International Journal of Scientific Research and Engineering Development-– Volume 7 Issue 2, Mar-Apr 2024

Available at www.ijsred.com

RESEARCH ARTICLE OPEN ACCESS

A Review: Air pollutions and PM 2.5 Policy and management in Thailand

Nutnaree Kladsomboon[1*], Sirapatsorn Boonmee[2], Phumphat Phattaravittakorn[3], Prapasiri Thuengkaew[4], Pimchanok Naknakorn[5], Tepsuda Nakduangta[6], Peerachaya Chaiprasart[7]

[1]Satthasamut School, Samut Songkhram, Thailand
[2]Srinakharinwirot University Demonstration School Prasarnmit (Secondary Division), Bangkok, Thailand
[3]The Newton Sixth Form School, Bangkok, Thailand
[4]The Prince Royal's College, Chiang Mai, Thailand
[5]Triamudom SuksaPattanakarn Ratchada School, Bangkok, Thailand
[6]Krabi Provincial Administrative Organization School, Krabi, Thailand
[7]Samsenwittayalai School, Bangkok, Thailand
*E-mail: baitong9913@gmail.com

----------**********----------

Abstract:

This comprehensive review explores the intricate relationship between air pollution and lung cancer, shedding light on both the global and Thailand-specific scenarios. Air pollution, a significant global health concern, is associated with 11.65% of global deaths, emphasizing the urgent need for interventions. Particulate matter, especially PM2.5, emerges as a critical air pollutant linked to lung cancer, posing severe health risks by penetrating deep into the lungs. The global epidemiology of lung cancer underscores the disease's prevalence and impact, with efforts to enhance prevention, detection, and treatment strategies. In Thailand, the escalating incidence of lung cancer, particularly at advanced stages, necessitates focused attention on risk factors, including second hand smoke, occupational hazards, and air pollution. The article highlights Thailand's proactive measures, exemplified by the National Cancer Control Plan (NCCP), which encompasses tobacco control, cancer screening, and advanced treatments. The burden of lung cancer on a global scale prompts a call for comprehensive measures, including strong tobacco control policies, improved healthcare access, research investments, and public awareness campaigns. The collaborative efforts of global organizations are crucial, especially amidst the COVID-19 pandemic, to effectively reduce the burden of lung cancer and improve outcomes for affected individuals and communities worldwide.

Keywords **—Air Pollution, PM2.5, Policy, Management**

----------**********----------

Background

Air pollution is one of the world's largest health and environmental problems [1]. It is the contamination of the indoor or outdoor environment by any chemical, physical, or biological agent that modifies the natural characteristics of the atmosphere [2]. It is attributed to 11.65% of deaths globally, and air pollution in Thailand is seasonal, occurring from December to February each year [3]. We can measure the quality of the air by using markers (Air quality can be measured using markers.). One of them is particulate matter with a diameter of less than 2.50 microns. PM2.50 is an air pollutant that is a concern for people's health when levels in the air are high [1]. These are tiny particles in the air that reduce visibility and cause the air to appear hazy when levels are elevated.

PM2.50 can cause many diseases, but the one that affects people the most is lung cancer. PM2.50 can penetrate deeply into the lung, irritate and corrode the alveolar wall, and consequently impair lung function. Lung cancer can cause complications, such as shortness of breath. People with lung cancer can experience shortness of breath if the cancer grows to block the major airways. Lung cancer can also cause fluid to accumulate around the lungs, making it harder for the affected lung to expand fully when you inhale. So, the population should limit exposure to air pollution and call on the authorities to create an index of pollution related to health [4,5].

This study's primary objective is to comprehensively review air pollution and PM2.5 policies and management in Thailand, utilizing recent research and academic sources as foundational data. By delving into the nuances of air quality management, the study seeks to contribute valuable insights towards effective policy formulation and strategic management in addressing this critical environmental and health concern.

Epidemiology of Lung Cancer

Global Epidemiology of Lung Cancer is to highlight the importance of early prevention and early detection of lung cancer. Overall, the global epidemiology of lung cancer is important. resources for researchers, medical personnel and policy makers interested in understanding the global burden of lung cancer. and develop effective strategies for the prevention and treatment of cancer [1].

