Countering effects on Air Pollution—Impact on Children’s Respiratory Health: Community Action

Charlottetown, Canada 16th - 17th October 2016

Rtn. Dr. H Paramesh
MD, FAAP (USA), FIAP, FIAMS, FIAA, FICAAI

• Pediatric Pulmonologist, Environmentalist
• Chairman: Lakeside Center for Health Promotions
  Lakeside Education Trust
• Advisor Rajiv Gandhi Institute of Public Health and Center for Disease Control RGUHS
• Member Alliance Health Promotion, Geneva
• Member International Consensus on Pediatric Asthma (ICON) study
• Member Board of Director for Commonwealth Association for Health and Disability (COMHAD)
• drhparamesh@gmail.com
Our Bengaluru – Environmental Profile

• 920m above sea level. Fastest growing city in the world (Forbes – 2010)

• Daily temperature – Max: 28.9°C Min: 18.9°C (07)

• Average Rainfall – 80.8cm per year

• Growth of Bangalore: 69km² – 1949 741km² – 2007 800 km² – 2011

• We add 20km of built up area per year and lose 20% of green area per year

• Was named as air conditioned city, garden city, pensioners’ paradise

What is now?

• Sneezing city, wheezing city and pensioners nightmare city

HP
Bengaluru Urban Agglomeration Zone (BUAZ)

- **Population:**
  - 0.1m (1880)
  - 1.6m (1971)
  - 2.92m (1981)
  - 8.9m (2011)

- **Vehicles:**
  - 3.7m (2011)
  - 5.88m (2015)
  - 70% are 2-wheelers (2011)
  - Registration 600 vehicles/day (2010)
  - Now 1600 new vehicles/day (2016)

- **Fuel Consumption:**
  - 3-3 ½ fold increase in consumption of automobile fuel

- **Slow traffic emit (10 km/hr) 5 ½ times more CO.**

- **Congestion costs` 3000-4000 Cr/yr.**
  - Apart from Health cost

*Source: IOCL - 2008,; Dept of Transport, GoK, 2011*
ENVIROMENTAL IMPACTS ON HEALTH

WHAT IS THE BIG PICTURE?

FACT:
23%

of all global deaths are linked to the environment.

That's roughly 12.6 million deaths a year.

WHERE IS IT HAPPENING?

- 3.8 million
  in South-East Asia Region
- 3.5 million
  in Western Pacific Region
- 2.2 million
  in European Region
- 1.4 million
  in Eastern Mediterranean Region
- 854,000
  in Western Pacific Region
- 827,000
  in the Region of the Americas

World Health Organization
@healthenvironment
CLIMATE CHANGE EXAGGERATE ALL THE RISKS OF ENVIRONMENTAL POLLUTION

- Climate Change
  - Temperature Rise
  - Sea Level Rise
  - Hydrologic Extremes

Extreme Weather-Related Health Effects
- Air Pollution
  - > Heat stress, cardiovascular failure, injuries, fatalities
- Allergies
  - > Respiratory allergies
- Vector-Borne Disease
  - > Malaria, dengue, chikungunya
- Water-Borne Disease
  - > Cholera, leptospirosis

Psychosocial Impacts on Displaced Populations
- Health Impacts from Conflicts
  - > Anxiety, post-traumatic stress, Depression, despair
  - > Forced migration, civil conflicts

Info graphics: Chaitanya Chandan; Data sources; National Physical Laboratory, New Delhi; Protecting Human Health from Climate Change’ (August 2009), WHO/SEARO; ‘Climate Change Impacts on Human Health in India (Keysheet 9), Ministry of Environment and forest and Climate Change
Our Environment (Climate) Our Health

- Climate change will be the defining issue for health system in the 21st century.
- Adaptation to climate change is essential in primary prevention of health issues.
- Climate change will widen the health equity gap within and between countries.
- Asthma a global health epidemic > 1 billion affected. Anticipate to 4 billion in 2050.
- Outdoor air pollution - 3.7M - deaths.
- Indoor air pollution - 4.3M - deaths.
- 5.3 Trillion (US dollar) annual subsidies are given for fossil fuel industry, which is more than the total health budget of the world.
Climate Change / Asthma

↑ CO2

Prolonged flowering season by global warming stress on Plants

↑ Allergic pollen and season

New Plants Ambrosia

New Allergies

Prolonged Symptoms

Stress on plants ↑ potent allergen

Diesel particle coated pollen 50 times more potent

Stronger symptoms
**CO2 emissions then and now**

The global warming theory predicts that increased amounts of carbon dioxide (CO2) in the atmosphere enhance the greenhouse effect and thus contribute to global warming.

