U.S.-IRAN SYMPOSIUM ON 
AIR POLLUTION IN 
MEGACITIES

Beckman Center of the National Academies of Sciences & Engineering 
Irvine, California

September 4, 2013
THANKS MESSAGE
to all organizers of this exchange program
AIR POLLUTION, CLIMATE CHANGE AND THE ORIGINS OF CHRONIC DISEASES FROM EARLY LIFE

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Global Database on Child Growth and Malnutrition

WHO Global Database on Child Growth and Malnutrition

Department of Nutrition for Health and Development

"We are guilty of many errors and many faults, but our worst crime is abandoning the children, neglecting the foundation of life. Many of the things we need can wait. The child cannot. Right now is the time his bones are being formed, his blood is being made and his senses are being developed. To him we cannot answer "Tomorrow". His name is "Today"."

Gabriela Mistral, 1948

UNICEF-WHO-The World Bank: Joint child malnutrition estimates - Levels and trends

Standard data-entry forms

Download forms
EXCEL (0-60 months)
xls, 26kb
PDF (0-60 months)
pdf, 30kb

Contact us
The world belongs into the hands of children!
Take Care
Clean Our Air
Clean air will mean their future
Closing Pediatrics to Geriatrics!
Total deaths around the world:
58 million
Total deaths around the world: 58 million

Deaths from non-communicable diseases around the world: 35 million
Total deaths around the world: 
58 million

Deaths from noncommunicable diseases around the world: 
35 million

Deaths from non-communicable diseases in developing countries: 
28 million
Total deaths around the world: 58 million
Deaths from NCDs around the world: 35 million
Deaths from NCDs in developing countries: 28 million
Deaths from NCDs in developing countries which could have been prevented: about 14 million
LEVELS OF PREVENTION

Whole population through public health policy

Whole population selected groups and healthy individuals

Selected individuals with high risk patients

Patients

PRIMORDIAL PREVENTION
establish or maintain conditions to minimise hazards to health

PRIMARY PREVENTION
prevent disease well before it develops
Reduce risk factors

SECONDARY PREVENTION
early detection of disease (e.g. Screening & Intervention for Pre diabetes)

e.g. primary care risk factor reduction for those at risk of chronic disease, falls, injury

TERTIARY PREVENTION
treat established disease to prevent deterioration

e.g. exercise advice as part of cardiac rehabilitation

Advocacy for social change to make physical activity easier

Primary care advice as part of routine consultation
Although it is well-documented that lifestyle change of populations has a crucial role in the rapid rise in non-communicable diseases (NCDs), but *per se* it cannot explain the rapid change in the pattern of diseases.
Genetic factors

Lifestyle factors

Environmental factors
The rise in the incidence in NCDs and their risk factors matches the rise in rapid urbanization, and in turn the rise in air pollution.
How Does PM become a problem for us?

TRANSITION METALS LIKE: CHROMIUM, IRON AND COPPER ACT ON CELLS TO RELEASE TOXIC OXYGEN SPECIES

POLYAROMATIC HYDROCARBONS: THEY CAN ADHERE TO DNA

Particle diameter

\[ 0.03 \, \mu m < \phi < 3 \, \mu m \quad 3 \, \mu m < \phi < 10 \, \mu m \quad \phi < 10 \, \mu m \]
Comparison of estimates of percent change in mortality risk associated with an increment of 10 μg/m³ in PM2.5 or 20 μg/m³ of PM10 or smoke for different time scales of exposure.