Lung cancer is one of the most common types of cancer worldwide. It is the leading cause of many cancer-related deaths. According to the Global Cancer Observatory (GCO), lung cancer accounted for 11.4% of all new cancer cases and 18.0% of all cancer deaths in 2020. As of 2021, approximately 2.2 million new cases of lung cancer have been diagnosed worldwide, with 1.8 million reported deaths. The incidence and mortality rate of lung cancer varies greatly by region. in high-income countries, the incidence of lung cancer has decreased. while low-and-middle income countries Increased incidence of lung cancer This trend is mainly due to differences in the prevalence of smoking and exposure to environmental risk factors such as air pollution and occupational hazards [6,7]. In the past few years Great advances have been made in the diagnosis and treatment of lung cancer. including the development of targeted therapies and immunotherapy. However, access to these therapies remains limited in many parts of the world. especially in low- and middle-income countries [8]. In summary, lung cancer remains a major global health issue. There are large geographic and socioeconomic differences in incidence and mortality. Additional efforts are needed to address the risk factors. Improved access to early detection and treatment. and reduce the burden of this disease on patients and the healthcare system.

According to recent studies, lung cancer is the leading cause of cancer death in Thailand. The incidence and mortality rate of lung cancer has been increasing steadily in recent years. It is estimated that there are approximately 18,000 new lung cancer cases in Thailand, with more than 14,000 deaths from the disease being reported [3,9]. The incidence of lung cancer in Thailand has been increasing over the years. According to the data collected from 1 January 2007 to 30 September 2012 at Prapokklao Hospital, there were 627 cases of lung cancer patients. Among them, 71.5% (449) were male, indicating a higher prevalence in males. The majority of cases, 93.1% (583), were classified as non-small cell lung cancer (NSCLC), with Adenocarcinoma being the most common pathology type, accounting for 93.1% [10]. Furthermore, a significant proportion of patients presented with advanced stages of lung cancer. Among the NSCLC cases, 82.0% were classified as stage IV, indicating the disease had already spread to other parts of the body. Additionally, 69.8% of the small cell lung cancer (SCLC) cases were diagnosed as extensive stage SCLC, indicating a widespread disease at the time of diagnosis. The treatment outcomes for advanced NSCLC and extensive staged SCLC were also reported. The median overall survival (mOS) for advanced NSCLC patients was 8.67 ± 0.81 months. The one-year survival rate was 31.5%, and the two-year survival rate was 6.6%. In contrast, for extensive

staged SCLC, the mOS was 6.67 ± 1.25 months, with a one-year survival rate of 18.2% and a two-year survival rate of 9.1%. These findings highlight the increasing prevalence of lung cancer in Thailand, with a significant proportion of cases diagnosed at advanced stages. The data underscores the importance of early detection and effective treatment strategies to improve survival rates and outcomes for lung cancer patients in the country.

There are several factors contributing to the rising incidence of lung cancer in Thailand. This includes exposure to second hand smoke. air pollution and occupational hazards such as exposure to asbestos Smoking remains a major risk factor for lung cancer, with about 20% of the population being smokers. The most common type of lung cancer in Thailand is adenocarcinoma. This is followed by squamous cell carcinoma and small cell carcinoma. Lung cancer is often diagnosed in Thailand in its advanced stage, with only 20% of cases diagnosed at an early stage. This makes the prognosis and survival rate poor. Efforts are being made to improve the prevention and management of lung cancer. Cancer in Thailand. The Thai Ministry of Public Health has implemented a national tobacco control program to reduce the prevalence of smoking in the population. In addition, several studies are underway to investigate new treatments for lung cancer and improve detection rates in lung cancer in early-stage [11,12].

