

A review on human health associated with traffic emission and road dust.

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Abstract

In this review we have try to collect knowledge about traffic emission and knowing various diseases originated from traffic related air/dust and also how can effect to humans daily life. To human health perspective road dust and traffic related air pollution information collected from near about 50 journals and many books. Those journal and books finding explained that many diseases like respiratory disorder, allergic symptom, toxicological, and mental disorder impacts are occurred in human and other organisms due to traffic and heavy vehicles dusts. Eye irritation like dry eye, eye itching, eye redness due to fine dust of traffic are also explained. Gaseous particles i.e. carbon monoxide and fine dust particle associated with an increased risk of epileptic symptoms.

Keywords: Traffic emission, Road dust, Allergy, Respiratory disorder.

Introduction

Several studies point toward the harmful effects of air pollution on human health. It has been estimated that globally 8,000 people die every day from diseases related to air pollution. India is the second-highest in the world population. According to the latest survey of Road safety in India: Status report 2016, The Global Burden of Disease (GBD) study estimates that there were 253,993 deaths in India in 2016 [1]. This effect is likely to be observed for the foreseeable future as the majority of Asia, Africa, and the Middle East's middle- and low-income countries continue to have rising levels of air pollution, including increased particulate matter (PM), noxious gases, and various hazardous chemical compounds [2]. Urbanisation and increased population density have both increased exposure to traffic-related air pollution, resulting in increased health concerns in both developing and developed countries [3]. In 2015 it was estimated that 66% of the population in Beijing, 41% of New Delhi, 67% of Paris, and 96% of Barcelona were exposed to high levels of traffic-related air pollution [4]. The busy road traffic also contributes to spreading air pollution. Many Indian cities and towns face severe traffic congestion. There are several reasons responsible for traffic congestion. Another strong reason for the congestion is the inefficient infrastructure that lacks intercity, intra-city divided lanes on the highways, and the lack of freeways connecting one city to another. In the Indian scenario, it is also observed that due to the lack of traffic sense, numerous traffic problems occur [5]. Active travel may cause people having the highest exposure to air pollution as they are directly inhaled the pollutants [6]. Clearly, outdoor air pollution threatens human health and wellbeing in many ways. Our health can deteriorate when the air quality is poor.

Background

Traffic-related air pollution (TRAP) is one of the major sources of exposure in urban areas and has been associated with a wide range of adverse human health effects [7]. Air pollution has risen to the fourth largest cause of early death, according to the State of Global Air Report Institute, 2020. The increase in cases of asthma and allergies has become an important health issue throughout the globe [8].

Definition

Road dust is earthen material or dirt that becomes airborne, primarily by the friction of tires moving on unpaved dirt roads and dust-covered paved roads. It consists mainly of coarse particles, which in some cases may be contaminated with man-made and naturally-occurring pollutants such as asbestos, mining by-products, animal and human waste, snow and ice control applications (salts) and engine oil [9].

Purpose of review

This article reviews the natural and industrial components of road dust pollutants that can directly or indirectly induce various diseases like as allergy, itching, sneezing, runny eye, dry eye, burning, atopic dermatitis and respiratory problems etc. The emphasis put on and up to date current research of road dust pollution these impacts, disease, by observation and experiment did by the environments, public health engineers and social workers as well as members of general suffering from these afflictions.

Health Effect of Allergy and Eye Irritation

Air pollution is defined as the presence of noxious substances

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in the air at levels that impose a health hazard. Traffic-related air pollutants refers to a broad group of pollutants including elemental carbon, black soot, nitrogen dioxide (NO₂), nitric oxide (NO), sulfur dioxide (SO₂), particulate matter (PM_{2.5} and PM₁₀), carbon monoxide (CO), and carbon dioxide (CO₂) [10]. Overall, 12.6% of the children had asthma, 30.0% had allergic rhinitis (AR), and 14.4% had atopic dermatitis (AD). Mite sensitization significantly increased the risk of AD, AR, and asthma (OR (95%CI) 2.15 (1.53-3.03), 1.94 (1.46-2.58), and 2.31 (1.63-3.29), respectively). Exposure to PM10, PM(2.5), CO, and O₃) was associated with asthma (OR (95% CI) 1.39 (1.03-1.87), 1.45 (1.07-1.97), 1.36 (1.01-1.83), and 0.68 (0.51-0.92), respectively) [11]. Significantly high number of subjects in study group complained of ophthalmic symptoms compared to control group. Seventy eight per cent subjects in the study group had symptoms such as redness, watering, irritation, strain or photophobia whereas this number was 45% in control group [12]. The tearing or burning

responses associated with eye irritation are most likely to be experienced above 0.30 ppm (Figure 1) [13]. Very fine particle appears very dangerous than larger particle and combustion particle appear more dangerous than road dust [14].

