic Profile of Lung Cancer Patients

Parameters	Lung Cancer Patients (N=235)
Age	55.69±10.27
Sex	
Male	163(80.69%)
Female	72(35.64%)
Smoking History	
Smoker	108(45.96%)
Ex-Smoker	82(34.89%)
Non Smoker	45(19.15%)
Histology	
Adenocarcinoma	114(48.51%)
Squamous Cell Carcinoma	106(45.11%)
Small Cell Carcinoma	8(3.40%)
Other	7(2.98%)
Stage	
I/II	8(3.40%)
III/IV	227(96.60%)

Lung cancer patients were categorized into four groups according to WHO classification as:

Group 1: Underweight (BMI<18.5 kg/m^2)
Group 2: Normal (BMI= 18.5–24.9 kg/m^2)
Group 3: Overweight (BMI= 25–29.9 kg/m^2)
Group 4: Obese (BMI≥ 30 kg/m^2)

Highest proportions of patients were found in the Group 1, which comprises 55.32% (130), followed by Group 2, 40.43% (95) and Group 3, 3.40% (8), Group 4 contains 0.85% (2) of lung cancer patients (Fig. 1).

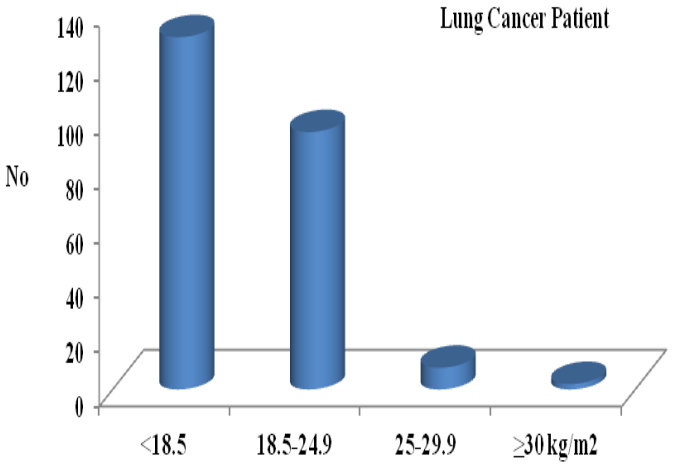

Fig. 1: Distribution of lung cancer patients according to BMI

Male and female lung cancer patients were categorized according to BMI (Fig. 2). Out of 130 Lung cancer patients 70% (91) male, and 30% (39) female were present in Group 1 while in Group 2, out of 95 lung cancer patients, 67.37 % (64) male, and 32.63% (31) female were present and Group 3 comprises 75 % (6) male and 25% (2) female. In Group 4, lung cancer patients were 100% (2) male for this study.

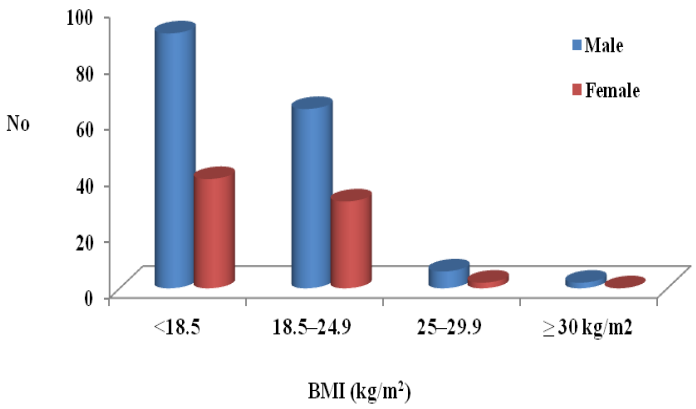

Fig. 2: Distribution of Male and Female Lung Cancer Patients according to BMI

Smoker, Ex-smoker and Non-smoker lung cancer patients were categorized according to BMI (Fig. 3). In Groups 1 out of 130 patients, highest no. of smoker 56.9% (74) were present, followed by Non-smoker 26.9% (35) and Ex- smoker 16.2% (21). Groups 2 of lung cancer patients also comprises the highest no. of smoker 33.7% (32), followed by Non-smoker 42.2% (42) and then Ex-smoker 22.1% (21). Groups 3 comprises 25% (2), 37.5% (3) Non-smoker and37.5 % (3) Ex-smoker, while Groups 4 having only Non-smoker100% (2) in this study.

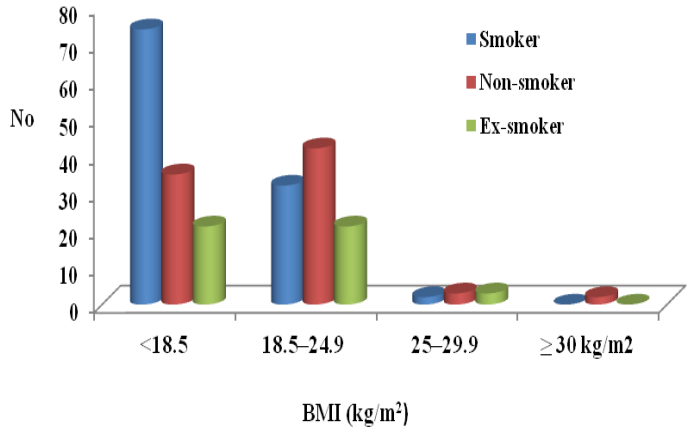

Fig. 3: Distribution of Smoker, Non-smoker and Ex-smoker Lung Cancer Patients according to BMI