Thailand Policy for The Prevention and Treatment of Cancer

Thailand has implemented a comprehensive National Cancer Control Plan (NCCP) encompassing strategies for addressing various cancer-related challenges, spanning prevention, early detection, treatment, and support for cancer patients [13]. With a particular focus on the strong correlation between smoking and lung cancer, the country actively pursues tobacco control measures, incorporating anti-smoking campaigns, regulations on tobacco advertising, and initiatives to reduce smoking prevalence [14]. Cancer screening programs are in place, designed to identify cancer at early, more manageable stages, potentially featuring specific programs for high-risk populations. Policies concerning cancer treatment emphasize ensuring access to quality healthcare services, covering diagnosis, surgery, chemotherapy, and radiation therapy, while also striving to provide advanced treatments like targeted therapies and immunotherapy. Public awareness campaigns play a pivotal role, disseminating information on risk factors, the significance of early detection, and lifestyle modifications for lowering cancer risk. Occupational health and safety policies address exposures that heighten the risk of certain cancers, including regulations safeguarding workers from carcinogenic substances. Additionally, Thailand supports cancer research initiatives and surveillance systems to collect essential data on cancer incidence, mortality, and trends, critical for effective planning and evaluation of cancer control programs [15].

Burden

Addressing the global burden of lung cancer is an urgent imperative, demanding targeted interventions, prevention strategies, treatment approaches, and public health initiatives. The profound impact of lung cancer on individuals, families, communities, and society necessitates preparedness on a global scale. Overcoming the challenges posed by its aggressive nature and the lack of early symptoms requires a multifaceted approach. Strong tobacco control policies, such as tax increases, comprehensive smoke-free policies, and educational campaigns, are pivotal given smoking's leading role in causing lung cancer. Additionally, enhancing healthcare access for early detection and treatment, investing in research and technology, and increasing public awareness about risk factors contribute significantly to mitigating the burden of lung cancer [1]. Collaborative efforts across disciplines and socio-ecological levels are essential, emphasizing disease control measures throughout the cancer care continuum. Global, national, and regional organizations play a pivotal role in leading efforts to reduce the burden of lung cancer, particularly amidst the complexities introduced by the COVID-19 pandemic. Lung cancer surveillance, with comparative assessments, is crucial for tracking progress, informing policy decisions, and designing effective health systems

[9,16]. The burden of lung cancer encompasses various aspects, including mortality, morbidity, economic impact, healthcare utilization, psychosocial impact, disparities, and public health challenges. Lung cancer is a leading cause of cancer-related deaths globally, with significant morbidity affecting patients' quality of life. The economic burden is substantial, impacting individuals, families, healthcare systems, and society as a whole [9,16]. Furthermore, disparities in lung cancer incidence, mortality, and survival exist among different populations, highlighting the importance of addressing systemic barriers to cancer care. Public health efforts aimed at prevention, early detection, treatment, and supportive care are crucial for reducing the burden of lung cancer on population health. In conclusion, comprehensive and coordinated efforts are necessary to address the significant global health challenge of lung cancer. By incorporating targeted interventions, prevention strategies, treatment approaches, and public health initiatives, it is possible to alleviate the burden and improve outcomes for affected individuals and communities.

Conclusion

From the study, it underscores the global significance of air pollution in relation to lung cancer incidence and mortality, particularly emphasizing the detrimental role of PM2.5. The focus on Thailand reveals an alarming rise in lung cancer cases, with many diagnosed at advanced stages, necessitating urgent attention to early detection and effective treatment. Factors contributing to this increase include second-hand smoke, occupational hazards, and notable air pollution. Thailand's proactive approach, as outlined in its National Cancer Control Plan (NCCP), involves comprehensive strategies from tobacco control to advanced treatments, reflecting a coordinated effort to address lung cancer challenges. The article advocates for global measures, such as strong tobacco control policies, enhanced healthcare access, research investments, and public awareness campaigns, to effectively combat the burden of lung cancer. Collaboration among global organizations becomes crucial, especially amidst the COVID-19 pandemic, highlighting the need for sustained efforts to address air pollution and lung cancer through a multifaceted approach across disciplines and socio-ecological levels.

