POLLUTION: A SILENT KILLER

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ABSTRACT

Exposure to contaminants, generally called pollution, relates back to olden age when the environment was clean and free from chemicals. Knowledge of human exposure to environmental contaminants is an important component of environmental epidemiology, risk assessment, risk management, status and trends analysis. Exposure information provides a critical link between sources of contaminants, their presence in the environment and potential human health effects. Important exposure medias include outdoor air, indoor air, food, exterior and interior soil, household dust, drinking and cooking water. Exposure occurs via inhalation, ingestion and dermal contact.

Indoor dust is becoming recognized as a reservoir for many toxic substances and a potentially significant source of human exposure. Pesticides found in indoor settled dust come from its use in the house, as well as from outdoor sources and as little or no training is provided for its use, unnecessary exposures often occur. Pesticides have also been examined in epidemiological studies as environmental risk factors for cancer. Assessing exposure to contamination with biological markers presents a unique advantage and represents a different perspective for evaluation of human exposure to contamination. Risk assessment may be used to identify and evaluate population and individuals at potentially greater risk so that appropriate mitigation actions can be implemented. A thorough evaluation of the various health and broader impacts of interventions to reduce pollution will help generate the evidence that is required for making sound policy recommendations. Thus globally, pollution prevention should be a key policy in National Environmental Protection activities of all the governments.

Keywords: *Hazards, Human Exposure, Exposure Media, Contaminants, Bio-markers, Risk Assessment*

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INTRODUCTION

Global health put at risk is neither a minor issue nor a theoretical problem; it is already happening and its consequences are related to major public health problems. Millions of families in the world exist or struggle to survive in environmental hazards[1]. "Hazard" is defined as the intrinsic property of a biological, chemical or physical agent to cause adverse health effects under specific conditions[2].

Exposure to contaminants generally called ***pollution***, relates back to olden age when the environment was clean and free from chemicals.

It is well known that the environment which fostered man when he was created on this earth was a hospitable one, tender with him, considerate of his health, and affording him means to live and prosper , such benevolent conditions might have continued as they have for thousands of years, had it not been for the serious change and dangerously harmful alterations in the structure, texture and composition of the environment which accompanied the rapid civilization and the breathless pace of industrialization witnessed on this earth. It was a change that turned the environment into a source of evil rather than a resort promoting good health. Soon humanity started to reap what its hands had sown and to pay dearly for the aggression it had committed against this magnanimous and generous environment, upsetting its delicate balance[3].

Immediately after World War II, the primary goal of all governments was to promote industrial growth as quickly as possible. The possibility of pollution was ignored and when it did begin to appear, knowledge of it was suppressed and denied to public[4].

Early 1960s in Japan the famous pollution case the "Mina Mata mercury poisoning" case occurred in which a chemical manufacturing firm released untreated mercuric oxides into a rich inshore fishing area. Reports of a strange disease had already appeared as early as 1956, linked to eating seafood, but it was in 1962 that the government officially recognized what was called the 'Mina Mata disease' or mercury poisoning[4].

An important aspect of public health protection is the prevention or reduction of exposures to environmen-

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tal agents that contribute to premature deaths, diseases, discomfort or disability[5]. Knowledge of human exposure to environmental contaminants is an important component of environmental epidemiology, risk assessment, risk management and status and trends analysis[6-8]

Exposure is defined as contact over time and space between a person and one or more chemical or physical agents[5].

Exposure information provides a critical link between sources of contaminants, their presence in the environment and potential human health effects. This information, if used in the contest of environmental management predicated on human risk reduction, will facilitate selection and analysis strategies other than the traditional "command and control" approach. Most of the environmental management structures around the world rely directly on the measured contaminants in various media to judge quality, infer risk and interpret compliance. Exposure information can evaluate the effectiveness of protecting segments of population more susceptible or at higher risk, it is this direct connection that makes exposure measures invaluable for evaluation of environmental health impacts on local, regional and global scale[9].

People are exposed to a variety of potentially harmful agents in air they breathe, the liquids they drink, the food they eat, the surface they touch and the products they use.[9] Thus exposure pathways define a link between an environmental and an exposure medium. Important exposure medias include outdoor and indoor air, food (commercial and home grown) exterior and interior soil , household dust, drinking and cooking water (can be an important source of chemical exposure).[10] Exposure then occurs by contact with contaminants in these exposure media via inhalation, ingestion and dermal contact.[11]

Several factors influence contaminants concentration in food. They vary by season, geographic distribution, grown by a small or mass producer and application of Pesticides on its production.[12] The vast majority of food that is actually consumed has undergone some form of processing, ranging from production, simple washing to complete reconstitution, as it progresses from the producer to the consumer.[13]

Soil constitutes a potential exposure pathway through direct contact, ingestion or inhalation of resuspended soil particles.[9]

Contaminated soil can be tracked inside homes, or may infiltrate indoors when resuspended. In either case, soil may become a component of settled indoor dust. Indoor dust is becoming recognized as a reservoir for many toxic substances and a potentially significant source of human exposure.

Outdoor settled dust is material deposited on roadways, streets and other paved surfaces. Indoor settled dust (house dust) is material deposited on indoor surfaces such as floors, carpets and furniture. Chemical contaminants present in indoor dust originate from activities in the home or can be tracked into the home from road dust, soil or work sites.[14] Material present in soil, outdoor and indoor dust may include clay, sand, bacteria, viruses, and allergens, products of incomplete combustion, environmental tobacco smoke, heavy metals, pesticides, asbestos fibers, paint fragments, solvents, flame retardants, cleaners and residues from synthetic fibers, building products and many other materials and pollutants.[15]

Children's activities like playing on floor make them more likely to be affected by settled dust exposure.

