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The Intersection of Tobacco Use, Health Disparities, and Inequalities in Lung Cancer Treatment and Survival

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Abstract

Tobacco use and socioeconomic status are related with each other and important determinants of disparities and inequalities to access to care. There is overall reduction in number of smokers but still most number of smokers is represented by people from low socioeconomic status, with less number of these people having an access to the treatment centers. Patients who are tobacco users have shown to be less likely to receive any form of treatment for lung cancer, whether that be chemotherapy, radiotherapy, or surgery. As there is less awareness about signs and symptoms of lung cancer, lower socioeconomic patients are likely to report to hospitals at advanced stages or many times as a medical emergency. We are well aware that patients with advanced lung cancer have lower chances of survival in view of incomplete response to treatment. As there is an intersection between tobacco use, health disparities, and inequalities and lung cancer treatment and survival, this issue needs better focus and attention to minimize disparities and inequalities in access to care and outcomes.

Keywords
- lung cancer
- tobacco
- smoking
- inequalities
- health disparities

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Introduction

Globally, lung cancer contributes 11.4 and 18% in overall cancer incidence and mortality, respectively, making it one of the leading causes of morbidity and mortality.[1] Not only disparities and inequalities in lung cancer care pose a challenge to increase survival but pattern of tobacco use and availability and affordability of health care facilities add more challenges. Use of tobacco products, mainly cigarette smoking, remains the leading preventable cause of death for all population groups.[2] However, there is a clear socioeconomic divide between the numbers of cigarette smokers.

Socioeconomic, Ethnic, Racial, and Health Disparities

Cigarette smoking as a risk for lung cancer mortality is influenced by many variables like race, socioeconomic status, and gender. Largest socioeconomic disparity has been reported in lung cancer in view of greater environmental exposures, contributing to increase incidence and mortality.[3–5] Poor prognosis is more commonly associated with lower income patients than higher income patients as they are less likely to receive curative treatments.[6] Although there is a decline in the incidence of lung cancer among black men, but still that is higher when it is compared with white men. Female racial smoking pattern is reflected by consistently higher new lung cancer diagnosis in white than black women.[7]

Studies have shown an association between lower socioeconomic status and higher chances for lung cancer with higher chances of presentation at a more advanced stage. This can be well understood with relationship between race, socioeconomic status, lung cancer occurrence, and outcomes.[8,9] Individuals with a lower socioeconomic status, represented by both poverty and lack of education are more likely to be current cigarette smokers.[10] During 2003 to 2011, men with less than a high school education and those below the poverty level had 2.6 times higher lung cancer mortality than their more educated and affluent counterparts. Education and income levels were also inversely related to female lung cancer mortality. Education and income inequalities in lung cancer mortality increased over time.[11]

Ethnic and racial disparities in lung cancer due to tobacco are also significantly marked. Lung cancer mortality is 10% higher for black men, than white men but 31% higher for white women than black women.[12] Using the Surveillance, Epidemiology, and End Results 18 database, Wafa et al recently demonstrated that Asian lung cancer patients exhibits lower incidence and mortality rates, when compared with blacks or whites.[13] There is substantial data that correlates racial discrepancies of lung cancer genes among different populations, hence suggesting "genetics" as an important factor for disparity among populations. Consider the frequencies of epidermal growth factor receptor (EGFR) mutations, its highly prevalent in Asian populations (30%), when compared with whites (7%).[14] Another study observed that African American population harbor 2.4% EGFR mutation, compared with 14.1% in whites.[15] Later, studies do suggest that EGFR mutation rate occurring in these populations was quite comparable.[16–18] However, still EGFR mutation burden is found to be on the higher side in Latin American cohort ($>$ 30%).[19] All these findings suggest that occurrences of genetic alteration among patients of lung cancer of diverse racial backgrounds play important role in lung cancer incidence.

One study indicates that high risk of lung cancer in Latinos and African American may be attributed to use of menthol cigarettes despite prevalence of fewer cigarette consumption on daily basis. Despite fewer cigarette consumption on daily basis, intermittent use of cigarette smoking, and initiation of smoking at later stage of life in comparison with white smokers, black smokers are at increased risk of lung cancer due to peculiar nicotine metabolism.[20,21] Smoking is the cause of nearly 87% lung cancer deaths.[21]

During the past 50 years, landscape for gender-based differences in global lung cancer incidence has vividly shifted. Results from Cancer Incidence in Five Continents (CI5), a 5-year study performed by the International Agency for Research on Cancer demonstrated that Turkey has the highest lung cancer rates followed by European countries, that is, Belarus and Croatia, in men. Among women, highest rates were observed in Denmark, followed by African Americans in U.S. and Iceland.[22] There is a speculation that women are more susceptible to develop lung cancer compared with men, at parallel level of exposure. This distinctness might be due to molecular alterations associated with the disease between the two genders.[23]

Smokers are most commonly disadvantaged citizens socially and economically.[24] A study within the United States showed that the number of smoking-related deaths in middle-aged men who achieved no more than a high school education was twice the amount of that then those who achieved more than a high school education.[25] In fact, within the United States, it has been shown that two of the largest tobacco manufacturers target their advertising to "working class" young people. Further driving the number of young lower-class citizens to start smoking at a younger age.[26] This particular class are also more likely to smoke more cigarettes a day and are less likely to stop smoking in comparison to higher class groups.[27]

