

**Effect of Air pollution on asthma prevalence in Erbil city**

Research Project

Submitted to (Department of Environment) in partial fulfillment of the requirements for the degree of BSc.

in environmental Health sciences

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**April -2023**

**Abstract**

Exposure to air pollution is associated with numerous effects on human health. There is evidence that long term exposure to ambient air pollution increases the risk of childhood asthma. Outdoor air pollution affects lung development and leads to morbidity from asthma in children and adults. Traffic and power generation are the main sources of urban air pollution. The idea that outdoor air pollution can cause exacerbations of pre-existing asthma is supported by an evidence base that has been accumulating for several decades, with several studies suggesting a contribution to new-onset asthma as well.

The aim of this study to investigate the impact of air pollution on asthma prevalence. We focused on clinical data and obtained the number of patients with annually asthmatics from 2017 to 2022 in Erbil city, the data were collected from some hospitals in Erbil city, among them Rizgary hospital. The maximum number of asthmatics (4930) was recorded in 2022 among them 75% were children. The average number of asthmatics in the 6 years was (4,471), where (2763) of them were children equal to (61%) of total asthmatics. Depending on the available data we concluded that exposure to air pollution during early life is associated with a greater risk of childhood asthma.

Keywords: air pollution, asthma, children

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**Introduction**

Air pollution is a problem as old as history itself. Air pollution can be defined broadly as the introduction of chemicals, particulate matter, biological materials into the atmosphere that causes harm and discomfort to humans and other living organisms, as well as damages the natural environment such as the damaging of the ozone layer or causing global warming( Hutton,G. 2011 and Linhares,D. *et al.,* 2015). Air contamination happens when unsafe or inordinate amounts of substances including gases, particles, and organic atoms are brought into Earth's climate. Both human activity and natural processes can generate air pollution (Kim, D. *et al*., 2018). The sources of pollution vary from small unit of cigarettes and natural sources such as volcanic activities to large volume of emission from motor engines of automobiles and industrial activities ( Mueller, W. et al., 2020). Long-term effects of air pollution on the onset of diseases such as respiratory infections and inflammations, cardiovascular dysfunctions, and cancer is widely accepted; hence, air pollution is linked with millions of death globally each year. A recent study has revealed the association between male infertility and air pollution ( Lee, Y. and Guo, Y. 2004 ; Kurt, O.K. *et al.,* 2016). Air pollutants have complex chemical and physical features dependent on the sources of pollutants, Outdoor air pollutants are either derived from human activities, such as industrial emissions, road traffic, residential heating, shipping, air traffic, construction, agricultural activities, war and fire accidents or from natural hazards, such as earthquake, volcanic eruption, spontaneous forest fires, and extreme temperature ( Stevens, E.L. *et al.,* 2019). Although natural hazards occur independent of human activities, they affect the living environment, health, and lives of humans as hazardous events ( Jurewicz, J.*et al.,*2018). Indoor air pollutants are generally released from smoking, building materials, air conditioning, house cleaning or air refreshing products, heating, lighting, and wood, fuel, or coal usage in cooking. Chemically, these pollutants can be presented as the vapor forms of inorganic pollutants, such as ozone (O3) it is the principal component of smog, which is caused primarily by automobile emissions, predominantly in urban areas. Ammonia (NH3) emission has become the most abundant gas-phase alkaline species in the atmosphere. Most of the ammonia released into the atmosphere is converted into particulate ammonium sulfate and nitrate (Koenig, J.Q. 2000), carbon monoxide (CO), nitrogen dioxide (NO2), and sulfur dioxide (SO2), or as the vapor forms of organic pollutants, such as polycyclic aromatic hydrocarbons (PAHs), monocyclic hydrocarbons benzene, toluene, xylene, and aliphatic chemicals. The particulate forms of air pollutants, however, usually consist of an inner carbon core with various organic pollutants and/or heavy metals on the surface. ( Kim, D. *et al.,* 2018). Epidemiological studies have shown that exposure to gaseous pollutants and PM is associated with a higher incidence of upper airway symptoms, such as rhinorrhea, nasal obstruction, cough, laryngospasm, and vocal fold dysfunction, and lower airway symptoms, such as cough, dyspnea, and wheezing, especially in children (Ding, L. *et al.,* 2017). This exposure is also associated with an increase in cough and wheezing in adults with chronic lung disease and in healthy adults (Linhares, D. *et al* 2015). Effects on pulmonary function which is an important marker of the effects of air pollution on the exposed population (Khreis, H. and Nieuwenhuijsen, M. 2017), as well as being an early, objective, and quantitative predictor of cardiorespiratory morbidity and mortality. Studies have demonstrated the acute and chronic effects of pollutants on pulmonary function in children, adolescents, healthy adults, and individuals with a history of respiratory diseases, Pollution and bronchial asthma(Celedon, J. 2006). Epidemiological and toxicological studies have demonstrated the association between air pollution and bronchial asthma. ( Li, R. *et al.,* 2017).