Brook R et al. Circulation 2010;121:2331-2378

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Figure 5. The materno/fetal cholesterol hypothesis. See text for detailed description of pathogenic events and diagnostic and therapeutical implications. Paintings: mother: Jan Vermeer, 1632–1675; child: Francisco de Goya, 1746–1828; adult with risk factors: Pierre Auguste Renoir, 1841–1919; announcement of an acute event; Rembrandt van Rijn, 1606–1669; sickness and death: Paul Delaroche, 1797–1885. Diagnostic approaches to assess risk are indicated by yellow arrows, preventive approaches by green arrows.
Lifecycle: the proposed causal links

- **Elderly Malnourished**
  - Reduced capacity to care for baby
  - Inadequate foetal nutrition

- **Woman Malnourished**
  - Pregnancy: Low Weight Gain
  - Inadequate food, health & care
  - Higher maternal mortality

- **Baby Low Birth Weight**
  - Higher mortality rate
  - Impaired mental development
  - Inadequate growth
  - Frequent infections
  - Inadequate food, health & care
  - Inadequate growth

- **Adolescent Stunted**
  - Inadequate food, health & care
  - Reduced mental capacity

- **Child Stunted**
  - Reduced mental capacity
  - Inadequate food, health & care

- **Epigenetic susceptibility to chronic diseases**

Adapted from James et al. SCN Millennium Rep. Food & Nutrition Bulletin, 2000, 21, 3S.
The adverse effects of early life exposure to air pollutants and climate change may predispose individuals to increased risk of NCDs in later years of life. Such health consequences may have transgenerational effects.
We conducted a series of studies in Isfahan, the second large and air-polluted city of Iran. We found that air pollutants, notably particulate matters, are independent determinants of risk factors for chronic non-communicable diseases, even in the pediatric age group.
Famous views of Isfahan city
But ....
Biological pathways linking PM exposure with diseases, the generalized intermediary pathways and the subsequent specific biological responses

Brook R et al. Circulation 2010;121:2331-2378

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Particulate Matter Air Pollution and Cardiovascular Disease: An Update to the Scientific Statement From the American Heart Association
Robert D. Brook, Sanjay Rajagopalan, C. Arden Pope III, Jeffrey R. Brook, Aruni Bhatnagar, Ana V. Diez-Roux, Fernando Holguin, Yuling Hong, Russell V. Luepker, Murray A. Mittleman, Annette Peters, David Siscovick, Sidney C. Smith, Jr, Laurie Whitsel and Joel D. Kaufman

Circulation. 2010;121:2331-2378; originally published online May 10, 2010;
doi: 10.1161/CIR.0b013e3181dbecel
Circulation is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
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Print ISSN: 0009-7322. Online ISSN: 1524-4539

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://circ.ahajournals.org/content/121/21/2331
Brook et al.\textsuperscript{254} have also demonstrated a novel relationship between a metric of long-term traffic exposure (NO2 level by residence) and the odds of having the diagnosis of diabetes mellitus among patients in 2 respiratory clinics in Ontario, Canada. In women only, the odds ratio of diabetes was 1.04 (95\% CI 1.00 to 1.08) for each increase of 1 parts per billion (ppb) of NO2. Across the interquartile range (4 ppb NO2), exposures were associated with nearly a 17\% increase in odds for diabetes mellitus.

The first biological support for this finding comes from a study in Iran that demonstrated that the previous 7-day-long exposure to PM10 was independently associated with worse metabolic insulin sensitivity among 374 children 10 to 18 years of age.\textsuperscript{255}

These findings suggest that the systemic proinflammatory and oxidative responses due to long-term PM air pollution exposure could potentially increase the risk for developing clinically important aspects of the metabolic syndrome, such as hypertension and diabetes mellitus. Further studies in this regard are warranted.
Lifestyle and environmental factors associated with inflammation, oxidative stress and insulin resistance in children

Roya Kelishadi a,*, Nourollah Mirghaffari b, Parinaz Poursafa b, Samuel S. Gidding c

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Received 22 March 2008; received in revised form 4 June 2008; accepted 20 June 2008
Available online 1 July 2008
Likewise, our studies described the independent association of air pollutants with surrogate markers of endothelial dysfunction, as well as with markers of inflammation, and a possible pro-coagulant state in children and adolescents.
The relationship of air pollution and surrogate markers of endothelial dysfunction in a population-based sample of children

Parinaz Poursafa, Roya Kelishadi, Ahmadreza Lahijanzadeh, Mohammadreza Modaresi, Shaghayegh Haghjouy Jovannour, Rohollah Assadi, Mohammad MEHDI Amin, Foroumarz Moattar, Abbasgholi Amini and Babak Sadeghian


Published: 18 February 2011

Abstract (provisional)

Background
This study aimed to assess the relationship of air pollution and plasma surrogate markers of endothelial dysfunction in the pediatric age group.