A look at natural and man-made CO2 emitted into the atmosphere:

### Pre-industrial time

- Decomposition
- Volcanic eruptions
- Respiration
  - Animal, people, vegetation breathe in oxygen and breathe out CO2
- Burning/forest fire

### Today

In addition to natural CO2 sources, modern society has increased CO2 emissions into the atmosphere:

- **Deforestation**: More CO2 escape to atmosphere instead of being converted into oxygen through plants' photosynthesis
- **Burning of fossil fuels**: Coal, petroleum (industrial)
- **Exhaust fumes**
- **Intense animal agriculture**

**Global atmospheric CO2 concentration**

Dramatic change coincides with the start of the industrial revolution (mid 1800s), when burning of large quantities of fossil fuels became a prominent feature in global climate.

- Data derived from ice cores
- Present day measurements

Source: Understanding Climate and Environment, Mauna Loa Observatory. Carbon Dioxide Information Analysis Center. Earth System Research Laboratory

Graphic: Elizabeth Albinson, Morten Lynge

© 2007 MCT
The spread of hay fever and allergic asthma according to socio-economic status and westernization level.

(Reproduced with permission from Annals of Allergy, Asthma & Immunology, Vol. 89(51). Matricardi PM, Bouygue GR, Tripodi S. Inner-city asthma and the hygiene hypothesis, 69-74. Copyright Elsevier 2002.)
ESTIMATED MORBIDITY FOR NON COMMUNICABLE DISEASES BURDEN IN INDIA

National Commission of Macroeconomics and Health GOI-2005
ESTIMATED MORTALITY FOR NON COMMUNICABLE DISEASES BURDEN IN INDIA

<table>
<thead>
<tr>
<th>Disease</th>
<th>Number in lacs</th>
</tr>
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<tbody>
<tr>
<td>Cancer</td>
<td>2.92</td>
</tr>
<tr>
<td>IHD</td>
<td>1.20</td>
</tr>
<tr>
<td>Stroke</td>
<td>1.02</td>
</tr>
<tr>
<td>Diabetes</td>
<td>0.21</td>
</tr>
<tr>
<td>Chronic Resp diseases</td>
<td>5.77</td>
</tr>
<tr>
<td>Injuries</td>
<td>7.49</td>
</tr>
</tbody>
</table>

*(Nongkynrih B et al, JAPI 2004 Feb; 52: 118-123) WHO, 2002 data*
Trends of Asthma Prevalence in Bengaluru

HP

Persistent Asthma

Asthma

Persistent severe asthma

Series 1

Series 2

Series 3

National Progress depends on Education and Health

Community Oriented Programme

To impact policy makers

Legal Activism

H. Paramesh
Challenges to be addressed in Asthma

- Avoids to hear the word asthma as diagnosis, more so in girl child
- No one in our family have asthma. Why our child has asthma?
- Contagious
- Worry about long term use of medicines
- Worry about steroids
- Growth of Children
- Inhalation therapy as a last resort
- Adolescent girls avoid inhalers
- Impinge on their freedom
- Embarrassing to take medicine in front of others
- Affordability, Accessibility, Availability, Acceptability
- Single dosage drugs
- Less adverse reaction
- Use Drug covered by insurance

H. Parameswaraiah
Community education and impact

- Press
- Social media
- Radio
- TV
- School talks
- Text books for physicians
- Working with service organisations - Rotary, Federation of senior citizens etc.
- CME programme 34 years
Children of heavy traffic school areas suffer more from asthma and it further increases in low socioeconomic children.

**Bar Chart**

- **Schools in low traffic regions**
  - No. 2565 (11.15%)

- **Schools in heavy traffic regions**
  - No. 3722 (19.34%)

- **Schools in heavy traffic with low socio economic status**
  - No. 273 (31.14%)

**P-Value**

$P \text{ Value I, II & III} < 0.001.$

Measures taken

- Decreased usage of private vehicles to drop children at school
- Car pooling
- Public transport
- Increased one way traffic to reduce congestion
- One way traffic reduce Air pollution by 28%
E.R visits for Wheezing During Diwali (Light) Festival increased by 100%

Mean Changes in So₂ Levels (ppm)

<table>
<thead>
<tr>
<th></th>
<th>Before Diwali</th>
<th>During Diwali</th>
<th>After Diwali</th>
</tr>
</thead>
<tbody>
<tr>
<td>P Value</td>
<td>0.064</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

H Paramesh 5th Intnl confi env & health 2010

Ambient SO2 levels reached values **200 times** above the safety limits recommended by WHO
Measures taken