Action of Allergic Factor in Body

The inflammatory response, which consists of phagocytes, eosinophil's, mast cells, and lymphocytes, spreads along the respiratory tract, leading to tissue damage (Figure 2). Mast cells and eosinophil's are commonly recognized for their detrimental role in allergic reactions on activation through the high- and low-affinity receptors for immunoglobulin E (IgE) FcεRI. These cells rapidly produce and secrete many of the mediators responsible for the typical symptoms of asthma and rhinitis [15]. Exposure of the skin to air pollutants has been associated with skin aging and inflammatory or allergic skin conditions such as atopic dermatitis, eczema, psoriasis or acne, while skin cancer is among the most serious effects [16].



Figure 1. Effect on human eye regarding dust particle.

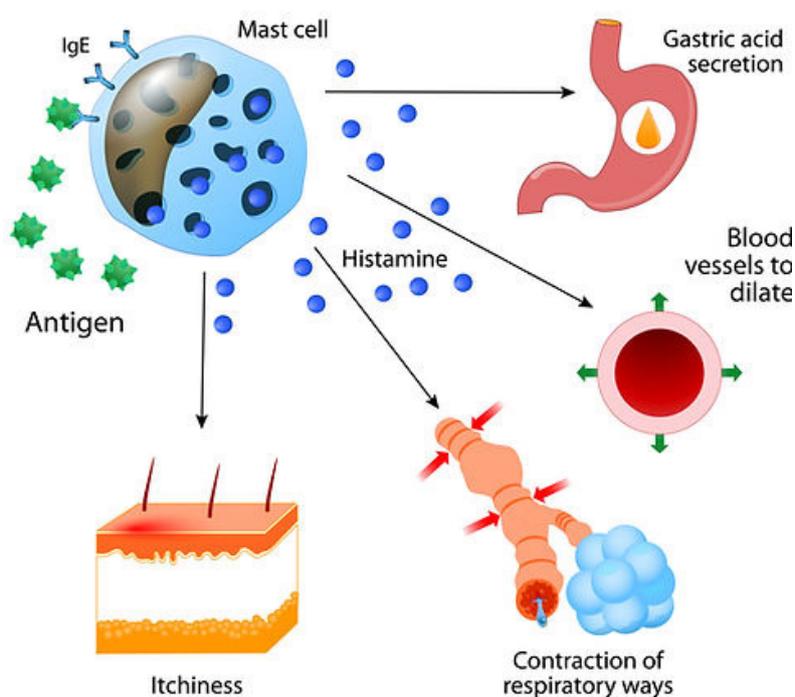


Figure 2. Mast cell activator disorder.

Impact of Long Term Exposure of Road Dust Pollutants

Various studies have identified this as ‘Sensitive Scalp Syndrome’ resulting from exposure to increasing levels of air pollution including particulate matter, dust, smoke, nickel, lead and arsenic, sulfur dioxide nitrogen dioxide, ammonia and polycyclic aromatic hydrocarbons (PAH) which settle on the scalp and hair [17]. Previous studies putting the evidence regarding various kind of environmental induce disease in humans and other organisms are as follows:

Hair falls

Dust and fuel particles in the air can make your hair follicles weak and lead to hair fall. The pollutants migrate into the dermis, transepidermally and through the hair follicle conduit, leading to oxidative stress and hair loss [17]. Hair loss due to pollution can coexist with or mimic androgenic alopecia. Concentration of mercury, zinc, lead, heavy metals can be determined from the air, dust and hair of the residents living around mining areas, indicating these as a cause of hair damage [18].

Skin itching

Fine polluted road dust fallen in human skin and stricken with skin and react to epidermis which create sensation allergy and itchiness [16]. Initial acute effects of irritants to the skin may include a prickling sense or rashes (redness). The most significant lasting dermal health effect of irritants is contact dermatitis, also called eczema. This is an inflammation of the skin which may result in rashes, itch or pain, nodules, vesicles (blisters), scaling, thickened skin and in severe cases fissures. The concentrations of air pollutants and exacerbation of sleep disturbance and itching on the same day, before, and after adjusting the effects of the confounding variables, so that the estimated odds ratios (95% confidence interval) between PM₁₀ and PM_{2.5} and exacerbation of itching were 1.06 (1.02–1.10) and 1.17 (1.07–1.28), respectively [19].