In a review study performed by (Salam, M.T. *et al.,* 2008) after having considered publications from 2006–2007 that examined the impact of residential traffic-related exposures on asthma occurrence and severity, they concluded that residential proximity to traffic sources increases the risk for asthma and asthma exacerbations. In addition, a study conducted by (Clark, N.A. *et al.,*2010) stated that early life exposures to CO, NO, NO2 PM10, SO2, black carbon, and industrial point sources were positively associated with asthma, with the strongest associations noted for traffic-related pollutants. In a recent Indian study, it was suggested that asthma admissions increased by almost 21% due to ambient levels of pollutants exceeding national air quality standards(yadav,R. *et al.,*2020 ; Lee, Y.and Guo, Y. 2004).

**Method**

We wished to assess the effects of air pollutants on asthma prevalence in Erbil city. Annual numbers of hospital visitors because of asthma attacks in children aged 0-17 years and adult from 2017 to 2022 were collected from some hospitals in Erbil city, among them Rizgary hospital.

**Result and Discussion**

Air pollutants are associated with an increase in a number of asthma. Examples of this a huge increase of asthma around all of world after a recent industrial development and consequently, the huge increase in the concentration of pollution (Balali-Mood, M. et al., 2016). The association asthma and air pollution was large effect on children than in adolescent and adult ( Faustini, A. et al., 2013). The present study was aimed to indicate the effect of air pollution on adult and child asthma in Erbil city. Depending on the available data we found that lowest number of asthmatic people (3820) was recorded in 2019 where (43%) of them was a child under 17 age while the highest number of patient (4930) was recorded in 2022 among them (75%) were child asthma. Generally, the average of asthmatic people from 2017 to 2022 was (4,471), which (1653) of them was adult and (2763) was child that equal to (61%) of total asthmatics (table 1).

We demonstrated that the number of asthmatic children increased overtime (figure 1), because of developing industries, increases of number of traffic that highly effected on air pollution (Khreis, H. and Nieuwenhuijsen, M. 2017). The exposure to outdoor pollutants (O3, NO2, SO2, CO, PM) could induce asthma symptoms (WHO, 2006), in addition the increasing prevalence of asthma has paralleled a rapid growth in the number of motor vehicles in use (Lee,Y. and Guo,Y. 2004 ; Modig, L. and Forsberg, B. 2007). The source of air pollution in Erbil city is traffic density and power generation. Traffic and power generation are the main sources of urban air pollution. The idea that outdoor air pollution can cause exacerbations of pre-existing asthma is supported by an evidence base that has been accumulating for several decades (Guarnieri, M. and Balmes, J.R. 2014). Air pollutants emitted from coal combustion in households may exceed those from industrial resources, and control of such air pollution is of great public health importance. Tobacco smoke is prevalent in Asia and partly responsible for asthma morbidity, despite growing awareness of its adverse respiratory effects. (Trivedi, M. and Denton, E. 2019). Asthma in children are highly susceptible to exposure to air pollution ,because they have higher basal metabolic rate and more physical activity than adults, and their respiratory system may be not enough developed and they are susceptible to air pollution ( Ding, L. et al., 2017). The effect of air pollutants during pregnancy that change metabolism increase fetal susceptibility to mineral inhalation and affecting of placental transported of oxygen, on the other hand smoking tobacco during pregnancy has been shown to increase risk of childhood asthma.

