

THE ASSESSMENT OF RISK FACTORS ASSOCIATED WITH MICROBIAL CONTAMINANTS IN DRINKING WATER SOURCES AT THE OXBOW LAKE OF CITARUM RIVER BASIN, DARAULIN VILLAGE, BANDUNG REGENCY, WEST JAVA, INDONESIA

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Abstract:

Daraulin Village located in Nanjung Village, Margaasih Subdistrict, Bandung Regency is a residential area surrounded by an oxbow lake of Old Citarum watershed along 2,890 m apart from the Upstream of Citarum due to the normalization program. disposal of improperly treated domestic wastewater effluent to the oxbow lake of Old Citarum, resulting in increased of water pollution. Daraulin with total population of 3382 people (1017 families), as many as 78% of the population used groundwater from dug wells as raw water to be treated, while 22% of the population used refilled drinking water for drinking water. In this study, 133 samples of raw water and drinking water quality were analyzed by microbiological parameters (Total Coliform and Fecal Coliform) listed on Government Regulation No.82 of 2001 and Regulation of the Minister of Health 492 / Menkes / PER / IV / 2010 by Most Probable Number (MPN) methods according to the Standard methods For The Examination of Water and Wastewater. 74% of groundwater samples, and 100% samples of raw water to be treated as refilled drinking water do not qualify for drinking water, and 72% of processed water from groundwater and 85.71% refilled gallon water at the consumer level do not qualify for drinking water. Non-parametric correlation test performed to identify related factors of microbiological contaminants in drinking water sources, and there is a correlation between the distance of septic tank and physical condition of the shallow wells microbiological contaminants in groundwater, and based on the results of observations, refilled water quality at the consumer level is strongly influenced by the packaging process.

Keywords: *refilled drinking water, ground water, fecal coliform, septic tank, total coliform.*

INTRODUCTION

Daraulin village is a residential area located in Nanjung Village, Margaasih subdistrict, Bandung Regency (**Figure 1**) and surrounded by the Old Citarum oxbow lake along 2890 meters which is apart from the Citarum Hulu.



Figure 1 The location of Daraulin Village (Scale 1 : 900.000)
(Source: Google Earth Aerial Photographs, 2016 and Bandung District Portal, 2016)

In 2005, the sanitary conditions of the Daraulin Village was relatively poor (40% of the population in Daraulin Village still practice open defecation). This condition encourages Governmental Organization (NGO) Warga Peduli Lingkungan in collaboration with the Department of Spatial Planning and Housing (Agency for Spatial and General Settlement) West Java and ESP USAID to make improvement by implementing the establishment of sanitation systems by built a communal septic tank with main distribution pipe for 200 Families (1000 people), but the facility of domestic waste water treatment has several shortages, such as inadequate processing compartment capacity and too many waste water to be treated that causing insufficient treatment for the domestic waste, then the waste which isn't processed properly disposed immediately to Citarum Lama oxbow lake, thereby increasing the pollution that could affect residents's health in Daraulin Village.

Furthermore, in 2013, Daraulin Village received Water Treatment Plant (IPA Daraulin) which is a relief from the Centre for Housing Research and Development Minister of state for Public Works (Puslitbangkim PU) using Citarum Lama Oxbow Lake water as a source of raw water. The processed water of IPA Daraulin is processed into drinking water by one of the two Refilled Drinking Water depos (RDWD) there. Although it has been two RDWD with another RDWD using PDAM water as raw water, for economic reasons, 78% of the residents of Daraulin Village are still using ground water which has been treated to fullfill their drinking water needs, in addition to a small portion of the population (22%) using refilled drinking water.

Water is feasible to be processed as drinking water as long as its quality meets the applicable standards, as well as for drinking water. In Indonesia, the regulations regarding the quality of raw water and drinking water is Government Regulation No.82 of 2001 about Water Quality Management and Water Pollution Control, and the Regulation of Health Minister No. 492 / Menkes / PER / IV / 2010 about Drinking Water Quality Requirements with Total Coliform and Fecal Coliform as indicator microorganisms. The existence of indicators microorganisms showed

contamination by feces, and the presence potential of pathogenic microorganisms that can cause water-borne diseases, exemplified diarrhea which ranks fourth in terms of the number of patients in Daraulin Village.

As known, the diarrhea can be influenced by five key factors known as 5F (Feces, Flies, Foods, Fluids, Fingers) (Soemirat, 2011). From the five factors, focus of this study is Fluids factor which is drinking water consumed by residents in Daraulin Village. According to Puspawati et al. research (2012), the contamination in groundwater can be affected by septic tank distance to inadequate ground water sources, and according to Mangarey et al. research (2014), the construction of dug well may affect the groundwater microbial quality, so the treatment is needed before the water is consumed, either by heating due to the water cooking to boil can kill the bacteria (Derslice & Briscoe, 1993), nor by filtration units in households level households. Meanwhile, the quality of refilled drinking water can be influenced by the raw water used, depot condition, operator, and the handling of container buyers (Adriyani & Suprihatin, 2015).

Based on the description above, and knowing that the safe drinking water is very important to the population health, it is necessary to research that aims to determine the factors contributed to the contamination of drinking water in terms of microbiology. Afterwards, the factors related to microbial contaminants in the drinking water at Daraulin Village can be identified, to improve the quality of drinking water at Daraulin Village.

MATERIAL AND METHODS

This study was located at Daraulin Village (RW06 and RW 07), Nanjung Village, Margaasih Subdistrict, Bandung Regency in February 2016 until May 2016. Generally, this study observed the quality of water starts from the raw water, until the quality of dominant drinking water used by Daraulin Village's residents at the consumer level.

The information for this study were obtained through primary data, and secondary data. Primary data were obtained from questionnaire concerned about the fulfillment of water for daily life, fields observation regarding to the factors that may affect to the water quality, and the microbial parameters were measured to determine water quality at Daraulin Village. Microbial quality of drinking water were carried out by using laboratory procedure conducted at the Laboratory of Water Quality (Environmental Microbiology), Environmental Engineering, Bandung Institute of Technology. On the other hand, the secondary data to support this study including administrative data, demography data, topography data, climate data, rainfall data, and the condition of sanitary facilities obtained from head of 06 RW and head of 07 RW Daraulin Village, Margaasih community health centre and Daraulin community health centre.

Determination of the number of samples were calculated using Eq (1) (Isaac & Michael, 1995 in Sugiyono, 2015)

$$S = \frac{\lambda^2 \cdot N \cdot P \cdot Q}{d^2 \cdot (N-1) + \lambda^2 \cdot P \cdot Q} \quad (1)$$

S = The number of samples

λ^2 = chi square, this value depends on the degree of freedom, and error levels. The confidence level for this study was 90%, and the value of chi square for this study was 2,706

N = The number of population

Therefore, the number of samples obtained at the household level from 1017 families were 64 families. The quality of raw water, clean water, and drinking water were analysed from each samples. Then, based on the results of observations, there were two refilled drinking water depo (RDWD) in Daraulin Village. Furthermore, the quality of raw water, processed water, and drinking water at the consumer level were analysed from each RDWD. Total number of samples can be seen in **Table 1**

Table 1 Number of samples

Sources	Number of samples
Raw water of refilled drinking water depo (RDWD)	3
Processed water of refilled drinking water depo (RDWD)	2
Drinking water at the consumer level	64
Ground water	64
Total	133

Because of the uneven population distribution in Daraulin Village, so the sampling location determined by *stratified random sampling method* in accordance with the number of population in each neighborhood, distribution of sampling locations can be seen in **Figure 2**



Figure 2. Sampling Location

Water samples were taken using a sterile bottle. In this study, 100 ml sample bottles made of dark thick glass sterilized using an autoclave so it would be clean and free of contaminants. Samples were taken and preserved by the cold temperature ($<10^{\circ}\text{C}$) (Clesceri et al., 1999), and laboratory tests carried out up to 30 hours after sampling.

The analyses of total coliform and fecal coliform were carried out by using Most Probable Number procedure as described in APHA (2005). That procedure was divided into three main phase as:

1. Presumptive Phase

Lauryl tryptose broth used in the presumptive portion of the multiple-tube test, the multiple tube which already contains samples were incubated at $35 \pm 0.5^{\circ}\text{C}$ for 48 ± 3 hours. Production of an acidic reaction or gas in the tubes or bottles within 48 ± 3 hours constitutes a positive presumptive reaction. Submit tubes with a positive presumptive reaction to the confirmed phase.

2. Confirmed Phase

Brilliant green lactose bile broth fermentation tubes used in the confirmed phase. The inoculated brilliant green lactose bile broth tube incubated at $35 \pm 0.5^{\circ}\text{C}$. Formation of gas in any amount in the inverted vial of the brilliant green lactose bile broth fermentation tube within 48 ± 3 h constitutes a positive confirmed phase. Then, the MPN value calculated from the number of positive brilliant green lactose bile tubes.

3. Completed Phase

Completed phase used to established the presence of coliform bacteria and to provide quality control data, at least 10% of positive confirmed tube used in this phase by streaking on MacConkey Agar, then incubated MacConkey Agar at $35 \pm 0.5^{\circ}\text{C}$ for 24 ± 2 hours, the positive results shown by the red colonies

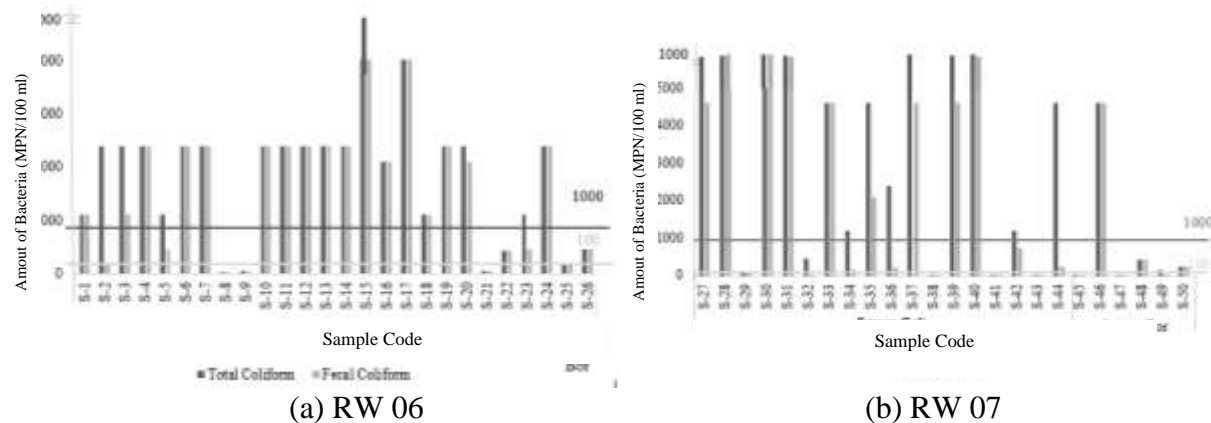
The results of water quality test, questionnaire data, and the results of field observations analysed by statistical test, which consists normality test and correlation test. In this study Kolmogorov-Smirnov (KS) method used to normality and correlation test by using Statistical Product and Service Solution (SPSS) version 23. Afterwards, the factors related to microbial contaminants in the drinking water at Daraulin Village can be identified, to improve the quality of drinking water at Daraulin Village

RESULTS

There are various ways to obtain drinking water, based on the results of the questionnaire, there were two types of predominantly drinking water sources used by residents of Daraulin Village, which are ground water (78%), and refilled drinking water (22%). Furthermore, this section will be divided based on the dominant source of drinking water used by residents of Daraulin Village.

Ground Water

Based on the results of questionnaires, as much as 78% of respondents preferred to use ground water as a source of drinking water, the main reason for chosen groundwater as drinking water sources was economically reason, and it was easy to obtain because most of families have dug wells in their homes. Although 80% respondents use dug wells, there are 20% of respondents used the bore well. Quantitative Test of Total Coliform and Fecal Coliform then performed on 50 samples of raw water from groundwater, and the results shown in **Figure 3**



Gambar 3 Total Coliform and Fecal Coliform concentration of groundwater

As shown in **Figure 3**, the blue line shows the quality standards for drinking water which is 1000/100 ml sample for Total Coliform, and the red line shows the quality standard of Fecal Coliform which is 100/100 ml sample, the number of Total Coliform and Fecal Coliform in the raw water were in the range of $4-11 \times 10^3$ JPT / 100 ml sample, therefore 80.9% dug well water samples and 62.5% of bore well water samples weren't suitable to be use as a source for drinking water.

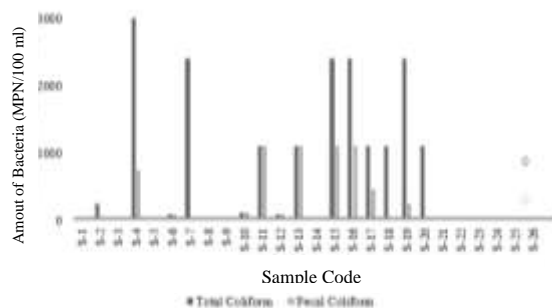
Small source of pollutants such as septic tanks could give a significant contribution on the presence of pathogenic bacteria (Richards et al., 2016), therefore, there were requirements for septic tanks, one of them was distance between the water source and septic tank which is 10 meters (Permen PU, 2009). In Daraulin Village, there were only 30.55% of respondents who have proper septic tanks in accordance to the requirements, due the average distance between the septic tank and water resources was only 4.4 meters. The high number of Fecal Coliform in wells was indicated high contamination by fecal coliform, and it have -0.699 of correlation coefficient with the distance of septic tank, therefore it can be said that the contamination in groundwater caused by septic tank distance was too close to the water source, particularly as occurs when a septic tank leak (Frick, 1999). Construction of the dug well can give effect to water pollution, according to the study by Pennsylvania Master Well Owner Network in 1999, there is a correlation between poor well construction with bacterial contamination, as happened in Daraulin Village, where there is a correlation ($r = -0.537$) between the condition of the dug well's construction and the presence of fecal Coliform, 13.8% of respondents have too short dug wells construction (less than 0.8 m), it can lead the contamination from the ground.

Based on the results of the questionnaire, 51.5% of respondents didn't collect waste regularly due the lack of waste transportation system, then some people threw their waste around the Citarum Lama Oxbow Lake, which are located within ± 60 meters from the nearest residential, but the correlation test showed that there was no correlation between the distance of water sources with piles of garbage around Citarum Lama Oxbow Lake and the concentration of fecal coliform in the water source. On the other hand, the disposal of improperly treated domestic wastewater effluent to the oxbow lake of Old Citarum, it increased the pollution level in the water bodies. The high number of Fecal Coliform in water bodies can affect the ground water's microbial contaminant (Dymond et al., 2016), as shown in **Figure 4**, the concentration of Fecal Coliform in the groundwater sources may be affected by the distance of ground water sources and the Old Citarum Oxbow Lake.

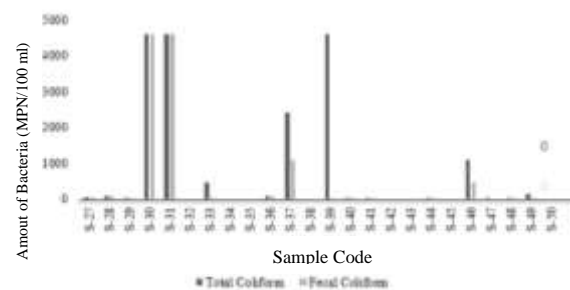


Gambar 4 Fecal Coliform Contour at Daraulin Village

There are two ways of processing raw water did by respondents, there were heating process (94%), and filtration unit (6%). Based on laboratory test results, there were 73% of water samples do not meet quality standards after treatment by the heating process, while 100% water samples (S-45, S-48) were treated by filtration unit complied the standard (**Figure 5**). There were two factors that could affect the heating process with, such as not effective process (the temperature on process did not reach 100 °C), or contamination can occur because of the respondents who treated water by heating process will kept their drinking water in a carafe or a specific container before consumed, which can be carried contaminants from the water container before it was consumed.



(a) RW 06



(b) RW 07

Figure 5 The concentration of Total Coliform and Fecal Coliform in drinking water Daraulin Village

Refilled Drinking Water

There were two Refilled Drinking Water Depo (RDWD) at DaraulinVilage which were RDWD 1 with 71.4% of users respondents, and RDWD 2 with 28.6% of users respondents. Raw water source used by RDWD 1 is water processed from the Water Treatment Plant (IPA) Daraulin sourced from Citarum Lama oxbow lake.

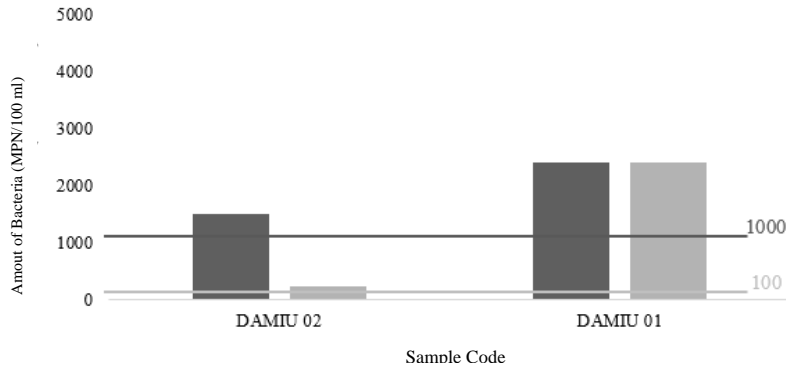


Figure 6 The concentration of Total Coliform and Fecal Coliform at RDWD's raw water

Based on laboratory test results, it is obtained that the concentration of Total Coliform and Fecal Coliform in raw water from each RDWD (**Figure 6**). Raw water used by both of RDWD didn't comply the quality standards, for RDWD 1, contamination may occur due to Citarum Lama oxbow lake that received the disposal of improperly treated domestic wastewater effluent, while the contamination of raw water in RDWD 2 can occurs because of the contaminants in the water tanks used before the raw water being processed.

Then both of RDWD used the same process to treated their raw water using reverse osmosis, which involves several steps, including: (1) First filtration process, which aims to filter the rough particles (2) Second filtration process by carbon filter, which aims to absorb dust, flavors, and colors (3) reverse osmosis system, by high-pressure pumps to push the water passes through the membrane and separate it from components that are not desired, such as the organic component, non-organic, bacteria, viruses, particles and dissolved ions or salts with the pore size of 0.0001 micron, (4) Packaging process, the gallon cleaned by using a plastic brush before. Processed water from both of RDWD comply with the drinking water quality standards (0 MPN / 100 ml) so the processed water from both of RDWD could be used as drinking water. Meanwhile, only 21.4% the refilled drinking water at the consumer levels comply the drinking water quality standard (**Figure 7**)

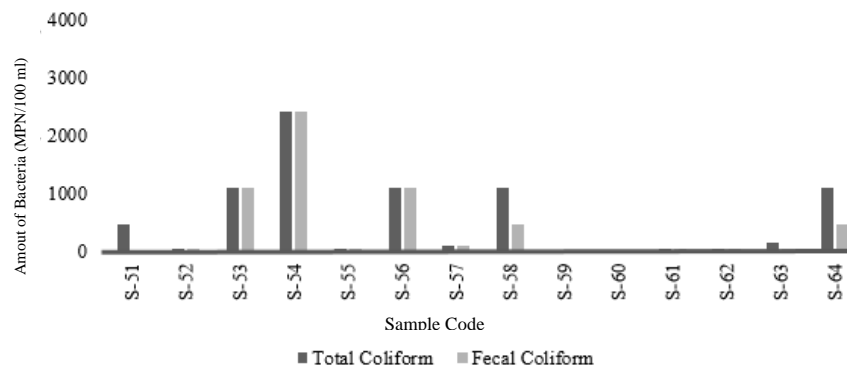


Figure 7 The concentration of *Total Coliform* and *Fecal Coliform* at consumer level

Figure 6 shows an increasing of the concentration of Total Coliform and Fecal Coliform at the consumer level that can be caused by several factors, there were the lack of hygiene in buyer's

container handling before being filled with the processed water, the of buyer's container just simply cleaned by using plastic brushes, or the lack of consumers habits against dispenser used. However, based on the observation showed that there is no correlation between the habit of dispenser cleaning with the concentration of fecal coliform and total coliform in drinking water, so the most factor causing the contamination is the packaging (handling) of buyer's gallons processed.

CONCLUSIONS

The results showed 73% of raw water samples from groundwater, and 100% raw water samples of refilled drinking water didn't not qualify as raw drinking water, then as many as 72% of the water processed from groundwater and 78.6% of refilled drinking water didn't not qualify as drinking water. Factors that contributed to microbiological pollution in the drinking water sources at Daraulin Villagewere the distance between the septic tank and water sources, construction of dug wells, and contamination from the Citarum Lama oxbow lake, while the quality of RDWD's raw water didn't qualify the standards, and the possibility of contamination in the water tank. Furthermore, the factors that contribute to the contamination of drinking water at the household level is the process of water heating, and the contamination of water storage containers, while the factors that caused contamination of refilled drinking water at the consumer level is the poor handling (packaging) process of buyer's gallon.

ACKNOWLEDGEMENT

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REFERENCES

- Adriyani, R & Suprihatin, B. (2015). Sanitation of Higiene refilled drinking water at Tanjung Redep Subdistrict, Berau, East Kalimantan. Health department of East Kalimantan Province: Berau, Indonesia. (In Indonesian)
- Derslice, J & Briscoe, J. (1993). All coliforms are not created equal: A comparison of the effects of water source and in-house water contamination on infantile diarrheal disease. Water Resources Research, Vol 29: 1983-1995.
- Dymond, J.R., Serezat D., Ausseil, A.E. & Muirhead, R.W., (2016) Mapping of Escherichia coli Sources Connected to Waterways in the Ruamahanga Catchment, New Zealand. Landcare Research. American Chemical Society: Washington, DC. USA.
- Eaton AD, Clesceri LS, Rice EW, Greenberg AE, 2005. Standard Methods for the Examination of Water and Wastewater, 21st ed. American Public Health Association: Washington, DC, USA.
- G.M. Fleeger. 1999. The Geology of Pennsylvania's Groundwater. 3rd ed. Educational Series 3. Harrisburg: Pennsylvania Geological Survey. Pennsylvania, US State
- Heinz Frick. 1980. Building Construction 1. Kanisius: Yogyakarta. (In Indonesian)
- Mangarey, F.B., Sondakh, R.C., Kawatu P.A.T. (2010). Hubungan antar konstruksi sumurgali

- dan karakter terhadap sumber pencemaran dengan kualitas bakteriologis air sumurgali di Desa Moyong kota Kecamatan Modayag Barat. Fakultas Kesehatan Masyarakat Universitas Sam Ratulangi: Manado, Sulawesi Utara, Indonesia.
- Puspawati, N., Wiryosoenjyo, K. & Sunarsih. (2012). Affect of septic tank, fields, and sewerage with MPN coliform in the dig well at Dawu Village, Paron, Ngawisubdistrict. Faculty of health community. Setia Budi Univeristy: Mojosongo, West Java, Indonesia.
- Reston, Va. 1986. Pennsylvania Groundwater Quality. U.S. Geological Survey Water Supply Paper 2325, National Water Summary. U.S. Geological Survey: US State
- Richards, S., Paterson, E., Withers P.J.A. & Stutter, M. (2016). Septic tank discharges as multi-pollutant hotspots in catchments. Science Of The Total Environment, Volume 542. Elsevier: Amsterdam, Netherlands.
- Soemirat, Juli. 2011. Environmental Epidemiology. GadjahMada University Press: Yogyakarta. (In Indonesian)
- Sugiyono. 2012. Statistic of Research. ALFABETA: Bandung. (In Indonesian)

Tuesday, November 14 th : Pre-Conference Training Workshops			
0845-0900	Meet and greet		
0900-1200	Impact Assessment for Environmental Health Paul Jagals (University of Queensland, Australia) Linda Rudolph (Public Health Institute, USA) Jennifer Wang (Health Care Without Harm, USA) Poornima Prabhakaran (Public Health Foundation of India, India)	Children's Environmental Health Peter Sly (University of Queensland/PBC, Australia) David Carpenter (State University of New York, USA) Stephania Cormier (University of Tennessee Health Science Centre, USA) Preet Dhillon (Public Health Foundation of India, India)	Scientific and Grant Writing Banalata Sen (Public Health Foundation of India, India) Sarah Iqbal (Wellcome Trust-DBT)
	Lancet Commission for Pollution and Health Launch Event: 0930-1130 [Stein Auditorium]		
1200-1245	Lunch		
1245-1315	Opening Ceremony K. Srinath Reddy, President (Public Health Foundation of India, India) and Peter Sly (Chair-PBC Board of Directors)		
1315-1415	Plenary 1: Environmental Health and the Sustainable Development Goals Speaker: K. Srinath Reddy (Public Health Foundation of India, India): <i>Improving environmental health via the SDGs</i> Chair: Peter Sly (University of Queensland, Australia)		
1415-1545	Symposium 1: Built Environment Chair: Amita Bhide (Tata Institute of Social Sciences, India) Speakers: 1. Amita Bhide (Tata Institute of Social Sciences, India) 2. Chris Skelly (University of Southampton, UK): <i>Urban microbial diversity and human health</i> 3. Shifalika Goenka (Public Health Foundation of India, India): <i>Built environment and green spaces – contribution to NCDs</i> ○ Safraj Shahul Hameed (Public Health Foundation of India, India) <i>Urban green spaces and hypertension</i> ○ Debarati Mukherjee (Public Health Foundation of India, India) <i>Park availability and major depression in individuals with chronic conditions: is there an association in urban India?</i>	Symposium 2: Food Security and Nutrition Chair: Prema Ramachandran (Nutrition Foundation of India) Co-Chair: Shweta Khandelwal (Public Health Foundation of India, India) Speakers: 1. Ranjitha Puskur (International Rice Research Institute, Philippines): <i>Environment-agriculture-nutrition security nexus: Through a social equity lens</i> 2. Prakash Shetty (University of Southampton, UK): <i>Integrating nutritional objectives in achieving food security: Leveraging agriculture for nutrition</i> 3. Bhavani RV (M S Swaminathan Research Foundation, India): <i>A farming systems approach to food and nutrition security</i> ○ Monir Hossain Moni (Asia Pacific Institute for Global Studies, Bangladesh): <i>Childhood deaths and infectious diseases linked to malnutrition: A sorrowful but shining story from Bangladesh</i>	Symposium 3: Health Sector Leadership on Environment - Decarbonising Health Care Chair: Giridhar Gyani (Association of Healthcare Providers (India)) Speakers: 1. Sasmita Patnaik (Council on Energy, Environment and Water, India) 2. Dong Chun Shin (Yonsei University, South Korea) 3. Jennifer Wang (Health Care Without Harm, USA) ○ Shriram Manogaran (Public Health Foundation of India, India): <i>A clean energy alternative for bridging energy gaps in health sector</i>
1545-1600	Tea break		

