"Economic Impact Due To Automobile Air Pollution Linked Diseases In Rewa"

[1,]Priyanka Rai, [2,]R.M.Mishra

[1,2],School of Environmental biology A.P.S.University Rewa(M.P.), 486003 India

Abstract

Nowadays air over major cities throughout the world has become over burdened with gases produced by automobiles. The death rate due to automobiles pollution is increasing rapidly in the metropolitan areas. Every year an estimated 800,000 people die prematurely from illnesses caused by outdoor air pollution worldwide. They compare cost-of-illness (COI) and willingness-to-pay (WTP) estimates of the damages from minor respiratory symptoms associated with air pollution using data from a study in Rewa in 2010-2011. The present study is an attempt to exploit air problems and diseases caused by the automobile air pollution and its cause economic problem by the treatment of disease. We conclude from our results that blood pressure, ENT (Eye, nose and throat), fatigue, gastrointestinal diseases and cancer were highly correlated with lead distribution. We also conclude that the motor vehicles/ automobiles now constitute the main source of air pollution. On the basis of observation Bus stand sites is highly polluted than the Sirmour chauk in which respiratory problem recorded 45.24% at sirmour chauk and 48.73% at Bus stand and expenditure is maximum on Bus stand is 572244 Rs. than the Sirmour chauk 509537 Rs.

Key Words: Urban air pollution, Human health and Economic loss.

1. Introduction

In most countries in Europe, ambient air quality has improved considerably in the last few decades. However, there is a large body of evidence suggesting that exposure to air pollution, even at the levels commonly achieved nowadays in European countries, leads to adverse health effects. In particular, exposure to pollutants such as particulate matter and ozone has been found to be associated with increases in hospital admissions for cardiovascular, respiratory disease, gastrointestinal disease, Skin disease, eye disease, ear disease and mortality in many cities in Europe and other continents. Recent studies have also tried to quantify the health effects caused by ambient air pollution; e.g., within the "Global Burden of Disease" project of the World Health Organization (WHO) it has been estimated that worldwide, close to 6.4 million years of healthy life are lost due to long-term exposure to ambient particulate matter. The World Health Organization (WHO) estimates that every year 800,000 people die prematurely from lung cancer, cardiovascular and respiratory diseases caused by outdoor air pollution. Other adverse health effects include increased incidence of chronic bronchitis and acute respiratory illness, exacerbation of asthma and coronary disease, and impairment of lung Function. This note outlines how cities can estimate health gains to their residents as they take steps to reduce outdoor air pollution. It discusses the types of studies used to quantify the relationships between air pollution and human health. Air quality affects human health. Nearly 1.4 billion urban residents in the world breathe air that fails the WHO air quality standards. At the global level, mortality due to exposure to outdoor air pollution is estimated to range from 200,000 to 570,000. In Indian cities, among the most polluted in the world, available mortality and morbidity statistics indicate that respiratory infections and chronic conditions are widespread. The major source of air pollution in Rewa is vehicular traffic, which emits particulate matter, sulphur dioxide, nitrogen oxides, carbon monoxide, hydrocarbons, etc. Particulate matter, the main atmospheric pollutant, can have severe health effects. Air pollution episodes in Muese Valley (1930),Donora (1948) and the London fog of 1952 resulted in heavy mortality. These events indicate that short term elevated levels of particulate matter and sulphur dioxide can lead to a variety of pulmonary disorders including mortality. Respirable particulate matter (RPM) is a respirable fraction with a diameter of less than the main factors which regulate occupational health status, are:

1. Nature and substance of exposure
2. Intensity or severity of exposure
3. Length of exposure
4. Personal susceptibility

Diesel also produces NO*x* that is easily absorbed in the blood and then reduces the oxygen-carrying capacity of the blood. It makes the lung tissues brittle and leathery and can cause lung cancer and emphysema (severe breathing problems)12. At the ITO Crossing, NO2 is above the standards in one out of every five days13. Even more disturbing is the fact that NO*x* from diesel

once out in the air forms ozone, yet another harmful gas. Adverse effects of air pollutants on human health can be acute or chronic. Acute effect manifests themselves immediately upon short term exposure to high concentrations of air pollutants whereas chronic effects become evident only after continuous exposure to low levels of pollutants. Pollutants can enter the body through a number of ways. They can cause skin and eye irritation; Particulate matter may be swallowed as a result of respiratory cleansing action. However, the primary mode of transfer of pollutants to the human body is through respiratory system. The slow and steady exposure to toxins present in the environment effect the human body and their toxins creep in to body slowly, sometimes causing lethal diseases and even death. The World Bank has estimated that Indians are spending Rs 4550 crores every year on treatment of diseases caused by ambient air pollution. The present study describe the economic impact due to automobile air pollution linked diseases , Rewa is situated on NH-7, traffic pollution is major sources of air pollution which cause human health diseases .