Reference

[1] Zhang, J., Li, J., Xiong, S., He, Q., Bergin, R.J., Emery, J.D., IJzerman, M., Fitzmaurice, C., Wang, X., Li, C., Zhu, F., Liang, W., He, J. (2021). Global burden of lung cancer: implications from current evidence. Annals of Cancer Epidemiology, 5, 20-31

[2] Virani, S., Bilheem, S., Chansaard, W., Chitapanarux, I., Daoprasert, K., Khuanchana, S., Leklob, A., Pongnikorn, D., Rozek, L.S., Siriarechakul, S., Suwanrungruang, K., Tassanasunthornwong, S., Vatanasapt, P., Sriplung, H. (2017). National and Subnational Population-Based Incidence of Cancer in Thailand: Assessing Cancers with the Highest Burdens. Cancers, 2017, 9(8), 108.

[3] Lehto, R.H. (2016). Symptom burden in lung cancer: management updates. Lung Cancer Manag, 5(2), 61-78.

[4] Xing, Y.F., Xu, Y.H., Shi, M.H., Lian, Y.X. (2016). The impact of PM2.5 on the human respiratory system. J Thorac Dis., 8(1), E69-E74.

[5] Srihawan, C. (2019 January 18). PM2.5 Air Pollutants: Tiny Particles That Can Have Huge (Health) Consequences. Samitivej hospitals. Cite 2023 Oct 10, from https://www.samitivejhospitals.com/article/detail/pm2-5-air-pollutants

[6] Siegel, R.L., Miller, K.D., Fuchs, H.E., Jemal, A. (2021). Cancer Statistics, 2021. CA: A Cancer Journal for Clinicians., 71(1), 7-33.

[7] DeSantis, C.E., Miller, K.D., Goding Sauer, A., Jemal, A., Siegel, R.L. (2019). Cancer statistics for African Americans, 2019. CA Cancer J Clin, 69(3), 211-233.

[8] Torre, L.A., Siegel, R.L., Jemal, A. (2015). Lung Cancer Statistics. Adv Exp Med Biol., 893, 1-19.

[9] Reungwetwattana, T., Oranratnachai, S., Puataweepong, P., Tangsujaritvijit, V., Cherntanomwong, P. (2020). Lung Cancer in Thailand. Journal of Thoracic Oncology., 15(11), 1714-1721.

[10] Kittiwarawut, A., Bunthaowong, P. (2014). Lung cancer in Prapokklao Hospital. J Prapokklao Hosp Clin Med EducatCenter, 31(4), 248-265.

[11] Sharma, G., Goodwin, J. (2006). Effect of aging on respiratory system physiology and immunology. Clin Interv Aging., 1(3), 253-260.

[12] Ministry of Public Health of Thailand. (2020). Strategic Plan of the National Cancer Institute 2020–2022. Cite 2023 Oct 2, from https://www.nci.go.th/th/Today/download/แผนยุทธศาสตร์สถาบันมะเร็งแห่งชาติ%2063-65.pdf

[13] WHO regional office for Europe. (2021). National Cancer Control Plan(NCCP). Cite 2023 Oct 20, from https://www.europarl.europa.eu/meetdocs/2014_2019/plmrep/COMMITTEES/BECA/DV/2021/06-16/Speaker_01_NCCP_for_BECA2_EN.pdf

[14] Patanavanich, R., Aekplakorn, W., Suriyawongpaisal, P. (2018). Trend analysis of smoking-attributable hospitalizations in Thailand, 2007–2014. TobInduc Dis., 16, 52.

[15] Insamran, W., Sangrajrang, S. (2020). National Cancer Control Program of Thailand. Asian Pac J Cancer Prev, 21(3), 577-582.

[16] Chang, J.T., Jeon, J., Sriplung, H., Yeesoonsang, S., Bilheem, S., Rozek, L., Chitapanarux, I., Pongnikorn, D., Daoprasert, K., Vatanasapt, P., Suwanrungruang, K., Meza, R. (2018). Temporal Trends and Geographic Patterns of Lung Cancer Incidence by Histology in Thailand, 1990 to 2014. Journal of Global Oncology, 4, 1-29