1600-1700	<p>Poster presentations (student and faculty)</p> <ul style="list-style-type: none"> ○ Mackwin D'Mello (Nitte University, India): <i>Death rates attributable to environment: a comparative study between WHO-SEARO and Central Africa countries</i> ○ Faisal Hassan (Aligarh Muslim University, India): <i>Psycho-social impacts of mental disorders in India and emergent needs of evidence based policies for public health</i> ○ Nidhi Gupta (GSSDGS Khalsa College, India): <i>High levels of HCH and its derivatives in blood of women in Punjab, India</i> ○ Priyanka Agarwal (Ambedkar University, India): <i>Determination of polycyclic aromatic hydrocarbons in placenta of North Indian women and its association with birth weight</i> ○ Aryan Anand (H.N.B. Garhwal University, India): <i>Curbing environmental pollution: A traditional approach with scientific aspects</i> ○ Iffath Zamani Neha (Indian Institute of Public Health-Hyderabad, India): <i>Detrimental effects of microplastics on marine life</i> ○ Prachi Dhole (Indian Institute of Public Health-Hyderabad, India): <i>Coal, climate and the public health - a global and national issue</i> ○ Prashika Rajendra Kurlikar (International Institute for Population Sciences, India): <i>Does menstruation hygiene matter in the workplace?</i> ○ Padam Jain and Dr. Abhijit Mathur (Indian Institute of Public Health-Gandhinagar, India): <i>Community perspective on climate change in rural Rajasthan</i> ○ Madhuri Verma (Pt. Ravishankar Shukla University, India): <i>Emission estimation of aromatic- and halogenated-VOCs from household solid fuel burning practices</i> ○ Shahina Bano (Pt. Ravishankar Shukla University, India): <i>Chemical source profiling for PM_{10-2.5} emissions from vehicular exhaust in India</i> ○ Myles Elledge (Research Triangle Institute, USA): <i>Shining a light on Sri Lankan CKDu</i> ○ Nishad Jayasundara (University of Maine, USA): <i>Mitochondrial toxicity of chemical mixtures derived from lakes in regions affected by chronic kidney disease of unknown etiology in Sri Lanka.</i> ○ Ramashankar Rath (All India Institute of Medical Sciences, India): <i>Community level environmental determinants of physical activity: A community based cross-sectional study in North India</i> ○ Madhu Anand (Ambedkar University, India): <i>Placental levels of organochlorine pesticides and its influence on birth weight</i> ○ Geetu Gambhir (University of Delhi, India): <i>Remediation of heavy metal ion toxicity from waste water using functionalized chitin</i> ○ Suganthi Jaganathan (Public Health Foundation of India, India): <i>Association of particulate matter (PM) 2.5 exposure and cardio-metabolic diseases (CMD) in low & middle income countries (LMICs): Systematic review and meta-analysis</i> ○ Safraj Shahul Hameed (Public Health Foundation of India, India) - <i>Built environment and cardiometabolic disease risk factors in urban Delhi</i> ○ Suhela Kapoor (Public Health Foundation of India, India): <i>Addressing environmental risks and associated child cognitive outcomes using a community centric, technology-enabled approach</i> ○ Rajamohanan Pillai (Dr. Somervell Memorial CSI Medical College, India): <i>Health system competence for handling epidemics: situation analysis of dengue in Kerala</i> ○ Antonio Pascale (Universidad de la República, Uruguay): <i>Acute carbon monoxide poisoning as an indicator of indoor co pollution. Case series from a pediatric emergency department</i> ○ Meena Sehgal (Centre for Waste Management, The Energy and Resources Institute (TERI), India): <i>Key factors affecting children's health in India: Results from NFHS-4 study</i> ○ Subhojit Dey (Indian Institute of Public Health-Delhi): <i>A meta-analysis of blood lead levels in India and attributable burden of disease</i> ○ Suyud Utomo (University of Indonesia, Indonesia): <i>Physical, psychological, social relationship, and spiritual health domains of quality of life among community living in Ciletuh-Palabuhanratu Geopark, Sukabumi Regency, West Java, Indonesia</i> ○ Rengaraj Selvaraj (Sultan Qaboos University, Oman): <i>Environmental nanotechnology: A green method for the reduction of hexavalent chromium present in water and wastewater</i> ○ Ririn Wulandari (University of Indonesia, Indonesia): <i>Mercury levels in hair with impaired central nervous system function in artisanal and small scale gold mining workers in Banten, Indonesia</i> ○ Sabyasachi Mohapatra (Tata Steel Rural Development Society, India): <i>Asymptomatic malaria prevalence in tribal population of Odisha</i> ○ Ashish Mahapatra (Tata Steel Rural Development Society, India): <i>"Malaria & malnutrition" its coexistence & incidence, an observational study in the tribal dense regions of Odisha</i> ○ K. Kanaga Sabapathi (Annamalai University, India): <i>Ensuring food security through sustainable agricultural practices in India</i> ○ Ema Hermawati (University of Indonesia, Indonesia): <i>PM_{2.5} exposure and children pneumonia in industrial and non-industrial areas, Padang, West Sumatera</i>
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	<ul style="list-style-type: none">○ Margareta Sintorini (Trisakti University, Indonesia): <i>The occurrence of dengue haemorrhagic fever in Bendungan Hilir and Tanah Abang district, Jakarta 2014-2015</i>○ Lipika Nanda (Indian Institute of Public Health-Bhubaneswar): <i>Household vulnerability to extreme heat in Odisha: A comparative study</i>○ Kazuko Ohno (Kyoto College of Medical Science, Japan): <i>Establishment of comprehensive radiation education e-learning system for medical staff</i>○ Shriram Manogaran (Public Health Foundation of India, India): <i>Coalescing health sector leadership on environmental pollution</i>○ Suzanna Dewi (University of Indonesia, Indonesia): <i>Hypertension and consumption of salted fish in an area supporting a salted fish industry</i>○ Vijaylatha Rastogi (Jawaharlal Nehru Medical College, India): <i>Chemical characterization, depolluting and anti-bacterial activity of hawan medicinal smoke (HMS)</i>○ Jamson Masih (Wilson College, India): <i>Chemical characteristics of PM_{2.5} particulate matter at two different micro-environment of Mumbai, India</i>○ Samayita Ghosh (Public Health Foundation of India, India): <i>Scoping review for children's environmental health and water sanitation and hygiene (WASH) outcomes in India</i>○ E.G.D.N. (Nilanthi) Suraweera (University of Colombo, Sri Lanka): <i>Knowledge and practices on management of plastic waste among main female householders in medical officer of health area, Kalutara, Sri Lanka</i>○ Shashank Bibhu (CARE India): <i>Clean cooking solutions and public health</i>○ Shereen Aameeka Lobo (Indian Institute of Public Health-Delhi): <i>Role of environmental sanitation in shaping the health of our children</i>○ Mohammad Tayyab (Jamia Millia Islamia University, India and PHFI): <i>Neighbourhood built environment, cardiometabolic diseases and their risk factors in South Asia: CARRS – GIS study</i>		
1700-1800	Student and Early Career Researcher Networking Event		
Wednesday, November 15th			
0900-0945	Plenary 2: Environmental Health and Maternal and Child health Speaker: Sowmya Swaminathan (Director General-Indian Council of Medical Research) <i>Research priorities in maternal and child health: An environmental health lens</i> Chair: Gwen Collman (US National Institute of Environmental Health Sciences)		
0945-1115	Symposium 4: Children's Environmental Health in South Asia Chair: Brittany Trottier (US National Institute of Environmental Health Sciences) Speakers: <ul style="list-style-type: none">1. Fujio Kayama (Jichi Medical University, Japan): <i>Metal exposure in air pollution</i>2. Panida Navasumrit (Chulaborn Research Institute, Thailand): <i>CRI programs in CEH</i>3. Lesley Onyon (WHO SEARO): <i>CEH in Southeast Asia</i>○ Santanu Pramanik (Public Health Foundation of India, India): <i>Effect of indoor air pollution on acute lower respiratory infection for children under 2 years of age in rural Assam</i>	Symposium 5: Persistent Organic Pollutants Chair: David Carpenter (State University of New York, USA) Speakers: <ul style="list-style-type: none">1. Mahmood A Khwaja (Sustainable Development Policy Institute, Pakistan): <i>Mercury [Recorded video presentation]</i>2. Aimin Chen (Univ. of Cincinnati, USA): <i>Flame retardants and child neurobehavior</i>3. Shahriar Hossain (Environment and Social Development Organization, Bangladesh): <i>POPs in recycled products: A new health and environmental risk</i>4. Krishnan Swaminathan (Kovai Medical Center & Hospital, India): <i>Pesticide exposures and diabetes: A plausible link?</i>	Symposium 6: WASH Chair: Raman VR (Water Aid, India) Speakers: Paul Jagals (University of Queensland, Australia): <i>Water security in the Pacific Islands</i> <ul style="list-style-type: none">1. Shyamala Mani (National Institute of Urban Affairs, India): <i>Waste Management and Environmental Health</i>2. Raman VR (WaterAid, India)<ul style="list-style-type: none">○ Arpita Ghosh (Public Health Foundation of India, India): <i>Household water and sanitation, mother's handwashing practices and village-level sanitation: a multilevel investigation of childhood diarrhea in rural Assam</i>○ Herto Dwi Ariesyady (Bandung Institute of Technology, Indonesia): <i>The Assessment of risk factors associated with microbial contaminants in drinking water at the Oxbow Lake of Daraulin</i>
1115-1145	Tea break		

1145-1245	<p>Student oral presentations</p> <ul style="list-style-type: none"> Abhishek Sharma (International Institute for Population Sciences, India): <i>Effect of persistent household poor sanitation on stunting: Evidence from Longitudinal study</i> Sunila Dixit (KS Hegde Medical Academy, India): <i>Climate change and its health risks on developing countries</i> Mithlesh Chourase (International Institute for Population Sciences, India): <i>Do night shelters make a difference in hygiene and sanitation practices among homeless women living in Delhi, India</i> Rahmi Yetri Kasri (University of Indonesia, Indonesia): <i>Sustainable rural water supply system: A citizen engagement model</i> Rakesh Kumar Sahu (Pt. Ravishankar Shukla University, India): <i>Spatial and temporal variation of atmospheric carbonaceous aerosols during a year-long measurement in Raipur, India</i> Ranti Ekasari (University of Indonesia, Indonesia): <i>Infant parenting on Tolotang community in Laccoling, Galung Maloang district, Parepare city</i> <p>Poster presentations (student and faculty)</p> <ul style="list-style-type: none"> Solomon Paul (Sri Ramachandra University, India): <i>Association between occupational heat exposures and DNA damage in select working populations</i> Priscilla Johnson (Sri Ramachandra University, India): <i>Ambient temperature and all-cause mortality in Chennai – a time series analysis</i> Herratdeep Singh (Indian Institute of Public Health-Delhi, India): <i>Modern agricultural practices and their impact on environment and human health</i> Sushil Kumar (Jawaharlal Nehru University, India): <i>High levels of organochlorine pesticides among adults in urban India</i> Arundhati Barman (Indian Institute of Public Health-Delhi, India): <i>A comprehensive study on usage of mosquito coil by human and its adverse implications</i> Uddipana Borah (Indian Institute of Public Health-Hyderabad): <i>The effects of exposure to heavy metals, through contaminated drinking water, on health</i> Rahmatillah Razak (Universitas Indonesia, Indonesia): <i>Determinant of antenatal visits among multiparous mothers in Jeneponto district</i> Banalata Sen (Public Health Foundation of India, India): <i>Increasing toilet use in rural India, using theory to design and interventions</i> Melina Magsumbol (Public Health Foundation of India, India): <i>Association of lead (Pb) exposure and incidental hypertension: A nested case-control study of the Center for Cardiometabolic Risk Reduction in South Asia (CARRS) Surveillance Study, a population representative cohort in New Delhi</i> Krishan Hirimuthugoda (National Institute of Health Science, Sri Lanka): <i>Effect on physical activity among users of walking track under wetland conditions in Colombo, Sri Lanka</i> Priya Lodhi (Indian Institute of Public Health-Delhi, India): <i>Home sanitation: knowledge and practice in community</i> Shiny Sohal (Indian Institute of Public Health-Delhi, India): <i>Study on assessment of nutritional status of school going children (6-8 years) in Delhi</i> Camellia Biswas (Ambedkar University, India): <i>The past, present and future of edible insects: a case study of Nyshi And Apatani tribes of Arunachal Pradesh, India</i> Himanshi Rohra (Ambedkar University, India): <i>Socio-economic and location effect on fine particulate in residential homes of Agra, India</i> Indrapal Meshram (National Institute of Nutrition, India): <i>Prevalence and correlates of anaemia and vitamin A among preschool children and women from north eastern states of India</i> Atar Singh Pipal (Pune University, India): <i>Sources and characteristics of carbonaceous aerosols along with their climatic nature</i> Ajay Taneja (Ambedkar University, India): <i>Particulate matter and heavy metals between coarse and accumulation range in diverse indoor microenvironments of Agra, India</i> Shrinivas Darak (Prayas Health Group, India): <i>Cost effective pathways for reducing resultant disease burden in India due to household air pollution</i> Anubhati Dutta (Public Health Foundation of India, India): <i>Review of food toxin or contaminants exposure and children's environmental health outcomes: An Indian Scenario</i> Ishita Rawal (Centre for Chronic Disease Control (CCDC) , India): <i>Association of persistent organic pollutants with incident diabetes: study protocol</i> Jayanta Kumar Moitra (EMTRC Consultants Pvt Ltd, India): <i>Practical approach on human health risk assessment study around industrial establishments</i> Suyud Utomo (University of Indonesia, Indonesia): <i>Profenofos residues at Holtikultura farmers, Garut, West Java, Indonesia</i> 		
1245-1330	Lunch		
1330-1500	<p>Symposium 7: Environmental Contributions to Cancer</p> <p>Chair: Preetha Rajaraman (U.S. Department of Health & Human Services)</p>	<p>Symposium 8: Developmental and Environmental Origins of Health and Disease</p> <p>Chair: William Suk (US National Institute of Environmental Health Sciences)</p> <p>Speakers:</p>	<p>Symposium 9: Climate Mitigation and Adaptation</p> <p>Chair: Budi Haryanto (University of Indonesia, Indonesia)</p> <p>Speakers:</p>

	<p>Co-Chair: Preet Dhillon (Public Health Foundation of India, India)</p> <p>Speakers:</p> <ol style="list-style-type: none"> David Carpenter (State University of New York, USA): <i>Inhalation as an important route of exposure to organic chemicals causes cancer and other diseases</i> Prakash C. Gupta, (Healis Institute, India) <i>Environmental effects of tobacco – from production to consumption</i> Ashok Ghosh (Mahavir Cancer Institute and Research Center, India) ○ Pasquale Russo (University at Albany, USA): <i>Ambient exposure to airborne carcinogens in New York State USA</i> 	<ol style="list-style-type: none"> Caroline Fall (University of Southampton, UK): <i>Longitudinal studies in India</i> Gwen Collman (US National Institute of Environmental Health Sciences): <i>The exposome across the lifespan</i> Lizbeth López-Carrillo (National Institute of Public Health, Mexico): <i>Maternal dietary intake of polyunsaturated fatty acids modifies association between prenatal DDT exposure and child neurodevelopment: A cohort study</i> <ul style="list-style-type: none"> ○ Laxmi Singh (Ambedkar University, India): <i>Assessment of lead and cadmium in placenta of Indian women and its association with birth weight</i> ○ Melina Magsumbol (Public Health Foundation of India, India): <i>Potential of hospital data for biosurveillance in developing countries: air pollution and neonatal outcomes in New Delhi, India</i> 	<ol style="list-style-type: none"> Budi Haryanto (University of Indonesia, Indonesia): <i>Climate change and urban air pollution health impacts in Indonesia</i> Linda Rudolph (Public Health Institute, USA): <i>Climate change and health: Impacts and opportunities</i> <ul style="list-style-type: none"> ○ Dileep Mavalankar (Indian Institute of Public Health-Gandhinagar): <i>Experience of Heat Action Plan in Ahmedabad</i> ○ Ambarish Dutta (Indian Institute of Public Health, Bhubaneswar): <i>Study of association between ambient heat and all-cause mortality from the eastern Indian city of Bhubaneswar, Odisha: exploration for the thresholds at which point the deleterious effects “kick in”</i> ○ Ririh Yudhastuti (Airlangga University, Indonesia): <i>Dynamics of climate-based DHF transmission in Surabaya</i>
1500-1545	<p>Plenary 3: Ambient Air Pollution</p> <p>Speaker: Rashid Shaikh (Health Effects Institute, USA)</p> <p>Chair: Damodar Bachani (John Snow Inc., India)</p>		
1545-1615	<p>Break</p>		
1615-1745	<p>Symposium 10. Metals in Water</p> <p>Chair: V Murugesan (B.S. Abdur Rahman University, India)</p> <p>Speakers:</p> <ol style="list-style-type: none"> Indah Salami (Bandung Institute of Technology, Indonesia): <i>Heavy metals pollution in surface waters of upper stream citarum river basin – Indonesia</i> V. Murugesan (B.S. Abdur Rahman University, India): <i>Mercury pollution, toxic effects and remediation techniques</i> 	<p>Symposium 11: E-waste</p> <p>Chair: Panida Navasumrit (Chulabhorn Research Institute, Thailand)</p> <p>Speakers:</p> <ol style="list-style-type: none"> Michelle Heacock (US National Institute of Environmental Health Sciences): <i>NIEHS response to e-waste</i> Rajat Rai Handa (CHINTAN, India) Inoka Suraweera (Directorate of Environmental and Occupational Health, Sri Lanka): <i>E waste and health: A growing public health issue in Sri Lanka</i> <ul style="list-style-type: none"> ○ Paromita Chakraborty (SRM Research Institute, India): <i>Crude electronic waste recycling is a potential source for toxic organic compounds in India: atmospheric transport models and human health risk assessment</i> ○ Kumudu Weerakoon (University of Colombo, Sri Lanka): <i>Electronic and electrical waste and its management among grade ten students in medical</i> 	<p>Symposium 12. Household Air Pollution</p> <p>Chair: Kalpana Balakrishnan (Sri Ramachandra University, India)</p> <p>Speakers:</p> <ol style="list-style-type: none"> Kalpana Balakrishnan (Sri Ramachandra University, India): <i>Integrating research into policy actions for household air pollution: Experiences from India</i> Giridhar Babu (Public Health Foundation of India, India): <i>Health effects of air pollution: A life course approach</i> Govinda Narke (Chest Research Foundation, India): <i>Other sources of household air pollution</i> <ul style="list-style-type: none"> ○ Ritu Parchure (Prayas Health Group, India): <i>Health impact of stacking behaviors (use of mix of traditional and modern cooking fuels)</i>

		<i>officer of health area Nivithigala, Sri Lanka; current disposal modalities, knowledge, attitudes and its correlates</i>	<ul style="list-style-type: none">Shamsh Pervez (Pt. Ravishankar Shukla University, India): <i>PM_{2.5} emission characterization for household solid fuel burning activities in India</i>
1930-	Dinner		
Thursday, November 16th			
0900-0945	Plenary 4: Environmental Equity Speaker: Ritwick Dutta (Legal Initiative for Forest and Environment, India) Chair: Shalini Bharat (Tata Institute of Social Sciences, India)		
0945-1015	Tea break		
1015-1200	Special symposium 13. CKDu Chair: Tissa Illangasekare (Colorado School of Mines, USA) Speakers: <ul style="list-style-type: none">1. Saroj Jayasingha (University of Colombo, Sri Lanka)2. Balaji Rajagopalan (University of Colorado, USA) and Gangadhar Taduri (Nizam's Institute of Medical Sciences, India): <i>Climate controls on human health</i>3. Herath Manthirithilake (International Water Management Institute, Sri Lanka)4. Kathy James (University of Colorado)5. Vidhya Venugopal (Sri Ramachandra University)	Symposium 14. Chemical and Metal Exposures Chair: TK Joshi (Centre for Occupational and Environmental Health, Maulana Azad Medical College, India) Speakers: <ul style="list-style-type: none">1. Andrew McCartor (Pure Earth, USA): <i>Global health impact of soil, heavy metals and chemicals</i>2. Tahir Rafique (Applied Chemistry Research Center, Pakistan) [<i>Recorded video presentation</i>]3. TK Joshi (Centre for Occupational and Environmental Health, Maulana Azad Medical College, India) <i>Chemical Exposures in Laboratories-A less Recognized Issue</i><ul style="list-style-type: none">○ Haryoto Kusnopranto and Suyud Utomo (University of Indonesia, Indonesia): <i>Distribution and contamination level of minerals nearby inactive nickel mining site in Pulau Obi, Halmahera Selatan Regency, Indonesia</i>○ Budi Hartono (University of Indonesia, Indonesia): <i>The behavioral exposure of mercury in the community of small scale gold mining area of Lebaksitu, Indonesia 2017</i>	Symposium 15: Ambient Air Pollution Chair: Rashid Shaikh (Health Effects Institute, USA) Speakers: <ul style="list-style-type: none">1. Stephania Cormier (University of Tennessee Health Science Centre, USA): <i>Environmentally-persistent free radicals: A new class of environmental stressor</i>2. Dorairaj Prabhakaran (Public Health Foundation of India, India)<ul style="list-style-type: none">○ Siddhartha Mandal (Public Health Foundation of India, India): <i>Assessing ambient air pollution exposure at fine spatio-temporal resolution using hybrid models in Delhi</i>○ Kishore Kumar Madhipatla and Sana Ansari (Indian Institute of Public Health-Delhi, India): <i>Temporal trends of particulate matter over Indian capital cities</i>○ Haider A Khwaja (University at Albany, USA): <i>Association of ambient fine particulate air pollution (PM 2.5) with cardiovascular morbidity in a megacity Karachi [Recorded Video Presentation]</i>
1200-1300	Lunch		
1300-1430	Symposium 16. Women's Environmental Health Chair: Lakshmi Lingam (Tata Institute of Social Sciences, India) Speakers: <ul style="list-style-type: none">1. Arundati Muralidharan (WaterAid, India): <i>Menstrual waste management</i>	Symposium 17. Bioengineering Solutions to Address Environmental Threats Chair: Rajendra Prasad (Delhi University, India) and Co-Chair: Rengaraj Selvaraj (Sultan Qaboos University, Oman) Speakers:	Symposium 18. Community Engagement on Environmental Health Chair: Monika Arora (Public Health Foundation of India, India) Co-Chair: Banalata Sen (Public Health Foundation of India, India)

	<p>2. Lakshmi Lingam (TISS): <i>Reconnecting the poverty-gender-energy nexus to address environment health concerns</i></p> <ul style="list-style-type: none"> ○ Prashika Rajendra Kurlikar (International Institute for Population Sciences): <i>Impact of migration on quality of life of female labour migrants in urban Mumbai, India: Need for public Health action</i> 	<p>1. Rengaraj Selvaraj (Sultan Qaboos University, Oman): <i>Green nano technology for environmental remediation: photocatalytic degradation of pharmaceuticals present in water and wastewater</i></p> <p>2. S. Rajamani (East-West Center Association, Chennai, India) <i>Sustainable industrial wastewater treatment and recovery of water for reuse – Indian and Asian scenario</i></p> <p>3. Rajendra Prasad (DU): <i>Production of biodiesel from fatty acids of Indian mustard oil</i></p> <p>4. Robert Arnold (University of Arizona): <i>Reactive oxygen species to transform trace organic contaminants in treated wastewater</i></p>	<p>Speakers:</p> <p>1. Shweta Narayan (Community Environmental Monitoring, India): Community activism to improve environmental health.</p> <p>2. Antonio Pascale (UDELAR): Community engagement to reduce pesticide exposure</p> <p>3. Derek Kornelsen (Univ. of Manitoba)</p> <p>4. Sunanda Reddy (CARENIDHI): Engaging marginalized communities for children's environmental health – An inclusive model</p> <ul style="list-style-type: none"> ○ Ankit Bhargava (Sensing Local, India): <i>Humanizing the understanding of air pollution</i> ○ Vidushi Bahuguna (Public Health Foundation of India, India): <i>Stakeholder analysis of household energy and health scenario in India</i>
1430-1500	Break		
1500-1545	<p>Plenary 5: Evidence to Policy Translation</p> <p>Speaker: Jairam Ramesh (Ex- Union Minister for Environment; Member of Parliament, Govt. of India): <i>Multi-sectoral policymaking to promote healthy environments: Lessons from developing countries</i></p> <p>Chair: Inoka Suraweera (Directorate of Environmental and Occupational Health, Sri Lanka)</p>		
1545-1700	<p>Closing Ceremony and Awards</p> <p>Chairs: Peter Sly (University of Queensland, Australia) and Dorairaj Prabhakaran (Public Health Foundation of India, India)</p>		

Subject: Certificate of Participation

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**International Conference of the
Public Health Foundation of India and the Pacific Basin Consortium**

14-16 November 2017, India Habitat Centre, New Delhi, India
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Environmental Health and Sustainable Development



This is to certify that **Herto Dwi Ariesyady** participated in the International Conference of the Public Health Foundation of India and Pacific Basin Consortium, 'Environmental Health and Sustainable Development', 14-16 November 2017, New Delhi, India.

K. Srikant-Raj

K. Srinath Reddy
President, Public Health Foundation of India

John D.

Peter D Sly
Chairperson, Pacific Basin Consortium for Environment and Health



**ABSTRACTS FROM THE PACIFIC BASIN CONSORTIUM AND PUBLIC HEALTH FOUNDATION OF
INDIA CONFERENCE**

NEW DELHI, INDIA

13-17 NOVEMBER 2017

ENVIRONMENTAL HEALTH AND SUSTAINABLE DEVELOPMENT

CURBING ENVIRONMENTAL POLLUTION: A TRADITIONAL APPROACH WITH SCIENTIFIC ASPECTS.

Presenting Author: Aryan Anand

Department of Environmental Sciences, H.N.B. Garhwal University, Uttarakhand.

Environment and Ecosystem- the two interrelated words are the most sought subject in terms of sustainable development and environmental Pollution is the soaring issue not only in developed countries but also in Developing and under developed countries. Many a countries are developing technologies that are economically sustainable, socially acceptable and environmental friendly.