Methods
This cross-sectional study was conducted in 2009-2010 among 125 participants aged 10-18 years. They were randomly selected from different areas of Isfahan city, the second large and air-polluted city in Iran. The association of air pollutants’ levels with serum thrombomodulin (TM) and tissue factor (TF) was determined after adjustment for age, gender, anthropometric measures, dietary and physical activity habits.

Results
Secondhand smoking, air pollution and endothelial dysfunction in healthy children

synergistic effects of genetic polymorphism and air pollution on markers of endothelial dysfunction in adolescents

Hematological/carcinogenic effects of air pollutants

- Anemia (hemoglobin, red blood cells)
- White blood cells
- Platelets

We found an association between air pollutants and CYP1A1 gene expression level (with carcinogenic effects) in the newborns’ cord blood.
Lead
Cadmium
Arsenic

Breast milk and environmental factors

Goudarzi MA, Parsaei P, Nayebpour F, Rahimi E. Determination of mercury, cadmium and lead in human milk in Isfahan, Iran. Toxicol Ind Health 2012
Vitamin D acts as a hormone and its deficiency has many adverse effects on skeletal & non-skeletal system, e.g. blood pressure, glucose metabolism, obesity, multiple sclerosis etc.

WHY hypovitaminosis D is so prevalent in some sunny regions?
We documented inverse associations of air quality index with UVB at ground level and serum 25(OH) vitamin D levels in pregnant women and their newborns, as well as in preschool-aged children. All these associations were independent of lifestyle and demographic factors.

Moreover, the findings of our reviews and meta-analyses supported the effects of air pollutants on birth outcomes, e.g., prematurity and low birth weight, which in turn increase the risk of NCDs in later life.

**Air Pollution, Platelet Activation and Atherosclerosis**

Parinaz Poursafa and Roya Kelishadi

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**Abstract:** Atherosclerosis begins in early life. The role of platelets is well-documented from its early stages. A wealth of evidence associates atherosclerotic cardiovascular disease with inflammatory diseases. The role of environmental factors, including air pollution, remains overlooked. Some studies have documented the effect of air pollution on inflammatory and pro-thrombotic factors implicated in the progression of cardiovascular diseases. In particular, the increase of platelet count and platelet hyper-reactivity towards agonists are emerging as markers of hematologic and hemostatic changes in response to the exposure to air pollutants. The systemic pro-inflammatory and pro-thrombotic response to the inhalation of fine and ultrafine particulate matters is seemingly associated with platelet activation. This association may have a clinical significance, particularly in the presence of cardiometabolic risk factors, and may indicate the need for anti-platelet treatment. It is of particular relevance to further study the significance of platelet activation and anti-platelet therapies in preventive measures in children and adolescents at risk of accelerated atherosclerosis.

**Keywords:** Atherosclerosis, air pollution, platelet activation, inflammation, prevention.
Air pollution and non-respiratory health hazards for children

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Submitted: 12 June 2009
Accepted: 7 August 2009

Arch Med Sci 2010; 6, 4: 483-495
DOI: 10.5114/ams.2010.14458
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Abstract

Air pollution is a global health issue with serious public health implications, particularly for children. Usually respiratory effects of air pollutants are considered, but this review highlights the importance of non-respiratory health hazards. In addition to short-term effects, exposure to criteria air pollutants from early life might be associated with low birth weight, increase in oxidative stress and endothelial dysfunction, which in turn might have long-term effects on chronic non-communicable diseases. In view of the emerging epidemic of chronic disease in low- and middle-income countries, the vicious cycle of rapid urbanization and increasing levels of air pollution, public health and regulatory policies for air quality protection should be integrated into the main priorities of the primary health care system and into the educational curriculum of health professionals.

