

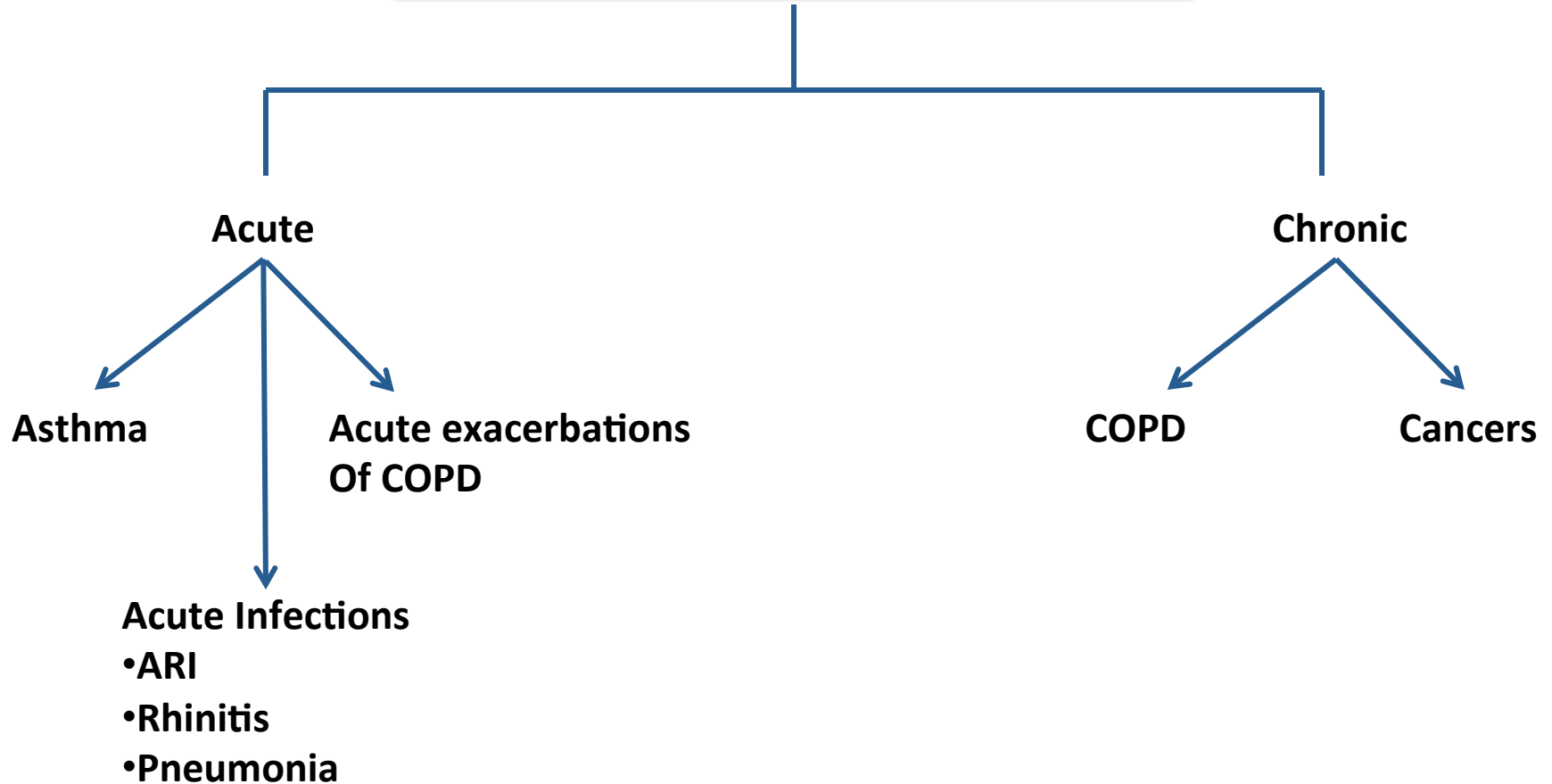
HEALTH IMPACTS OF AIR POLLUTION: STUDIES FROM INDIA

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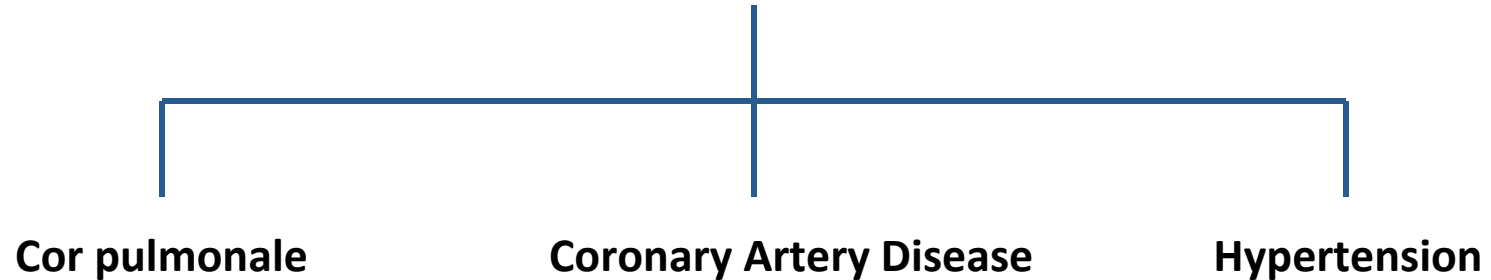
Health Impacts of Air Pollution

- Acute and Chronic
- Systems affected:
 - Respiratory System
 - Cardiovascular system
 - Nervous System
- Health out come depends on type of pollutants, duration of exposure, susceptibility and genetic make up, non environmental factors like immunity, nutrition status etc.

Respiratory system



Cardiovascular system



Nervous system

- Allergic conjunctivitis
- Cataract
- Neurotoxic manifestations

Air pollution

- **Vehicular pollution**
- **Domestic Indoor air pollution: biomass fuel and inadequate ventilation**
- **Industrial pollution**
- **Others: burning of solid waste, polythene, unregulated fire etc.**

The research questions

- **Burden of diseases in the country:** Morbidity, mortality, DALY
- **Contribution of air pollution:** Attributable risk and population attributable risk
- **Identification of high pollution zones/pockets**
- **Forecasting of disease burden**
- **Mitigation measures**

Significant research studies in India

Year	Authors	Location	Study design	Findings
1989	Bladen WA	Mumbai	Time series	Air pollution (PM, So ₂ , CO, HC) and ARI
1977-79	Kamat	Mumbai	Cross section	Low, Med., High poll levels with LFT & resp. symptoms
1979-99	Parmesh	Bangalore	Cross section	Pollution and asthma
1988-98	Chhabra et al	Delhi	Cross section	Pollution, SE status, LFT
1991-94	Cropper et al	Delhi	Time series	5-64 yrs mortality with TSP