India, being a signatory of many conventions that focus on preventing environmental pollution, have a challenge ahead on cutting emissions and creating essential technology to attain the goal in time. In spite of much advancement in technology, there are some traditional aspects which are still being followed in some states in which, Uttarakhand stands at good position. However such things have been to the knowledge of a very few.

In this paper, I would be discussing the traditional ways, rituals and inherited followings of the people that have so far been found successful and scientifically accepted in terms of damming the drivers for degradation of ecosystem and environment. Many a traditions have been found directly related to scientific approach well adapted for a sustainable and eco-friendly development. Combining these traditional approaches with biotechnology can open new dimensions in the era of controlling the degradation of environment.

Some traditions like creating sacred grooves, Sacred Landscapes, Gharats etc. have been protecting the environment since many decades and have been found equally efficient to the scientific approaches. I will also discuss the relation between the traditions and their linkage to the future development of technology that will curb the environmental pollution in an effective way.

DETERMINATION OF POLYCYCLIC AROMATIC HYDROCARBONS IN PLACENTA OF NORTH INDIAN WOMEN AND ITS ASSOCIATION WITH BIRTH WEIGHT

Priyanka Agarwal* and Ajay Taneja

**Department of Chemistry, Dr. B. R. Ambedkar University, Khandari Campus, Agra-282002, India*

Since 1990 concerns have been raised about reproductive abnormalities associated with in-utero exposure to persistent organic pollutants such as Polycyclic Aromatic Hydrocarbons (PAHs). PAHs not only acts as endocrine disruptors, but are also responsible for inducing oxidative stress i.e. crucial to maintain fetal growth and development. Thus, present study was explored to evaluate the association between placental PAHs level and infant birth weight among 90 healthy and non smoking pregnant Indian women. Placental level of sixteen priority Polycyclic Aromatic Hydrocarbons (PAHs) were analyzed with the help of gas chromatography equipped with flame ionization detector (GC-FID). Levels of PAHs were compared between two groups, one group (n=39) having fetuses with birth weight ≥ 2500 grams (normal birth weight) and second group (n=51) having birth weight < 2500 grams (low birth weight). Correlation analysis were conducted between the placental levels of measured PAHs and birth weight and showed inverse although not significant association with naphthalene (Nap), acenaphthylene (Ace), pyrene (Pyr), benzo(b)Fluoranthene (BbF) and benzo(k)Fluoranthene (BkF). However, significantly higher placental level of Benzo(a)Pyrene (BaP), a carcinogenic PAH and fluoranthene (Flt), a non carcinogenic PAH was recorded in low birth weight samples (BaP: 0.109 ± 0.33 and Flt: 0.040 ± 0.138) than normal birth weight samples (BaP: 0.463 ± 0.739 ppb and Flt: 0.21 ± 0.383 ppb). Results of linear regression model lay light upon significant association of BaP ($p < 0.001$) while non-significant association of Flt to depletion trend of birth weight. Also, the standardized PAHs effect was higher for BaP ($\beta = -0.575$) than that attributed to Flt ($\beta = -0.30$). This finding suggests the possible role of environmental pollutant like PAHs on impairment of fetal growth.

PLACENTAL ORGANOCHLORINE PESTICIDES AND ITS ASSOCIATION WITH BIRTH WEIGHT

M. Anand* and A. Taneja

Department of Chemistry, Dr. B.R. Ambedkar University, Khandari Campus, Agra-282002, India

Background: Among the agricultural chemicals, pesticides have been the most intensively considered for their association with preterm birth. Dichloro di phenyl trichloro ethane (DDT) is the most notorious pesticides because of its persistent nature, poorly excreted, its property to mimic estrogen hormone and biomagnified in the food chain, thereby increasing potential for human exposure. Organochlorine pesticides cross the placenta; this prenatal exposure has been associated with adverse pregnancy outcomes.

Objective: An attempt was made to evaluate the relationship between placental organochlorine pesticides (DDT & HCH) and birthweight.

Methods: Total of 90 mother-child pairs were selected from Agra city. Organochlorine pesticides were measured in the placental tissue by Gas Chromatography equipped with electron capture detector. Regression analysis were performed between birth weight and organochlorine pesticide concentrations.

Results: There was a significant decrease in birthweight with increasing organochlorine pesticides such as with every unit increase in alpha-HCH, beta-HCH, gamma-HCH, delta-HCH, total-HCH, p,p-DDE and p,p-DDT the birthweight decreases by 5.81 gms, 1.94 gms, 4.72 gms, 2.09 gms, 2.65 gms, 6.85 gms, and 10.8 gms respectively.

Conclusion: Preliminary results indicate that exposure to organochlorine pesticides may be related to a lower birthweight. Further robust multicentric studies are needed to conclude the link.

THE ASSESSMENT OF RISK FACTORS ASSOCIATED WITH MICROBIAL CONTAMINANTS IN DRINKING WATER SOURCES AT THE OXBOW LAKE OF DARAULIN VILLAGE, BANDUNG REGENCY, WEST JAVA, INDONESIA

Herto Dwi Ariesyady¹ & Eryanti Utami Putri

*Department of Environmental Engineering,
Faculty of Civil and Environmental Engineering, Bandung Institute of Technology
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In order to reduce the flood events in the upper stream of the Citarum River, West Java Province, Indonesia, the Government of Republic of Indonesia has performed stream straightening (normalization) program that remaining several oxbow lakes in the river basin. One of those oxbow lakes is located at Daraulin Village, Margaasih Subdistrict, Bandung Regency which is a residential area surrounded by an oxbow lake of Citarum River with a 2,890 meters length. Due to this normalization program, disposal of insufficient treated domestic wastewater treatment plant effluent to this oxbow lake resulted a water pollution. Due to high ground water table, this oxbow lake water pollution seemed to influence local shallow ground water quality. Daraulin Village has a total population of 3,382 people (1,017 families) in which that for drinking purpose, 78% of the population used groundwater from dug wells as clean water source before its boiling, while 22% of the population used refilled bottle drinking water. In this study, 133 samples of raw water and drinking water quality were determined by microbiological analysis (Total Coliform and Fecal Coliform) listed in Republic of Indonesia Regulation using Most Probable Number (MPN) method according to the Standard Methods for the Examination of Water and Wastewater (APHA, 2006). The results showed that seventy four percent of groundwater samples, and 100% samples of raw water to be treated as refilled drinking water did not meet the drinking water standard. Besides, 72% of processed water from groundwater and 78.6% refilled gallon water at the consumer level did not meet the drinking water standard as well. Furthermore, risk assessment used to compare the hazard index between refilled drinking water and groundwater showed that the highest risk of water source was attributed to groundwater obtained from dug wells. However in the consumer level, refilled drinking water had the highest risk associated with bottling hygiene process. A non parametric correlation test using Spearman Rank method showed that the quality of ground water had a strong correlation with diarrheal disease ($\alpha = 0,613$). These results indicated that people in oxbow lake isolated area were prone to have diarrheal disease from multiple sources of polluted water, and furthermore needs integrated efforts for overwhelming 5F-water pollution chains.

HOUSEHOLD WATER AND SANITATION, MOTHER'S HANDWASHING PRACTICES AND VILLAGE-LEVEL SANITATION: A MULTILEVEL INVESTIGATION OF CHILDHOOD DIARRHEA IN RURAL ASSAM

Arpita Ghosh¹, Jahnabi Hazarika^{1,3}, Sandra Albert^{1,3}, Santanu Pramanik¹

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3 Indian Institute of Public Health, Lawmali, Pasteur Hill, Shillong, Meghalaya, India 793 001

Background:

Despite externality benefits of sanitation on early childhood health being increasingly recognized, evidence on impact of community-level sanitation on child health is sparse. Using data from a cross-sectional survey, we investigated the effect of village-level sanitation in addition to the effect of household water, sanitation, and handwashing (WASH) practices on diarrhea among children aged 6–23 months in rural Assam.

Methods:

We analyzed data on 3,537 6-23 month old children from 236 villages across three districts — Kamrup Rural, Bongaigaon and Udalguri, in Assam. Mothers reported whether the youngest 6-23 month old child has had diarrhea in the past two weeks and they provided information on source of household drinking water, handling and storage; sanitation infrastructure and behavior of household members; and her own handwashing practices. Using a multilevel framework, we analyzed the association between childhood diarrhea and household drinking water quality, latrine ownership, mother's handwashing practices and village latrine coverage (defined as percentage of households in village with a latrine).

Results:

Improved source of drinking water (OR=0.5, 95% CI 0.35 to 0.71) and its storage in the household in closed containers (OR=0.63, 95% CI 0.45 to 0.87) were associated with a lower risk of childhood diarrhea. The mother's self-reported practices of washing hands before handling food, eating and feeding child (OR=0.86, 95% CI 0.80 to 0.93) and with soap after defecation and after cleaning a person who has defecated (OR=0.85, 95% CI 0.76 to 0.94) were associated with a reduction in diarrhea prevalence. Childhood diarrhea was not associated with household latrine ownership, but had a significant relationship with village latrine coverage (OR=0.67, 95% CI 0.47 to 0.95). Children from households with a high WASH score in villages having high latrine coverage had a 66% lower odds of diarrhea than children from households with a low WASH score in villages with low latrine coverage.

Conclusions:

In our study, the level of sanitation of neighboring households was more important than household's ownership of latrine for preventing diarrhea among children. Our analyses suggest that community-level sanitation in addition to household-level WASH practices is an important factor for early childhood health.

STAKEHOLDER ANALYSIS OF HOUSEHOLD ENERGY AND HEALTH SCENARIO IN INDIA

Authors¹: **Vidushi Bahuguna***, Samayita Ghosh*, Banalata Sen, Bhargav Krishna

Air pollution is a major and growing risk factor for ill health in India, contributing significantly to the country's burden of disease. Over two-thirds of rural Indians are caught in the '*chulha trap*' involving the use of solid fuels such as wood, dung or coal to satisfy their cooking and heating needs, resulting in smoke-filled homes and extremely high levels of exposure, especially in women and children. According to the Global Burden of Diseases, exposure to household air pollution causes more than 4 million premature deaths in the developing world, including more than 1.2 million deaths in India, every year.

In August and September 2017, we undertook a stakeholder mapping and conducted a series of dialogues to understand the landscape of household energy and health interventions in India. In doing so, the study documents the historical and current policies related to household energy use, household air pollution and its health impacts. We also collected secondary data on interventions, and held discussions with stakeholders from the government, private sector and civil society to understand:

- Their perceptions of the health impacts of air pollution
- The role of environmental health in policy development and decision-making
- Factors that may impact the implementation of national and state level programmes on household energy and health

Through this formative research, we outline the challenges in implementation that are prevalent at the national and state level, the importance of raising awareness of the health impacts of air pollution exposure, and the need to reform governance structures to factor environmental health in policymaking. This study also recognizes the importance of monitoring & evaluation of interventions as a means of continuous learning to address the continued challenges of household energy and health in India.

References:

<http://cleancookstoves.org/country-profiles/focus-countries/5-india.html>

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HUMANIZING THE UNDERSTANDING OF AIR POLLUTION

NIKITA BALIGA

Air Pollution is the fifth leading cause of death in India, resulting in about 620,000 premature deaths. It is associated with a range of health effects including respiratory and cardiovascular diseases. This has motivated multiple actors in the city, both private and public, to get involved in tackling air pollution, with the major focus on bridging the deficit in data on air quality by increasing number of sensors. However, the conflicts of quality of data - how good is good enough, is often hindering any form of mitigative actions despite the urgency to bring changes on ground. In search of the most accurate and reliable quantitative data, the key aspect of human experience of air pollution seems to be getting overlooked.

Addressing this status quo, the presentation covers work positioned around the hypothesis that quantitative data on air quality needs to be complemented by qualitative data, in order to make it contextual, meaningful and provide a holistic picture that can allow well-informed decision-making. The presentation covers a series of participatory exercises that were conceived to assimilate qualitative data such as: people's perception of air pollution, behavioral patterns and health impact.

- Air pollution perception surveys (over 100) during 'Happy streets' - a vehicle-free street event to encourage play and bring awareness, Bangalore
- Interactive game for Emission footprint mapping (around 250) of school children's mode of commute and travel distance to school, Mangalore
- Health Impact assessment through Pulmonary Function (67) Tests of traffic police to assess effects of outdoor air exposure, Bangalore
- Open houses (5) conducted to involve local community members during 'Breathe Bengaluru', a bottom-up study to develop a neighborhood model for air quality assessment

A key outcome of the community engagement was the reinforcement of the value of multi-stakeholder perspectives to address the complex issue of air pollution. In specific, the role of local community groups, whose personal insights with regard to causality of issues and everyday experiences can be invaluable to determine realistic and actionable solutions, was clarified. While, the interactive tools also became a way of bringing to light the position of individual actions and responsibilities of citizens versus their aggregative in determining personal exposure to polluted air as well as contribution to making of this crisis.

CHEMICAL SOURCE PROFILING FOR PM_{10-2.5} EMISSIONS FROM VEHICULAR EXHAUST IN INDIA

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PM_{10-2.5} chemical source profile for vehicular sources were established by adopting in-plume sampling method. PM_{10-2.5} samples were analyzed for mass and 32 species including 21 elements (Al, As, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Mo, Na, Ni, Pb, S, Sb, Se, V, Zn), 9 ions (Na⁺, K⁺, Mg²⁺, Ca²⁺, NH₄⁺, Cl⁻, F⁻, NO₃⁻, SO₄²⁻) and carbonaceous species (OC and EC). Atomic Absorption Spectrophotometer (AAS), ion chromatograph and thermal/optical reflectance methods were adopted for analyzing 21 elements, ions as well as OC and EC, respectively. Results indicated that all dust profiles were dominated by carbonaceous fractions (OC and EC) and identified as markers for all vehicular sources. While crustal elements (Al, Ca, Fe and Mg,) were found to be lower in all profiles. OC, EC and Pb were identified as reliable markers for vehicular exhaust emission sources. The Coefficient of divergence (COD) was evaluated to compare among the profiles, and results show that all profiles were differed from each other as the COD were found to be >0.3. These profiles are now being adopted in receptor models for source apportionment of particulate matter. The higher COD values and accurate source markers species justify that these reported source profiles are more suitable and provide more precise results.

A COMPREHENSIVE STUDY ON USAGE OF MOSQUITO COIL BY HUMAN AND ITS ADVERSE IMPLICATIONS

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The aim of this study is to investigate the cognitive effect of the sub-chronic exposure to mosquito coil smoke. With malaria and other mosquito-borne diseases serving as a major health problems in tropical areas, mosquito coil usage has increased in recent decades and the annual world consumption was estimated to be 32 billion coils by the year 2000. General abuse and wanton overuse of these mosquito coils and insecticidal sprays in the control of mosquitoes pose a serious public health challenge, especially innocuous and chronic inhalation of the fumes and consumption of produce that may have been laced inadvertently by chemical constituent of the insecticide. Epidemiologic studies have shown that long-term exposure to mosquito coil smoke is associated with asthma and persistent wheeze in children. A mosquito coil is widely known as an efficient mosquito repellent. Mosquito coil is a mosquito repelling incense usually shaped into a spiral and made from a dried paste of Pyrethrum powder. The major active ingredients of mosquito coil are Pyrethrin accounting for about 0.3 - 0.4% of coil mass. When a mosquito coil is burnt, the insecticides evaporate with smoke which prevents the mosquito from entering the room. This practice is currently used in numerous households in Asia, Africa, and South America. Normally, Mosquito coils are burnt indoors and outdoors in India to control mosquitoes. However, the smoke may contain pollutants of health concern. We conducted the present study to characterize the emissions from various common brands of mosquito coils from few regions. Human beings get exposed to a chemically complex mosquito coil smoke containing small particles ($<1\ \mu\text{m}$), metal fumes, and vapours that may reach the alveolar region of the lung. Coils consist of an insecticide/ repellent, organic fillers, binders, and additives such as synergists, dyes, and fungicides. Thus, the smoke contains pollutants of health concern. The concentrations of pollutants resulting from burning mosquito coils may exceed health-based air quality standards and have ill effects on health. In this review, we discuss the health implications due to burning of mosquito coils.

RECENT METHODS FOR THE REMOVAL OF TOXIC DYES FROM AQUEOUS SYSTEMS

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Due to growing industrial activities especially in the developing countries the problem of water pollution is reaching a threshold level causing ground and surface water quality depletion. Industrial effluent from textile, leather, plastic etc industries contain various synthetic dyes as one of the major pollutant which is toxic to the human health. Due to high cost of employing and maintaining a water treatment plant and weak environmental control laws the level of these pollutants is threatening local population especially in developing countries. Therefore, the removal of dyes from industrial effluent is one of the priority issue. Even till date different methods have been constantly used to mitigate and address these problems, but scientist could not achieve remarkable method to apply on large scales because of the complex nature of dye molecules. Hence, simple, safe and cost effective methods for the removal and recovery of dyes from industrial effluent are required and in this context modern methods including membrane technology and nanotechnology may provide an alternative. Conventional technologies are categorized into three methods: chemical, biological and physical methods.

In our laboratories efforts are being made to develop new nanotechnology based chemical and physical methods for the removal of toxic dyes from water. Polymer inclusion membranes (PIM) are synthesized and used as a separating medium for the transport of dyes from water in a locally self designed apparatus. Beside this the locally extracted and synthesized biopolymer chitosan was modified with to magnetic Fe_3O_4 chitosan nanoparticles (m- Fe_3O_4 -CNs) and successively used for the removal via adsorption towards sulphonated anionic dye Reactive Orange 107. All the analytical parameters were optimized to make the two methods viable for use of large scale. Such green water treatment procedures will help replacing the costly water treatment technologies which industries usually avoid.

CLEAN COOKING SOLUTIONS AND PUBLIC HEALTH

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One dimension of poverty that particularly hits women, especially those belonging to most vulnerable groups, is energy poverty, namely the limited access to clean and efficient energy sources. Cooking accounts for over 80% of the total household energy consumption in rural India¹ and biomass is a predominant cooking fuel, with firewood chips contributing to around 75% of cooking energy needs in rural areas². A less evident impact of continued use of fuelwood in traditional stoves is Household Air Pollution (HAP) which is responsible for around 500,000 deaths in India every year: this can be avoided through adoption of clean fuels and improved cooking devices, including Improved Cook Stoves (ICS)³.

A study commissioned by CARE India in select locations in Chhattisgarh and Odisha has revealed continued use of traditional mud stoves by >90% households (HH); nearly half of the surveyed HHs have never seen a stove other than the traditional stove; and 100% of surveyed HHs were found to be dependent on forest for firewood as the primary source of cooking fuel. A subsequent scientific study on performance of traditional cook stoves in field conditions has indicated that the CO emission rate (per minute) from the current cook stoves is around 4 g/min as compared to World Health Organization (WHO) recommendations of 0.35 g/min of CO, a Particulate Matter (PM) emission rate of around 400 mg/min as compared to WHO recommendations of 1.75 mg/min. These results were supported by lab testing results of traditional cook stoves. The magnitude of problem is huge and its neglect appalling. Awareness, availability, access and affordability of the alternatives have emerged as the four main factors hampering the adoption of cleaner cooking energy solutions. Unlike, as found in urban and peri urban areas, adoption of electric and LPG stoves through Pradhan Mantri Ujjwala Yojana (PMUY) by Forest Dependent Households (FDHs) has multiple barriers; a complex combination of factors like cooking traditions, intra-household distribution of incomes and gender dynamics, culture, religion, and affordability affects immediate switch to such options; under such circumstances ICS could be a solution toward gradual shift to the cleaner household cooking energy by Forest FDHs.

Informed by the above studies and the need to enhance the adoption of sustainable lifestyles among FDHs, CARE, with support from the European Commission, is implementing a unique initiative on "Evolving a Women-centred Model for Improved Cook Stoves Extension" in the geography. It is adopting an incremental approach to increase the awareness of women on clean energy options for HH use, facilitate acquisition of ICS through financial and technical interventions, and influence men and other stakeholders in the ICS ecosystem to be supportive of women's endeavours for clean energy transition.

1 TERI (2007). TERI Energy Data Directory and Yearbook 2007 (p. 348). Delhi: TERI.

2 National Sample Survey Organisation (2007). Energy Sources of Indian Households for Cooling and Lighting, 2004/05. NSS 61st Round; Report No. 511 (p. 213). Kolkata: Ministry of Statistics and Public Information, GoI.

3 Newspaper reports on India Clean Cookstoves Forum (ICCF) 2014, held in November 2014 in India

THE PAST, PRESENT AND FUTURE OF EDIBLE INSECTS: A CASE STUDY OF NYSHI AND APATANI TRIBES OF ARUNACHAL PRADESH , INDIA.

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Along with man's struggle with the environment, his quest for food has followed up the evolutionary trend since time immemorial. The Human food habits are entwined with human traditions which have developed a sedentary dependency of various indigenous tribes mainly due to factors of habitation, topography, nature of the land, climate, availability of flora and fauna and various other aspects.

Insect eating has been a part of the traditional knowledge of many tribes around the globe. It being a multifarious organism, plays a pivotal role in human society. It is not just a part of nature but acts as food and curative supplement which has induced a lot of curiosity in humans to study and find out how these abominates can be used as an alternative to meet various essentials of human especially in the world of food scarcity and medicine.

This report is an overview of understanding edible insects also known as 'entomophagy' and its various usage as a nutrient supplement and medicinal values in Arunachal Pradesh(North-East India) through the lens of 'future of food security in India'.

Tribes of Arunachal Pradesh often serve insects as raw material for folk remedies, traditional totems and taboos apart from dietary supplements. Traditional knowledge of a community at times brings up the uses of the insect as entomotherapy i.e. the therapeutic use of insects. Entomotherapy are often a transfer of knowledge from one person to another verbally or sometimes used by folk healers or shamans as an age old tradition.

Unlike countries such as Thailand and China in Asia where entomophagy is very common and highly accepted as a daily food, studying insect beyond its biological properties in India is still thought to be incoherent. An ethnographic approach for understanding entomophagy and entomotherapy in India is necessary to not only safeguard the tribal traditions, culture and food pattern but also can be used as a weapon to fight national and global food crisis in future.

THE EFFECTS OF EXPOSURE TO HEAVY METALS, THROUGH CONTAMINATED DRINKING WATER, ON HEALTH.

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The advancement in the infrastructure, technology and healthcare is able to improve the health and lifestyle of modern society but some basic problems are yet to be solved. One such prevalent problem is the presence of high levels of heavy metals in drinking water which exceeds recommended limits as set by the regulatory authorities in different countries of the world. Heavy metals such as Arsenic, Mercury, Cadmium, Nickel, Zinc and Lead are found to be present in especially groundwater drinking water which concerns for public health and health care professionals. The predominant source includes contamination of drinking water by industrial wastes and an array of chemical products where heavy metals are used in high concentration for their manufacture and also as ingredients. The health issues includes cardiovascular diseases, risks of diabetes ,cancer, renal and neural damage and even risk of emergent suicidal tendencies. The heavy metals harms the normal physiology and homeostasis by many possible mechanisms including production of ROSs(Reactive Oxygen Species) resulting in oxidative stress where ROSs causes potential damage to lipids, proteins , DNA , the three major bio-molecules of the cell and the organism as a whole. Thus utilization heavy metal contaminated water is resulting in high morbidity and mortality rates all over the world. Several studies are underway to resolve it by using antioxidant supplementation but data suggests a serious review on understanding the biochemical mechanisms and importance of antioxidants in resolving the issue of metal induced oxidative stress.

CRUDE ELECTRONIC WASTE RECYCLING IS A POTENTIAL SOURCE FOR TOXIC ORGANIC COMPOUNDS IN INDIA: ATMOSPHERIC TRANSPORT MODELS AND HUMAN HEALTH RISK ASSESSMENT

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Electronic waste (e-waste) has emerged as a critical global environmental problem because of its massive production volume and insufficient management policy. Improper management of domestic e-waste and lack of proper handling of illegally dumped e-wastes from developed nations is further complicating the e-waste associated problem. Because the rate of e-waste accumulation is startling and the combinatorial effects of toxicants are complex we aimed to investigate toxic organic compounds in the informal e-waste recycling sites and nearby dump sites of four major Indian cities: New Delhi in the north; Kolkata in the east; Mumbai in the west and Chennai in the south. Persistent organic compounds like polychlorinated biphenyls (PCBs), phthalates and bisphenol A, associated with the end-of-life-cycle of these chemicals have been observed from the crude e-waste (discarded electrical and electronic equipment) recycling sites and nearby dumpsites. Incomplete combustion contributed in emission of polychlorinated dibenzo para dioxins and furans (PCDD/Fs) and polycyclic aromatic hydrocarbons (PAHs). FLEXPART model predicted atmospheric PCB levels using existing PCB inventory were nearly 100 folds lesser than our observed PCBs in Indian atmosphere. Positive Matrix Factorization (PMF) model identified distinct congener pattern based on the functional activity viz., e-waste dismantling, shredding, precious metal recovery and open burning in dumpsites. E-waste metal recovery factor was loaded with 86-91% of dioxin like PCBs (dl-PCBs) viz., PCB-77, -105, -114 and -118 and elevated level of PAHs, phthalates and bisphenol A possibly associated with burning of cable wires coated with plastic. Furans were higher in the acid leaching sites of New Delhi leading to highest toxicity equivalents (TEQs) among all the cities. Heavier PCB congeners were emitted from the core metal recovery sites. TEQs for dl-PCBs and benzo-a-pyrene in the core metal recovery sites and nearby dumpsites are indicating risk to human health due to prolong exposure.

INCREASING TOILET USE IN RURAL INDIA, USING THEORY TO DESIGN AN INTERVENTIONS.

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Background: Almost 3 million toilets have been constructed In Gujarat since the start of the Swaach Bharat Mission in 2014. Whilst many are in full use, many are also partially or not at all used. We employed the theory and process of Behaviour Centred Design (BCD) to design an intervention to address this problem.

Methods: Following the BCD intervention design methodology we: A: Assessed what was already known through literature review and an expert framing workshop, B: Built knowledge through qualitative formative research (FR) in four villages in Bhavnagar district and a creative workshop and C: Created and prototyped an intervention package. A theory-based checklist of behavioural determinants was used to organise findings at each stage in the process

Results: We narrowed down our target behaviour to ‘all family members use the government provided toilet at all occasions when at home’. Our hypotheses about drivers of this behaviour were refined and developed iteratively. Determinants of OD included; having an incomplete or poorly-built toilet, lack of engagement with an alien ‘government toilet’, desire to limit use to prevent pit filling, preference for fresh air, poor initial use experience of smell and a ‘packed’ feeling, routine of using fields (particularly among men), limited water supply for flushing, and traditions concerning child faeces disposal. The intervention was developed by a local creative agency and included a toilet makeover and ‘emo-demos’ of pit filling.

