Air Pollution: A Tale of Two Cities

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Abstract:

This article describes the battle with air pollution in two large cities, London and Delhi. Air pollution is a major cause of morbidity and mortality across the globe, particularly affecting those in large, urban environments. Action has been take to reduce pollution levels and some improvement have been seen, but not to a significant enough degree. We as healthcare professionals have a responsibility to advocate for greater change to be made.

Key words
Air pollution, New Delhi, London, morbidity

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Air pollution and Health

Having lived in London for the last ten years with many summers spent in bustling Indian cities, I often worry how much pollution I have been exposed to. It's not uncommon on my walk home from the underground station to smell the pungent fumes from car exhausts. Likewise, I recall countless times looking up at an urban skyline in India to see grey smoke waft through the air. Newspapers often liken living in a large city to smoking over a hundred cigarettes a year (1). However, these seemingly sensationalist headlines hold truth. Chronic exposure to ambient air pollution has devastating effects on health and those living in large, urban areas are often the most exposed.

Air pollution is the amalgamation of harmful chemicals in the air due to natural or human causes. Outdoor or ambient air pollutants include carbon monoxide, nitrogen oxides, sulphur dioxide and particulate matter (small particles produced in part by burning fossil fuels) which are emitted from vehicle exhaust, fumes from industry, heat and power generation and agriculture. Another chemical, ground level ozone, is a key element of smog, which is produced when chemicals such as those found in vehicle exhaust fumes react in sunlight.

Breathing in these pollutants on a daily basis has disastrous consequences on our health. 91% of the world's population live in areas where the air quality is below the standard set by WHO. Ambient air pollution lead to significant levels of morbidity and mortality through cardiovascular disease, respiratory disease and cancer. WHO figures show that 29% of all deaths and disease from lunch cancer and 4.2 Million premature deaths in 2016 were due to

outdoor air pollution (2). Chronic exposure to particulate matter leads to cardiovascular and respiratory disease, nitrogen dioxide can cause airway inflammation and ozone can lead to worsening of asthma and stunted growth in children (3).

Not only is ambient air pollution directly damaging to health, but it also acts as a mechanism of climate change. Carbon dioxide, though not directly damaging to health, is the major by-product of burning fossil fuels and is a powerful greenhouse gas, trapping heat in the atmosphere. Particulate matter worsens this problem by settling on surfaces such as ice caps and snow reducing their reflective properties causing less light to be reflected from the earth's surface and increasing surface temperatures.

London

London is a city with a long history of air pollution. 1952 was the year of the Great Smog, a week long episode of extreme air pollution in which the air was thick with a polluted fog. It contributed to the death of at least 4,000 people. As a result, the Clean Air Acts of 1956 and 1968 were created. These acts banned emissions of black smoke from urban residential areas and factories which were forced to switch to smokeless fuels (4). The act was successful in reducing visible pollution due to particulate matter. However, despite the clearing of the skies, air quality in London is still of serious concern with current pollution levels exceeding limit values set by the European Union (4).

The latest report by the London Air Quality Network for 2018 showed that large reductions in carbon monoxide have been seen over the last twenty years. There has also been a decrease in nitrogen dioxide levels between 2017 to 2018 and particulate matter 10 and 2.5. Nonetheless, it is important to bear in mind other nitrogen dioxide levels are still exceeding set limits causing the majority of the 9,400 premature deaths per year linked to ambient air pollution in London (5) (6). With one third of London's schools being in close proximity to roads with illegally high levels of nitrogen dioxide we need continued vigilance against this threat (3).

Steps are being taken to tackle this problem through the London Local Air Quality Action Plan. This initiative gives responsibilities to each London borough to monitor and put in place schemes to reduce air pollution. The key areas being addressed are transport and green infrastructure. Encouraging active travel is one component, specifically creating cycle super highways and more pedestrianized areas such as the Van Gogh Walk in Lambeth. The congestion charge zone is being used to create an ultralow emission zone as of April 2019. This means that any vehicles entering the congestion charge zone will also need to meet a minimum exhaust emission standard or pay an extra charge. Possibly most significantly there will be a UK wide ban on new petrol and diesel cars as of 2035. Green infrastructure refers to green spaces designed to promote healthy living, mitigate flooding, improve water and air quality, cool the urban environment and promote ecological resilience. By increasing the numbers of and access to green spaces it is hoped air quality will improve through reduced industrial and transport related emissions and reduced dispersion of pollutants (3) (7).

Delhi

Everyday in Delhi approximately eighty people die due to air pollution related illness (8).
In 2016 Delhi experienced one of its worst episodes of Diwali smog. Pollution levels were some of the highest Delhi had seen over the preceding 17 years with PM 2.5 fourteen times the allowed standard. According to the Centre for Science and Environment pollution levels were higher than those recorded in the Great Smog of London 1952 (9). 'Diwali smog' is the peak of extreme air pollution, largely due to particulate matter, that occurs as a result of the combustion of fireworks in celebration of the Hindu festival. The smog of 2016 was particularly extreme due to a mixture of fireworks, vehicle exhaust fumes, fumes from burning garbage and burning of paddy residues in neighbouring states coupled with a lack of wind. This left particulate matter stagnant in the air and a smog that lasted ten days (10). Emergency action was required, schools were shut down, the Badarpur power plant was closed and construction was halted for ten days.

The incident in 2016 lead to long term steps being taken to address the air pollution crisis affecting Delhi. Areas of priority included reduction in emissions from diesel fuelled vehicles, waste burning, construction and power plants. The Delhi Clean air action plan laid out key action needed in order to tackle this worsening issue (9). Specific measures included laws against visibly polluting vehicles, more pedestrianized zones and improved public transport systems (11). Badapur coal fired power plant was permanently shut down in 2018 (12). Polluting industries were targeted, with industrial units not compliant with environmental and waste management policies shut down and sanctions placed on industries using poor quality fuel such as furnace oil which emits extremely high levels of sulphur when burned. Waste management was a key issue with greater vigilance over already banned open burning of waste and crop burning. Legal frameworks were put in place to ensure proper recycling of construction waste. Banning of diesel generator sets and limitations on use of brick kiln which are fired by coal was also recommended (9).

Some improvement was seen with decreasing average levels of particulate matter and sulphur dioxide from 2016 to 2017. Results of the Air Quality Index (AQI) showed the number of days with very poor or severe air quality had decreased and satisfactory days nearly doubling from 2016 to 2017 (13). However, despite this a repeat episode of severe smog was seen in 2019. A Public health emergency was declared. The AQI in New Delhi was un-recordable indicating levels over 999 (normal air quality between 0-50). On November 3 PM 2.5 levels were 23 times higher than the WHO air quality guidelines (14).

Next Steps

The effect of air pollution on health is well established. Thousands of people around the world, particularly those in major cities, are suffering ill health and early death due to unnaccepatble levels of exposure. Governements are attempting to take action, but change is not occuring fast enough. As a society we need to realise that a paradigm shift is required. This is not a crisis to be averted for future generations, this is a crisis we are living through now. On an indiviudal level better choices to reduce fossil fuel combustion such as active travel are required. However, there is a limit to what one person can do. We as healthcare professionals have a responsbility to advocate for our patients not just in the clinical setting,

but also in the wider community on public health matters such as this. We must put pressure on our governemtns to rapdidly divest from fossil fuels, increase legislation on air pollution levels and invest in renewable fuel sources. If we do not we will only continue to see patients suffering from preventable illness on a mass scale. Change can happen, as we have seen with successful initiatives to reduce pollution to date, but we cannot be complacent.

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