Eye burning

Autorickshaw drivers reported the highest prevalence of ophthalmic symptoms, such as eye redness (44%) and eye irritation (36%). In comparison, vendors reported a higher prevalence of headaches (43%) and eye redness (40%) due to increased exposure to vehicular emissions [20]. Medical conditions associated with increased air pollution are mainly eye irritation, conjunctivitis, dry eye syndrome (DES) meibomian gland dysfunction (MGB) and blepharitis [21]. Specifically, the reader will appreciate why it is possible to refer to them as mediators of Environmental Dry Eye Disease (EDED), a singular clinical entity inside DED context, directly caused by pollutants and/ or adverse climatic conditions [22].

Respiratory disorder

The inhalation of external materials triggers the lungs to react in different ways, including airway irritation, asthma exacerbation, inflammatory reactions and fibrosis [23]. Dust includes the most commonly found harmful particles in the atmosphere, and street sweepers are exposed to a combination of soil, sand and gravel dust particles, vehicle dust, bioaerosols

and plant particles [24]. In some studies, sneezing, coughing, eye irritation, lung tissue swelling, asthma and throat infections were found to be more prevalent among individuals exposed to occupational dust [25]. In the wheezing/asthma cohort, living close to the street with a high traffic density was a risk factor for asthma exacerbations (odds ratio [OR]=1.79; 95% confidence interval [CI], 1.13-2.84), whereas living near green areas was found to be protective (OR=0.50; 95% CI, 0.31 -0.80) [26].

Asthma

Asthma is a chronic respiratory disease characterized by variable airflow obstruction, bronchial hyperresponsiveness and airway inflammation. Evidence suggests that air pollution has a negative impact on asthma outcomes in both adult and pediatric populations [27]. From a mechanistic perspective, air pollutants probably cause oxidative injury to the airways, leading to inflammation, remodelling, and increased risk of sensitisation [28]. Adjusted odds ratios for wheezing, physician-diagnosed asthma, ear/nose/throat infections, and flu/serious colds indicated positive associations with air pollutants, some of which reached borderline statistical significance [29].

Epilepsy

Daily exposure to elevated CO concentrations may be associated with an increased risk of epileptic seizures, especially for subclinical seizures [30]. The daily number of epilepsy patients was statistically significantly affected by the autumn (95%CI: 10.017–19.845) and winter (95%CI: 0.279 to 13.292) seasons [31]. The strongest relations of epilepsy admission were observed in the over 59-year group for carbon monoxide (CO) in lag 0 (RR=2.1455, 95% CI: 1.5823-2.9091), nitrogen dioxide (NO₂) in lag 0 (RR=1.0409, 95% CI: 1.02821.0537), and particulate matter under 2.5 microns (PM_{2.5}) in lag 5 (RR=1.0157, 95% CI: 1.0062 - 1.0252). There were also significant associations for particulate matter under 10 microns (PM₁₀) in the under 18-year group in lag 2 (RR=1.0064, 95% CI: 1.0029 - 1.0098), ozone in lag 0 (RR=0.9671, 95% CI: 0.9581-0.9761), and sulfur dioxide in lag 5 (R =0.9937, 95% CI: 0.9891-0.9983) [32].

Sneezing

Symptoms of allergic rhinitis were defined as the simultaneous presence of rhinorrhea, nasal congestion and sneezing in the absence of respiratory infection [33]. While, exposure to traffic exhaust could be attributed to ~3.13% rise in the incidences of redness of eyes among general population, the outcomes of this survey show that daily exposure to traffic pollution is an important health concern for the urban population in general, as well as for various occupational groups in particular, working in outdoor environment [34]. We would have to conclude that roadside dust is a relatively minor component of total suspended particulate allergenic activity. But it's a component that may have some relevance.

Wheezing, coughing, tightness in the chest and shortness of breath

In India, five to ten per cent of people have asthma, which is a health issue that largely goes undiagnosed. The patients have

episodic cough, chest tightness, breathlessness and wheezing (a whistling sound from the chest). PM₁₀ are very small particles found in dust and smoke. They also include particulate matter (PM) and ozone, and biological contaminants, such as viruses and bacteria, which can penetrate the human airway and reach the bloodstream, triggering airway inflammation, dysfunction, and fibrosis. Pollutants that accumulate in the lungs exacerbate symptoms of respiratory diseases [35].

Conclusion

This review emphasis traffic pollution related disease which are effect to human being and dangerous to society. Respiratory diseases are most and major cases are seen in urban area which originate from polluted air and dust. This study revealed various side effects of road dust and disease. Health effect and allergy action in human body are discussed. Long term exposure of road dust pollutants, various gaseous, disease and their causes are briefly explained. Precaution and prevention is must for the daily life from traffic and protect yourself from traffic emitted air and dust.

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