Implications: The process of intervention design using BCD was straightforward, rapid and relatively cheap. The next step is to trial the intervention.

DOES NIGHT SHELTERS MAKE A DIFFERENCE IN HYGIENE AND SANITATION PRACTICES AMONG HOMELESS WOMEN LIVING IN DELHI, INDIA?

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Introduction: Hygiene and sanitation practices are important determinants of health. Recently “Swachh Bharat Mission” is been implemented across in the country to have 100% free open defecation in next 3 years. In this context it is necessary to look into the hygiene and sanitation practices among those homeless women who does not have access to basic livelihood. Also, it is important to understand providing night shelters to the homeless people make any differences in their hygiene and sanitation practices.

Methods: The study used the primary data collected among the homeless women living in night shelters as well as living in streets during July 2015 to Dec 2015 in New Delhi. The homeless women above 15 years were interviewed to collect information about the causes of homelessness, living condition, and health conditions. 200 homeless women from night shelters and 100 homeless women from streets through the NGOs who are working for the homeless were interviewed. Both quantitative and qualitative method was used in data collection. The ethical review clearance was taken from the Student Research Ethics Committee (SREC), IIPS, Mumbai.

Results: About 88% of the women living in night shelters are using the toilet facilities. However, only 21% non-sheltered homeless women have using toilet facility. Majority are using either nearby railway tracks (28%), open spaces (35%) or on the streets (8%) to relieve themselves. The homeless women living in streets do not have access to clean drinking water and drink water from any religious places, burst water pipe line or from road side hotels. The homeless women don't clean their nail, garments, body and hair. About 24% found clean in all (nail, garments, body and hair) compared to 12% among non-sheltered.

Conclusion: The homeless are generally don't have access to basic sanitation and water supply to meet their daily requirement. Therefore, it is an urgent requirement to make sure the homeless gets at least proper access to basic livelihood.

COST EFFECTIVE PATHWAYS FOR REDUCING RESULTANT DISEASE BURDEN IN INDIA DUE TO HOUSEHOLD AIR POLLUTION

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Background:

The global burden of disease study estimates that about 13% of mortality and morbidity in India is due to household air pollution (HAP). HAP has been conclusively associated with significant risk of Ischemic Heart Disease (IHD), Stroke, Chronic Obstructive Pulmonary Disorders (COPD), Lung Cancer (LC) and Acute Lower Respiratory Infection (ALRI). While the efforts for providing access to Liquefied Petroleum Gas (LPG) have been intensified recently, there is little information about the different possible pathways of transitioning to modern fuels in India and their cost effectiveness. This analysis estimates the costs and health benefits of expanding usage of modern fuels from 2015 to 2030 in India.

Methods:

Four scenarios were constructed. Baseline scenario was defined as continuation of modern fuel penetration with current trends and efforts. Scenario built on the assumption of reasonably successful rollout of Pradhan Mantri Ujjwala Yojana was termed as PMUY. In Multi-Fuel scenario the focus is not only on LPG but also on other modern fuels. The SDG scenario assumed aggressive push towards modern fuel with 100% access by 2030 as envisioned in the Sustainable Development Goal-7. Economy-wide financial costs of the transitions were estimated. Integrated Exposure Response Curves were used to calculate disease specific relative risks for IHD, COPD, LC, Stroke and ALRI. Health benefits in term of averted annualized Disability Adjusted Life-Years (aDALYs) were estimated using the WHO projections of background disease burden for 2015 and 2030.

Results:

At the end of 2030, 22% of background DALYs would be attributable to HAP in baseline scenario. This proportion would be 14.3% and 10.1% in PMUY and Multi-fuel scenario respectively, with complete elimination of HAP related burden in SDG scenario. The SDG scenario is the most cost-effective with the cost of preventing each DALY at just over Rs. 100,000. According to WHO CHOICE model, all three scenarios are highly cost-effective.

Conclusions

Aggressive transitioning to modern fuel is highly cost effective and even as the only intervention, can take off substantial proportion of disease burden, facilitating timely achievement of the targets especially for CVD and COPD set during the recent National Health Policy.

HYPERTENSION AND CONSUMPTION OF SALTED FISH IN AN AREA SUPPORTING A SALTED FISH INDUSTRY

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In Indonesia, the province of South Sumatra has the second highest prevalence of hypertension in the area, with Bangka Belitung province having the highest incidence. Palembang City, in South Sumatra, is a significant region of fish production, including a home-based industry for producing salted fish. The aim of this cross-sectional design study was to analyze the association between the consumption of salted fish and the incidence of hypertension in residents of this region. The study was conducted in the 5 Ulu Subdistrict, Palembang City, South Sumatra Province, in April–June 2016 on a sample of 90 subjects obtained using the cluster method. Systole and diastole blood pressure was measured by trained nurses using a sphygmomanometer and stethoscope. Samples (approximately 250 g) of salted fish sold in the 5 Ulu Subdistrict and most commonly consumed in each neighborhood or ‘*Rukun Tetangga*’ (RT) were collected and sent to the Faculty of Fisheries Product Technology, Bogor Agricultural Institute for analysis of the NaCl levels. Data on salted fish consumption and hypertension were then analyzed with the chi square test. No association was found between the consumption of salted fish with high levels or normal levels of NaCl and the incidence of hypertension in people living in the area of salted fish production ($p \text{ value} > 0.05$). People who consumed salted fish and lived in the area of salted fish production had a the same risk of developing hypertension as those who consumed salted fish and lived in other areas.

A META-ANALYSIS OF BLOOD LEAD LEVELS IN INDIA AND ATTRIBUTABLE BURDEN OF DISEASE

DR. SUBHOJIT DEY

Multiple studies in India have found elevated Blood Lead Levels (BLLs) in target populations. There is a dearth of efforts to use these studies to understand population wide BLLs, leading to a lack of data that could potentially inform industry specific environmental and public health policies in mitigating lead exposure in populations.

Materials and Methods: We review studies with published BLL data from the past 10 years on populations in India to calculate a geometric mean BLL for various subgroups. We then apply methods developed by the WHO to calculate the attributable disease burden.

Results: We find that the average BLL resulting from non-occupational exposures in adults and children is 6.76 $\mu\text{g/dL}$ (95% CI: 4.47-10.23) and 10.09 $\mu\text{g/dL}$ (95% CI: 8.11-12.54), respectively, and that these BLLs resulted in 7 million DALYs in 2013 (95% CI: 4-11).

Conclusions: Population-wide BLLs in India remain elevated despite regulatory actions to deal with the most significant sources, possibly due to small scale and unregulated lead smelting industries. The attributable disease burden may be larger than previously calculated, particularly with regard to intellectual disability in children. Larger population-specific BLL studies are required to inform future calculations.

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COAL, CLIMATE AND PUBLIC HEALTH- A Global and National Issue

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India, the fourth largest producer of coal in the world, is at the breakneck pace of industrialization. India is generating 59.9% of its total electric power by coal. It is a great achievement. We are concerned about the power requirements of the country it's good but the question is "what are we losing...?". Are we concerned about the environment, the public health and the climatic change?

Coal mining causes not only air pollution but it adversely affects the surface water, groundwater and large areas of landmass and ultimately one of the biggest reason for the climate change. Coal particulate pollution shorten approximately 1000000 lives annually worldwide, which is one third of all premature deaths related to all air pollution sources. Air pollution from coal mining and coal power plants causing public health crisis with nearly 115000 premature deaths, 10000 child mortality, 625 million cases of respiratory symptoms, 170000 chronic bronchitis, 8 million chest discomfort and asthma attacks to nearly 21 million people every year.

In the year 2015-16 coal production in India was estimated to be 638.05 MTe. The Indian government has estimated that by 2020, India will need 1.5 BTe of coal. What we will be producing by 2020 is nearly thrice what we are producing today. Coal mining and power plant pollution cost hospitals in India 16000-23000 Cr per year.

Greenhouse gases like CO₂ CH₄ N₂O HFCs PFCs and SF₆ causes trapping of heat reflected by earth surface and ultimately results in the rise of average global temperature. It is clear that the energy from coal is the major contributing factor for GHG emission followed by agriculture. India, being a member State of Paris Climate Agreement needs to focus the issue of carbon emission by coal. This becomes an important topic of research not only in the field of public health and environment but also for the economy of the nation. This paper aims to analyse the effects of coal in the public health and its contribution in climate change.

CLIMATE CHANGE AND ITS HEALTH RISKS ON DEVELOPING COUNTRIES

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Background: The environmental risks posed by climate change to human health cannot be emphasized enough. Warmer summers, fewer cold days, floods and droughts will naturally increase the burden of diseases and disorders on the world. The majority of the burden will be faced by the developing countries and socio- economically disadvantaged communities. This paper aims to analyse the burden of climate change induced health risks on developed and developing countries.

Methodology: Relevant information regarding climate change and its health risks was derived from databases like ProQuest Central, Wiley and BioMed Central. Social determinants of health and statistics for mortality from environmental health risks were accessed from World Health Organisation. Comparative analysis was done between South-East Asian countries (SEARO) and Americas high-income OECD countries, on factors like aggregate deaths attributable to environment and specifically, to air pollution.

Results: For the year 2012, the percentage of deaths attributable to the environment for the SEARO countries was 28% while for Americas (high-income OECD countries – Canada, Chile and the USA) it was 11%. Air pollution is the leading cause of climate change. In SEARO countries, DPRK had the highest mortality rate attributable to household and ambient air pollution (per 100,000 population) – 238.4. Maldives had the lowest rate of 15.3. In Americas, Chile had the highest mortality rate – 19.3.

Conclusion: The findings reaffirm the belief that developing countries are more at risk of climate change induced environmental health risks than the developed countries. The lowest mortality rate, for SEARO, attributable to air pollution was closer to the highest mortality rate of Americas. This indicates a vast difference between the burden of health risks brought about by climate change for developed and developing countries. Sustainable development measures that promote the symbiosis of adaptation and mitigation are needed. The Paris Agreement on Climate Change is a milestone in this regard, as it explicitly states the right to health as a major reason to act on climate change. However, it needs to be assessed how effective the agreement will be in protecting the right to health.

DEATH RATES ATTRIBUTABLE TO ENVIRONMENT: A COMPARATIVE STUDY BETWEEN WHO-SEARO AND CENTRAL AFRICA COUNTRIES

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The environment affects our health in a variety of ways. The interaction between human health and the environment has been extensively studied and environmental risks have been proven to significantly impact human health, either directly by exposing people to harmful agents, or indirectly, by disrupting life-sustaining ecosystems. Although the exact contribution of environmental factors to the development of death and disease cannot be precisely determined, the World Health Organization (WHO) has estimated that thirteen million deaths annually are attributable to preventable environmental causes. An ecology study was conducted to compare the death attributable to environment among SEARO countries and Central Africa Countries. Population data for 2012 on Age-standardized death attributable to environment from World Health Statistics available in public domain were analyzed. In SEARO countries the most of the deaths attributable to the environment (per 100000 populations) are non communicable disease (83.08%) while 16.92% of the deaths are attributable to infectious, parasitic, neonatal and nutrition. Comparing with Central African Countries most of the deaths attributable to the environment are communicable disease (53.7%) while 46.3% are attributable to non-communicable disease. In SEARO countries the difference in deaths attributable to environment ranges from 51 to 260 and 5 to 62 in non communicable disease and infectious disease respectively. While in Central African countries, age-standardized death attributable to environment ranged from 54 to 247 and 67 to 178 among infectious and non-communicable disease respectively. The results shows that in SEARO countries deaths associated with environmental condition are mainly due to non communicable diseases (83.08%) while in Central Africa countries it is both due to communicable disease (53.7%) as well as non-communicable disease (46.3%). The results of this study are particularly important for health care sector of both the regions to address the country specific issues, where policies and programmes are generally framed. Along with reducing disease burden, the estimates provide an overview of opportunities for prevention through healthier environments. Further studies to confirm and explore the finding are recommended.

STUDY OF ASSOCIATION BETWEEN AMBIENT HEAT AND ALL-CAUSE MORTALITY FROM THE EASTERN INDIAN CITY OF BHUBANESWAR, ODISHA: EXPLORATION FOR THE THRESHOLDS AT WHICH POINT THE DELETERIOUS EFFECTS “KICK IN”

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Background

Despite scorching summers, there are limited studies from India exploring the effects of “hot days” on human health.

Objectives

To study the various aspects of the short-term association between ambient heat and health outcomes in Bhubaneswar, India, mainly for estimation of temperature threshold(s) - when the hazardous effects of heat “kick in” - so that accurate city-specific weather warning systems can be developed and mitigation policies informed

Methods

We collected daily temperature and all-cause mortality data of Bhubaneswar city for March to July (2007-2014). We conducted time-series analysis using a Generalized Additive Model with quasi-poisson distribution to examine the association between daily maximum temperature and mortality rates and its interaction with minimum daily temperature.

Results

Two thresholds for maximum temperature were identified: 36.2o C when mortality rate crossed the annual average (represented by the null value) and 40.5o C when the lower 95% confidence limit of the risk curve also crossed null value; and then rose steeply thereafter. Every degree Celsius rise in temperature above 36.2o C increased the mortality risk by 2% (MRR: 1.02; [1.01, 1.03]). Daily maximum temperature was significantly more hazardous when minimum temperature of the day crossed median value (25.6 o C). The effect of ambient heat was of immediate onset with little lagged effect.

Conclusion

The study identified the city-specific thresholds of daily maximum temperature for Bhubaneswar beyond which the ambient heat increased the risk of all-cause mortality. Also, daily minimum temperature was found to be a significant “enabler”, implying its importance in the future hot weather warning system.

REVIEW OF FOOD TOXIN OR CONTAMINANTS EXPOSURE AND CHILDREN'S ENVIRONMENTAL HEALTH OUTCOMES: AN INDIAN SCENARIO

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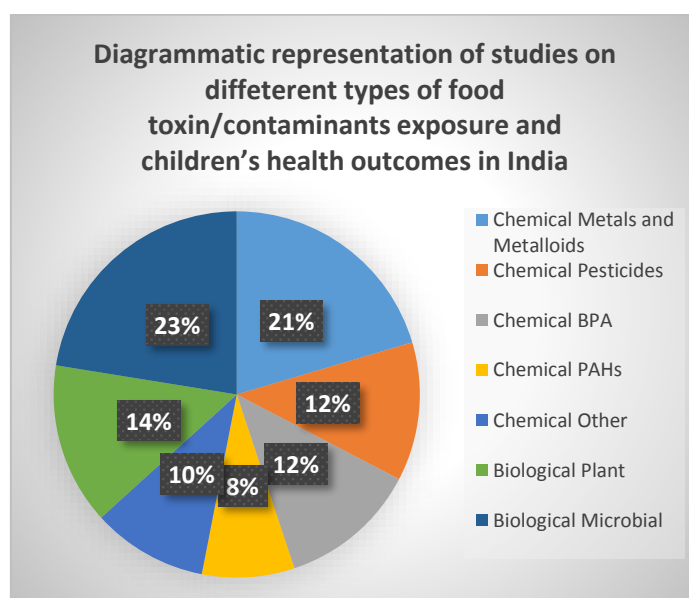
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Background: Food toxins or contaminants can be of chemical (metals and metalloids, pesticides, radioactive particles, plastic etc.) or biological (plant, animal, microbial) origin. Children are at high-risk for food toxin exposure as compared to adults because of their different dietary and lifestyle habits. They tend to absorb and accumulate higher amount of toxins in body during growth, development and differentiation phases. Immaturity of vital organs make children extremely susceptible to toxin exposures. It can cause growth and developmental delay leading to poor quality of life. Death and disability (affected nervous system, liver and kidney) due to toxic reaction from food in a country like India with very young and growing population cause huge burden. It is necessary to review the existing literature on health effects of food toxins and contaminants on children in India.

Methods: The review contains published articles and grey literature within last ten years (2008-2017) on health effects of food toxins and contaminants on children (0-18 years) in India. Online resources were searched from PUBMED, PLOS ONE, Google Scholar, ScienceDirect, Shodhganga and Institutional repositories. Relevant articles found were 49 in number. The articles were then separated according to the categories of toxin/contaminants. The words used for search were food contaminant or food toxin and child. Searching for different toxins or contaminants by name- lead, arsenic, mercury, Bisphenol-A, PAHs, pesticides, mycotoxin etc. yielded additional results.

Results: The table below shows available literature on **health outcomes** of **Indian children** from exposure to different categories of **toxins/contaminants in food**-

Toxins/Contaminants		Studies	Health outcomes observed
Chemical	Metals and Metalloids	10	Neuro-behavioural & developmental disorders; hypovolemic shock; gastrointestinal, cardiac, liver, kidney and skin disorders; higher morbidity and mortality
	Pesticides	6	
	BPA	6	
	PAHs	4	
	Other	5	
Biological	Plant	7	
	Microbial	11	



The reviewed literature includes mainly case-control and cross-sectional studies. A good number of exposure or health-risk assessment studies are available in India, whereas evidence-based studies focusing on children's health outcomes is very few and need immediate attention. Longitudinal cohort studies/ long-term follow-up studies can provide great insight and can help designing necessary plan of action towards minimizing harm and burden.

INFANT PARENTING ON TOLOTANG COMMUNITY IN LACCOLING, GALUNG MALOANG DISTRICT, PAREPARE CITY

Ranti Ekasari

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Infant was an important period for the child growth. Infant parenting covers general knowledge from infant's mother and their family includes their faith, exclusive breastfeeding availability, giving colostrum, sanitary hygiene of infant's family who lives in the same house, Sanro and The Maternal and Child Health Centre Officer information. Tolotang community has their own way of parenting their infants according to their value in their religion. Sanro/Uwa will give them information about many things in life. The purpose of the research was to know how Tolotang Community take care of their children. This research was a qualitative study with case-study design. Data was collected through in-depth interviews and observation to infant's mother, infant's family, Maternal and Child Health Centre Officer and Sanro. This research was held on August 2017 in Laccoling. The research showed that all Tolotang Community have Sanro who will tell them an information about taboo habit such as they may not come out from house while their infants were under 40 days of age. A Sanro also gave a massage when they were in pregnancy period. The Maternal and Child Health Centre Officer agree with Sanro. Besides, all infant's mother giving exclusive breastfeeding. They thought that it is important and they do not need to spend money for it. They also gave the colostrum to their infants but they did not know the meaning of colostrum. Sanitary hygiene of infant's parenting showed all informants have a person who smokes in their house. But the smoker always keeps a distance from the infant. Infant took a bath in dishes wash place with specific basin because their toilet was under their house since all of their house was made from wood and have a ladder. Infant's mother also keeps their breast clean by wash it with clean water. As a conclusion, Tolotang community takes care of their infant according to their financial condition. They also have their own way to keep their sanitary hygiene. According to their faith, their Sanro has similar paradigm with their Maternal and Child Health Centre Officer since they are both Tolotang Community.

SHINING A LIGHT ON SRI LANKAN CKDu

Authors:

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An important global environmental health crisis has emerged around chronic kidney disease of unknown etiology (CKDu). CKDu presents as kidney disease without common causative factors such as diabetes or hypertension. CKDu is slow to progress, irreversible, and asymptomatic until late stages. Geographic “hot spots” of CKDu have emerged in several countries, including Central America, Bulgaria, Croatia, Serbia, India, and Sri Lanka. CKDu is most commonly observed among people working in the soil and as agricultural workers and affects social and economic wellbeing. Despite efforts, no study has yet pinpointed the likely causes of CKDu with supporting data, and many studies have focused on individual risk factors (e.g., exposure to arsenate pesticides). We postulate that CKDu etiology is multifactorial, involving genetic predisposition, nutritional/dehydration status, environmental nephrotoxin exposure, and behavioral/lifestyle factors. This presentation will review findings from two small studies completed in targeted geographic areas of Sri Lanka between 2013 and 2017 to shed light on potential risk factors associated with CKDu and to explore more exhaustively in a more comprehensive study. We completed a broad panel, metallomics/mineralomics laboratory analysis to screen whether heavy metal and trace nutrient concentrations in biological, environmental, and food samples collected from two endemic towns contain above average background values or exceed current health benchmarks. Our regional geochemical screening analysis identified specific constituents above levels of potential concern, including cadmium, lead, mercury (human blood or hair); arsenic (soil); fluoride and lead (drinking water). In 2017, we initiated a case-control study, collecting human biological samples (blood and urine) and environmental samples (drinking water, rice, and soil) from endemic areas in Sri Lanka, and associated these samples with individual surveys to link environmental and other risk factors. Our goal is to use these findings and lessons learned to launch a comprehensive case-control study in endemic and non-endemic areas. The study would include robust datasets of georeferenced multimedia samples associated with personal surveys to enable comparative statistical analysis and human health risk analysis for several countries with documented CKDu. This approach will improve likelihood of accurately identifying collective risk factors associated with CKDu in Sri Lanka and other hot spots.

REMEDICATION OF HEAVY METAL ION TOXICITY FROM WASTE WATER USING FUNCTIONALIZED CHITIN

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The contaminants in the waste water from various sources that pursue in the environment are pesticides, dyes, aromatic hydrocarbons, oils, heavy metals etc. and these contaminants are a major hazard to the individual's health and surroundings. Heavy metals are kind of inorganic pollutant and these cannot be removed using physical and chemical methods as in case of organic pollutant because of their qualities like solubility, oxidation - reduction characteristics, and complex formation. Therefore the heavy metal decomposition plays a major concern.

Adsorption is one of the most popular techniques for the removal of heavy metals ions from wastewater. This method provides an important and attractive alternative for treatment of wastewater, where the adsorbent is cheap (low cost) and does not require any additional pre-treatment step before application.

The aim of present study was to investigate the adsorption properties of surface modified chitin in aqueous solution containing cadmium ions (heavy metal) .For this purpose, the ligands of ethylene diamine tetracetic acid was immobilized onto polymer matrices of chitin. The effect of dose of adsorbent, pH , treatment time and temperature was analysed with the help of UV-VIS spectroscopy. The functionalized chitin was characterized by IR - spectroscopy. In case of cadmium, increase in adsorption was observed as the doses of adsorbent was increased. When dose of adsorbent was 0.1g , pH 7.5 ,temperature 323K , and treatment time of 15 minutes, maximum adsorbent was observed with adsorbent % of 68.09% , 45.76% , 8.018% and 21.87 % respectively. Functionalized Chitin showed a promising application in wastewater treatment.

HIGH LEVELS OF HCH AND ITS DERIVATIVES IN BLOOD OF WOMEN OF PUNJAB, INDIA

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Pesticides, environment protection, and women health have been of global concern. Organochlorine pesticides are non biodegradable and are known xenoestrogens. The aim of this study is to assess the level of organochlorine pesticides specifically HCH and its derivatives in three biological matrices (blood, tumour and surrounding adipose) of women suffering from either benign or malignant breast disease. The study population is selected from Punjab due to the excessive usage of pesticides in this region for several decades. Total 100 Women were chosen for this study who were undergone surgery for benign or breast malignancy. Results reveal the considerable levels of HCH and its derivatives in these samples. Body Burden of total HCH in three different matrices was found in the following order viz; blood > adipose > tumour. In blood samples the level of isomers of HCH were found higher in benign group than malignant group. In case of adipose tissue γ -HCH and δ -HCH were found higher in the malignant group and γ -HCH and β -HCH were found to be on higher side in benign group. Where as in tumour samples, this was found almost double in the malignant group then that of benign one. The level of HCHs was found to be extremely significant ($p < 0.001$) in blood, adipose and tumour samples except β -HCH in tumour. The major finding in this study is that the women with breast malignancy have higher levels of isomers of HCH in comparison to the benign breast disease. This work shows the positive association between high level of HCHs and breast diseases. This also reveals that this hazardous chemical is still in use although it is banned

ASSOCIATION OF AMBIENT FINE PARTICULATE AIR POLLUTION (PM_{2.5}) WITH CARDIOVASCULAR MORBIDITY IN A MEGACITY KARACHI, PAKISTAN

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Air Pollution impacts on mortality and health are a significant public health issue worldwide. Population-based studies have documented health risks resulting from short-term exposure to air pollutants. Southeast Asia is now the most polluted region in the world, with 2.6 million deaths related to outdoor air pollution. These new estimates are based not on a significant increase in pollution, but on improved knowledge of the links between air pollutants and cardiopulmonary diseases and cancers. We have investigated the short-term effects of PM_{2.5} and black carbon (BC) in ambient air on hospital admissions and emergency room (ER) visits among residents living in one of the largest cities of Southeast Asia, Karachi, Pakistan. Daily records of hospitalizations and ER visits for cardiovascular diseases (CVD) at three major hospitals serving the city were collected. The 24 h concentrations of PM_{2.5} were collected at two commercial/residential and industrial/residential sites. BC measurements were obtained from PM_{2.5} filters using an optical transmissometer. Single- and multi-pollutant lagged generalized linear time-series models were utilized to analyze daily counts of hospital, meteorological, and pollutant data. PM_{2.5} and BC concentrations in the city ranged 27 - 279 µg/m³, 1 - 32 µg/m³, respectively. Analysis showed the evidence of positive associations of fine particle air pollution, meteorological factors, and seasonal parameters with ER visits and hospital admissions due to CVD in Karachi. Statistically strongest relationships were observed for all patients (RR = 1.499, 95% CI = 1.240 – 1.812 for Korangi; RR = 1.778, 95% CI = 1.349 – 2.345 for Tibet Center) and hospital admissions (RR = 1.613, 95% CI = 1.274 – 2.043 for Korangi; RR = 2.036, 95% CI = 1.424 – 2.911 for Tibet Center) for PM_{2.5} concentrations (151 – 200 µg/m³). This study provides scientific evidence on the magnitude of health effects associated with air pollution in urban centers of large developing nations, evaluate BC as an additional indicator for evaluating health impacts associated with ambient air pollution, and finally, to provide scientists and policy makers with vital information for policy planning.

THE BEHAVIORAL EXPOSURE OF MERCURY IN THE COMMUNITY OF SMALL SCALE GOLD MINING AREA OF LEBAKSITU, INDONESIA 2017

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The concept of behavioral exposure was introduced in 1985, mostly applied in the working community of small scale industries or informal sectors not in the community at large. This study was done in an area of small scale gold mining of Lebaksitu, Indonesia. The area of the study is located in 690 meters above sea level, geographically it has potential for agriculture. This particular area also has some mining materials such as limestone, and gold. The gold mining process was started in 1994 up to now. They are small scale gold miners which mostly using mercury for amalgamation to extract gold from ores and released into the environment to become waste during the process of purifying gold. This condition can affect biota in the environment and finally community health. The study aiming at the degree of behavioral exposure of mercury in the community of Lebaksitu, such information can be used as strategy for public health program. The study design used in this study is cross sectional. The study was conducted in May 2017. There are 68 respondent included in the study. The data obtained from the laboratory test was used as the biomarker of exposure of mercury. With the standardized behavioral questionnaires combined with the biomarker was then categorized into low level of behavioral exposure and good behavioral exposure. Further analyses indicated that lower level behavioral exposure was 3 times greater risks than the good one controlled by the length of stay in the area. As the behavioral exposure is variable that can be controlled by public health measure, so this study suggested that public health measure can be applied in this particular area to control the risk.