• Education of the society and school children to decrease the usage of Fire Crackers

• Regular Usage of inhalers before bursting crackers

• There is decreased sale of fire crackers

• There is decreased emergency room visits
Impact of Education on Asthma

Hospital admission of Acute severe asthma

- 1995-1997: 24.05
- 1997-2000: 12.34

E.R. visits of asthma

- July 00 – June 01: 3147, 672 (21.35%)
- July 01 – June 02: 2996, 476 (15.83%)
- July 02 – June 03: 3984, 475 (11.92%)

Paramesh.H., Cherian.E., Principles and Practice of Tropical Allergy and Asthma
Ed Wiqar A Shaikh - 2006
Lead Poisoning

- Ingested, inhaled or absorbed through skin

**Source:**
- 86% of atmospheric lead – auto exhaust, leaded petrol, water pipes, paint, battery storage, crystal glass, ceramic glaze, enamel jewelry, etc.
- Lead concentration in dust is directly proportional to the volume of traffic
- Children absorb 50% and adults 10-20% of ingested lead.
- Lead in tissue, cord blood correlate with air levels.

**Effect:**
- GIT, peripheral nerve, central nervous system, decreased IQ, convulsions, coma, death
- Saudi Arabia study – 5000 children – 1989 – using 0.8 G/L of lead in petrol showed no alarming lead poisoning.
- Bangalore study – 863 children – using 0.59 G/L of lead in petrol showed – 4.6% of increased lead level over 10µg/dl*.

**Trend:**
- Use of unleaded petrol will reduce lead pollution. No cause for fear psychosis, however there should not be any complacence in preventive measures.

**AVOID MEDIAGENIC DISEASE**

Measures to limit the lead poisoning Ganesha Festival Lead Poisoning

• Banned leaded petrol

• Increased usage of clay idols than painted one

• Increased use of assigned places by municipal authorities for immersion of idols

• Increased usage of immersion at home in the bucket and use the same for garden
Increase greenery

- Giving free saplings of plants with tree guard and having the child’s name over it is a very successful programme during World Environmental Day celebrations.
Air pollution/ Spinal Health/ School bags

- Decrease Wt. of school bags should not be more than 10% of body wt.
- It is recommended to all the school authorities and education departments
- Encouraged School sports in children with asthma controller medications by using controller medicines to prevent episodes
- Many schools use regularly yoga classes and teach breathing exercises.
• **Global**
  - 2.9 billion people (42%) were affected in 2012.
  - 4.3 million death per year.
  - 58% are women and children.

• **Indian**
  - 1.15 million premature deaths per year.
  - 85% of Indian population are mainly women and children (1990).
  - Chulhas used in solid cooking fuel, release smoke equivalent to 400 cigarettes per hour.

*Source: A Down to earth Body Burden – 2015, 94 - 106*
<table>
<thead>
<tr>
<th>Allergen</th>
<th>Source</th>
<th>Prevalence Percentage</th>
<th>Recommendations</th>
</tr>
</thead>
</table>
| HDM Dermatophagoides pteronyssinus, D. farinae /Blomica Tropicalis | Bed, blankets, pillows, stuffed toys, Carpets, draperies, upholstered furniture | 60%                   | • Washing bedding linen in water more than 130°F (55°C)  
                    |                                                                        |                       | • Expose the bedding linen to sunlight once a week       |
| Cockroach           | Kitchen stores, drains, garbage areas, ill maintained houses           | 25%                   |                                          |
| Fungus              | Wet, humid, ill ventilated houses, basement, attics, shower curtain, leakages, indoor plants, carpets, furniture | 7.5%                  |                                          |
| Pollen              | • Tree pollen Jan-Apr  
                    |                       | • Grass pollen July-Nov  
                    |                       | • Weed pollen Nov-Jan | 7.5%                |
| Pets Cats and Dogs  | Cat is more allergenic than dog. Pets are vector for pollens/molds    | 5%                    | Pets especially dogs are not the cause for increase prevalence of asthma |
Cooking Fuel V/s Prevalence of Asthma in Children

- **Dung Cakes**: 48.8% (P < 0.001)
- **Agri Waste**: 47.8% (P < 0.001)
- **Firewood**: 46.6% (P < 0.001)
- **Kerosine**: 8.3% (P = 0.043)
- **Gas**: 2.6% (P = 0.001)
- **Electricity**: 1.2% (P = 0.001)