Soil and settled dust can be a significant source of exposure to numerous toxicants in addition to lead, pesticides and Polycyclic Aromatic Hydrocarbon (PAHs). Children's lead exposure from settled dust is one of an important contributor, besides the use of gasoline, lead-based paint in housing and steel structures, and airborne emissions from industrial paint sources that have settled in residential environment. Older homes are especially susceptible to lead dust exposure if paint is peeling or renovations are being done.[16]

Pesticides found in indoor settled dust come from its use in the house, as well as from outdoor sources and as little or no training is provided for its use, unnecessary exposures often occur.

Studies done in USA have shown that in general population, the highest concentration and the largest number of pesticides are found in house dust as compared to soil, air and food.[17-19]

Pesticides have also been examined in epidemiological studies as environmental risk factors for cancer.[20]

In house dust where pesticides are used for insects, particles of chemicals like Chlordane and Heptachlor are found. In homes treated for termites, residents are exposed to toxic particles of Pentachlorophenol and Lindone (chemical agents) used in wood preservatives. Gardeners especially are exposed to pesticides used for flea and other insects.[16]

According to "The world health report 2002", in the year 2000, indoor air pollution was responsible for more than 1.5 million deaths and 2.7% of the global burden of diseases. In 11 under developed countries; ***Pakistan*** being one of it, indoor air pollution is responsible for a total of 1.2 million deaths a year.[21]

Global reliance on solid fuels ; biomass fuels such as wood, dung, agricultural residues and coal for energy needs has emerged as one of the most important threats to public health. Cooking and heating with solid fuels on open fire or traditional stoves results in high levels of indoor air pollution. Indoor smoke contains a range of health damaging pollutants, such as small particles and carbon monoxide [21-23]

Microbiological organisms have long played an important role in human ecology. As humans have modified the environment through cultivation, landscaping and building structures, ecological balances have been disturbed. The distribution of moisture and nutrients has also been altered to a point where it is quite common to encounter reservoirs of fungi, bacteria, algae and infestations of mites and cockroaches. Through air-borne dispersion, ingestion or direct contact, humans confront components of microorganism continuously. Today pharmaceutical companies among others are exploring fungal enzymes for a variety of reasons including new drugs, non-chemical pesticides, Bio -degradation of waste and possible catalysis of chemical reactions. Fungi are also critical to the production of cheese and fermentation of beer. However, human exposure to microorganism has also resulted in allergic, toxic and infectious disease.[24]

Mites absorb water vapor and are dependent on the absolute humidity found indoors. House dust Mites thrive on organic debris found in house dust like skin flakes, hair follicles and fungi.[24] Mites antigen mainly found in fecal pellets is a potent allergenic material found in bedding, mattresses, carpets and furnishers.[24] Cockroaches are year - round inhabitants of homes. They have access to both food and water, and are often found in kitchens and bathrooms. Cockroaches are thought to secrete their allergens on to their bodies and on to surfaces they touch.[25]

Cats and dogs are domestic pets .Cat allergen is found in saliva and sebaceous gland secretions, while dog allergen is associated with dander, hair, saliva and serum. Direct contact as well as inhalation, ingestion with these allergens can cause allergic reactions.[26] Cats and dogs antigens have been found in dust samples collected from theatres, offices, aero planes, schools and homes. This is because of its small particle size which sticks to clothing and is transported to other locations.[27]

Assessing exposure to contamination with biological markers presents a unique advantage and represents a different perspective for evaluation of human exposure to contamination.[28] Biological markers of exposure have been used most frequently in industrial hygiene and occupational medicine.[29-31]

The biomarkers used must demonstrate that an exposure is occurring or has occurred, and separate individuals on the basis of their level of exposure.[32] Though the use of biological markers have resulted in improved exposure assessment, their use is not without limitations, as for many bio- markers little information is available to interpret the results accurately and justly.[33,34] Challenges associated with the use of biological markers include source identification, pharmacokinetics, timing of exposure, bio- variability, altered response as a result of exposure, and potentially invasive sampling procedures with ethical concerns.

Among the causes of susceptibility to pollutant exposure are genetic variability, age, gender, pre-existing diseases such as diabetes and asthma, inadequate diet, life style factors (smoking), stress and inadequate access to health care.

Risk assessment may be used to identify and evaluate population, and individuals at potentially greater risk so that, if warranted, appropriate mitigation actions can be implemented.[35] Exposure and risk information for susceptible population is critical since health slots and regulations are often developed with the intent of protecting them.[25]

CONCLUSION

Research constitutes a key building along a spectrum of activities that are required in working towards the reduction of the health burden from indoor and outdoor pollution. World Health Organization particularly emphasizes the importance of ongoing and planned intervention projects and also encourages research into the impacts of indoor air pollution .A thorough evaluation of the various health and broader impacts of interventions to reduce pollution will help generate the evidence that is required for making sound policy recommendations.

Thus Pollution prevention should be a key policy in National Environmental Protection activities of all the governments. Pollution prevention is reducing or eliminating waste at the source by modifying production processes, promoting the use of non-toxic or less-toxic substances, implementing conservation techniques, and reusing materials rather than putting them into the waste stream.[35]

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CONFLICT OF INTEREST

The authors declare no conflict of interest.