CLIMATE CHANGE AND URBAN AIR POLLUTION HEALTH IMPACTS IN INDONESIA

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Climate change in Indonesia greatly affects economy, poor population, human health, and the environment. It influences air pollutant emissions as higher emissions of carbon dioxide (CO₂) have caused rapidly worsening air pollution. The large number of vehicles together with lack of infrastructure results in major traffic congestions resulting in high levels of air polluting substances, which have a significant negative effect on public health. The study objective to identify diseases-related air pollution caused by climate change and develop reduction emission scenario. Current air pollution in Indonesia caused more than 50% of morbidity across the country. Diseases stemming from vehicular emissions and air pollution include acute respiratory infection, bronchial asthma, bronchitis, chronic obstructive pulmonary disease, lung cancer and cardiovascular diseases. The prevalence and incidence rate of diseases related to air pollution is predicted worse in the future since the range growth of energy consumption 6-8 percent per year. The increasing of NO_x will reach 51% (from 814 kilotons per year in 2015 to 1225 kt/yr in 2030), PM_{2.5} rise 26% (from 87.7 kilotons per year in 2015 to 110.5 kt/yr in 2030) and similarly to other pollutants of SO₂, PM₁₀, VOC, and O₃. Scenarios for reducing emission of Euro IV's standard implementation in 2018, 2020 and 2023 found significant results.

It may conclude that an earlier implementation of EURO IV standard in Indonesia a faster emissions reduction with lower cost of economics and its health impacts.

PSYCHO-SOCIAL IMPACTS OF MENTAL DISORDERS IN INDIA AND EMERGENT NEEDS OF EVIDENCE BASED POLICIES FOR PUBLIC HEALTH

Faisal Hassan Daud Salim Faruquie

India is a country undergoing transitions, due to its geo-political might, enacting policies becomes a hideous task in administrative terms. Government of India has adopted international standards for framing its policies to attend the challenges banking on the effectiveness of such policies in developed countries. The prevalence of mental health problems among adults and children suggest that there are considerable financial impacts of mental illness which affect personal income, the ability of ill persons and more often their designated caregivers; consequently there is a lack of utilization of treatment and support services. The losses due to mental disorders faced by family members of the patients are very difficult to be quantified and often ignored consequently but they do have a significant impact on the quality of life of family members. The average cost of mental health problems in developed countries is estimated to be between 3% and 4% of GNP, while the same cost is around 2% in case of developing countries like India. While mental disorders impose a great stress upon national budget both in terms of expenses and imminent loss of productivity, there is a great need of dealing with this situation in an effective manner. Around 450 million people in the world suffer from mental health disorders, 1 million commit suicide every year, 4 out of 6 of disability causes are due to neuropsychiatric disorders like depression, alcohol abuse, schizophrenia & bipolar disorder. Apart from being a health related issue, mental disorders also are a social issue as those suffering get victimized by human rights violations, stigmatization and discrimination whether they receive care at psychiatric facilities or at home. Psycho-Social nature of mental disorders and their remedies being an important issue of social medicine has effectively made them a concern for public health. The National Mental Health Care Act of 2017 enacted by the Parliament of India defines mental health in the precinct of international medical standards. Though the act is expected to fetch better outcomes but at the same time, its administration could pose enactment challenges like before. This paper investigates the National Mental Health Program of India in accordance with the National Mental Health Care Act of 2017 and provides a critique paving way for crafting sturdy mental health programs using evidence based approach.

PM 2,5 EXPOSURE AND CHILDREN PNEUMONIA IN INDUSTRIAL AND NON INDUSTRIAL AREAS, PADANG, WEST SUMATERA

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Pneumonia is the leading cause of death among children worldwide than any diseases. More than 2 million children aged 1 to 5 years died of pneumonia each year across the region. The prevalence of children pneumonia in Indonesia is 18.5% per 4,6 km. From year to year there is an increasing number of cases of pneumonia in Padang, West Sumatera. Inhalation of toxic chemicals such as particulates can also cause tissue damage in the lungs that suspected to be the cause of pneumonia. This study aims to analyze the relationship of PM_{2.5} with incidence of children pneumonia living in industrial and non-industrial areas in Padang and other risk factors that lead to pneumonia. This study conducted in early 2017 used case-control design. The sample consisted of 51 children younger than five years each for industrial and non-industrial areas. The results indicated that variables associated with pneumonia in children were exclusive breastfeeding and vitamin A. While the concentration of PM_{2.5} and indoor air pollution factor were not associated to the incidence of pneumonia in children. In conclusion, the incidence of pneumonia in children is associated to the concentration of PM_{2.5} after controlled by the location of the kitchen, exclusive breastfeeding, vitamin A, nutritional status, and measles immunization.

EFFECT ON PHYSICAL ACTIVITY AMONG USERS OF WALKING TRACK UNDER WETLAND CONDITIONS IN COLOMBO, SRI LANKA.

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Introduction

Planned environment and Communities can strongly enhance opportunities for people to improve their levels of physical activity (PA). Peaceful area for physical activity nevertheless offer benefits to mind and body both. As most of population travel for work from sub-urban and minimal occupancy of wetland in urban busy settings, it is much beneficiary to develop walking tracks (WT) with wet, greenish surroundings in sub-urban area for the use of working community.

Materials & Methods

Between 10/ 2014 and 12/ 2014, a total of 428 individuals, attending to selected WTs in Kotte area were randomly assigned to collect data by using interviewer administered questionnaire. The participants were surveyed of their profile, purpose of using Walking tracks, pattern of PA and compared their PA levels after starting use WT with, PA levels before starting to use WT. Non-parametric “Wilcoxon T test” was used to assess the comparison.

Results & Discussion

About 67% of participants revealed that they used to come WT for both relaxation and to do PA and 21% of participants were exercisers only. 51% (n=218) were previous regular exercisers and rest of 49% has started to do regular exercises after establishment of WT. Study in American trail tracks, 23% (n=93) of those surveyed were new exercisers and 77% (n=321) were habitual exercisers (Gordon et al., 2004).

Well-educated rich people with more than 40 year age category were attending to WP in majority. Median time spent in WP was 60 minutes and median MET score / week was 792. Wilcoxon T test showed that PA level among users was significantly higher after starting to use WT over their earlier PA levels ($p < 0.0001$). Being a male (81%), employed person (80%) or having income >50,000LKR (84%) is significantly higher with doing recommended level of PA to their opponents' side ($p < 0.05$).

Conclusions & Implications

Providing people with enthusiastic environment is challenging to empower people for their own health. Younger and unoccupied groups should be encouraged to do regular physical activity by increasing their awareness on Non communicable diseases and health benefits of physical activity and concurrently should be incorporated younger generation preferred physical activity measures to WT.

ELEMENTAL ANALYSIS OF DRINKING WATER FROM AN ASGM AREA IN INDONESIA

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Background: The increase in artisanal and small-scale gold mining (ASGM) activities in Indonesia has been noted in the last decade. The practice has been suspected to threaten drinking water quality around mining areas with possible health effects to the population exposed to the contaminated water. A water quality survey on elements with potentially damaging biological effects is needed.

Objective: To investigate the concentration of multiple elements in drinking water at an ASGM area in West Sumatra, Indonesia.

Methods: The sampling was performed in May 2015. Drinking water samples from springs and wells were collected (n=25) and multiple elements were analyzed by using ICP-MS.

Results: Hg was not detectable in drinking samples from West Sumatra. Maximum Pb concentration in drinking water samples exceeded the WHO guideline value of 10 µg/L. Mn concentration in drinking water samples also exceeded WHO previous guideline values of 400 µg/L.

Conclusion: The elevated concentration of Pb and Mn in drinking water warrants a caution to the exposed population, particularly to pregnant women and children.

ASSOCIATION OF PARTICULATE MATTER (PM) 2.5 EXPOSURE AND CARDIO-METABOLIC DISEASES (CMD) IN LOW & MIDDLE INCOME COUNTRIES (LMICS): SYSTEMATIC REVIEW AND META-ANALYSIS

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Introduction:

According to the latest urban air quality database, 98% of cities in LMICs with more than 100000 inhabitants do not meet WHO air quality guidelines and global air pollution has increased by 8% from 2008-13. (WHO 2016) Based on numerous epidemiological studies and large clinical observation, the PM_{2.5} has been considered as the main culprit of the adverse cardiovascular effects of air pollution on human health. (Brook 2010 & Dockery 2007) Information is limited LMICs setting where exposure levels are significantly higher than HICs and composition of particulate matters are different.

Research Question: What is the association of exposure to PM 2.5 and cardio-metabolic diseases and outcomes in low- and middle-income countries?

Methods:

Data sources:

Medline, Embase, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Cochrane Database, SCOPUS, and Web of Science searched to May 2017 with restrictions to English language.

Eligibility criteria:

Studies investigating the associations between particulate matter (<2.5 µm diameter (PM_{2.5})), and cardio-metabolic diseases and outcomes and conducted in a low- or middle-income country were identified from the World Bank classification at <http://data.worldbank.org/about/country-classifications>.

Quality Assessment:

We assessed all the included studies for risk of bias across three parameters: selection bias, assessment of exposure, and adjustment for confounders. (**Cochrane risk of bias tool**) for the quality of the extracted studies.

Results:

From 3903 unique articles, 617 were reviewed in depth with approximately 70 satisfying our inclusion criteria. The events that were studied included Hospital admissions, incidence & prevalence and deaths due to CM diseases (hypertension/diabetes/prediabetes/insulin resistance/Myocardial Infraction/Angina/cardiac arrest/cerebro-vascular diseases/dyslipidemia) and Continuous or categorical outcomes: Hypertension/hyperglycemia/dyslipidemia. The review results will be presented during the conference as the review is ongoing.

COMMUNITY PERSPECTIVE ON CLIMATE CHANGE IN RURAL RAJASTHAN

1. Dr. Mahaveer Golechha, Dr. Abhijit Mathur, Dr. Padam Jain

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Background: In India, Rajasthan is one of those states facing adverse effects of Climate Change. In Rajasthan the rural areas are largely neglected when it comes to assessing the Community perception and awareness about climate change and its impact on health. These two are important for developing adoption strategies.

Methods: The study was a cross-sectional survey of residents of two blocks – one from the southern part and other from the western part of Rajasthan. A total of 150 households were selected randomly and survey completed by a structured questionnaire. This was supplemented with 10 key informant interviews (KIIs) and some informal talks.

Results: Only 27 percent respondents were aware about what is climate change. On other hand Overall, 98.33 percent of the respondents reported that the heat during the summers had increased and 96.66 percent reported that rainfall pattern had changed, 83.33 percent reported that ground water level gone down, 85.33 percent stated decrease in crop production compared to previous experience. Only 8.66 percent respondent were looking for weather forecast daily and almost 50.66 percent never looked for any weather forecast. KIIs and informal talks also reported that summers and winters were warmer than previous years.

Conclusions: The concept of “Climate Change” is relatively new in rural areas although they had clear perceptions about changes in heat, cold and rainfall patterns that had occurred over the last five to ten years. Local perceptions of climate change include overall warmer winter and increased heat in summer with changing patterns of precipitation. The effect of climate change was mostly related to decrease in ground water level and its effect on livelihoods, livestock and health. Most local perceptions are consistent with the evidence regarding the vulnerability of rural areas to Climate change. Rural Rajasthan is on dual burden of Climate change because of first absence of awareness and second lack of resources for treatment. The systemic collection of these information will enable policy makers, researchers and scientists to design and implement different action plans and strategies for climate change in rural areas which are more vulnerable.

MITOCHONDRIAL TOXICITY OF CHEMICAL MIXTURES DERIVED FROM LAKES IN REGIONS AFFECTED BY CHRONIC KIDNEY DISEASE OF UNKNOWN ETIOLOGY IN SRI LANKA.

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Biological toxicity of chemical mixtures is a significant and complex environmental health concern. Despite extensive efforts in the field of toxicology, the impact of chemical mixtures remains difficult to characterize and poorly understood. Chronic kidney disease of unknown etiology (CKDu) in Latin American and South Asia are characteristic examples of a critical environmental health concern that is potentially a consequence of exposure to a mixture of anthropogenic chemicals. Notably, CKDu is a major epidemic in the dry-zone of Sri Lanka affecting ~5-20% of adults in certain regions. Exposure to environmental contaminants (e.g., metals (Cd, As), pesticides, Fluoride) is thought to contribute to CKDu in Sri Lanka. However, a specific role for an individual chemical compound has been repeatedly tested without compelling positive results, indicating a role for synergistic and interactive toxic effects of chemical mixtures. Nonetheless, despite being much more environmentally realistic, this remains to be examined. Here, we utilized zebrafish *Danio rerio* as a model to evaluate toxicity of exposure to chemical mixtures derived based on sediment extracts from lakes in the regions in Sri Lanka that are affected by this disease. Zebrafish were exposed to sediment extracts to examine effects of exposure on survival rates, cardiac development and function, oxidative stress response, kidney development, induction of cytochrome P450s, mitochondrial function and behavior. Preliminary studies show direct effects on mitochondrial function and larval behavior with exposure to sediment extracts from CKDu affected areas. Ongoing chemical analyses of sediment extracts are focused on identifying metals and other compounds (non-targeted analysis) in these mixtures. Further efforts are underway to examine toxicity of sediment derived from drinking-water wells and rice fields and to evaluate mitochondrial integrity in fish inhabiting lakes from the affected regions. With the emergence of environmental health concerns likely resulting from chronic exposure to contaminant mixtures, such as CKDu, developing methods to better characterize toxicity of chemical mixtures is critical. Our results suggest that evaluating mitochondrial integrity (functional and structural), especially in organisms native to the environment coupled with laboratory exposures, may serve as a marker of long-term exposure to complex mixtures of anthropogenic contaminants.

AMBIENT TEMPERATURE AND ALL-CAUSE MORTALITY IN CHENNAI – A TIME SERIES ANALYSIS

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Background: Studies have shown that increased mortality is associated with seasonal temperature variations and prolonged periods of high/cold temperature. However, not much of information is available in the developing countries such as India. Moreover, examining the trend in mortality and morbidity over the years in relation to temperature variations may help in predicting the potential future health effects from global warming. Hence, this study was conducted to evaluate the association between temperature and mortality. **Aim:** This study was aimed to examine the relationship between daily all-cause mortality and moderate increases in temperature in the Chennai City of India, using a time series approach.

Methods: All-cause mortality data for the years 2002 to 2009 were collected from the Corporation of Chennai and was categorized by gender, age and cause of death. Data collection on the temperature, dew point, relative humidity, wind speed, and barometric pressure for Chennai City was done at the Regional Meteorological Centre. A Poisson Regression model was used to estimate the percent change in mortality due to a change of apparent temperature.

Results: The monthly average number of all-cause mortality ranged from 92.45 to 119.87 in Chennai City. For a mean daily increase of 1 °C above the thresholds in Chennai, the estimated increase in daily total mortality was 3.83 (95% CI = 2.76 – 4.89). The mortality due to cardiovascular and respiratory causes varied slightly with temperature.

Conclusion: The time series analysis carried out in this study showed an association between a moderate increase in temperature and mortality in Chennai City. The result of this study can be potentially used for projecting the consequences of climate-change scenarios in Chennai and offering insights into the susceptibility of individuals to adverse effects of increased temperature so that effective prevention programs can be implemented for high risk populations.

A CASE STUDY OF AUTISM SPECTRUM DISORDER (ASD): Study in Mumbai

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Introduction: Autism is a neurological disorders that affects how a children interacts and how they experience the world around them. According to Centers for disease control and prevention (CDC) 's report 2012, autism is reported as 1 in every 68 children in the United States. This includes 1 in every 42 boys and 1 in every 189 girls. More than 10 million children are (aged between 9 to 10 years) affected by ASD in India and its prevalence estimate are still unavailable. The exact cause and cure are still unturned.

Objective:

- To find the awareness of ASD in the population.
- To check the behavior pattern over the children.
- To examine the impact over parents.

Methodology: Hospital and School based case study over children as well as parents was conducted followed by schedules. In Mumbai district of Maharashtra there are 3 specialized hospitals for ASD diagnosis and 4 Schools for studies and behavior development of children. Assessment of ASD is conducted by measuring the use of sleeping disorder, sensory modalities, communication behavior of children and their inappropriate behavior through focus group interview and schedules containing five pointer Likert scale.

ADDRESSING ENVIRONMENTAL RISKS AND ASSOCIATED CHILD COGNITIVE OUTCOMES USING A COMMUNITY CENTRIC, TECHNOLOGY-ENABLED APPROACH

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An estimated 200 million children in low- and middle-income countries fail to reach their full development potential; 65 million of them live in India. An increasing association has been found between environmental exposures and cognitive functioning. Air pollution, especially indoor pollution is shown to have significant impact on child development leading to decreased cognitive functioning.

Studies have established a dose-response relationship between extent of prenatal exposure to Poly Aromatic hydrocarbons (PAHs) and reductions in brain white matter volume, cognitive impairment and increases in symptoms of ADHD. Chemical exposure through Pesticides chronic as well as acute, both prenatal and postnatal, is known to affect neurodevelopment and growth in developing children.

This may be a result of neurotransmitter disruption and associated effects on gene regulation and signal transduction pathways. Also, poor hygiene and sanitation practices have been associated with stunting and associated cognitive impairments. Globally, one of the biggest challenges for improving child cognition outcomes such as preschool readiness, social adaptation, attention, learning, memory, language development, etc is lack of tools for early assessment of developmental delay. This, combined with poor access to health care facilities and prevalent social taboos, stigmas and superstitions further perpetuates ignorance, creating an atmosphere of ineffective action.

We propose to use a multi-pronged approach using the Care Group (CG) model together with an interactive voice response (IVR) technology for environmental health education with a focus on child cognition related risk factors. CG is a peer-based participatory learning approach, which will be used to disseminate key health messages to mothers and caregivers. The in-person interaction through CGs will be supported by Mobile Vaani (MV), which will use mobile phones to disseminate health information. The CG model has been successfully implemented in more than 28 LMICs, however, never before in India and never in the context of mental health. MV has proven successful across 25 Indian districts for information dissemination and exchange, especially in media-dark rural communities.

This proposal shall be a first of its kind of study in India in the field of Environmentalneuroepidemiology, to assess the impact of exposures such as air pollution, pesticides, and sanitation on cognitive development of children. Using a combination of Care Group and Mobile Vaani – two proven community engagement and empowerment approaches – we propose to improve the cognitive parameters of developing children in these rural communities in a sustainable way.

SUSTAINABLE RURAL WATER SUPPLY SYSTEM: A CITIZEN ENGAGEMENT MODEL

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Sustaining service delivery of rural water supply system requires a transformation from community-based approach that gives authority to community to make decision to citizen engagement approach that requires a shared ownership and responsibility between citizen and government. To understand factors influencing citizen engagement along the service delivery cycle, a case study was conducted in four villages in two districts in Indonesia with similar geographical and water system but having contrast sustainability performance according to the monitoring system of the Pamsimas (the biggest rural water supply program in Indonesia). Analyzing data collected from 720 households, in-depth interview, focus group discussion, documents and water quality testing results with environmental health, sociology and behavior change theories, the study synthesizes different factors influencing citizen engagement in pre and post construction stage or during and after development intervention. The study also found different forms of citizen engagement happened along the service delivery which were influenced by different social and environmental condition. A model for citizen engagement to sustain service delivery of rural water supply system is proposed. Lessons from this empirical study and the model generated shall provide some insights for sector's stakeholders to deliver and sustain service delivery of rural water supply.

INORGANIC ARSENIC EXPOSURE

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Inorganic arsenic exposure is world-wide health concern and specially to developing fetuses and children. It has not reported about arsenic exposure level among children and pregnant women in Japan. We collected three-day food duplicates and drinking water of 106 children and 105 pregnant women in two cities, and total and inorganic arsenic contents were measured by ICP-MS. Total arsenic in mother's and child's nail was also assessed as a biomarker of long-term chronic exposure level. We found that total and inorganic arsenic in food intake were higher among children compared to mothers, especially among frequent Hijiki seaweed consumers. Retarded children group in Bayley III gross motor development showed statistically significant higher dietary intake of inorganic arsenic.

HIGH LEVELS OF ORGANOCHLORINE PESTICIDES AMONG ADULTS IN URBAN INDIA

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Background/Aim: Persistent organic pollutants have been implicated as endocrine-disrupting chemicals, yet continue to be produced and used. Studies of the health effects of these exposures are needed, and this requires standardized exposure measurements. In a subsample of participants, we will undertake cross-validation between India and US laboratories for quality assurance. Here we report preliminary results from samples measured in the US.

Methods: Levels of PCB congeners (118, 138, 153, 180) and organochlorine pesticides (p,p'-DDT, o,p'-DDT, p,p'-DDE, o,p'-DDE, *beta*-Hexachlorocyclohexane [β -HCH], *trans*-Nonachlor, hexachlorobenzene) were quantified in 80 randomly selected plasma samples stored at baseline (2010-2011) from a nested, prospective case-control study of diabetes conducted in Delhi and Chennai (n=708). Analysis was done using isotope dilution GC-MS/MS. Geometric means (GMs) (95% confidence intervals [CI]) are presented as ng analyte/g lipid where lipid was calculated as (2.27xtotal cholesterol)+triglycerides+62.3 mg/dl. Concentrations <limit of detection (LOD) were assigned a value of LOD/sqrt(2). If >40% of samples were <LOD, GMs were not calculated.

Results: Participants were (mean \pm SD) 40 \pm 12 years; 76% were female. p,p'-DDE was detected in all participants (GM [95% CI], 364 [280-473] ng/g lipid) and p,p'-DDT in 74% (GM [95% CI], 33.4 [25.0-44.7] ng/g lipid). The 95th percentile for p,p'-DDT in our sample was 257 ng/g lipid compared to (95th percentile) 20.7 ng/g lipid in the US adult population (NHANES 2003-2004). β -HCH was detected in 91% of participants: GM (95% CI), 211 (152-294) ng/g lipid. This value is 27X that reported for the US adult population: GM (95% CI), 7.89 (<LOD-9.09) ng/g lipid (NHANES 2003-2004). PCB congener 118 had the highest concentration of the four congeners evaluated: GM (95% CI), 9.11 (8.10-10.25) ng/g lipid.

Conclusions: Preliminary results suggest that levels of p,p'-DDT and β -HCH among a largely female urban population in India are notably high. The high levels of p,p'-DDT may reflect more recent use of this insecticide.

DOES MENSTRUATION HYGIENE MATTERS AT WORKPLACE?

AN IGNORED ISSUED AMONG WOMEN GARMENT WORKERS IN MUMBAI, INDIA

PRASHIKA KURLIKAR, PhD Research Scholar

International Institute for Population Sciences (IIPS)

Introduction: Many adolescent girls and women in workplace environment faced the menstrual hygiene problems in low-income country like India. In spite of efforts taken to reduce poverty and health problems among women, less attention given to the sanitation and hygiene related barriers specially related to managing menstruation hygiene at workplace. In India, garment industry is one of the largest informal sectors, where nearly 80 percent are women. Such informal sector lack enforcement of occupational safety regulations and standards, which fails to provide women's sanitation-related needs at workplace. Such condition adds to the vulnerabilities and may hinder women's contribution to workplace and their health and wellbeing. Hence present paper attempts to know why it is important to consider menstrual hygiene at workplace, does it matters? How hygienic the adolescent and women garment worker at workplace? Do women faced any menstrual disorders.

Data and methodology: Mixed method approach has chosen. A sample of 10 female garment workers for in-depth interview were chosen in Mumbai partly by random and partly by snowball sampling. A structured interview schedule used to collect quantitative data from 150 respondents and 10 in-depth interviews conducted using interview guideline

Results: Total 150 adolescent girls and women garment worker were included in the study. The average age of the participant is about 23.04 years. An interview with adolescent girls and women shows that most of them got the information about menstruation from their mother and friends. It is observe that maximum adolescent and women were using old cloths during menstruation. Interview with women give in-depth information about how hygienic women are at their workplace. Maximum women reported that they do not have adequate water and sanitation facilities at their workplace.

Conclusion: From above finding, it is clear that menstrual hygiene at workplace do matters especially for adolescent and women. It is affecting their health well being. Present study shows that it is important to consider menstrual hygiene and water and sanitation facilities at workplace. To address the issue of WASH and MHM-related inequities facing adolescent girls and women it is a key challenge that need to be address.

IMPACT OF MIGRATION ON QUALITY OF LIFE OF FEMALE LABOR MIGRANTS IN URBAN MUMBAI, INDIA: NEED FOR PUBLIC HEALTH ACTION

PRASHIKA KURLIKAR, PhD research scholar

International Institute for Population Sciences

World Summit (September 2002) on Sustainable Development identified health as an integral component of sustainable development and called for a more efficient, equitable, and accessible health care system for the populations. It considers health as an important key indicator of human well-being. The wide range of diseases has risen due to poor working and living environment pollution, which affects human health in many ways. Job opportunities in the urban area attract poor population from the rural area. This paper examines the quality of life of the migrant female garment worker who works and lives in slums of Mumbai City, India. Quality of life of the female migrant worker was examine in four domains - physical and psychological health, social relationships, and working environment. Data collected by face-to-face interviews using a constructed pre-tested questionnaire adapted from WHOQOL-BREF. The study conducted with sample 150 workers for quantitative research, and 10 In-depth Interviews for qualitative research. The study shows that most of young migrants come from rural area in search of employment and had low level of health-related quality of life. Workers' marital status, duration of work, education level, monthly income, and types of house showed significant associations with health-related quality of life.