Key words: air pollution, children, health, prevention, chronic disease, public health.
CLIMATE CHANGE and health impacts on origins of NCDs
In our recent visit to DC museums
Heat-related health effects on origins of chronic diseases include increased rates of pregnancy complications, pre-eclampsia, eclampsia, low birth weight, renal effects, food insecurity, decreased quality of foods (notably grains), malnutrition, water scarcity, exposures to toxic chemicals, worsened poverty, population displacement etc.

Poursafa P, Kelishadi R. What health professionals should know about the health effects of air pollution and climate change on children and pregnant mothers. Iran J Nurs Midwifery Res. 2011;16(3):257-64
Global WARNING!

Globesity!
Climate Change/Air Pollution/Obesity

**Global warming: Causes and effects**

- Earth's temperature has risen about 1 degree Fahrenheit in the last century. The past 50 years of warming has been attributed to human activity.
- Burning fuels such as coal, natural gas and oil produces greenhouse gases in excessive amounts.
- Greenhouse gases are emissions that rise into the atmosphere and trap the sun's energy, keeping heat from escaping.
- The United States was responsible for 20 percent of the global greenhouse gases emitted in 1997.
- Most of the world's emissions are attributed to the United States' large-scale use of fuels in vehicles and factories.
- Some predictions for local changes include increasingly hot summers and intense thunderstorms.
- During the past 100 years, global sea levels have risen 4 to 8 inches.
- Damaging storms, droughts and related weather phenomena cause an increase in economic and health problems. Warmer weather provides breeding grounds for insects such as malaria-carrying mosquitoes.

**Effects of**
- Low birth weight
- Overconsumption
- .........?
Exposure to environmental chemicals with endocrine disrupting activities, notably in early life, may result in everlasting adverse health effects; these obesogen chemicals have disruptive transgenerational effects on fat homeostasis, lipid metabolism, and on programming the development of lifelong excess weight.

Chapter 15
The Effects of Climate Change and Air Pollution on Children and Mothers' Health
Roya Kelishadi and Parinaz Poursafa

Abstract
Air pollution and climate change have numerous health hazards for pregnant mothers and children. Therefore, environmental protection activities should be considered a health priority. The importance of environmental factors on maternal and child health care should be considered one of the main public health priorities for primordial/primary prevention of chronic diseases.
Collaboration of Child Growth & Development Research Center and Environment Research Center, Isfahan University of Medical Sciences
I. Increasing public awareness about indoor- and outdoor air pollution (media, pamphlets, face-to-face education,...)

II. Increasing the knowledge of health professionals about indoor- and outdoor air pollution (CME programs, seminars,...)
Certificate of appreciation

Thank you for your participation in

WORLD ENVIRONMENT DAY 2012

-the day to celebrate the people’s power to positively change our environment and the future.

Every action counts, and when multiplied by a global chorus, becomes exponential in its impact. With your contribution, we have succeeded in making WED 2012 the biggest event yet.

Welcome to the worldwide WED community!
IV. Series of educational books on ozone
(for families and schools)
V. Is there any treatment modality for harm reduction of the health effects of environmental factors?
ZIZYPHUS JUJUBA (JUJUBE FRUIT)
SUGGESTIONS

CLICK HERE TO MAKE A SUGGESTION
I.

Given that we documented all the aforementioned adverse health effects by chronic exposure to AQI of moderate levels and exposure to PM10, we suggest that the actual standards of harmful effects of air pollutants for children and adolescents are mostly relevant for *acute* effects (and not *chronic* ones), thus they need to be revised.
II. Given

✓ the emerging epidemic of NCDs
✓ their origins from early life, and
✓ the independent role of air pollutants in the development of NCDs and their risk factors,

planning effective environmental protection programs can be considered as the key for primordial/primary prevention of the global epidemic of most chronic diseases.
It is health that is real wealth and not pieces of gold and silver.

Mahatma Gandhi
A Clever Person Solves A Problem,
A Wise Person Avoids it [Albert Einstein]

So Let’s be Wise for Prevention of
Chronic Non-Communicable Diseases
from Early Life!
PARTNERSHIP

International and national organizations, academic staff, consumers, industry, NGOs and the media all play important roles for providing a healthy future for the next generation!