1991	Kumar et al	Hyderabad	Cross section	SPM, SO ₂ , NO _x with LFT

Significant research studies in India

Year	Authors	Location	Study design	Findings
1992-93	Deb et al	Tripura	Ecologic	Air pollution and ARI: Urban vs rural under 5 children
1995-97	Gupta et al	Chandigarh	Case control	Urban residence no risk for lung cancer
1997-99	Lahiri et al	Kolkata, Burdwan, 24 Parganas	Cross section	Ambient air pollution and children's (6-17 yrs) LFT
1997-98	Pande et al	New Delhi	Longitudinal	High pollution days with ER visits for resp illnesses
1999-2001	Kumar et al	Mandi Gobindgarh, Morinda	Cross section	Air pollution, TSP with COPD, LFT

Significant research studies in India

Year	Authors	Location	Study design	Findings
2000	Gupta et al	Delhi & Yamuna Nagar	Cross section	Air pollution & dry eye
2000	Agarwal et al	Delhi	Cross section	Haze and Vit. D level among children
2000-03	Agarwal et al	Delhi	Ecologic	SPM & RSPM with COPD
2002-03	Sharma et al	Kanpur	Panel	Per 100mg/m ³ resulting in mean reduction of PEF by 3.2L/min
2003	Anjaneyulu et al	Hyderabad	Cross section	PM & Resp diseases
2003	Joseph et al	Mumbai	Cross section	PM ₁₀ and health
2003-04	Ingle et al	Jalgaon	Cross section	PM ₁₀ , SO _x , NO _x with LFT in policemen

Significant research studies in India

Year	Authors	Location	Study design	Findings
2005 (P)	Ghose et al	Kolkata	Cross section	Ambient air quality and respiratory diseases
2007	Nidhi et al	Delhi (1998-2004)	Cross section	Env. Pollution and resp. morbidity risk assessment
2008 (P)	Uzma et al	Hyderabad	Case control	Petrol filling workers and controls' blood picture and LFT