DISTRIBUTION AND CONTAMINATION LEVEL OF MINERALS NEARBY INACTIVE NICKEL MINING SITE IN PULAU OBI, HALMAHERA SELATAN REGENCY, INDONESIA

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Obi Island in Halmahera Selatan Regency, Maluku Utara Province, is one the lateritic nickel sites with deposit varies from 0.5% to 3%. To assess mineral distribution and contamination around mining site, an exposure evaluation has been conducted in Kawasi village nearby inactive nickel mining site and in Soligi as remote or reference village in Pulau Obi, Maluku Utara Province. Exposure investigation design of ATSDR 1996 Type-1 Health Study was applied to analyze distribution and contamination level (CL) of gases, particulates, and metals in 5 ambient air locations, while essential trace metals, heavy metals, and metalloids were analyzed in 40 drinking water samples, 32 foodstuff samples, and 10 soil samples. All minerals were determined using ICP-MS analyses. The results show that the minerals in ambient air, drinking water, and foodstuffs have very low detection frequency where the concentrations of all minerals were far below the legal limits with CLs<1. In foodstuffs, mineral contaminations were very low with no mineral exceeds the health standard or reference values except cyanide and mercury. In contrast, CLs of soil contaminants are very high ranging from 8 (cobalt in Kawasi) to 674 (manganese in Soligi). Overall, the order of CL is Mn (598)>Pb (491)>Cd (173)>Zn (61)>Cr (23)>Co (15)>Ni (0.4)>As (0.28)>Fe (0.008) in Kawasi and Mn (820)>Zn (274)>Co (116)>Cd (78)>Cr (23)>As (0.42)>Ni (0.76)>Fe (0.014) in Soligi. It is concluded that ambient air TSP, six soil metals (cobalt, manganese, chromium, zinc, lead, and cadmium), and foodstuffs' cyanide and mercury are critical contaminants out of 31 minerals in total.

ROLE OF ENVIRONMENTAL SANITATION IN SHAPING THE HEALTH OF OUR CHILDREN

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Introduction: Our environment has changed drastically over the years impacting the lives of the people. Poor water, sanitation and hygiene are major contributing factors for the poor health of adults as well as children. Around 1.7 million deaths in 2012 of under-five children were reported due to exposure to poor environment. The Government of India has initiated Swachh Bharat Abhiyan in 2014 with a vision to achieve a clean India by 2019 having improved sanitation as one of the major focus areas.

Objectives:

1. To determine the correlation between improved drinking water source and improved sanitation facility with prevalence of diarrhea among under-five children using NFHS-4 data.
2. To compare the NFHS-3 and NFHS-4 statistics for the selected variables.

Methodology: Secondary data were obtained from National Family Health Surveys 3 and 4. Prevalence of diarrhoea was considered as the outcome variable. Proportion of households in each State with improved drinking water resource, and improved sanitation facility were considered as the exposure variables. The correlations between the exposure and outcome variables were obtained in the form of correlation coefficients independently and by conducting regression analyses using Stata 14.0.

Results: There was no correlation between improved drinking water source and prevalence of diarrhoea ($r = 0.0575$, p value = 0.73). There was significant correlation between improved sanitation facility and prevalence of diarrhoea ($r = -0.366$, p value = 0.026). Lakshadweep (sanitation, diarrhoea: 99.4%, 5.2%) and Kerala (98.1%, 3.4%) have improved sanitation and low prevalence of diarrhoea whereas Bihar (25.2%, 10.4%) and Jharkhand (24.4%, 6.9%) have shown the worst. Regression analyses after adjusting for improved drinking water showed decrease in prevalence of diarrhoea by 0.07% with every 1% increase in improved sanitation facility (p value: 0.015). The selected variables have showed a declining trend between NFHS 3 and 4 data.

Conclusion: Environmental risks are causing millions of preventable deaths worldwide every year. With the implementation of the cleanliness initiative, there has been improvement in drinking water source and sanitation facilities across many States, however, there is lot of scope for improvement in the other States, as seen from the latest NFHS data.

HOME SANITATION: KNOWLEDGE AND PRACTICE IN COMMUNITY

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Sanitation has significant impacts not only on health but on social and economic development particularly in developing countries. T.Akar, AMALi (2012) conducted a study on “factor influencing knowledge and practice of hygiene in water, sanitation and hygiene programmed in area of (Bangladesh Rural Advancement Committee) BRCA has been providing WASH intervention to 180 rural upzilas since 2006. And they conclude lack of interest, traditional knowledge etc. are some factor barrier to hygiene and practice. Sanitation now become a problem that has been overlooked by many areas. Pits are been dumped by garbage, a huge amount bad smells, dirtiness that attracted to flies and other arthropod and rodents these lead to numerous infection. Main objective of this study is to assess knowledge of community for home sanitation and to assess the practice of rural community regarding to home sanitation. A Descriptive survey approach adopted for the study. The convenient sampling was used to select 125 sample object. After analysis it is found that 68(55.2%) sample subjects were used to defecate in open field and 71(56.8%) were consuming water from Hand pump. It was found that majority of sample subjects had average knowledge. Majority of them considered the water they drink is already clean. Most of them dispose household waste in open field near by their house. The study focus on community people knowledge and their practice regarding home sanitation. Community people had thought that they drinking safe water and there is no need of water treatment. Despite of having average knowledge in community most of them do not have toilets in home and defecate in open field. Used to through garbage in open field.

MATERNAL DIETARY INTAKE OF POLYUNSATURATED FATTY ACIDS MODIFIES ASSOCIATION BETWEEN PRENATAL DDT EXPOSURE AND CHILD NEURODEVELOPMENT: A COHORT STUDY.

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Background: Maternal 1,1-dichloro-2,2-bis(p-chlorophenyl)ethylene (DDE) serum levels during pregnancy have been negatively linked to child neurodevelopment in contrast to intake of omega-3 and -6 (ω -3 and ω -6) fatty acids.

Objectives: To assess whether maternal dietary intake of ω -3 and ω -6 during pregnancy modifies the association between exposure to DDE and child neurodevelopment from age 42 to 60 months. Methods: Prospective cohort study with 142 mother–child pairs performed in Mexico. DDE serum levels were determined by electron capture gas chromatography. Dietary ω -3 and ω -6 intake was estimated by questionnaire. Child neurodevelopment was assessed by McCarthy Scales.

Results: Docosahexaenoic (DHA) fatty acid intake significantly modified the association between DDE and motor component: increased maternal DDE was associated with lower motor development in children whose mothers had lower DHA intake ($\beta_{\log 2DDE} = -1.25$; 95% CI: $-2.62, 0.12$), in contrast to the non-significant increase among children whose mothers had higher DHA intake ($\beta_{\log 2DDE-motor} = 0.50$; 95% CI: $-0.55, 1.56$). Likewise, arachidonic fatty acid (ARA) intake modified the association between DDE and memory component: increased maternal DDE was associated with a significantly larger reduction in the memory component in children whose mothers had lower ARA intake ($\beta_{\log 2DDE} = -1.31$; 95% CI: $-2.29, -0.32$) than children whose mothers had higher ARA intake ($\beta_{\log 2DDE-memory} = 0.17$; 95% CI: $-0.78, 1.11$).

Conclusions: Dietary intake of DHA and ARA during pregnancy may protect against child neurodevelopment damage associated with prenatal maternal DDE levels.

TEMPORAL TRENDS OF PM_{2.5} OVER INDIAN CAPITAL CITIES

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Ambient PM_{2.5} air pollution is the 5th-largest risk factor for ill health in India, causing an estimated 620,000 deaths annually (Cohen et al., 2017). Indian capital cities, being the centres for administration, education, and employment, account for more than 70 million residents. In the present study, we report the latest seasonal trends of ambient PM_{2.5} levels over 26 Indian capital cities.

We obtained PM_{2.5} data of 26 Indian capital cities from 92 monitoring stations of various states and the central pollution control boards for the years 2015-2016. We used PM₁₀ data and PM_{2.5} conversion factors (derived individually for all cities based on their $\frac{[PM]_{2.5}}{[PM]_{10}}$) to impute PM_{2.5} data for the cities with no direct PM_{2.5} measurements. We checked the collected data for negative and other spurious values and excluded the corresponding values from our analysis.

Our results indicate that Ranchi has the maximum PM_{2.5} pollution (Median±IQR = 125±18 µg/m³) while Aizawl has the lowest (8±4 µg/m³). We find all the cities located in the central India and on Indo-Gangetic region (IGP) have alarming levels of PM_{2.5} (89±34 µg/m³) followed by the cities in south (44±22 µg/m³), west (30±15 µg/m³), and north eastern India (26±9 µg/m³). Except Aizawl, We find none of the other Indian capital cities comply with annual standards prescribed by the WHO and only few capital cities in south, west and north eastern India comply to Central Pollution Control Board standards. The higher concentrations over the capital cities of central India could be attributed to extensive local mining activities, whereas, higher levels over IGP could be due to colder winters, greater domestic usage of biomass and coal, extensive consumption of fossil fuels for vehicular and industrial activities, existence of large number of brick kilns and low atmospheric dilution rates when compared to other parts of India (Maithel et al., 2012; Guttikunda et al., 2015). We notice winters as critical periods and monsoon as lean periods for PM_{2.5} pollution for cities of IGP, south, west, and north eastern India. However, in case of central India, we find PM_{2.5} levels consistently higher (≈30 times of WHO standards) during all seasons.

ASSOCIATION OF LEAD (PB) EXPOSURE AND INCIDENTAL HYPERTENSION: A NESTED CASE-CONTROL STUDY OF THE CENTER FOR CARDIOMETABOLIC RISK REDUCTION IN SOUTH ASIA (CARRS) SURVEILLANCE STUDY, A POPULATION REPRESENTATIVE COHORT IN NEW DELHI.

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The heavy metal lead (Pb) is ubiquitous and does not degrade over time, increasing population risk to intergenerational neurodevelopmental, circulatory and nephrotoxic effects. New Delhi residents may be predisposed to exposure due to unregulated and hazardous working conditions (informal battery and e-waste recycling, lack of occupational protective laws), and haphazard monitoring of emissions from industrial factories surrounding the capital. Current evidence shows that Pb exposure and its concomitant stress on the vascular system increases risk of developing hypertension pathway leading to cardiovascular disease. Although its effects on health have been widely documented, its potential for harm even at low-levels (<5 ug/dL) is a burgeoning public health concern. This work in progress paper describes the methods of a pilot study which examines the association of plasma Pb levels to incidental hypertension. We will describe this study nested within the Center for Cardiometabolic Risk Reduction in South Asia (CARRS) Surveillance Study, a population representative cohort in New Delhi. Second, we will discuss use various biomarkers to characterize possible mechanisms by which Pb exposure may lead to increased blood pressure. Finally, an overview environmental risk factors for chronic diseases is discussed.

Aims: The present study aims to assess the association between incidental hypertension and plasma Pb levels in non-occupationally exposed CARRS participants in New Delhi, India.

Methods: This nested case-control study of 300 adult participants comes from the larger New Delhi CARRS cohort (N=5364). The age-adjusted prevalence of hypertension among male CARRS participants in the New Delhi cohort was 37% and 28% among females after two years of follow-up. One out of six participants (16.2%) developed hypertension after two years. Blood pressure readings were taken during the CARRS baseline survey and after two years of follow-up. During both surveys, participants were phenotyped for cardio-metabolic diseases and risk factors through survey questionnaires, blood pressure measurements, anthropometric, and collection of fasting blood and urine samples.

We will conduct trace elemental analysis of stored plasma samples for Pb, hs-CRP and the oxidative stress marker malondialdehyde.

“MALARIA & MALNUTRITION” ITS COEXISTENCE & INCIDENCE: AN OBSERVATIONAL STUDY IN THE TRIBAL DENSE REGIONS OF ODISHA BY TATA STEEL RURAL DEVELOPMENT SOCIETY

Authors: - Dr Ashish Mahapatra*, Dr Sabyasachi Mahapatra**, Nilloy Mitter***

“Malaria and malnutrition are closely related in the months of hunger gap when malnutrition is at its peak often coincides with rainy season when the number of malaria cases shoot up. The disease combines in a vicious circle. Children sick with malaria are more likely to become dangerously malnourished”.

Study Site: - TSRDS catering areas of Bamnival & Sukinda

Methodology: - Eight villages were selected based on their inaccessibility and demography spread across Bamnival and Sukinda region. Single day Camps were organised to conduct Malaria testing using Antigen based RDK and Nutritional Assessment of 6 months to < 5 yrs. children using MUAC tapes. All consenting beneficiaries were enrolled into the study. Pre monsoon organising of camps & distribution of anti-malarial drugs to all Malaria Positive cases along with other essential drugs.

Observations: - A total of **225 under children** (6months to <5yrs) were screened for both Malaria and Malnutrition out of 1132 beneficiaries were included in the study. **51% of the under five children were suffering from malaria** and of the 225 children screened for Malnutrition, **33% of the children were in the Yellow and Red zone (i.e. borderline and Sev. Acute Malnutrition) of the MUAC tape. Of the 74 children identified with malnutrition 64 % were suffering from Malaria.**

Conclusion: - There was a positive correlation of Malaria and malnutrition among the study population in lines with the recommendation from WHO. All malnourished children with malaria were referred to adjoining NRC of the district headquarters and Follow up visits were done to the villages during MMU field visits. Neem oil preparation was recommended to all the people of the villages. To conduct follow up camps post monsoon to evaluate the results of our intervention.

STUDY ON MERCURY ADDED CONSUMER PRODUCTS: SKIN WHITENING CREAMS (SWCS) USE IN PAKISTAN

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Sustainable Development Policy Institute (SDPI), Islamabad. Pakistan

Thousands of chemicals are used in material production processes that have not been adequately assessed for human and environmental impacts and yet are used daily in consumer products. There is ample scientific evidence to support a link between public health (especially children, pregnant females) and toxic chemicals, such as Mercury, in consumer products, food, air and water. Mercury ranked as 3rd in the hazardous list of toxic substances, is a pollutant of increasing concern, as it is human, wildlife and environment.

Over the past few years, sustainable development policy institute (SDPI) has been actively carrying out research on health and environmental effects of the use of mercury added products, such as mercury dental amalgam (accessible www.sdpi.org) and mercury containing skin white, available in the local markets ning creams (SWCs) in Pakistan. The main objectives of the present study on SWCs were to (i) examine levels of mercury content in SWCs, using standard analytical method, in a few selected main cities of Pakistan (ii) assess & highlight the health complications arising/prevaling among mercury containing SWCs users, through interviewing dermatologists/skin specialists in private clinics, teaching institutions and general hospitals in the same selected cities and (iii) identify factors that are influencing the public's opinion regarding their skin complexion and enhancing an obsession for a fair complexion. According to Minamata convention on mercury, manufacture, import or export of SWCs, having mercury content above 1ppm, are to be phased out by 2020. Chemical analyses of some of the SWCs studied and to be presented at PBC-2017, revealed alarmingly very high mercury content, far above 1ppm limit.

Our research findings provide ample evidence of most likely mercury exposure to personnel because of the use of SWCs containing high levels of mercury content. We strongly recommend (i) mercury specific legislation for public/consumers daily use products, (ii) review and revision of dentistry & dermatology curriculum at medical institutions and (iii) ban on the production/use of SWCs with total mercury content above one ppm.

ASSESSING AMBIENT AIR POLLUTION EXPOSURE AT FINE SPATIO-TEMPORAL RESOLUTION USING HYBRID MODELS IN DELHI

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¹Public Health Foundation of India, ²Harvard School of Public Health

Air pollution is a growing public health hazard in India, with high concentrations of particulate matter, especially in major metropolitan areas. Short and long term health impacts of ambient air pollution include exacerbated respiratory symptoms and risk of cardiometabolic diseases. The GEOHealth Hub is a 5 year NIH U grant awarded to Public Health Foundation of India and Harvard School of Public Health to carry out research and capacity building on environmental health with a focus on air pollution and cardiometabolic diseases. One of the prominent research aims of the project is estimation of daily PM_{2.5} exposure at a 1 sq. km. spatial resolution over Delhi and Chennai, and associate the exposure estimates with cardiometabolic health outcomes in subjects belonging to the a cardiometabolic cohort with longitudinal data at the two cities. In this talk, we will discuss the exposure modeling exercise for ambient PM_{2.5}, which is a multi-source, data intensive statistical modeling framework involving techniques such as generalized mixed effects linear models and machine learning approaches such as support vector machines. We shall present the data that has been collected by our team as part of this exercise, including data on meteorological variables, land use, satellite observations and ground monitoring data over 2010-2016 covering the National Capital Region. Basic overviews of the multi-stage modeling, including spatio-temporal interpolation of meteorological data, associating PM_{2.5} with satellite observations, and supervised learning of non-linearities and interactions, would also be presented along with preliminary exposure estimation results for the Delhi model. We shall end with some directions on associating the predicted exposures with cardiovascular outcomes in the cohort.

A CLEAN ENERGY ALTERNATIVE FOR BRIDGING ENERGY GAPS IN HEALTH SECTOR

Shriram Manogaranⁱ, Dr. Bhagat Chandra⁺, Bhargav Krishnaⁱ

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The focus of energy access and health were more a household level issue like indoor air pollution but recently that access to energy is also recognised as critical for public services like health facilities (Agarwal, 2016). In India, about 55% of all households depend on the public health system to meet their healthcare needs, this dependence is higher in rural areas. About 58% of the rural population identifies a government or public health facility as their first point of treatment (DLHS-4, 2013). Thirty-three million people in India rely on health facilities having no electricity. (Agarwal, 2016).

Understanding about the energy needs in health centres is a crucial step in accessing the gaps in energy access. According to the Rural Health Statistics 2016, about 4.6% of functional PHCs in India are unelectrified. The DLHS-4 data indicate that one out of every two PHCs suffers from unreliable power supply or has no electricity access at all (DLHS-4, 2013). This affects the ability of a health provider to deliver higher standards of health service. This burden from inefficiency in delivering electricity has an impact on the health providers and on the people. This results in health facilities having to rely on expensive backup options like diesel generators that have significant cost implications, health issues and contributing as an air pollutant source (Ramji, 2016).

In the current context, solar energy could play a vital role as an enabler of healthcare delivery in areas that have no or inadequate access to grid power. It can compensate for lack of regular power supply and enable uninterrupted provision of health services (WHO, 2015a). Solar power can also compensate for fluctuations in voltage that affect the working and life of medical equipment (UNICEF and UNIDO, 2016). Besides service delivery, they also offer climate change mitigation in terms of providing power supply during certain weather events (Agarwal, 2016).

We present a case study from a hospital in Delhi on how they have utilised solar energy as an alternative source in achieving continuous power supply while also achieving significant economic benefits and reduction in their carbon footprint.

COALESCING HEALTH SECTOR LEADERSHIP ON ENVIRONMENTAL POLLUTION

Shriram Manogaran¹, Bhargav Krishna¹

¹Public Health Foundation of India

India's remarkable growth story of the last 30 years has resulted in sustained economic expansion, but has also resulted in a dwindling and degraded ecosystem, and a growing cloud of pollution. Environmental pollution (unclean air, water and chemical contamination) contribute significantly to India's burden of disease, and rank among the top risk factors for ill health. The growing threat of climate change with changing disease patterns and increased risk of natural disasters has only added to the urgency of tackling these important determinants of health.

The continued reliance on polluting fossil fuels, unsustainable use of water, and poor waste management compels health systems, professionals and professional bodies to advocate for more inclusive and inter-sectoral policymaking to safeguard public health. It also calls for the health sector to lead by example by reducing its own environmental footprint. With this in mind, the Health and Environment Leadership Platform (HELP) was established in 2017 in partnership with Health Care Without Harm, as a unique platform working towards:

- Leadership in health systems by reducing its environmental and energy burden
- Advocating for inter-sectoral, collaborative policymaking to address the health impacts of environmental pollution
- Building the capacity of physicians to address the health impacts of environmental pollution

HELP currently comprises over 6000 healthcare institutions and 27,000 physicians, with an eminent governing council guiding its work. In this presentation, we aim to showcase the unique activities undertaken by this platform which include:

- A call to action on improving air quality released by the Steering Committee on behalf on the Health sector
- Publishing case studies of practical solutions in areas like energy, water and bio-medical waste implemented by hospitals
- Sensitizing the next generation of health care leaders on what comprises green healthcare institutions
- Dissemination of IEC material on environmental exposures
- Developing a short course for physicians on clinical aspects of environmental exposures.

Through the work of the platform, we aim to show that coalescing health sector leadership on environmental exposures can play a key role in raising awareness, building capacity, and creating change.

CHEMICAL CHARACTERISTICS OF PM_{2.5} PARTICULATE MATTER AT TWO DIFFERENT MICROENVIRONMENT OF MUMBAI, INDIA

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PM_{2.5} samples were collected from Nov 2016 to April 2017 indoor and outdoor air of domestic home of Mumbai, India. Twenty four hour PM_{2.5} samples were collected on 25-mm PTFE filter paper using Sioutas Impactor with SKC Leland Legacy Sample Pump operated at 9 L/min. The sampled filters were digested in 6–8 ml HNO₃ and kept on a hot plate at the temperature of 40–60 °C for 90 min, the solution was diluted with a known volume and analyzed on ICP-AES. The concentration of PM_{2.5} was found to be higher in outdoor 102.22 µg/m³ than indoors 115.61 µg/m³. The total contribution of analyzed metals in PM_{2.5} was 60 to 70% in indoors and outdoors. The concentration trends of trace metals in indoor and outdoor was in the order Al>Fe>Zn>Pb>Cu>Mn>Cr>Ni. Al, Fe and Zn was found to be dominant and higher in indoor and outdoor air. The probable reason of being the higher Zn concentration in indoor and outdoor was due to automobiles such as lubricating oils and tires, while Al and Fe may arise from resuspended dust. The sources of analyzed metals are house dust and anthropogenic activities indoors and another from infiltration from outdoors. The results of the present study are of practical importance in identifying sources and processes that control levels of fine particulate matter in a respirable size range. Further, the elemental constituents of respirable size range particulate matter are of public health interest, as it determines human susceptibility to pollution processes. The above study is further under processes and the detailed results of the study will be published and presented in the conference proceeding.

PREVALENCE AND CORRELATES OF ANAEMIA AND VITAMIN A AMONG PRESCHOOL CHILDREN AND WOMEN FROM NORTH EASTERN STATES OF INDIA

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Introduction: Micronutrients deficiencies such as iron, vitamin A, iodine etc. are very much prevalent among the population in India. Anaemia and Vitamin A deficiency are an important public health nutritional problem in India, affecting all age and gender. **Objective:** To assess the prevalence & correlates of anaemia & vitamin A among different physiological groups. **Methodology:** A community based cross-sectional study was carried out by adopting systematic random sampling procedure in Meghalaya, North-eastern state of India. A total of 30 household (HH) each from 20 villages were covered and information on socio-demographic particulars was collected and diet survey was carried out using 24 hour recall method in every 6th HH. Blood sample (20 μ L) was collected by finger prick using haemoglobin pipette on filter paper (Whatman No.1) and dry blood spot (DBS) samples were prepared for haemoglobin estimation and free falling drop of blood from a finger prick was collected on a pre-coded special chromatography filter paper (Whatman no.1) to estimate Vitamin A on sub-sample of subjects. Haemoglobin was estimated using cyanmethemoglobin method and vitamin A by HPLC. Serum retinol level <20ug/dl is considered for Vitamin A deficiency and haemoglobin level of <11g/dl for children and pregnant women, and <12 g/dl for NPNL women was considered as anaemic. **Results:** The overall prevalence of anaemia was 68%, 83%, 70% and 86% among pre-school children, NPNL women, pregnant women and lactating mothers, respectively, while prevalence of Vitamin A deficiency was 59% among preschool children and 48% among adult women in Meghalaya. No significant difference was observed in the prevalence of anemia with socio-demographic variable. However, it was observed that the intake of iron and vitamin A was below 50% of RDA among the population. **Conclusion:** Anaemia and vitamin A deficiency are an important public health problem among pre-school children and women in Meghalaya. Therefore, there is a need to strengthen the existing national nutritional programme and educate people to consume more diversified diet containing GLV, animal food and fruits in order to combat problem of micronutrient deficiency.

“ASYMPTOMATIC MALARIA PREVALENCE IN TRIBAL POPULATION OF ODISHA” AN OBSERVATIONAL STUDY BY TATA STEEL RURAL DEVELOPMENT SOCIETY

Dr Sayasachi Mohapatra * Dr Ashish Mahapatra** Niloy Mitter***

Asymptomatic infection by Malaria Parasite is an important obstacle to eliminating malaria. Asymptomatic cases do not seek treatment for infection, and therefore they become a reservoir for the parasite. The identification and treatment of asymptomatic infections should reduce the parasite reservoir.”

We screened a tribal population of 521 individuals in Sukinda block of Jajpur district of Odisha by using a dual-antigen rapid diagnostic kit (RDK). All positive individuals were treated with artemisinin-based combination therapy (ACT). A significant proportion of the study population infected with *P. falciparum* but showed no clinical manifestations.

Methodology;

The study was conducted during pre-monsoon season from May 2017 to July 2017 in 4 villages of Sukinda Block of Jajpur district in Odisha. The villages are situated in a valley surrounded by thick forests and inhabited by a tribal population. All willing individual were tested for malaria irrespective of clinical signs of malaria. All positive individuals were treated with an artemisinin-based combination therapy (ACT),

Observations;

Prevalence of Malaria in study population was 42.21%. Prevalence in children of age group 0-5 years was higher than normal population 59.52. %

67 % Malaria Parasite positive cases were asymptomatic.

28% of the children of age group 0-5 having Malaria parasite were asymptomatic, 68% of the older age group harbouring malaria parasite were asymptomatic.

Conclusion/Discussion

A significant proportion of our study population harbouring malaria parasite were asymptomatic. Children at the age group of 0-5 were more symptomatic than older age group.

PRACTICAL APPROACH ON HUMAN HEALTH RISK ASSESSMENT STUDY AROUND INDUSTRIAL ESTABLISHMENTS

Dr. J. K. MOITRA, Director, EMTRC Consultants Pty Ltd.

The main objective of Human Health Risk Assessment Study (HHRA) is to describe the nature and significance of potential health risks to human from Chemicals of Potential Concern (COPC). The author coordinated seven HHRA studies around industrial establishments in different geoclimatic regions of India. The scope of work includes i) delineating 10 km area around the industrial establishment as study area, ii) quantifying pollutants in ambient air, ground water, surface water and soil samples collected from upwind and downwind locations, iii) conducting risk assessment by applying the measured concentrations to a Model developed as per USEPA guidelines, iv) generate health data of representative human population by engaging qualified doctors and technicians, iv) demographic and dietary profiling of the cross sectional human population, vi) suggest corrective measures to improve health status. Environmental sampling locations were selected by applying historical meteorological data, physiographic maps, emission profiles of the industry and mathematical modelling. RISC5 Model was used to estimate the carcinogenic and non-carcinogenic risk due to the identified COPC. Medical camps were organised to check the health of 750-1000 residents, who were exposed to similar microenvironment for more than 5 years. General health and hygiene, BMI, BP, Pulse, Spirometry, ECG, Diabetes, routine blood and urine test were carried out. Interviewer administered questionnaire was applied to collect information about the dietary pattern, socio-economic status, history of addiction, diseases and chronic conditions. This paper discusses the findings of HHRA studies. Data on impact of environmental contaminants on human health could be used for rationalizing i) ambient air, water and soil quality standards, ii) emission discharge standards iii) air quality index iv) Environmental Impact Assessment study of Industrial Projects for grant of regulatory permits. HHRA study will yield genuine results only when the cross sectional samples for interview and health check-up is selected using the most appropriate technique. Limitation of HHRA study is the availability of qualified doctors and technicians who are willing to spare time for 15-20 days at a stretch and work in remote / inhospitable sites.

