

## **Air Pollution and Heart Attacks**

Dr.O.P. Yadava  
CEO & Chief Cardiac Surgeon  
National Heart Institute  
New Delhi

Though it has been felt for a long period of time that heart attacks and related maladies strike more often during the winter months and when the atmosphere is full of smog, it was not till recently that scientific credibility was provided to this premise or gut feeling. In the July 2004 issue of Circulation, Dr. Robert Brook first time demonstrated that air pollution had scientific basis for causation of heart attacks and related illnesses. Certain special subset of population are at increased risk from air pollution:

- a. Elderly people
- b. People with underlying blockages of the arteries of the heart
- c. Underlying lung disease like Asthma or Bronchitis
- d. Diabetics
- e. Those who belong to lower socio economic strata of the society.

Not only are heart diseases more common, but strokes are also increased in incidence because of air pollution, specially because of suspended particulate matter in the air. Though the exact mechanism of action by which smog and pollution contribute to increase risk of heart attack is not known, a new study published in the June 13, 2006 issue of Biochemistry, appears to throw some light on this mechanism. It is postulated that the mixture of pollutants in the air including ozone, cross react with cholesterol in the body causing oxidation of the cholesterol and leading to byproducts called 'Atheronals' which possess certain biological effects causing cholesterol deposition (atherosclerosis). A major contribution to the pathogenesis of these illnesses is 'second hand' or 'passive tobacco' smoke. All these not only increase the incidence of heart attacks or strokes, but also cause increased death from these ailments and prolonged exposure to elevated levels of particulate pollution reduces over all life expectancy. It is estimated in one of the studies that one in fifty heart attacks are directly triggered by out door air pollution. It is not only in India that we lag in this aspect but even in advanced countries like United States of America, where the US Environmental Protection

Agency though has laid down the National Ambient Air Quality standards for particulate matter, 19% of the US counties with air quality monitoring systems are still not meeting these standards. In people of lower socio economic strata and even in middle class families, the single largest contributor to indoor air pollution is passive second hand smoke. Because the weather out side is cold, most people tend to smoke indoor and the indoor smoke remains suspended with all windows and doors of the building closed and may add to the morbidity related to heart attacks. Even in public places, where adequate number of air changes of air conditioning are not provided, second hand smoke has become a major public health hazard.

Infact the effects of second hand smoke could be on an average 80-90% as large as those from active smoking was a finding of another study published online May 23, 2005 in 'Circulation'. The various mechanisms by which second hand smoke may be bringing out its ill effects are:

1. Aggregability & adhesiveness of the platelets
2. Dysfunction of inner lining of the blood vessels (endothelial dysfunction)
3. Increased stiffness of the wall of the arteries
4. Increased deposition of cholesterol (atherosclerosis)
5. Increased oxidative stress and reduced antioxidant defence mechanism needed to protect the body
6. Increased inflammation of the lining of the arteries of the body.
7. It also reduces the levels of good cholesterol and increases insulin resistance thus making the diabetes worse.

The effect of second hand smoke is extremely quick and the dysfunction of the lining of the arteries, may start within 20 minutes of exposure to the second hand smoke leading to increased clot formation and chances of arteries getting blocked because of this clot and causing heart attack.

Though deaths due to heart attacks are more in winter months, but heart attacks seem to follow a 'U' shaped curve. Deaths due to heart attacks are high at very low temperature, then it falls to its lowest level with a temperature of around 23° centigrade (moderate climate) but again the deaths due to heart attacks keep rising when the temperature exceed 24° centigrade. Therefore, even in summer months, the incidence of deaths from heart attacks is high and in this humidity too may play a role. There is linear correlation between deaths due to heart attacks and humidity – higher

the humidity more the heart attack deaths. This is a specially true for elderly people and the exact genesis of the same has not been worked out till date. In a Greek study, the average daily heart attack deaths of those who were > 70 years of age was 3.53 in June and 7.03 in December and this was statistically highly significant. The most important factor deciding the daily death rate was the average daily temperature for the preceeding week. These were the findings of CLIMATE study carried out in Athens and reported online July 13, 2006 in 'Heart', a reputed catalogued journal.

What should one do ?

1. The most important thing is that one must keep the indoors of the house adequately ventilated and at least once in a day, open the windows and doors to let fresh air in.
2. Smoking inside the house should be totally banned.
3. The exhaust ventilation of kitchen should be good so that the fumes, especially because of open charcoal cooking, should not spread in the house.
4. Do wet mopping of the house and keep the surrounding areas planted with some kind of a ground cover so that the level of pollution, dust and smoke is reduced.
5. One should avoid going out early in the morning and late in the evening when the smog levels are high and one should try and exercise in cleaner areas only.
6. Keep one self adequately hydrated and not sit in one position or one posture cross legged for too long a period of time.
7. A fidgety and twiddling lower limb is always a good thing for the heart.

### **Statistics**

In National Heart Institute, in an epidemiological study looking at the pattern of admission, there was a 6.1% increase in overall admission in Nov-Dec 2006 as compared to May-June 2006. However, if only coronary admissions, that is due to heart attack and related illnesses were seen, it rose by 14.87% during the same period.