2. Material And Methodology

The questionnaire based survey was conducted in two road, Sirmour chauk and Bus stand for valuation of health cost due to air pollution. Human population was surveyed for the following aspects.

- Human capital (Earnings foregone due to premature death as a result of exposure to air pollution)
- Cost of illness (expenditures in medicines, doctor fees, lost working days and wages, expenditure in transportation and lodging etc.)

The morbidity cost also includes the expenditures associated to persons actually suffering with air pollution oriented chronic diseases, their admission in nursing homes, and other expenditures after their death. The cost of illness is calculated on the basis of lost wages due to lost working days and additional expenditures towards transportation, purchase of medicines, doctor's fees etc.

3. Result And Discussion

Health Impacts

Observation of traffic pollution impact on human health near Sirmour chauk and Bus stand in Rewa city (M.P.) Taple – 1 and Table-2. Represent the air pollution linked diseases in which percentage of persons suffering from respiratory diseases was found to be maximum on Bus stand 48.73% and 45.24% on Sirmour chauk. Most of the respiratory diseases observed under the present study were silicosis, breathlessness, asthma, bronchitis, cough, burning of mouth and throat and lung cancer. cardiovascular diseases 33.34% on sirmour chauk and 35.91% on bus stand. Gastrointestinal diseases is one of the important air pollution oriented diseases which is observed on both side is 43.07 % and 45.10%. sirmour chauk and Bus stand near both side percentage of skin diseases is higher than other air pollution linked diseases which is 47.60 from sirmour chauk and 52.75% from Bus stand .Eye, ear and teeth diseases is also air pollution linked disease in this survey work Percentage of these diseases noted 29.60%,23.83% and 20.73% near Sirmour chauk and 33.24%,31.99% and 25.22% near Bus stand. In this present work we show the percentage of air pollution linked disease is maximum on Bus stand than the Sirmour chauk. Other diseases like malaria, vomiting, anemia, cancer, vitamin deficiency, jaundice, pneumonia etc were reported at both sites. But these are not supposed to be caused by air pollution. Other diseases percentage found at Sirmour chauk 25.08% and at Bus stand 37.17%.Results indicate higher incidence rate of respiratory diseases among the people at Sirmour chauk and Bus stand near road side. Association between air pollution and lung function parameters has already been well documented (Islam and Schlipkoter, 1989;HEI,1995,2000a,2000b; schwela,1996,2000; Schlesinger, 2006;Pope,2000a 2000b; WHO,2000a,2000b). At low level of exposure of SO_2 for 24 hour period (mean annual level below 50 gm) epidemiological studies have demonstrated effect on mortality (total cardiovascular and respiratory) and on hospital emergency admissions for total respiratory causes and chronic pulmonary disease (WHO/EURO, 2000; Schwela, 2000). With respect to morbidity (hospital admission for cardiovascular respiratory diseases) an increase in 502 for long term exposure was significantly associated with an increase in adverse health effects (Schwela,2000). World Health Organization (WHO) estimates that approximately 3 million people die each year due to air pollution in the world (World Bank 2001). According to the WHO, air pollution is responsible for increases in outpatient visits due to respiratory and cardiovascular diseases, hospital admissions and mortality.

Human exposure to TRI emissions and to PM2.5 can be estimated with the intake fraction, defined as the total potential human dose as a function of total exposure relative to the source term (Bennett, McKone et al. 2001). The intake fraction is multiplied by linear dose response and concentration-response functions of human health hazard for TRI and PM2.5 respectively to estimate excess cancer cases and premature mortality (Bennett et al. 2003; Nishioka, Levy et al. 2003). The concentration-response function underlying PM2.5 premature mortality predicts annual adverse outcomes due to respiratory ailments and lung cancer that are specific to an emissions year. Thus, 1998 emissions are

associated with 1998 premature deaths. Mineral silicate is an unavoidable constituent of limestone from which lime and cement are processes (Gupta 1994), Silica is not considered carcinogenic, although the risk of lung cancer increases with silica exposure (Cherry et al. 1998).Air pollution's impact on health is very complex as there are many different sources. The individual effects vary from one to another, and it is especially harmful to the young children and the elderly, and those with existing respiratory problems. Children are at risk because their lungs are not fully developed; they breath faster, and they spend lots of time outdoors.