CHILDHOOD DEATHS AND INFECTIOUS DISEASES LINKED TO MALNUTRITION: A SORROWFUL BUT SHINING STORY FROM BANGLADESH

Monir Hossain Moni, Dhaka Bangladesh

As alerted by the UNICEF, nearly half of all childhood deaths worldwide are associated with malnutrition (ie, undernutrition), and about 29,000 children under the age of five die every day (21 each minute) mainly from repeated but preventable infectious diseases. In any event, the levels and trends in child mortality resulted from undernutrition are ironically widespread in Asia. With the understanding of such a life-and-death circumstance, this paper typically explores the underlying causes and harmful effects of child malnutrition in South Asia. But it essentially spotlights this public health issue facing Bangladesh, one of the SAARC's most promising and prosperous nations. More concretely, it proffers an inquisitive case study on why Bangladesh, which has admirably managed to sustain an astonishingly rapid reduction in the rate of child malnutrition over the past 20 years, can be a 'role model' for other countries across and beyond South Asia in their best practices against poverty-prompted malnutrition as the most dangerous single threat to the loss of children's lives. This theoretically-flavored but empirically-grounded research as a combination of different disciplines builds up a forthright argument why the academic researchers, government policymakers, political leaders, business executives, development practitioners as well as other involved contributors should deeply imagine that an extremely poor person cannot even afford to eat minimum daily calories needed to survive his/her life, let alone enough food or nutritious diet. Such a gloomy portrayal shamefully undermines a cherished idea of human dignity for so hungry people in an era of plenty of secure food in the globe, and thereby hinders the UN's recently-adopted SDGs and human security agenda. Hence, the piece justifiably recaps that we all must rethink innovative and achievable solutions to uproot child undernutrition as an eventual killer from not only Bangladesh and South Asia but also Asia and the world.

PARK AVAILABILITY AND MAJOR DEPRESSION IN INDIVIDUALS WITH CHRONIC CONDITIONS: IS THERE AN ASSOCIATION IN URBAN INDIA?

Debarati Mukherjee, PHFI

Green space exposure has been positively correlated with better mental-health indicators in several high-income countries, but has not been examined in low- and middle-income countries undergoing rapid urbanization. Building on a study of mental health in adults with a pre-existing chronic condition, we examined the association between park availability and major depression among 1208 adults surveyed in Delhi, India. Major depression was measured using the Mini International Neuropsychiatric Interview. The ArcGIS platform was used to quantify park availability indexed as (i) park distance from households, (ii) area of the nearest park; and within one km buffer area around households - the (iii) number and (iv) total area of all parks. Mixed-effects logistic regression models adjusted for socio-demographic characteristics indicated that relative to residents exposed to the largest nearest park areas (tertile 3), the odds [95% confidence interval] of major depression was 3.1 [1.4-7.0] times higher among residents exposed to the smallest nearest park areas (tertile 1) and 2.1 [0.9-4.8] times higher in residents with mid-level exposure (tertile 2). There was no statistically significant association between other park variables tested and major depression. We hypothesized that physical activity in the form of walking, perceived stress levels and satisfaction with the neighbourhood environment may have mediating effects on the association between nearest park area and major depression. We found no significant mediation effects for any of our hypothesized variables. In conclusion, our results provide preliminary and novel evidence from India that availability of large parks in the immediate neighbourhood positively impacts mental well-being of individuals with pre-existing chronic conditions, at the opportune time when India is embarking on the development of sustainable cities that aim to promote health through smart urban design - one of the key elements of which is the inclusion of urban green spaces.

HOUSEHOLD VULNERABILITY TO EXTREME HEAT IN ODISHA : A COMPARATIVE STUDY

Dr. Lipika Nanda, Subhashisa Swain, Shreeporna Bhattacharya
Indian Institute of Public Health, Bhubaneswar

Introduction:

Heat wave is emerging as a great threat and has been accounted to loss of many lives in developing and developed countries. Because of extreme change in temperature during summer the livelihood of people living in vulnerable area is affected. This study aims to understand the factors responsible for heat episode among city dwellers during summer.

Methods:

A comparative cross sectional study was conducted among 766 households in twin cities of Odisha covering 1099 population. A validated tool was used to collect information on socio-demographic factors, medical history, housing conditions, adaptation mechanisms and practices being practiced during summer. Multiple logistic regression using generalized estimating equations (GEE) to account for clustering effects at the household and slum levels was performed to test the various hypotheses using STATA SE 12.

Result:

Out of 766 households, 306 HHs were from slums of twin city and 460 HHs were surveyed from non-slum areas. Information was collected for 404 vulnerable individuals from slum and 695 individuals from non-slum areas. In comparison to non-slum areas, slum residents were more at risk of getting exposure to heat because of the housing structures, heat trapping materials on roof (asbestos and tin) (50%), overcrowding, lack of electric supply (29%), and access to water supply (16%) and exposure to additional heat during cooking because of use of solid fuel chullah (57%). Nearly, 38% of non-slum and 66% of slum participants had any chronic diseases. People in slum areas are more dependent on water and other traditional cooling mechanism, whereas, HHs in non-slum areas spends more on personal protection and architectural modification to avoid heat exposure. Almost 79% of people living in slum area had experienced heat illness compared to 60% staying in non-slum areas. Logistic regression reveals that, males staying indoor were two times higher at risk of getting heat illness compared to females (OR 2.03, 95% CI: 1.52-2.71). Presence of kitchen outside the home makes the residents two times more vulnerable towards the heat exposure and illness (OR 2.50, 95% CI: 1.15-5.40). Presence of chronic conditions predisposes higher risk (2-4 times) of getting heat illness. Practice of cooling methods like use of fan/ac/cooler decreases the chance of getting heat illness by 60%.

Conclusion:

The experience of heat wave depends on the physiological and housing conditions of the individuals. Identifying vulnerable population and understating the community specific adaptive practices is essential to design an effective heat action plan.

DETRIMENTAL EFFECTS OF MICROPLASTICS ON MARINE LIFE

Dr. IFFATH ZAMANI NEHA.
MBBS. MPH

Microplastics are small plastic pieces <5mm in size. Microbeads are tiny products of polyethylene plastics added to health and beauty products such as tooth paste, facial scrubs, compact powders, baby creams, oils, conditioners and shampoos. Microplastics come from variety of sources-

(A) Larger plastic debris that degrades into smaller pieces and

(B) Microplastics are manufactured for value addition of beauty products

These tiny particles easily pass through water filtration systems and end up in oceans and other water bodies posing a potential threat to aquatic lives. As plastics don't break down for years they are ingested and accumulated in the bodies of marine animals, some small fishes also die due to suffocation during respiration. These plastics are degrading the ocean environment and marine biodiversity by increasing the surface temperature and by adding unnecessary chemicals to water.

DDT and BPA are known to adhere to these tiny pieces and make way inside the fishes, oysters and crustaceans. Fish is the primary source of protein for one fifth of human population, and tiny plastics ingested by them, are consumed by humans worldwide. More than quarter of all fishes are believed to have ingested plastics.

Microplastic fragments are responsible for the make-up of bulk of Great Pacific Garbage Patch which is an area in the Northern Pacific ocean filled with tiny plastics covering around,700,000 sq. km. These micro plastics are known to affect health of human beings and aquatic species.

Consumer awareness about the degrading potentials of microplastics is yet to catch up the world attention.

A systematic review to know the effects of microplastics on the health of both human and marine life is warranted and it is of immense public health importance.

ESTABLISHMENT OF A COMPREHENSIVE RADIATION Education E-LEARNING SYSTEM FOR MEDICAL STAFF

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Six years have passed since a nuclear accident occurred at the Fukushima Daiichi Nuclear Power Station, operated by Tokyo Electric Power Company. The recovery of Fukushima and affected areas are continuing. However, disaster prevention parties and general physicians don't have enough knowledge about radiation and radiation protection. A major factor is probably the lack of information available allowing people to understand the situation for themselves.

Nuclear physicians and radiation protection experts created an e-leaning system and three booklets to promote measures to counter radiation.

We chose the following six contents.

1. Radiation All Around Us
2. Types of Radiation
3. Effects on the Human Body
4. Radiation Protection
5. Radiation Standards
6. Using Radiation in Health Care

The aim of this system is to provide simple explanations using simple words. People can feel free to skip to topics of interest. This system will be helpful for people thinking about the issue of radiation effects.

INDOOR AIR POLLUTION: HEALTH HAZARD TO COMBAT IN INDIA.

Prerana Pandia Herratdeep Singh

Background: According to WHO, 4.3 million people a year die from the exposure to household air pollution. Carbon dioxide exhaled out of lungs may accumulate in a closed and overcrowded place. But such an increase is usually small and temporary unless the room is really airtight. Indoor air pollution like burning of coal in room may also prove to be fatal. What is more common in a poorly ventilated house is a vague constellation of symptoms described as the sick building syndrome. Indoor air pollution from solid fuels accounted for 3.5 million deaths and 4.5% global daily-adjusted life year (DALY) in 2010; it also accounted for 16% particulate matter pollution. In India, out of 0.2 billion people using fuel for cooking; 49% use firewood; 8.9% cow dung cake; 1.5% coal, lignite, or charcoal; 2.9% kerosene; 28.6% liquefied petroleum gas (LPG); 0.1% electricity; 0.4% biogas; and 0.5% any other means

Objectives:

1. To study the burden of disease associated to indoor air pollution or air pollution as a whole in India.
2. To study the various measures to be adopted to in order to minimize the indoor air pollution and hence its harmful effects.
3. To assess the various community based interventions that can be applied to India in order to combat the issue of indoor air pollution.

Methodology: Present research has systematically reviewed research papers, case studies, epidemiological studies via online database 'PubMed', 'Google Scholar' and 'Web of Science'.

Results: There are social, cultural, and financial factors that influence the decision of people about energy and cooking. Other factors include the availability and flexibility of traditional fuels, the type of dishes prepared, the taste of food, the problems with smoke, the aesthetic appeal of stoves, and users' perception about other alternatives.

Conclusions: Indoor air pollution has been addressed in the various millennium development goals 1,3,4, and 7. Studies done so far in India provide us enough evidence that indoor air pollution is a cause of increasing morbidities and mortalities, and there is a need for an urgent intervention.

HEALTH IMPACT OF STACKING BEHAVIORS (USE OF MIX OF TRADITIONAL AND MODERN COOKING FUELS)

Ritu Parchure¹, Shrinivas Darak¹, Vinay Kulkarni¹, Ashok Sreenivas², Ann Josey², Ashwini Dabadge²

¹Prayas Health Group; ²Prayas Energy Group

Background –

Household air pollution (HAP) is the second largest cause of mortality and morbidity in India. With the increasing penetration of modern cooking fuels, reduction in HAP related disease burden is anticipated. However, it is known that households stack fuels when multiple fuel options are available. The health impacts of such behaviors largely remain unknown. We describe the health impacts of stacking, as the country progresses to transition to modern cooking fuels.

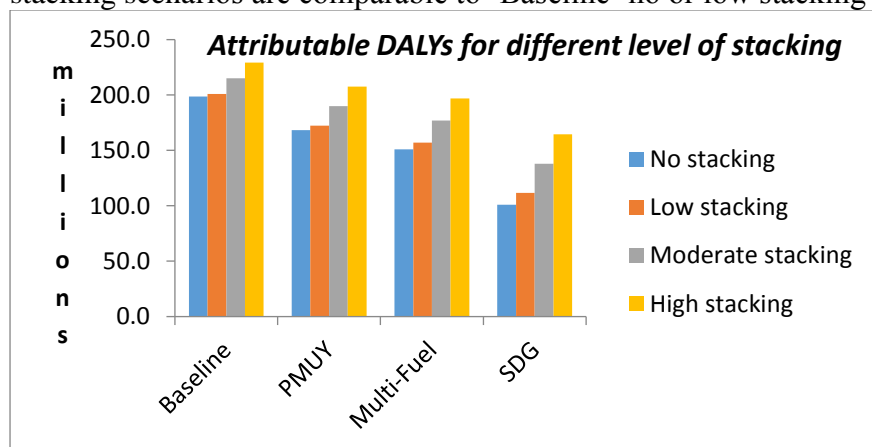
Methods –

A modeling exercise was undertaken to assess the cost effectiveness of different pathways of transitioning to modern cooking fuels in India from 2015 to 2030. ‘Scenarios’ that assume different rates and levels of modern fuel penetration were considered. ‘Baseline scenario’ built on past trends assumed lowest rate of penetration. ‘PMUY scenario’ assuming successful rollout of Pradhan Mantri Ujjwala Yojana. ‘Multi-fuel’ scenario focused on all modern fuels with similar rates of penetration as PMUY. ‘SDG scenario’ assumed 100% penetration by 2030. Further analysis was done assuming four levels of solid fuel stacking - no, low, moderate and high.

Attributable DALYs due to ischemic heart disease, chronic obstructive pulmonary disease, stroke, lung cancer and acute lower respiratory infections were calculated based on age and gender specific risk ratios using integrated exposure response curves.

Results –

Considering no stacking of fuels, the aggregate attributable health burden over 16 years in the ‘Baseline’, ‘PMUY’, ‘Multi-fuel’ and ‘SDG’ scenarios is 199 million, 168 million, 151 million and 101 million DALYs respectively. The attributable DALYs are significantly higher for high level of stacking, across all scenarios. As one moves from no to high stacking, additional 30, 39, 46 and 63 million DALYS are attributed for ‘Baseline’, ‘PMUY’, ‘Multi-Fuel’ and ‘SDG’ scenario respectively. Benefit of higher penetrations of modern fuels gets negated with high stacking. Attributable DALYs in ‘Multi-Fuel’ and ‘PMUY’ high stacking scenarios are comparable to ‘Baseline’ no or low stacking scenario respectively.



Conclusions –

Increasing modern fuel penetration would achieve substantial health benefits only if stacking levels remain low. As provision of modern cooking fuels do not necessarily translate into its use, behavioral interventions for complete shift to modern fuels would be equally important.

ACUTE CARBON MONOXIDE POISONING AS AN INDICATOR OF INDOOR CO POLLUTION. CASE SERIES FROM A PEDIATRIC EMERGENCY DEPARTMENT.

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Introduction: Acute carbon monoxide (CO) poisoning occurs frequently in cold months, associated with combustion in a non-adequate ventilated environment. Carbon monoxide exposure is difficult to diagnose and may be missed in the clinical anamnesis. Early diagnosis and timely treatment can reduce morbidity and mortality, minimize the risk of sequelae and prevent further exposure. The purpose of this study is to contribute to the identification of children CO exposure scenarios.

Objectives: Describe the clinical-epidemiological characteristics and exposure scenarios of the acute pediatric non fire, CO poisonings admitted to a Pediatric Emergency Department (PED), in Montevideo, Uruguay.

Material and methods: Retrospective observational descriptive study of all patients admitted to the PED with acute CO poisoning from January 1, 2014 to August 31, 2016. Inclusion criteria: patients under 15 years old with diagnosis of acute CO poisoning. Exclusion criteria: patients exposed to fire smoke. The data were obtained from the emergency medical records. Statistical analysis was expressed with simple frequency distribution and summary measures.

Results: Fourteen patients between 1 to 14 years old (median 10 y.o) were included. Nine CO related incidents were reported. Five of them were collective, with 10 poisoned children (10/14). All cases occurred in winter. Sources of CO exposure were reported in all incidents: gas water heater (n=3), gas stoves (n=2), gas oven (n=1), gas heat panel (1), brazier (n=1), kerosene stove (n=1). The average of carboxyhemoglobin (COHb) levels in children who have not received oxygen was 17.3% whereas in those who have received oxygen was 5.3%. Severe acute poisoning was diagnosed in 13 cases. No deaths were reported.

Conclusion:

Acute poisoning is the most visible effect of CO indoor accumulation, however is still underdiagnosed due to clinical similarities with common children winter diseases (flu, gastroenteritis) or common neurological symptoms (headache). These case series shows that CO poisoning is most of the time detected in severe cases. Despite it is a tardive indicator, acute severe CO poisoning is still one indicator of indoor CO accumulation that deserves surveillance. Each case of acute CO poisoning should trigger environmental interventions in children homes.

ASSOCIATION BETWEEN OCCUPATIONAL HEAT EXPOSURES AND DNA DAMAGE IN SELECT WORKING POPULATIONS

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Introduction: Heat stress is environmental and occupational hazard and impacts exposed population to a range of health effects from fatigue, tiredness, heat syncope, heat stroke and death (1). Direct heat exposure to cells causes protein degradation and DNA damage, which can lead to genetic alteration and cell death. DNA alterations could represent a common signal for the induction of stress protein synthesis during heat shock or exposure to reactive oxygen species in humans (2). Studies have shown that high heat exposures lead to the generation of an oxidative stress in cells and generation of free radicals that induces cell damage (3).

Objective: To study the association between chronic occupational heat exposures and DNA damage in select working population in Southern India.

Materials & Methods: Genotoxic damage of lymphocytes in workers was assessed by micronuclei test. The determination of micronuclei in lymphocytes was performed by casting slides stained with giemsa and calculating fluorescence to determine the extent of DNA damage by manual scoring that was confirmed by imaging using Zeiss Metaphase System. One thousand Binucleate (BN) was scored for each sample. DNA damage was calculated using a formula to find micronucleus (MN) frequency in exposed and non-exposed samples. SPSS was used for statistical analysis

Results: We studied 60 exposed workers (exposed to frank heat such as furnaces) and an equal number of non-exposed workers from the same work settings. The MN test that was done for both exposed and control groups revealed a significant positive association between heat exposures and DNA damage ($p\text{-value} < 0.0022 \times 10^{-13}$, $t = 30.353$, $df = 120.8$). The MN frequency, an indicator of DNA damage, in exposed group ranged between 0.026 – 0.45. The observed MN frequency (0.0347 vs 0.016) for workers exposed to chronic high temperatures (WBGT $40.3^{\circ}\text{C} \pm 1.95$) vs workers exposed to moderate temperatures (WBGT $31.08^{\circ}\text{C} \pm 1.88$) demonstrates that heat stress has a role in DNA damage of the exposed population.

Conclusion: The results demonstrate clear association between occupational heat exposures and DNA damage with high MN scores for high-heat exposed workers. The emerging research evidence is expected to highlight the need for protective labor policies for working population exposed to chronic high-heat work environments.

PM_{2.5} EMISSION CHARACTERIZATION FOR HOUSEHOLD SOLID FUEL BURNING ACTIVITIES IN INDIA

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The dominance of solid biomass combustion emissions in the Indian region, and the integrally large uncertainty in solid biomass fuel, provoked the current work and we estimate emissions of solid biomass in real world situation like cooking activities. In current study, we reported emission factor of particulate matter (aerodynamic diameter < PM_{2.5}), organic and elemental carbon, hazardous heavy metal and ionic species measured for various categories of fuels namely coal cake (CC), fuel wood (FW), dung cake (DC), mixed fuel (MF= FW + DC) and crop residue (CR). For these fuels (CC, FW, DC, MF and CR in that order) PM_{2.5} EFs were contribute 63%, 62%, 61%, 78%, 65% respectively. Out of PM emission carbonaceous matter were contribute 41%, 28%, 36%, 40%, 31% and ionic species 3%, 6%, 4%, 6%, 4% respectively and contribution of elemental species were very less (0.01-1.3%) for all type of fuels. These estimates are higher from previous chamber-based studies. In present study smoldering phase is dominant over flaming phase, therefore the elemental carbon to total carbon ratios vary from 0.08 to 0.49 it indicates that high elemental carbon fractions can be emitted from solid biomass combustion. A very good mass closure ($r^2 = 0.89$) between ions, metals and carbon with total weight was obtained and show very poor correlation with MCE.

IMPACT OF TIMING OF INITIATION OF BREASTFEEDING ON NEONATAL MORTALITY IN INDIA

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Early initiation of breastfeeding has lifelong benefits for both the mother and child, the risks of not breastfeeding are particularly pronounced early in life. The deleterious effects of maternal and child mortality both can be prevented or reduced by early initiation of breastfeeding.

In this particular study we have examine the role of behavioral factor i.e., timing of initiation of breastfeeding affecting neonatal deaths using a nationally representative dataset India Human Development Survey-II (IHDS-II), 2011-12. Sample Registration System (SRS) is used to see the rate of change in NMR from the year 2011 to 2015. District Level Household & Facility Survey (DLHS-4), 2012-2013 and AHS (Annual Health Survey), 2012-13 state reports have been used to show the district wise distribution of women who have breastfed their child within one hour of birth. For the underlined study, Binary Logistic Regression Model and Population Attributable risk have been computed.

There is wide inter-state and intra-state variations of neonatal mortality exist across country. Most of the neonatal deaths occurred in rural areas, Muslim religions, Schedule tribe's caste households. Mothers in younger age group, illiterate and babies who were underweight, higher birth order, very small in size and boys had witnessed higher neonatal deaths. Regression results that a woman did not breastfeed newborn within the one hour after his birth then, the odds of neonatal mortality is increased by three times ($OR = 2.93, 1.89-4.53$) more likely than those neonates who have breastfed within one hour of his birth. PAR estimates depict that that two third of the incidence attributed to delayed breastfeeding.

So, these findings support a recommendation of early initiation of breastfeeding as an intervention to achieve SDGs to reduce maternal and neonatal mortality.

HEALTH SYSTEM COMPETENCE FOR HANDLING EPIDEMIC : SITUATION ANALYSIS OF DENGUE IN KERALA.

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Kerala state had the worst hit of dengue epidemic which started from July and continued to September, 2017. The fever counts and hospitalizations was increasing day by day, slowly came down and is now under control. This paper describes the epidemic and the challenges identified by the clinicians in case management. Though under control now, the epidemic can repeat again in the future and prevention is possible if we are prepared to learn from the present epidemic. Moreover what has happened in Kerala can happen to India tomorrow and the whole country should be prepared for this in coming years.

Objectives: 1. To describe the magnitude of epidemic and trends during past years. 2. To identify the challenges encountered in case management by clinicians. 3. To critically look in to the health system competence in controlling the epidemic in the state.

Methods: Secondary data analysis of surveillance based data and desk review of the situation periodically by the clinicians who managed the cases.

Results: we can see the steady increase of number of cases of dengue in the state

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Dengue	961	734	677	1011	2597	1304	4172	7938	2575	4075	7439	16530
India				28292	18860	50222	75808	40571	99913	129166	36635	

Conclusions: The clinical picture was different from that of previous epidemics The epidemic of dengue was beyond the system's capacity to handle. The case fatality was only 1% and this may be due to the timely medical care. Majority of deaths occurred in adults. The lessons learned from surveillance can be used for designing the specific control strategies in future. Deaths were also associated with significant comorbidities like diabetes and chronic obstructive pulmonary diseases or preexisting chronic liver disease.

SOURCES AND CHARACTERISTICS OF CARBONACEOUS AEROSOLS ALONG WITH THEIR CLIMATIC NATURE

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Carbonaceous aerosols constitute a significant fraction in fine particles (PM_{2.5}), and it could be accounted for up to 40% of mass of PM_{2.5} in an urban atmosphere. Therefore, determination of particulate matter (PM_{2.5}) and its associated with carbonaceous aerosols are very important due to its impact on climate, visibility reduction and natural environment. In order to identify their nature and relationship with the major synoptic-scale circulation patterns, fine particles were collected from Pune atmosphere and were analyzed in terms of carbonaceous species (organic and elemental carbon). Average mass concentration of PM_{2.5} was $104.57 \pm 25.70 \mu\text{g m}^{-3}$ for entire study period. This indicates that observed values of PM are substantially higher than NAAQS and WHO standards, respectively. Carbonaceous analysis results showed that concentration of OC and EC were 31.25 and 2.73 $\mu\text{g m}^{-3}$. The calculated OC/EC ratios were observed 15.83 and 17.24 indicating abundance of organic carbon which suggests the excess of secondary organic aerosols. Effective carbon ratio (ECR) an approach for climatic nature of carbonaceous aerosols was found to have an average value of 2.42. This clearly indicates that abundance of SOC and lower values of POC and EC could lead to the reduction in atmospheric warming effect due to combustion PM and increases scattering properties of incoming radiations. The monthly air mass backward trajectory clusters analysis was performed which supports the transport of aerosols from the long range transportation as well as dominance of local sources over SW Indian region.

EFFECT OF INDOOR AIR POLLUTION ON ACUTE LOWER RESPIRATORY INFECTION FOR CHILDREN UNDER 2 YEARS OF AGE IN RURAL ASSAM

Dr Santanu Pramanik, Samina Parveen, Sandra Albert, Arpita Ghosh

Background:

Key sources of indoor air pollution (IAP) in India, particularly in rural areas, are smoke from biomass fuels and coal during household cooking, tobacco smoking inside the house and smoke from mosquito coils and incense sticks. In addition to the type of sources, ventilation of the space plays an important role in determining the level of IAP. Although the link between exposure to IAP and acute lower respiratory tract infection (ALRI) among children is well-established in various contexts, rigorous studies from India is sparse.

Methods:

We analyzed data on 3,536 children aged 6-23 month old from a cross sectional survey in 236 villages across three districts — Kamrup Rural, Bongaigaon and Udalguri in Assam. To measure exposure we considered all potential sources of IAP such as use of solid cooking fuels, ventilation status of the cooking area, child's presence during cooking, child's exposure to tobacco smoke and mosquito coil or liquidators or dhuna in closed space. Outcome measurement was based on WHO definition of ALRI for research and case management under field conditions. Using a multilevel framework, we analyzed the association between childhood ALRI and different sources of IAP after adjusting for usual confounders and incorporating sampling design features.

Results:

Children from households using solid cooking fuel are significantly more likely to develop ALRI symptoms relative to households using cleaner cooking fuels, after adjusting for district fixed effects, household socio-economic status, mother's age, education, and health seeking behavior, father's education, child's age, gender, birth order and village level random effect to account for clustering.