Table (1): the prevalence of asthma in adult and children during 2017 to 2022 in Erbil city

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Year | No. asthmatics | Adult | Children under 17 | %.of child |
| 2017 | 4430 | 1841 | 2589 | 58 |
| 2018 | 4732 | 2171 | 2561 | 54 |
| 2019 | 3820 | 2143 | 1677 | 43 |
| 2020 | 3835 | 1001 | 2834 | 73 |
| 2021 | 4755 | 1532 | 3223 | 67 |
| 2022 | 4930 | 1231 | 3699 | 75 |
| Average | 4,471 | 1653 | 2763 | 61 |

**Conclusion**

Overall effect of air pollution on human health become a worldwide problem. Indoor and outdoor can source of air pollution that cause asthma in child and adult ,because of rapid economic and industrial development, increase number of traffic and human activity is a major problem on asthmatics. It is possible that some permissible levels of ambient air pollutants in Asian countries are not sufficiently low for human health protection. The obtained result showed air pollution highly effected on children than adults, and the number of asthma incidence in children is rising overtime.

**Recommendation**

-The pulmonologists and clinicians must investigate the exposure to air pollutants and of recognizing this as a risk factor that should be taken into account.

- It is possible that some permissible levels of ambient air pollutants in Asian countries are not sufficiently low for human health protection. Better technology and public policy are needed to help prevent the enormous suffering and human loss associated with air pollution.

-Avoid major intersections, heavily trafficked roads, and higher-emission sides of a given road.

- Supporting local garden initiatives can help improve the long-term air quality in your local neighbourhood. Plants help clean the air around them by consuming CO2.

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Figure (1): the number of asthmatic children aged fewer than 17 and adult from 2017 to 2022

پوختە

پیس بوونی ھەوا کاریگەری زۆری لەسەر تەندروستی مرۆڤ ھەیە . بەڵگەکان دەیسەلمێنن کە بەرکەوتنی ھەوای پیسی دەوروبەر بۆ ماوەیەکی درێژ مەترسی تووش بوون بە رەبو لە مندالان زیاد دەکات، کە پیس بوونی ھەوای دەرەکی کاردەکاتە سەر گەشەی سیەکان و دەبێتە ھۆی تووش بوون بە رەبو لە مندال و پێگەیشتووان . ھۆکارەکانی ھاتووچۆ و وێستگەکانی دابین کردنی کارەبا بە سەرچاوەی سەرەکی پیس بوونی ھەوا لە ناوچە شارستانیەکان دادەنرێت. بیرۆکەی پیس بوونی ھەوا کە دەبێتە ھۆی قورس کردنی بارودۆخی تەندروستی ئەو کەسانەی تووشی رەبو بوونە پشتگیری کراوە لەلایەن بنچینەی ئەو بەلگانەوە کە بۆ چەند سەدەیەک کەلەکەبووە لەگەڵ زۆر لەو لێکۆڵینەوانەی دەری دەخەن کە پیس بوونی ھەوا دەبێتە ھۆی تووش بوونی مرۆڤ بەرەبو.

ئامانج لەم توێژینەوەیە بریتیە لە لێکۆلینەوە لە کاریگەری پیس بوونی ھەوا لەسەر بلاو بوونەوەی رەبو. لەم توێژینەوەیە تیشکمان خستە سەر داتای پزیشکی واتە ژمارەی ئەو کەسانەی کە سالانە تووشی رەبو بوونە لەنێوان ٢٠١7—٢٠٢2 لە شارى هةوليَر، داتاکان وەرگیراون لە ضةند نةخوشخانةيةك لة نيوانيان نەخۆشخانەی رزگارى لە شارى هةوليَر،کە زۆرترین ژمارەی تووش بوون بە رەبو (4930) تۆمارکرا لە سالی ٢٠٢2 لە نێوانیاندا ٧5٪‏ ی مندال بوون. لە ماوەی ئەم (٦) ساله دا ناوەندی ژمارەی تووشبوان بە رەبو گەیشتە (4471) کە (2763) ی مندال بوو و دەکاتە ٦1٪‏ ی تووشبوان. پشت بەستن بەو داتایانەی کە ھەیە بۆمان دەردەکەوێت کە بەرکەوتنی ھەوای پیس لەقۆناغەکانی سەرەتای ژیانی مرۆڤ پەیوەندی ھەیە بە زیادبوونی مەترسی تووش بوون بە رەبو لە قۆناغی مندالی.