Table -1 Incidence of automobile air pollution oriented diseases among the people near sirmour chauck in Rewa City (M.P.)

S.NO.	Diseases	Male			Female			Total %
		Child	Adult	Old	Child	Adult	Old	
1	Respiratory	6.81	11.81	8.21	5.54	7.54	5.33	45.24
2	Cardiovascular	3.47	6.81	5.00	4.80	7.41	5.85	33.34
3	gastrointestinal	4.61	7.30	9.75	5.12	7.39	8.90	43.07
4	Skin	6.98	7.87	10.32	4.56	9.22	8.65	47.60
5	Eye	3.42	6.8	6.3	2.76	5.98	4.34	29.60
6	ear	2.87	4.43	5.34	2.54	4.89	3.76	23.83
7	Teeth	2.31	4.11	4.96	2.31	3.61	3.43	20.73
8	Other	3.90	3.73	4.68	3.05	5.54	4.18	25.08

Table -2 Incidence of automobile air pollution oriented diseases among the people near Bus stand in Rewa City (M.P.)

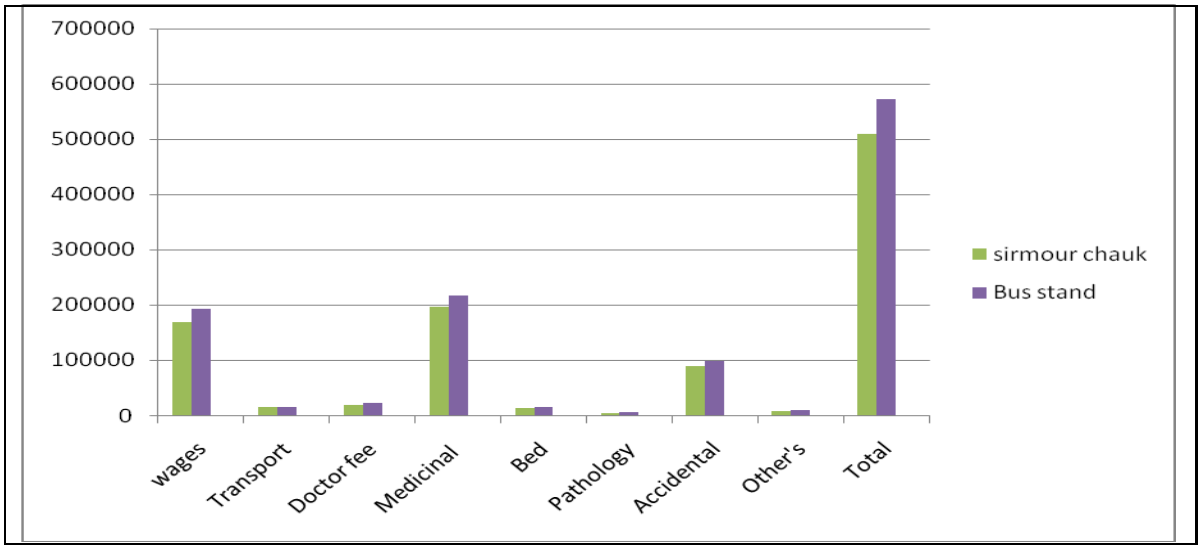
S.NO.	Diseases	Male			Female			Total %
		Child	Adult	Old	Child	Adult	Old	
1	Respiratory	7.21	12.43	8.86	6.32	8.41	5.50	48.73
2	Cardiovascular	3.98	6.51	5.69	5.46	8.67	5.60	35.91
3	gastrointestinal	4.98	7.65	8.79	6.22	7.77	9.69	45.10
4	Skin	7.85	6.87	10.90	6.89	9.71	10.53	52.75
5	Eye	5.05	6.67	8.30	2.66	6.58	3.98	33.24
6	ear	3.87	5..43	7.40	2.61	5.70	6.98	31.99
7	Teeth	3.89	7.01	2.43	2.80	5.66	3.43	25.22
8	Other	5.77	5.81	5.79	3.76	7.53	5.51	37.17

