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Review Article

Air Pollution and Poor Air Quality in Delhi-NCR: Some Health Tips and Protective Measures

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Abstract

Recently the air quality has gone down markedly in Delhi-NCR region, so much so that the governmental authorities declared the situation as a public health emergency. This tends to cause considerable health concerns among people living in this region as it can cause or increase breathing problems and other health issues. In fact, the air pollution and poor air quality affect not only the elderly, children and patients with chronic respiratory diseases but also many healthy individuals. Based on the authors' knowledge and experience, coupled with the extant situation's desk review and other inputs obtained, the present article is a brief overview of the subject matter of air pollution and poor air quality in Delhi-NCR region. Key health tips for individuals and other protective measures to be taken at mass level for combating air pollution have been discussed here.

Keywords: Air Pollution; Air Quality; Health; Advisory

Abbreviations

NCR: National Capital Territory Region; PM: Particulate Matter; WHO: World Health Organization

Introduction

The World Health Organization (WHO) defined health in its broader sense as "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity" [1]. It is important to address all components of health - preventive, promotive, curative and rehabilitative – to attain such a well-being. A disease or unhealthy condition can affect our body, mind and social life, in addition to an undue financial burden on our pockets. Various factors can affect health and result in acute and chronic health issues at individual and mass levels; such factors may include hereditary risks, unhealthy lifestyle and bad environment. Out of them, environmental factors have become very crucial these days, particularly due to the rapidly increasing incidents of various environment-related health problems and the need for a collective effort to control and manage these problems.

Over the past few years, the northern India including Delhi and adjoining geographical areas of the National Capital Territory Region (NCR) has been witnessing extremes of air pollution leading to worsening air quality. Several episodes of severe air pollution and spikes in poor air quality have happened in and around Delhi-NCR every year, especially in the months of October and November, which are being attributed particularly to mass stubble burning, rising vehicular emission, and dust storms. Recently the air qual-

ity has gone down markedly in Delhi-NCR, so much so that the governmental authorities declared the situation as a public health emergency [2]. Such a situation of severe air pollution and poor air quality tends to cause considerable health concerns among people living in this region of the country as it can cause or increase breathing problems and other health issues. In fact, the air pollution and poor air quality affect not only the elderly, children and patients with chronic respiratory diseases but also many healthy individuals.

The present article is a brief overview of the subject matter of air pollution and poor air quality in Delhi-NCR region based on the authors' knowledge and experience, coupled with the extant situation's desk review and other inputs obtained through focus group discussions and interactions with various relevant domain experts. Emphasis has been given on important preventive, proactive and mitigatory measures to avoid or minimize harmful effects of air and dust pollution and poor air quality. Key health tips for individuals and other protective measures to be taken at mass level for combating air and dust pollution have been discussed here.

Air pollution in India and Delhi-NCR

Air pollution refers to the presence of toxic or harmful substances in the air, at such high levels that pose health risks. Such substances – also called as air pollutants – affect us either directly by coming in contact with our skin, eyes, airways etc. or indirectly by lowering the air quality with resultant damaging effects [3].

Dusty environment adds to air pollution and poses further health risks to the exposed people. Recently the severity of dust pollution has increased remarkably in several regions of India and many other countries, calling for focused action for its prevention and control [2-4]. Air pollution is the fifth largest killer in India, with estimates of nearly 1.5 million deaths attributed to air pollution in this country [4]. In particular, Delhi-NCR remains one of the most affected geographical areas due to air and dust pollution in the country. According to a WHO survey of 1600 cities across the world, Delhi's air quality is the worst of any major city, with poor air quality being linked to irreversibly damaging the lungs of almost 50% of all children in this city [5].

Key air pollutants and their sources

There are numerous toxic or harmful chemicals and other substances that are produced in different processes and can cause air pollution. Many of these air pollutants are either manmade or linked to key human activities. Major air pollutants can be divided into three groups - gases, dust particles, and aerosols - as discussed below [6-9]:

- **Gases:** Major gaseous air pollutants are carbon monoxide, carbon dioxide, oxides of Sulphur, nitrogen etc., ammonia and other volatile organic compounds, and gaseous products of burning, vehicular emission, industrial processes etc [6].
- **Dust particles (Particulate Matter):** Their sources include civil construction works (buildings, roads, bridges etc.), biomass burning (fossil fuels, wood, dry leaves etc.), vehicular emission, diesel genset exhaust, industrial emission (including that from coal power stations), wildfires, mining, foundries, and volcanic activities. Dust storms and thunderstorms can add huge quantities of dust particles in the air and quickly make the air quality very poor [7].
    i) Level of particulate matter in the air (called as "PM level") is measured as $PM_{2.5}$, PM_{10} etc. (where the numbers 2.5, 10 etc. denote sizes of such particles in micrometers). It also reflects the severity of dust pollution. Particles less than or equal to 10 micrometers in diameter are so small that they can get into the lungs with breathing and pose serious health risks. $PM_{2.5}$ is considered more harmful than PM_{10} as the finer particles can go deeper into the lungs, causing more damage and associated health problems [7,8].
- **Aerosols:** This means clouds of liquid droplets and solid particles in a gas that are found in the air. They may contain various pollutants including biological molecules (like spores, biological wastes, grass dust, animal dander etc.). Sometimes, aerosols are included under the dust particles group due to similar health hazards [9].