*Paramesh H. IAP Text Book of Pediatrics 2016.*
Cooking fuel

• Better usage of Chulhas

• Encourage the use of commercial cooking fuel in urban area

• Encourage gobar gas (biomass gas) usage in villages

• Usage of solar heating to decrease CO2

• Govt. subsidy
Tobacco Smoking Habit

- 41% of urban children – 10-17 yrs (3078)
- 21.8% of rural children – 10-17 yrs (2194)
- 36.0% of urban club going women
- 2.0% of rural farm worker women
- 30.6% of traffic police
- 34.0% of non traffic police
- 14.0% of Poultry farm workers
- 28.0% of Agriculture farm workers

W.H.O will never be on speaking terms with tobacco industry

Margaret Chan - 2013
Cigarrette Smoking Parents V/s Asthma Prevelence in Children

- Smoking: 22.8% (P 0.018)
- Non Smoking: 8.0% (P 0.004)

<table>
<thead>
<tr>
<th>Reason</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peer Pressure</td>
<td>29%</td>
</tr>
<tr>
<td>Curiosity</td>
<td>18%</td>
</tr>
<tr>
<td>Pleasure/Fashion</td>
<td>16%</td>
</tr>
<tr>
<td>Frustration</td>
<td>12%</td>
</tr>
<tr>
<td>Status Symbol</td>
<td>10%</td>
</tr>
<tr>
<td>Relieve tension</td>
<td>08%</td>
</tr>
<tr>
<td>Concentration</td>
<td>05%</td>
</tr>
<tr>
<td>Other reasons</td>
<td>02%</td>
</tr>
</tbody>
</table>

*H Paramesh. Pulmonary clinics of India, Academy of Respiratory Medicine-June 2014 Pg. 217-227*
Tobacco smoke

- Tobacco ban of public sale near schools.
- Awareness programmes in schools, parents education about the ill effect of tobacco smoke.
- There is 38% reduction in usage of tobacco in children and youth 2007-2015.*
- There is 7% increase girl smokers, office goers. Between 2007-2014.*
- There is continued efforts in education.

*Study from Lakeside Education Trust in progress
Ventilation & Asthma

WELL Ventilated: 8% (P=<0.001)

ILL Ventilated: 22% (P=<0.001)

Paramesh H Cherian E 5th International Conference on Environment and Childrens health 2010, IAP Text Book of Pediatrics 2016
Point Prevalence of respiratory infection/indoor air pollution
A Rural Study

No. Of houses 612, children <5 years 301

Children living in single room are 10.5 times more likely to develop respiratory infection when compared to children living in double rooms. P<0.001**

Vaastu. What is it?

- The science of structure and a design of Indian Environment
- Based on Vedic mathematics
- It is like Holistic medicine
- **Good cross ventilation**
  - Avoid Indoor Pollution “Sick building syndrome”
  - Avoid bad odor flies and related diseases
- **Good Sunlight**
  - To Kill germs
  - To Kill dust mites
- **Greenery**
  - Soothing effect Gives $O_2$
  - Absorbs formaldehyde

Hospital Ventilation and Infection Risks.

- Good Ventilated ward should have 6 air changes/hr.
- When windows are closed, it is only 1.5 air change/hr
- Risk of infection is 4 times higher

Carl Gilkeson, Cath Noakes, Laura Pickin
AalaTimes.com
http://www.aalatimes.com/2013. April 21st
Millennium Goal in ARI Control Programme

Sustainable Development 2016-2030
- Focus on environmental risk factors

Hib + Pneumococcal vaccine

Control of Risk factors – 47% ↓ in mortality

ARI control Programme of WHO/UNICEF/IAP
Early Diagnosis/ use of antibiotics/ Follow up

Vaccines to control measles, whooping cough communicable disease
- Admit
- Humidified O₂
- Antibiotic for suspected germs

H Paramesh
Traffic Police Suffer More from Air Pollution than Non-Traffic Police

H. Paramesh, Pulmonary Clinics of India, Academy of Respiratory Medicine - June 2014 Pg. 217-227
Preventive Measures taken

- Discussed in the parliament and recommended-1999
  - Use of traffic police masks - shift in duties (policy changes)
  - Rotation of jobs
  - Regular lung function and advice
Air pollution and Industry Karnataka state
(Chairman TAC Karnataka State Pollution Control Board 2001-05)

• Convincing the industrialists responsibility on health of their employees and the neighbourhood villages which are affected depending on the windrose data of that industry.

• Requested them to spend 1% of their profit for the health, education and social cause.