Distribution of histological subtypes of Lung Cancer Patients according to BMI (Fig. 4). Group 1 of the lung cancer patients, having 44.62% (58) Adenocarcinoma, 49.23% (64) Squamous cell carcinoma, 2.31% (3) Small cell carcinoma and 3.85% (5) other types and 53.68% (51) Adenocarcinoma, 40% (38) Squamous cell carcinoma, 5.26% (5) Small cell carcinoma and 1.02% (1) of other types were found in Group 2 of lung cancer patients. Group 3 comprised 62.5% (5) Adenocarcinoma, 37.5% (3) Squamous cell carcinoma, while Group 4, having 50% (1) Adenocarcinoma, 50% (1) Squamous cell carcinoma.

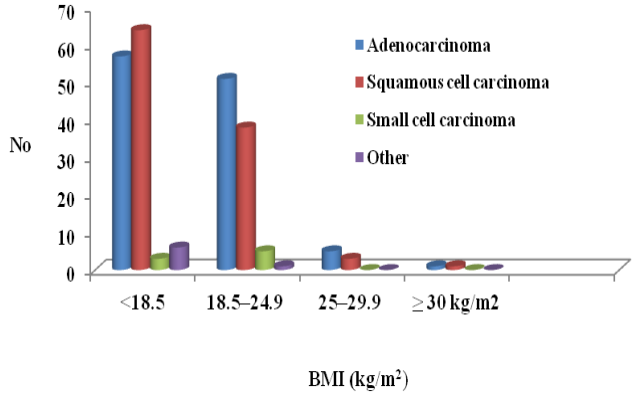

Fig. 4: Distribution of histological subtypes of Lung Cancer Patients according to BMI

The present study showed a significant association between BMI and smoking status ($p<0.005$) while non-significant association were found between BMI and gender ($p=0.75$) as well as between BMI and histological subtypes ($p=0.74$).

DISCUSSION

It has been shown by the previous studies that BMI appears to be inversely related to lung cancer [20-35]. Smoking is a powerful risk factor for lung cancer and is also inversely associated with bodyweight according to the previous study [36]. Lower BMI was observed in lung cancer patients. The high no. of 130 (55.3%) lung cancer patients were found in group1 (BMI< 18.5 kg/m^2) in this study. In the previous study, it has been reported that 44.3% of the lung cancer patients were underweight. Previous study investigated that BMI-LC association had conventionally stratified for smoking status. The Strong inverse association was observed between BMI and lung cancer among smokers [37]. In this study highest no. of smokers 56.9% (74) were also found in Group 1 (BMI<18.5 kg/m^2) followed by Group 2 which were having 33.7% (32) smokers and Group 3 having 25% (2) of smokers. The Results of the present study showed the significant association of BMI with the smoking status of lung cancer patients ($p<0.005$). The finding that obesity has been associated with a reduced lung cancer risk may be due to the confounding caused by smoking because smoking habits affect both body weight and body composition [38,39]. The previous study examined the association of BMI before diagnosis and adenocarcinoma adjusted for age and smoking status. Men with BMI in the leanest category (BMI<20.8) at 3 years before diagnosis and with BMI in the highest category (BMI≥25.0) at 3 to 4 years before diagnosis had increased risk of adenocarcinoma but in 1 year, 2 years, and 5 years before the diagnosis and non-significant association between BMI and adenocarcinoma in men was found. In women, no inverse association was observed between BMI at 1 to 5 years before diagnosis and adenocarcinoma. The

previous study also showed an increased risk of lung cancer for lower BMI at the time of lung cancer diagnosis in men after stratification by smoking status. The previous study has shown that the association between leanness and risk of lung cancer was also found at 1 to 2 years before the diagnosis of lung cancer. The association between lower BMI and lung cancer was found in men the majority of whom were smokers [40].

It has been examined in a previous study that the association of anthropometric factors stratified by histological type of lung cancer revealed an inverse association between BMI and adenocarcinoma of the lung among never-smokers [41]. Several previous studies had reported an association between leanness and lung cancer mainly in smokers [42,43]. In the present study, non-significant association was observed between BMI and gender (p=0.75) as well as between BMI and histological subtypes (p=0.74) of lung cancer patients in North Indian Population.

CONCLUSIONS

In the present study, we found a significant association between BMI and smoking status while non-significant association between BMI and gender as well as between BMI and histological subtypes in lung cancer patients in North Indian Population. It had been shown by various studies that the use of tobacco, cigarette smoking, and regular use of alcohol increase risk of lung cancer while regular intake of fruits such as apples, banana, fresh vegetables like tomato, carrot, and milk products have protective effects against lung cancer. The higher no of lung cancer patients was underweight in this study. Therefore, it has been suggested that good nutritional status based on a balanced diet constitutes one of the preventive factors for tumors.

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