Health hazards of air and dust pollution

Poor air quality due to dust, smog and other air pollutants can affect one's health either directly by coming in contact with skin, eyes and airways, or indirectly by disturbing other body functions. Such effects can range from mild symptoms to serious diseases/complications [3]. As per the WHO's estimates, nearly 4.2 million people die every year as a result of exposure to ambient (outdoor) air pollution [10].

Depending upon the duration and the intensity of exposure, the air and dust pollution can cause acute and/or chronic adverse health effects. Acute effects are generally in terms of local allergic and irritant effects, particularly on skin, eyes, mucosa and airways. On the other hand, a longstanding exposure to air and dust pollution can impact the respiratory system gradually, leading to or aggravating such chronic respiratory diseases as bronchial asthma, allergic rhinitis/sinusitis, chronic obstructive airways disease, emphysema, interstitial lung disease, and even lung cancer. In addition, air pollution has also been linked to various non-respiratory diseases such as ischemic heart disease, brain stroke, adverse birth outcomes etc [10].

At individual level, more common symptoms due to an acute exposure to air pollution include:

- Sneezing, runny nose.
- Cough, repeated throat clearing.
- Wheeze, shortness of breath (including asthma attacks).
- Chest tightness or chest pain.
- Eye redness and watering.
- Dizziness, giddiness, nausea, headache, irritability.
- Inability to concentrate, low productivity.

Persons having an existing longstanding respiratory condition (like asthma and chronic bronchitis) are at a much greater risk, and even a small decrease in air quality can make their symptoms worse. Other vulnerable groups include smokers, heart patients, children, the elderly, and persons at smoky or dusty workplaces (such as factories, construction sites etc.). In addition, poor visibility due to smog and dust pollution also increases incidents of road traffic accidents, deviation/cancellation of flights, slowing of daily productive life, and associated financial losses at individual, community and national levels [10].

Health tips and other protective measures

As air and dust pollution are associated with poor air quality and can lead to health problems, it is important to know about certain preventive, proactive and mitigatory measures that can be taken at individual and mass levels to protect against their harmful effects. Key health tips and other protective measures for this purpose are given below:

Health tips for individuals

- Don't indulge in activities that increase air pollution. Rather, show your environment-friendly actions:
  - i. Do carpooling or use public transport system.
  - ii. Don't burn leaves and garbage.
  - iii. Refrain from bursting low-standard firecrackers (if necessary, one can use 'green' alternatives and at identified locations only).
  - iv. Follow the statutory guidelines for control of air and dust pollution.
- Keep your house and workplace clean and dust-free:
  - i. Use vacuum cleaner and do wet-mopping (rather than dry sweeping).
  - ii. Use curtains and chicks to further reduce dust entering your living space.
  - iii. Sprinkling of water in and around your house/workplace can help settle the dust particles down.
  - iv. Keep doors and windows closed (esp. during mornings/evenings when outdoor environment is dustier).
- Avoid spending time in smoky and dusty outdoor (esp. in mornings/evenings and during peak traffic hours, if possible).
- Avoid exposure to smoke of firecrackers and similar other activities.
- Exercise indoor (rather than outdoor during poor air quality periods).
- Keep yourself well hydrated (drink water and other liquids in adequate quantities, say, 2-3 litres daily).
- Inhale steam and do gargles with warm water (or warm saline water), esp. after returning from dusty environment.
- Protect yourself by getting your flu shot (ask your doctor for more information).
- Use protective face masks (like N95 masks) in more polluted areas.
- Use of good-quality room air purifier may also help reduce indoor air particulate load.
- Take extra care of the vulnerable ones (kids, elderly, patients with chronic diseases).
- Generate awareness among your friends, colleagues and family members and motivate them to reduce air pollution.
- In case you develop any relevant symptom, consult your doctor without delay and follow the advice.

Protective measures to be taken at mass level

- Focus on controlling the origins of air pollution.
- Strict implementation of standards and regulation for pollution control (industry license, motor vehicles, legal verdicts etc.).

- Continuous monitoring of air quality and other air pollution indicators, and sharing this information in public domain.
- Prudence in civil construction activities.
- Curbing deforestation and promoting green drives, afforestation and vegetation buffers.
- Awareness generation through mass media, emailers, group talks etc.

Conclusion

In the wake of recent extremes of air pollution and poor air quality in and around Delhi-NCR, there is a lot of public concern with respect to their adverse health effects. No doubt, there is a need for a collective effort to control and manage this serious problem. It is inevitable that sincere efforts are made and appropriate actions are taken at individual and mass levels to combat this public health emergency. It is expected that the key health tips and other measures discussed in this article will be helpful to many in preventing and mitigating various harmful effects of air and dust pollution and poor air quality.

Conflict of Interest

None. There is no direct or indirect real or perceived financial interests or conflicts; and this work of the authors is without any prejudice to their academic or professional associations.

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