Economic Valuation of Health Impacts

Fig1. Represent the air pollution associated health cost of people at both sides (Sirmour chuk and Bus stand) near traffic pollution. A questionnaire based survey was conducted at sides to collect information on the expenditure made by people, as a result of air pollution, towards cost of illness in which expenditures of medicines 195937 Rs. and 216720 Rs. at both side. Medicinal charge is maximum than other charges. Wages charge 168420 Rs. on Sirmour chauk and 192141 Rs. Bus stand . Transport charge noted on both side is 15370 Rs. And 15588 Rs. Whereas doctor fee, bed charge and pathology is noted on Sirmour chauk is 18630 Rs., 13670Rs. and 2950Rs. and on Bus stand is 21330Rs., 13990 and 4760Rs.Accidental charges on both sites is 87980Rs. and 98765Rs.But other's charges which not include in

these charges is noted 6580 on Sirmour chauk and 8950 on Bus stand. Result indicate the total expenditures is 509537Rs. at Sirmour chauk and 572244 noted on Bus stand. On the all observation we can say Bus stand site is more polluted than Sirmour chauk per year. The world Bank (1997) estimated that air pollution cost china's economy more than 7% of GOP in 1995, largely in health damage. Chinese researches using the risk-dollar trade off method to revels the implied value of statistical life (Li. Schwartz and Xu. 1998) , the median value of willingness to pay in a sample of 500 for avoiding a death was US dollar 160,000,612. It is estimated that 251 premature deaths, 7.7 million cases of acute and chronic mobility, and 6,589 person-years of restricted activities would have been avoided if Shijizhuang had met the national ambient air quality standards in 2000. Appling the economic valuation number, this implies US dollar 40 million for premature deaths and US dollar 31 million for morbidity. Using incidence rates and survey data Li et al. (1998) estimated the costs of public health associated with air pollution in Shijiazhuang to be 63 million dollar. However, health cost estimate under present investigation is smaller than those of estimate cost of Li et al.(1998) .

Fig.1-Human health based economic loss due to air pollution at both sites in Rewa,(M.P.)



References

[1]. Abbey, D., Nishino, N., Mcdonnell, W., Burchette, R., Knutsen, S., Beeson, W.L., Yang, J.X., 1999. Long-term inhalable particles and other air pollutants related to mortality in nonsmokers. American Journal of Respiratory and Critical Care Medicine 159, 373–382.

[2]. Alberini, A., Cropper, M., Fu, T., Krupnick, A. , Liu, J., Shaw, D. and W. Harrington, W., 1997.Valuing Health Effects of Air Pollution in Developing Countries: The Case of Taiwan. Journal of Environmental Economics and Management 34(2): 107–126.

[3]. Aunan, K., Pan, X.-C., 2004. Exposure-response functions for health effects of ambient air pollution applicable for China—a meta-analysis. Science of the Total Environment 329, 3–16.

[4]. Bennett, D. H., McKone, T. E., et al., 2001. Defining Intake Fraction', Environmental Science and Technology 36: 206A-211A.

[5]. Cropper, M., Simon, N., Alberini A. and Sharma, P.K., 1997. The Health Effects of Air Pollution in Delhi, India. World Bank Policy Research Working Paper 1860. Available <http://econ.worldbank.org/docs/534.pdf>.

[6]. Delucchi, M.A., 2000. Environmental Externalities of motor vehicle use in the US. Journal of Transportation Economics and Policy 34 (2), 135–168.

[7]. Dockery D.W and Pope C.A. III 1994. Acute Respiratory Effects of Particulate Air Pollution, Annual Review of Public Health, v.15, pp: 107-132.

[8]. Dominici, F., Shepard, L., Clyde, M. 2003. Health effects of air pollution: a statistical review. International Statistical Review 71 (2), 243–276.

[9]. Gupta, V.K. Verma, A.K., 1994 Respirable dust exposure in iron and steel industries, Chemical.Environ.Res 3 (1& 2) : 147 – 149.

[10]. HEI, 1995. Particle air pollution and daily mortality. Replication and validation of selected studies; the phase I report of the particles epidemiology evaluation project. Health Effects Institute, Cambridge M.A. USA.