The lower socioeconomic class smokers require more support and assistance in smoking cessation as they are more often intensely addicted to nicotine.[28] These people are less likely to seek out and receive adequate medical support, make it a difficult barrier in making services accessible to all.[29] The public health campaigns that have been implemented across Europe have been successful in reducing the number of smokers. However, this reduction has mostly occurred among the middle- and high-income groups.[30] Quitting smoking is also difficult for low socioeconomic classes. Higher level of education contributes significantly in quitting smoking in comparison to other individuals with lower level of education.[21] Further highlighting the disparities within the use of tobacco among socioeconomic classes.

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Disparities in Survival

Lung cancer is one of the most common cancers, and tobacco smoking is the most common and well-established cause for it. Increased use of cigarettes among lower socioeconomic population is attributing to the higher incidence of lung cancer.[5] Lower survival rates among lower socioeconomic groups are reported and this difference in cancer survival rates may be due to division of socioeconomic class.[31] There may be many contributing factors to this situation like patients failing to seek medical treatment on time and report to hospital in emergency with advanced diseases, or primary health care services in deprived area are less effective. Therefore, lower socioeconomic patients are likely to present late or as a medical emergency. Both of which lower their chances of survival. Lower socioeconomic groups are also more likely to start smoking at a younger age, therefore they expose their lungs to carcinogens for a prolonged period of time and are more likely to develop lung cancer in later part of their life.[32]

American Thoracic Society released a statement on health care disparity in lung cancer and found that the current guidelines do not take into account the racial, ethnic, and gender-based differences which do not fully include high-risk individuals. Disparities in availability of health care facilities for rural high-risk patients, insurance cover, status of the individual's education, and financial conditions are among the point found which needs to be addressed.[33] Participation rate of black smokers was comparatively low in the National Lung Screening Trial, while study results show higher rate of mortality reduction among black then in white.[20]

Numerous studies have documented disparities in survival among patients diagnosed with non-small cell lung cancer (NSCLC). In particular, patients who are non-white,[34–36] low income,[37,38] or uninsured[39,40] have a higher mortality rate from NSCLC compared with other patients. Surgical resection, the most successful treatment, is an option only for localized disease[41] and individuals presenting with advanced disease, have fewer options for successful medical intervention. Thus, black patients are less likely to have the option of surgical resection, which may contribute to the lower 5-year survival. Access to chemotherapy and radiotherapy is also very limited.

In spite of the existence of these disparities, stage of the disease and delivery of the treatment on time are more important predictors of survival than race and socioeconomic status.[42] In the delivery of care for patients diagnosed with NSCLC, disparities that pertain to individual characteristics such as race, marital status, education, and age have been reported both in receipt of treatment and survival.[43]

Disparities in Treatment

Socially and economically deprived groups are also deprived of on time treatment and report lower treatment rates.[44] These patients are less likely to receive any form of treatment whether that be chemotherapy, radiotherapy, or surgery.[6] This disparities to receive cancer treatment can be influenced by other mediating factors that include exposure to distinctive environmental conditions linked to residential segregation, genetic differences, resilience factors, nativity/migration, and cultural practices and beliefs, and availability of treatment factility.[45,46]

Tobacco use and socioeconomic status are related to each other and are important determinants of disparities and inequalities to access to care. There are overall reduction in number of smokers but still represented by people from low socioeconomic strata with less number of people having an access to the treatment centers.[47] Prolonged exposure and increased frequency of exposure are important determinants of higher incidence of lung cancer among this population. These patients are particularly difficult to treat in view of late stage of presentation where intent of treatment change to palliative and also mispresumptions are made by medical staff due to their class.[29]

Education inequalities are important factors for tobacco use and lung cancer management. Better survival is reported in many studies among early-stage lung cancer patients who are more educated. A Swedish study reported that early-stage lung cancer patients with high education level had better survival whereas lower survival was observed in high educated stage III lung cancer patients.[48] One study observed higher overall survival in higher educated early-stage disease out of three studies on socioeconomic and educational inequalities in overall survival from lung cancer in England.[49] One study from Denmark discussed the role of educational inequalities in overall survival which were explained by differences in stage of lung cancer at diagnosis, delivery of first-line treatment, comorbidity, and lower cancer survival.[50] Two studies reported worst overall survival in lung cancer patients living in deprived areas in view of difference in receipt of prescribed treatment.[51,52] Higher concentration of deprivation and lower levels of education was associated with decrease in survival in an American study.[43] However, it is unclear how clinical and treatment differences contribute to these survival differences.

Conclusion

Disparities and inequalities in terms of tobacco use and lung cancer treatment and survival have been reported in many studies. Association of these factors have been observed in lower socioeconomic population, socially deprived population, and less educated population and found to be significantly influencing the overall survival of lung cancer patients. More work is required to better educate the lower socioeconomic class to not undertake and to stop smoking as optimal strategy for preventing lung cancer.

Conflict of Interest
None declared.

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