(P) Year of publication

Salient features of Indian studies

- All studies support strong causal association between air pollutants and adverse health outcome
- Most studies are confined to large metropolitan cities
- Heterogeneity of methods, materials and assessment tools
- Clinical findings are not corroborated by measurements and vice versa
- Developed country model are not appropriate to study impact in developing country (Maureen Cropper)

Significant research studies in India: Indoor Air Pollution

Year of publication	Authors	Location	Study design	Findings
2011 (P)	Sreeramareddy et al	National (2005-06) Demographic health survey	Ecological (MLR, SLR, adjusted OR)	High BMF use and low birth weight (n=47139 births) BW in 41% only.
2010 (P)	Dutta et al	Kolkata (n=244,236 women)	Cross sectional	BMF use, PM ₁₀ , PM _{2.5} with hypertension, oxLDL, antiCL antibody in premenopausal women
2010 (P)	Mondal et al	Kolkata	Cross sectional	Enzyme (Akt) activity with BMF
2010 (P)	Guddattu et al	National (2005-06)	Cross sectional	High PAR (18%) of BMF for Asthma in 15-49 women as per NFHS 3

(P) year of publication

Significant research studies in India: Indoor Air Pollution

Year	Authors	Location	Study design	Findings
2009	Tielsch et al	Tamil Nadu (1998-2000)	Cross sectional 11728 newborn	BMF increases risk by 49% LBW, 34% resp. illness, 21% infant mortality
2009 (P)	Salvi et al	Global	Cross sectional	BMF more significant risk factor for COPD than ETS (3 billion vs 1.01 billion)
2001-03	Kolappan et al	Tiruvallur	Nested Case Control study 255 cases, 1275 control	BMF & TB Adjusted OR: 1.7 (2.0-2.9)
2009 (P)	Padhy et al	W Bengal	Cross sectional 8-13 yr children:	BMF and Chronic resp. illness & Oxidative stress, asthma (OR 2.1), LFT, low RBC, high WBC
2005 (P)	Saha et al	Village in western India	Cross sectional (165 M, 204 Female)	BMF reduces significantly values of all LFTs

(P) Year of publication

Significant research studies in India: Indoor Air Pollution

Year	Authors	Location	Study design	Findings
2004	Musthapa et al	Lucknow	Cross sectional (179 females)	Chromosomal aberration and micronucleus due to cow dung >wood> kerosene>LPG
2003	Mishra	National (NFHS 1998-99)	Cross sectional (38595 elderly person)	BMF as risk factors for Asthma prevalence (aOR: 1.59; 1.3-1.9)
1997	Mishra	National (NFHS 1992-93)	Cross sectional (33875 children)	BMF increases ARI risk in children (20% to 40%)

Health Effects of Indoor Air Pollution

- COPD
- Asthma
- Acute Respiratory Infections
- Tuberculosis
- Birth outcome
- Ophthalmic afflictions
- Oxidative stress
- Cardiovascular diseases

Overall impressions

- Most of the studies are cross sectional in nature, thereby limited in scope to establish casual pathway or the mechanism of action
- Publication bias limits access to wider research
- Very little work on Gene-environment interaction

Overall impressions

- Majority of the health outcome are multi-factorial; simultaneously influenced by other factors, the most important being ETS, immunity status but in most of the published research, all known factors are not included in analysis
- All studies are not reporting adjusted results and taking care of eliminating biases
- Study periods not mentioned

Overall impressions

- Quality of health data is questionable: all hospitals do not record as per ICD classification
- Cases treated on OPD basis are not considered
- Genetic factors and non environment risk factors are not taken into consideration
- True exposure to air pollutants are measured through proxy

Future directions of research

- Base line data
- Triangulation of data
- Convergence
- Participatory research
- Disease Surveillance and environmental monitoring
- Setting up of cohorts with long term goals
- Micro and macro environment studies

Future directions of research

- Base line data: About incidence and prevalence of diseases
- Should be available for small geographical areas
- For same area, up to date and accurate real time data on air pollution levels as well as climate parameters
- Data on exposure assessment

Future directions of research

- Focus on micro-environmental studies with respect to indoor air pollution and its health effects
- More research in gene-environment interaction
- Setting up of disease surveillance units in various physical, biological and social set ups and availability of weather and pollution data from same areas

THANK YOU