• Instituted pulmonary function testing, pulse oximetry and compulsory hearing test as an annual checking of the staff and public.
Supreme court of India appointed Bhurelal committee to tackle Air pollution menace (utilized our data from World Bank Project/Govt. of Karnataka-2003 and commission of Macro Economics and Health, Govt. of India-2005)

• To clean up Mega cities in time bound fashion from Air pollution

• To maintain good school environment

• Clean emission certificates to all vehicles

• Banning old vehicle on the road
Reaction Oxygen Species (ROS) effect on the airways

Air Pollution/Respiratory Allergies/Nutritional Environment

Antioxidants

- Fruits
- Vegetables
- Butter
- Curds
- Fish
- Pickles (limited)
- Oils rich in Omega – 3 fatty acids (Fish Oil)
- Wine (limited)
- Encourage traditional food habits
Economic burden of diseases for the policy makers

Global economics on Health*

• 97% is for care
  $7,452 billion (2013)

• 03% is for prevention
  $272 billion (2013)

India spends over 52% of total budget on care of persistent asthma and antihistamines**

• ₹140 billions for asthma
• ₹1 billion for antihistamines

* WHO data
** ADEX module

H. Paramesh
ECONOMIC BURDEN OF ASTHMA IN INDIA

(NCMH Background Papers, 2005)
POSITION PAPER

International consensus on (ICON) pediatric asthma

Airway Diseases Education and Expertise (ADEX) in Pediatrics: Adaptation for Clinical Practice in India

H Paramesh, K Nagaraju, TSukumaran, Sharad Agarkhedkar, Santanu Bhakta, Raj Tilak, Vijayasekaran D, Varsha Narayan, Amey Mane, Abhay Phansalkar and Ganesh Kadhe

From ADEX working group, Indian Academy of Pediatrics Allergy and Applied Immunology Chapter, Indian Academy of Pediatrics, India.

Correspondence to: Dr H Paramesh, Sirona Center for Health Promotion, Bengaluru 560094, Karnataka, India.
dr_paramesh1@yahoo.com

Justification: Asthma and allergic rhinitis together are part of the concept of ‘one airway, one disease’ or ‘united airway disease’. The management of allergic airway diseases should address this united concept and manage the issue by educating the patients and their parents and health care providers, along with environmental control measures, pharmacotherapy and immunotherapy. Here, we present recommendations from the module of ‘Airway Diseases Education and Expertise’ (ADEX) that focused on allergic rhinitis, asthma and sleep disorder breathing as a single entity or Allergic Airway Disease.

Process: A working committee was formed by the collaboration of Pediatric Allergy Association of India (PAAI) and Indian Academy of Pediatrics (IAP) Allergy and Applied Immunology chapter to develop a training module on united airway disease.

Objectives: To increase awareness, understanding and acceptance of the concept of “United Airway disease” and to educate the primary health care providers for children and public health officials, in the management of united airway diseases.

Recommendations: Recommendations for diagnosis, management and follow-up of Allergic airway disease are presented in this document. A better compliance by linking education of child, parent, grandparents and other health care providers, and scientific progress by collaboration between practitioners, academicians, researchers and pharmaceutical companies is suggested.

Keywords: Allergic rhinitis, Asthma, Education, Guidelines, Management
Legal Activism
(Based on our data from our studies)

- Appointment of Retired Supreme Court Judge Bhurelal Committee to reduce the air pollution in major cities and focus on school environment

- Banning tobacco smoke in Public places in our state before Supreme court judgement

- Urban slums suffer more than rural population which acted as catalyst in urban slum clearance board for better facilities for the slum dwellers

H.Paramesh
Hit the Root & Trunk, branches will fall automatically.
WE CAN IMPROVE OUR ENVIRONMENT TO IMPROVE OUR HEALTH

1. Apply low carbon strategies in energy generation, housing and the industry.
2. Use more active and public transportation.
3. Introduce clean fuels for cooking, heating and lighting and clean technologies.
4. Reduce occupational exposures and improve working conditions.
5. Increase access to safe water and adequate sanitation and promote hand washing.
6. Change consumption patterns to lower the use of harmful chemicals, minimize waste production and save energy.
7. Implement interventions that can increase sun protective behaviour.
8. Pass smoking bans to reduce exposure to second-hand tobacco smoke.
9. Always use a health in all policies approach to create healthier environments and prevent disease.

These WIN-WIN strategies are fundamental to achieving the Sustainable Development Goals.

World Health Organization
#EnvironmentalHealth

Let’s all work towards a healthier environment for our health.
The main objective of science is not to open the door to infinite wisdom but to roll back the boundaries of infinite error.

* Bertold Brecht’s Life of Galileo

Nature has provided every one’s need not for his greed.

* Mahatma Gandhi
“A Healthy Breath will always bring Healthy life”
“Each one Teach one and plant one tree”

Thank You!