[11]. HEI,2000a. The National Morbidity, Mortality and Air Pollution Study, Part-I: Methods and Methodologic issues; Part-II: Morbidity and Mortality from air pollution in the United States, Research Report 94,June 2000,Health Effects Institute, Cambridge, M.A. USA.
[12]. HEI,2000b. Reanalysis of the Harvard Six cities study and the American cancer society study of particulate air pollution and Mortality, a Special Report of the Health Effects Institute's Reanalysis Project, July 2000. Health Effects Institute, Cambridge,MA,USA.
[13]. HEI, April 2004. Health Effects of Outdoor Air Pollution in Developing Countries of Asia. Special Report 15, Health Effects Institute, Boston, MA.
[14]. Holgate, S., Samet, J., Koren, H., Maynard, R., ed., 1999. Air Pollution and Health. San Diego, California: Academic Press.
[15]. Islam, M.S. and Schlipkoter, H.W,. 1989. Assessment of symptomatic and functional health standard of elderly woman exposed to didderent ambient air qualities. In :Man and his ecosystem (eds. L.J.Brasser and W.C.Mulder). Elsevier Science Publishers. Amserdam. Vol.1:41-44.
[16]. Laden, F., Neas, L.M., Dockery, D.W. , and Schwartz, J., 2000. Association of Fine Particulate Matter from Different Sources with Daily Mortality in Six U.S. Cities. Environmental Health Perspectives 108(10): 941–947.
[17]. Li,J., Schwartz,J. and Xu,X.,1998. Health benefits of air pollution control in Shenyang, China, Research report, School of Public Health, Harvard University.
[18]. Nishioka, Y., Levy, J. , et al., 2003. A Risk-Baed Approach to Human Health Impact Assessment for Input-Output Analysis (Boston, MA: Harvard School of Public Health).
[19]. Pandey, K.D. , Bolt, K., Deichmann, U. , Hamilton, K., Ostro B., and Wheeler, D., 2003 (forthcoming). The Human Cost of Air Pollution: New Estimates for Developing Countries. Washington DC: World Bank.
[20]. Pope, D., Thun, M., Namboodiri, M. , Dockery, D., Evans, J., F. Speizer, F., and Heath., C., 1995. Particulate Air Pollution as a Predictor of Mortality in a Prospective Study of U.S. Adults. American Journal of Respiratory Critical Care Medicine 151(3): 669–674.
[21]. Pope III, C.A., 2000a. Epidemiology of fine particulate air pollution and human health: biologic mechanisms and who's at risk? Environmental Health Perspectives 108 (Supplement 4), 713–723.
[22]. Pope III, C.A., 2000b. Invited commentary: particulate mattermortality exposure-response relations and threshold. American Journal of Epidemiology 152 (5), 407–412.
[23]. Pope III, C.A., Burnett, R.T., Thun, M.J., Calle, E.E., Krewski, D., Ito, K., Thurston, G.D., 2002. Lung cancer, cardiopulmonary mortality, and long-term exposure to fine particulate air pollution. Journal of American Medical Association 287 (9), 1132–1141.
[24]. Samet, J.M., Zeger, S.L., Dominici, F., Curriero, F., Coursac, I., Dockery, D.W., Schwartz, J., Zanobetti, A., 2000. The National Morbidity, Mortality and Air Pollution Study Part II: Morbidity and Mortality From Air Pollution in the United States. Health Effects Institute, Cambridge, MA.
[25]. Samoli, E., et al., 2003. Investigating the dose-response relation between air pollution and total mortality in the APHEA-2 multicity project. Occupational and Environmental Medicine 60 (12), 977–982.
[26]. Schlesinger,R.B., Kunzli, N.,Hidy,G.M.,Gotschi,T. and Jerrett,M., 2006. The health relevance of ambient particulate matter characteristics: coherence of toxicological and epidemiological inferences.Inhal.Toxicol.18:95-125.
[27]. Schwela,D.H.,1996. Exposure to environmental chemicals relevents for respiratory hypersensitivity : global aspects. Toxicology letters 86:131-142.
[28]. Schwela,D.H.,2000. Air pollution and health in urban areas, Reviews on Environmental Health 15:13-42.
[29]. Spix, C., et al. 1998. Short-term effects of air pollution on hospital admissions of respiratory diseases in Europe: a quantitative summary of APHEA study results. Archives of Environmental Health 53 (1), 54–64.
[30]. World Bank,1997. China's Environment in the New Century: Clear water, Blue Skies, The world bank, Washington, DC.
[31]. World Bank, 2001. China: Air,Land and Water, Environmental Priorities for a new Millennium, The World Bank, Washington,DC.
[32]. WHO, 2000a. Guidelines for Air Quality, WHO/SDE/OEH/00.02.World health organization, Geneva, Switzerland, Internet address:http://www.who.int/peh/air/Airquality.htm..
[33]. WHO, 2000b. Guidelines for Air quality http://www.who.int/peh/air/Airqualitygd.htm, World health organization, Geneva.
[34]. World Health Organization Regional Office for Europe. Air Quality guidelines for Europe. 2nd Ed. Copenhagen: World Health Organization Regional office for Europe,2000. (WHO Regional Publications, European Series,91).
[35]. Woodruff, T. J., J. Caldwell, et al., 2000. Estimating Cancer Risk from Outdoor Concentrations of Hazardous Air Pollutants in 1990', Environmental Research 82: 194-206.