

Air Pollution Impacts on Women's Health

Mohammad Ali Baghapour^{1,*}

¹School of Health, Shiraz University of Medical Sciences, Shiraz, IR Iran

*Corresponding author: Mohammad Ali Baghapour, School of Health, Shiraz University of Medical Sciences, Shiraz, IR Iran, E-mail: baghapour@sums.ac.ir

Received 2015 January 10; Accepted 2015 February 15.

Keywords: Environmental Exposure, Air Pollution, Indoor, Women's Health

Current scientific researches indicate that environmental factors affect women's health. In spite of the growing interest in assessing impacts of environmental factors on the health status of women, more attention should be focused on assessing the effects of air pollution on women's health. Recently the impact of air pollution, both indoor and outdoor, on women health has been a topic of considerable interest to a wide range of researchers and policy analysts (1, 2). Research findings have documented a statistical association between exposures to air pollutants, both criteria and non-criteria, and the development of disease and illness, including cancer, chronic obstructive pulmonary disease (COPD), cardiovascular disease, reproductive dysfunction, autoimmune diseases, and neurologic impairment (3-6). These findings have been found in short-term studies, which relate day-to-day variations in air pollution and health effects, and long-term studies, which have followed cohorts of exposed individuals over time. Effects have been seen at even very low levels of exposure (7).

There are many epidemiological studies that have assessed the increased risk of lung cancer from living in an urban rather than a rural area, with the assumption that living in an urban area is a surrogate for higher air pollution exposure (8). In general, these studies have found an elevated risk for lung cancer in urban populations compared to nonurban ones (9). Some of these studies were specifically conducted on women. For example to investigate the relationship between female lung cancer mortality and outdoor air pollution using an index reflecting ambient concentrations of criteria air pollutants in Taiwan, a matched case-control study was conducted using female deaths that occurred from 1994 through 2003. The results of the study showed that women who lived in the group of municipalities with highest levels of air pollution exposure index were at a statistically significant increased lung cancer risk compared to the group living in municipalities with the lowest air pollution exposure index, after controlling for possible confounders (10).

Some epidemiological studies suggest that the in-

creased risk from fine airborne particles may be gender specific with postmenopausal women being more susceptible. The association of long-term exposure to PM_{2.5} with cardiovascular events has been studied on women without previous cardiovascular disease in 36 US metropolitan areas. Results from this women's study showed that long-term exposure to fine particulate air pollution is associated with the incidence of cardiovascular disease and death among postmenopausal women. Results indicate that for each 10 $\mu\text{g}/\text{m}^3$ increase in PM_{2.5} there is a 24% increase risk of a cardiovascular event and the risk of dying from heart attack or stroke is increased by 76% (11).

It has been found that both short-term and long-term exposure of pregnant women to low levels of common air pollutants during pregnancy significantly increases the risk of babies being born small (12). Researchers estimate that for every increase of 5 $\mu\text{g}/\text{m}^3$ exposure to PM_{2.5} during pregnancy, the risk of low birth weight rises by 18%. Research findings have indicated that if levels of PM_{2.5} reduce to 10 $\mu\text{g}/\text{m}^3$, more than one in five cases of low birth weight deliveries can be prevented.

References

1. Bryant K. Impact of air pollution on women's health. Society for the Advancement of Women's Health Research. *Otolaryngol Head Neck Surg.* 1996;**114**(2):267-70. [PubMed: 8637748].
2. Haynes SG, Lynch BS, Biegel R, Malliou E, Rudick J, Sassaman AP. Women's health and the environment: innovations in science and policy. *J Womens Health Gen Gen Med.* 2000;**9**(3):245-73. doi: 10.1089/152460900318452. [PubMed: 10787222].
3. Stafoggia M, Cesaroni G, Galassi C, Badaloni C, Forastiere F. [Long-term health effects of air pollution: results of the European project ESCAPE]. *Recenti Prog Med.* 2014;**105**(12):450-3. doi: 10.1701/1706.18612. [PubMed: 25533231].
4. Hashim D, Boffetta P. Occupational and environmental exposures and cancers in developing countries. *Ann Glob Health.* 2014;**80**(5):393-411. doi: 10.1016/j.aogh.2014.10.002. [PubMed: 25512155].
5. Tian L, Ho KF, Wang T, Qiu H, Pun VC, Chan CS, et al. Ambient carbon monoxide and the risk of hospitalization due to chronic obstructive pulmonary disease. *Am J Epidemiol.* 2014;**180**(12):1159-67. doi: 10.1093/aje/kwu248. [PubMed: 25480818].
6. Adamkiewicz L, Gayer A, Mucha D, Badyda AJ, Dabrowiecki P, Grabski P. Relative Risk of Lung Obstruction in Relation to PM₁₀ Concen-

- tration as assessed by Pulmonary Function Tests. *Adv Exp Med Biol.* 2015;**849**:83–91. doi: [10.1007/5584_2014_103](https://doi.org/10.1007/5584_2014_103). [PubMed: 25523626].
7. Brunekreef B, Holgate ST. Air pollution and health. *The lancet.* 2002;**360**(9341):1233–42.
 8. Hemminki K, Pershagen G. Cancer risk of air pollution: epidemiological evidence. *Environ Health Perspect.* 1994;**102**(Suppl 4):187.
 9. Woodruff TJ, Caldwell J, Coglianò VJ, Axelrad DA. Estimating cancer risk from outdoor concentrations of hazardous air pollutants in 1990. *Environ Res.* 2000;**82**(3):194–206. doi: [10.1006/enrs.1999.4021](https://doi.org/10.1006/enrs.1999.4021). [PubMed: 10702327].
 10. Chiu HF, Cheng MH, Tsai SS, Wu TN, Kuo HW, Yang CY. Outdoor air pollution and female lung cancer in Taiwan. *Inhal Toxicol.* 2006;**18**(13):1025–31. doi: [10.1080/08958370600904561](https://doi.org/10.1080/08958370600904561). [PubMed: 16966302].
 11. Miller KA, Siscovick DS, Sheppard L, Shepherd K, Sullivan JH, Anderson GL, et al. Long-term exposure to air pollution and incidence of cardiovascular events in women. *N Engl J Med.* 2007;**356**(5):447–58. doi: [10.1056/NEJMoa054409](https://doi.org/10.1056/NEJMoa054409). [PubMed: 17267905].
 12. Perin PM, Maluf M, Czeresnia CE, Nicolosi Foltran Januario DA, Nascimento Saldiva PH. Effects of exposure to high levels of particulate air pollution during the follicular phase of the conception cycle on pregnancy outcome in couples undergoing in vitro fertilization and embryo transfer. *Fertil Steril.* 2010;**93**(1):301–3. doi: [10.1016/j.fertnstert.2009.06.031](https://doi.org/10.1016/j.fertnstert.2009.06.031). [PubMed: 19631320].