Policy implications:

Lack of access to cleaner fuels such as LPG gas cylinders in rural areas is one of the determining factors for prevalent use of solid cooking fuels. Under the current government scheme for rural distribution of cooking gas, the distributors are exempt from making home deliveries of cylinders. The government needs to ensure that cooking gas distributors serving rural areas and with sales exceeding certain number of refills a month provide home delivery of cylinders to their customers. This may increase the proportion of households using cleaner cooking fuels in rural areas.

PRODUCTION OF BIODIESEL FROM FATTY ACIDS OF INDIAN MUSTARD OIL

Rajendra Prasad

The technology described in this paper is based on the process developed in India for which a patent has also been granted recently#. The main starting material of this invention is waste mustard oil or residual oil obtained from mustard cake through solvent extraction. Although, commercially available mustard oil can also be used for the conversion described here, but since the mustard oil is widely used in India for edible purposes, it would be desirable to utilize the waste oil for this technology. It is estimated that about 7,00,000 tons of waste mustard oil is generated every year which is unfit for human consumption and can easily be diverted for use of the process described here, This mustard oil is split into glycerin and fatty acids. The fatty acids are then fractionated into two major fractions as erucic acids (C22: 1) and mixed fatty acids. The mixed fatty acids fraction which is essentially free from erucic acids (C22:1) is converted to methyl ester through trans-esterification resulting into Biodiesel of ASTM/BIS standard which can be used as a fuel for automotive engines direct or as a blend with petroleum based diesel. The process disclosed herein provides Biodiesel of very high quality along with two value added bye products, viz., erucic acid and glycerin. All the resultant products of this invention after due purification are industrially useful and together make the invention commercially viable.

Patent No. 283047 granted to Puri Oil Mills,
Prosecuted by the author

HEALTH RISK ESTIMATES FROM EXPOSURE TO MINERALS AND COMMUNITY HEALTH PROFILE AMONG POPULATION LIVING NEARBY INACTIVE NICKEL MINING SITE IN PULAU OBI, HALMAHERA SELATAN REGENCY, INDONESIA

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In mineral mining some metals, metalloids, and nonmetals are released to the environment leading to pollution in air, water, soil, and foodstuffs. To estimate health risks from exposure to these minerals, a public health risk assessment was conducted in Kawasi village at close proximity to inactive mining site and in Soligi as remote village in Obi Island. A total of 530 non-nickel miner residents (225 in Kawasi and 315 in Soligi) consisting of proportionally equal number of adult males, fertile age women, and school age children were subjected to anthropometric characterization for body weight and height, exposure time, frequency, and duration, and disease signs and symptoms associated with critical effects from exposure to a total of 31 minerals in ambient air ($n = 5$), drinking water ($n = 60$), foodstuffs ($n = 64$), and soil ($n = 10$). All mineral levels in ambient air, drinking water, foodstuffs, and soil were far below the standards or reference values with contamination level (CL) < 1 and risk quotient (RQ) < 1, except cyanide and mercury in foodstuffs. In cassava, cyanide CL was extremely high up to 922 folds with RQ of 531, indicating that this goitrogenic mineral may cause iodine deficiency since the iodine in drinking water and foods was undetected. The top 5 adverse health impacts observed were respiratory disorder, diarrhea, clumsy, skin rashes, and arrhythmic heart rate. Of these, skin rashes are almost certainly caused by zinc deficiency, while clumsy might be associated with mercury exposure with CL up to 3.5 although its RQ < 1.

PHYSICAL, PSYCHOLOGICAL, SOCIAL RELATIONSHIP, AND SPIRITUAL HEALTH DOMAINS OF QUALITY OF LIFE AMONG COMMUNITY LIVING IN CILETUH-PALABUHANRATU GEOPARK, SUKABUMI REGENCY, WEST JAVA, INDONESIA

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Ciletuh Geopark in Sukabumi Regency, West Java, is newly established national geopark which is now being promoted to be the UNESCO Global Geopark. So far, impacts of geopark development on human health and the environment have not been addressed since studies in this site were mostly focused on geology of 65-million year rocks, community empowerment, sustainable development, and education program. The present study explored global quality of life perception in physical, psychological, social interaction, and spiritual dimensions of health. A total of 101 residents (79 adults and 22 teenagers) of Cimarunjung hamlet of Ciwaru village in Ciletuh geoarea were involved as study subjects. Physical environment changes were investigated by focus group discussion and direct observation, while quality of life was scored using structured interview. The results show that 63.4% of residents perceived that the physical environment has been changed during geopark development. Meanwhile, the overall quality of life scores were 11.9% fair, 58.4% good, and 29.7% excellence. Specifically, spiritual health, with total score of 9.9% fair, 69.3% good, and 20.8% excellence, was better than psychological (3% bad, 20.8% fair, 52.5% good, 23.8% excellence), physical (3% bad, 37.7% fair, 49.5% good, 16.8% excellence), and social interaction health domain (2% worst, 15.8 bad, 43.6% fair, 35.6% good, 3% excellence). Physical, psychological, social interaction, and spiritual dimensions of health were not significantly associated with physical environment changes ($p>0.05$). In conclusion, physical environment of Ciletuh geoarea has been perceivedly changed but the changes did not influence the quality of life so much.

CLIMATE CONTROLS ON HUMAN HEALTH

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Recent climate change assessments by the Intergovernmental Panel on Climate Change (IPCC) project strong warming and drying trends for most regions in the subtropics ($\sim 15^{\circ}$ – 35° N/S latitudes). Almost two third of the world's population lives in these latitudinal belt, with limited infrastructure and significant subsistence agriculture – which makes them vulnerable to climate extremes. The projected climate trends will increase the likelihood of sustained and intense heat waves, severe prolonged droughts and extreme precipitation. These combinations of dry and wet extremes will have significant impacts on agricultural output, public health and the socio-economic well-being of these societies.

We present an overview of current and future changes in climate extremes – such as trends in hot and dry spells, extreme precipitation events, maximum and minimum temperature – based on historical and selection of the IPCC climate models (CMIP5) for these latitudes. We then present links between climate variability and public health mediated via connections to infectious diseases – with focus on the Indian subcontinent and Africa. Incidentally, the subtropics has also been experiencing an increase in Chronic Kidney Disease (CKD) exacerbated by a warmer and extreme climate, which will also be explored for the Indian subcontinent. The understanding of connections between climate variability and diseases will be of immense help to policy makers to develop effective mitigation strategies.

SUSTAINABLE INDUSTRIAL WASTEWATER TREATMENT AND RECOVERY OF WATER FOR REUSE – INDIAN AND ASIAN SCENARIO

Dr. S. Rajamani

Chairman - Asian International Union of Environment (AIUE) Commission

The ground and surface water resources in many locations in and around polluting industries such as textile, chemical, pharma leather tanneries, etc. contain high Total Dissolved Solids (TDS) and not fit for domestic and industrial use. Conventional treatment system reduces the Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Suspended Solids (SS), heavy metals etc. and not TDS and salinity which are mainly contributed by chlorides, hardness and sulphates.

There is not much scope in mixing the treated industrial effluent with domestic sewage to achieve the TDS level in many locations in the absence of organized sewage treatment plants of required capacity. Many industries are located in the land locked areas and there are constraints to discharge the treated effluent with high TDS.

The TDS limit is being enforced in India and other parts of the World depending upon the final mode of disposal. In addition to the removal of TDS in the treated effluent, it is necessary to recover water for reuse to meet the challenge of water shortage. Different types of units such as Micro Filter (MF), Ultra Filtration (UF), Membrane Bio-Reactor (MBR), Nano Filtration (NF), Reverse Osmosis (RO) etc. have been developed for recovery of water from saline ground water, Sea water and domestic/industrial wastewater with high TDS. Management of the concentrated saline stream RO system seems to be one of the major issues in land locked areas. This technical paper deals with environmental challenges and technological development in domestic and industrial wastewater treatment and management in Asian Countries.

IMPACT OF ORGANIC MANURES IN AGRICULTURE FOR CROP PRODUCTIVITY AND FOOD SECURITY OF DEVELOPING NATIONS

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Modern agriculture largely depends on the use of chemical fertilizers due to introduction of high yielding fertilizer responsive varieties. The application of chemical fertilizers has undoubtedly increased the production at the same time it leads to the accumulation of hazard on pollutants and undesirable effect on the soil sustainability in the long term. The major effect of green revolution is that our agriculture became chemicalized. Toxic residues of the agricultural chemicals are entering the human diet which is the major concern today. With the increase in crop yields from modern farming techniques reaching a plateau in most of the countries, and the environmental problems due to excessive use of chemical fertilizers and pesticides becoming a matter of concern, the need for sustainable agriculture is increasingly being felt, the world over. In the process of attaining higher levels of food production for matching the demands of the growing population during the past four decades, emphasis was laid on intensive agricultural practices. The technologies generated over the past four decades have proved detrimental to the natural resource base and the environment in different parts of the world. Due to energy crisis, escalating cost of chemical fertilizers and poor purchasing power of marginal and small farmers, it is imperative to develop strategy to use organic manures/wastes to its maximum potential with proper technology to meet the shortage of fertilizers and for improving soil fertility. Soil is the basis for all life in the universe, directly or indirectly, so hope of a healthy world rests on a good, healthy and fertile soil. Therefore, there is an urgent need of rejuvenating the tired, over-worked, degraded, polluted and malnourished soil to make it potent for future food production.

Recycling of biological resources, wastes and by-products can improve farm natural resources and income. In this context there is an imperative need to improve the production of grains without affecting the environment and the quality of food grains with improved low cost agriculture technology. To compensate the losses caused by chemical fertilizers, organic manures are strongly recommended. Commonly available organic manures include farmyard manure, composts of farm- wastes, crop residues, cattle dung, night soil and poultry, sheep and goat manures, fish meal, oilcakes, sewage, sludge and green manure. Organic wastes and surplus crop residues can be recycled in soil by different methods such as in situ incorporation of green manure, green leaf manure, organic matter or by organic mulch besides composting which will eventually improve the physical, chemical and biological properties of soil resulting in higher crop productivity and also addition of organic manures save environment in a greater way.

CHEMICAL CHARACTERIZATION, DEPOLLUTING AND ANTI-BACTERIAL ACTIVITY OF HAWAN MEDICINAL SMOKE (HMS)

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Background & Objectives- The physical process of traditional *Hawan* (*Yajya*), involves sequential oblation & sublimatization of odoriferous, medicinal, nutritious substances onto consecrated fire. Devised by ancient sages of India, it is said to purify the environment and cure diseases. In the current scenario of exalted pollution and the resultant unmanageable diseases, it seemed prudent to find scientific validation of these claims and explore its possible use in environmental and public health.

Material & Methods- *Hawan* was performed using *Ficus religiosa* wood(W), clarified cow's butter(G) and GC-MS characterized herbal mixture (*Hawan samagri*-S) under experimental conditions for 30min in a chamber. Chamber air/ medicinal smoke (HMS) was sampled before, during and at various intervals after *Hawan* to determine the bacterial bioload of air, chemical bioactives, gases and pollutants. Gas Chromatography Mass Spectroscopy (GC-MS) analysis of HMS and pyrolysed *Hawan* ingredients (HI) was done. Analysis of smoke by burning W alone and in combination with G was used as control. Live quantitative cultures of pathogenic bacteria (n=15) including *E.coli*, *K.pneumoniae*, *S.aureus*, *P.aeruginosa*, *E.faecalis*, *Proteus mirabilis*, etc. were exposed to HMS followed by incubation at 37°C in incubator for 18-24hrs and colony counts were recorded. Statistical analysis of results was done by Completely Randomized Block Design (CRD) and Student Z test.

Results- Pyrolysis and GCMS analysis of HMS and HI revealed absence of toxic pollutants with presence of an array of compounds known to have antimicrobial, anti-oxidant and holistic health benefits. Bacterial bioload of air decreased by $\geq 90\%$. CO, CO₂, NO_x levels decreased below baseline. 60-100% reduction in the viable colony count was seen on exposed bacterial cultures.

Conclusion- *Hawan* is a scientific, ecofriendly fumigation technique, that facilitates detoxification of the environment primarily due to released chemical actives, with potential multi-dimensional health benefits as well. Hence it can be adapted for use in environmental remediation and public health medicine in our combat against bacteria, pollutants and the diseases caused by them.

COMMUNITY LEVEL ENVIRONMENTAL DETERMINANTS OF PHYSICAL ACTIVITY: A COMMUNITY BASED CROSS-SECTIONAL STUDY IN NORTH INDIA

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Physical inactivity is one of the proximal determinants of Non communicable diseases. In India also the prevalence of physical inactivity is very high. Physical activity is mainly self driven and its relation to built environment is less studied. This Study aimed to identify the community level environmental determinants responsible for physical activity among adults after adjusting for individual and family level determinants, in a block in north India.

Methods: This is a community based cross-sectional study conducted in rural and urban areas of district Faridabad. Neighborhood Environment Assessment Tool (NEAT) was used to assess the environment for leisure time physical activity, physical activity sites and duration of physical activity of the participants staying in the community.

Results: Only one fourth of the participants were doing leisure time physical activity. This number was higher among urban participants than rural. Among the communities the mean density of physical activity sites was 1.33 with median density of zero. Median walkability score of the communities was found to be 7.5 (5.5-9.8) and walkability of urban community was found to be higher than the rural community. No physical activity related advertisement was found in the communities. Age of participant, gender, education attitude towards physical activity, doing WTPA was found to be related to physical activity. In multilevel model 1.7% of the variability of physical activity among participants was explained by the community level variables after adjusting for the individual level variables.

Conclusion: Environment is found to be related to physical activity although major part is contributed by the individual level determinants. Further research is required to confirm the role of environment.

ASSOCIATION OF PERSISTENT ORGANIC POLLUTANTS WITH INCIDENT DIABETES: STUDY PROTOCOL

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Background/Aim: Nearly 20% of the 415 million adults with diabetes in the world live in India. While the contribution of risk factors such as unhealthy diets and physical inactivity has been evaluated, other potential risk factors such as persistent organic pollutants (POPs) remain unexplored. Studies of the health effects of these exposures are needed, therefore we propose to study this association between POPs in human plasma and incident diabetes.

Methods: The proposed study design is a nested case control study within the CARRS (cArdiometabolic Risk Reduction in South-Asia) Study; a prospective cohort study that enrolled 12,271 participants from Delhi and Chennai during 2010-2011. Fasting blood samples were available from 10,227 participants and aliquots of plasma were stored in cryo-vials at -80 degrees Celsius; samples for the proposed study will come from these aliquots. The proposed study will involve cross-validating gas chromatography-mass spectrometry (GC-MS) methods for measuring the relevant polychlorinated biphenyl (PCB) congeners (118 and 153) and organochlorine pesticides [p,p'-dichlorodiphenyltrichloroethane (DDT), p,p'-dichlorodiphenyldichloroethylene (DDE), β -hexachlorocyclohexane (HCH), *trans*-nonachlor (TNC)] in human plasma between laboratories at Emory University and Jawaharlal Nehru University. Levels of two PCB congeners and four organochlorine pesticides will be quantified in n=80 (n=40 cases and n=40 controls) for this cross-validation exercise. Once sufficient agreement between laboratories is achieved, levels of these POPs will be quantified in n=230 incident diabetes cases and n=460 city- and gender-matched normoglycemic controls. Cases of incident diabetes will include participants having fasting plasma glucose (FPG) ≥ 126 mg/dl or HbA1c $\geq 6.5\%$ or self-reported physician-diagnosed diabetes. The association between POPs levels and incident diabetes will be estimated using multivariable conditional logistic regression.

Conclusions: This will be the first study from a low- and middle-income country to address this research question using a robust prospective study design and gather evidence on the potential role of environmental exposures in causal pathway of diabetes.

CATTLEMAN BEHAVIOR IN OUTBREAK AREA OF ANTHRAX IN CENRANA, MAROS REGENCY

Rahmatillah Razak

Universitas Indonesia

Anthrax is a zoonotic disease which is generally acute and leads to high mortality, this disease can attack animals and humans. Cenrana is one of the areas in Indonesia which is endemic to anthrax. This area has outbreak of anthrax cases in cows and horses in 2012 and 2017, and there is one human suspected anthrax in 2017. The purpose of this study was to see the behavior cattlemen in outbreak area of anthrax. The research was held on August 2017 in Cenrana, Maros Regency. The research was a qualitative study and data collected by interviewing 8 informants, health provider, and local community leaders. The observation was also conducted to aim the validity of these data. The result showed that there were risky behaviors toward anthrax cases, such as the habit of cattlemen who directly slaughtered their cattle when the illness symptoms are found in their cattle. It should be done to avoid loss of costs and transmission disease to other cattle. Due to limited facilities and infrastructure, the cattleman will throw the cattle to the cliff if it was die because of anthrax symptoms in order to distrust it. The aspect of hygiene, the cattleman rare to clean the cage and didn't wear protective equipment if they contact with their cattle so that it will cause the high risk of transmission to human. Local health provider have implemented vaccination programs in that area but they were unable to cover it all due to the semi-intensive cattle shelling. The conclusion of this research is that cattleman behavior has not applied prevention and proper control to anthrax cases. Moreover, it is necessary to provide information through counseling from veterinary or health provider and there should be village cadres and regular surveillance about animal health in that area.

DETERMINANT OF ANTENATAL VISITS AMONG MULTIPAROUS MOTHERS IN JENEPONTO DISTRICT

Rahmatillah Razak

Universitas Indonesia

Antenatal care is one of the recommended programs by World Health Organization (WHO) to improve maternal and neonatal health. Antenatal visits are recommended to be comprehensive at least four times visits during pregnancy to ensure protection pregnant women and fetus, early detection of risk factors, prevention and early treatment of complications in pregnancy and childbirth period that can cause the maternal and neonatal mortality. In developing countries, coverage of antenatal care in the first trimester (K1) increases annually, different from the antenatal coverage in the third trimester (K4) which sometimes decreases. Jeneponto is one of the districts in Indonesia that has antenatal coverage which has not reached national target in 2014, so it is important to see the full achievement and determinant of adequate antenatal visits program specifically in a multiparous mother who had experience with pregnancy and give birth. The sample contains in this study were multiparous mothers who have children more than one and give birth in 2014, therefore sample total were 262 multiparous mothers, adequate antenatal visits in this study was when mothers check their pregnancy once in first trimester, once in second trimester, and twice in third trimester on mother pregnancy period. Design of the study was cross-sectional with proportional random sampling method in eleven sub-districts, which its primary data was collected by interviewers using questioner instrument. Data was collected from September 2014 to January 2015 in Jeneponto. Univariate and bivariate were data analysis of this study, which is using odds ratio and confidence interval. The percentage of multiparous mothers who had adequate antenatal visit was 72%. The result showed that the higher education mothers (OR=2.04 Confidence Interval (CI) 1.04-4.01), working mothers (OR=2.37, 95% CI 1.01-5.59), previous give birth assistance by health provider (OR=1.78, 95% CI 1.03-3.07) and previous place of give birth in health facility (OR=2.33, 95% CI 1.29-4.22) had a significant association with adequate antenatal visits among multiparous mothers. While distance from home to a health facility (OR=1.02, 95% CI 0.57-1.78) and health insurance (OR=1.11, 95% CI 0.64-1.92) had no significant association with adequate antenatal visit among multiparous mothers. Multiparous mothers who had received services from a health provider in a previous pregnancy and childbirth will do adequate antenatal visits in the second pregnancy and beyond.

SOCIO-ECONOMIC AND LOCATION EFFECT ON FINE PARTICULATE IN RESIDENTIAL HOMES OF AGRA, INDIA

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Pollution indoors remains as one of the latest predicaments over the globe owing to a large fraction of time (80-85%) spent inside the homes by the masses which make it a greater health hazard than outer settings. It is identified as one of the real problems and thus has managed to attain as one of the top five environmental hazards by EPA. In view of the dreadful menace of the subject, a more integrated approach is needed in augmentation of raising awareness about the potential to save lives and reduce health burden. The present study attempts to lay the indoor air quality scenario of Indian households with varying location and income parameters. Real time monitoring of Fine Particulate matter of different sizes PM_{2.5}, PM_{1.0}, PM_{0.5}, and PM_{0.25} was undergone with Grimm Aerosol Spectrometer 1.109 at inside and outside of nine residential houses in urban, rural and roadside houses in Agra, India during monsoon season of July- September'2016. The indoor average mass concentrations recorded for PM_{2.5}, PM_{1.0}, PM_{0.5}, PM_{0.25} was maximally recorded for rural homes (84.12 $\mu\text{g m}^{-3}$, 46.79 $\mu\text{g m}^{-3}$, 32.64 $\mu\text{g m}^{-3}$, 0.102 $\mu\text{g m}^{-3}$) followed by urban homes (42.81, 40.15, 26.16, 0.101) and least for roadside homes (37.66 $\mu\text{g m}^{-3}$, 36.00 $\mu\text{g m}^{-3}$, 23.62 $\mu\text{g m}^{-3}$, 0.010 $\mu\text{g m}^{-3}$). The outdoor PM concentration trend followed a similar pattern with a small difference of the roadside homes reporting higher mass concentration than urban houses in the outdoor environment. The average I/O ratios of all sized particulates were calculated differentially for each microenvironment. The ratios were greater than 1.00 for urban and rural sites while for homes located at roadside environment were <1.00. Regressions analysis were further attempted to investigate the influence of outdoor air-pollutant concentrations on indoor concentrations. Linkage of pollutant concentration with the household activities was explored by analyzing the diurnal trend of all the income houses. Questionnaire survey was also carried out to know about the socio-demographic house characteristics and behavioral patterns of the residents. The findings highlight the importance of the location and the socio-economic status in affecting the exposure of residents to toxic PM levels.

AMBIENT EXPOSURE TO AIRBORNE CARCINOGENS IN NEW YORK STATE USA

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Cancer incidences rates have increased in most countries since 1990 (Global Burden of Disease Collaboration, 2015). Cancer is due to several different factors, including genetics, inflammation, infection and exposure to carcinogenic substances ranging from radiation to chemicals (Loeb and Harris, 2008; Aggarwal and Gehlot, 2009; Kalunig et al., 2011).

It is widely recognized that many if not most cancers cannot be fully explained by established “risk factors”. This includes some of the most prevalent cancers, including cancers of the breast and colon. The President’s Cancer Panel (USDHHA, 2010) recently stated “There is a lack of emphasis on environmental research as a route to primary cancer prevention.”

In this study we have:

- (1) determined the total number and volume of toxic chemicals released into New York’s air (statewide and by county) for the 7-year period 2008-2014,
- (2) determined the total number and volume of “known carcinogens” as defined by governmental “authorities” (the International Agency for Research on Cancer, U.S. Environmental Protection, the U.S. National Toxicology Program, U.S. Occupational Safety and Health Administration, the State of California, and the European Union),
- (3) determined the total number and volume of “known carcinogens” for specific cancers as classified by the International Classification of Diseases, 10th ed., for example, the specific chemicals and total volume of releases associated with breast cancer, colon cancer, etc., and
- (4) determined the volume of pollutants by major emission type (point, non-point, on-road, and mobile non-road).

The data used in this study is EPA’s National Emissions Inventory, the country largest and most comprehensive air pollution data set. To our knowledge, this is the first effort to use this data to document exposure to “known carcinogens”.

Our most important finding is that in a 7-year period a total of 23.7 billion pounds of chemicals were released into New York’s air that have been positively associated with human cancer, including 10.7 billion pounds of “known carcinogens”.

In our opinion, these results represent an important step toward a fuller understanding of environmental contamination as a cause of human cancer, a major concern for both industrialized and industrializing countries.

Ensuring Food Security Through Sustainable Agricultural Practices in India

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India is pre-dominantly an agricultural country with more than 70 percent of the people directly or indirectly associated with agriculture. In early sixties, with the increasing population India had to increase its food production to feed its population. With the aim of increasing the food production 'Green Revolution' was introduced in India. It resulted in increased production of cereals, pulses, oilseeds, minor millets and horticultural crops like fruits and vegetables. Because of Green Revolution, India could attain self sufficiency in food production. There was more focus for greater agricultural production without any regard for environment. This caused devastating damage to the environment, land water, soil and forest.

Now it is high time to think of safe and pollution-free environment. The scholars, researchers, policy makers, planners and extension workers are focusing their efforts on eco-friendly environment through sustainable agricultural practices. Agriculture can be judged to be sustainable if it is 'ecologically sound', 'economically viable', 'socially just', 'humane' and 'adaptable'. Unless serious efforts are made to propagate and practice sustainable agricultural practices our Indian agricultural development will soon be in dire-straits. Sustainable agricultural practices include organic farming, bio-farming, chemicals-free farming, judicious use of water, bio-diversity, and crop rotation, adaptation to drastic climatic changes, integrated farming systems and environment friendly agriculture. The need of the hour is marching towards sustainable agriculture. An attempt was made to identify the sustainable agricultural practices adopted by the tribal farmers of Kolli Hills. The tribal farmers adopted a lot of practices like organic manuring, vermi composting, green leaf manuring, application of farmyard manure, crop rotation, leaving the land for fallow for some time, dusting of ash to control pests, spraying neem oil to control pests and diseases etc. Most of these practices are adopted by more than sixty percent of the tribal farmers. Suggestions are made to make use of these practices for attaining sustainable agricultural development.

URBAN GREEN SPACES AND HYPERTENSION

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The goal of this study was to investigate cross sectional associations between urban green spaces and hypertension. We used data from the Cardio Metabolic Risk Reduction study in South Asia (CARRS) on 2,575 individuals aged 20 years and above. Hypertension was defined as Systolic Blood Pressure (SBP) of ≥ 140 mmHg and/or a diastolic blood pressure (DBP) of ≥ 90 mmHg and/or self-reported treatment for hypertension. Urban Green Spaces were measured using a combination of field data collection, Geographical Information System (GIS) and remote sensing data. We ran a “Spike and Slab” (SS) Bayesian Hierarchical model for variable selection with SBP as a continuous response variable with other 20+ variables collected from the study. We then used the top variables from the SS model, based on the absolute values of the Bayesian Model Averaged (BMA) estimates, to run a logistic model with Hypertension as the outcome to identify potential association between the green space and the risk of Hypertension. Age (BMA estimate = 6.633) was found to be the most significant variable to be associated with the SBP whereas high physical activity was found to be the least significant variable (BMA estimate = - 0.337) associated with SBP from the list of 12 variables. The logistic model, based on 12 variables, found logarithm of distance to the nearest Green Space and the normalized difference vegetation index (NDVI) significantly related to Hypertension when it was adjusted for other 10 variables found important from the SS model. The logistic model revealed that increase in logarithm of the distance to the nearest green space increases the risk of hypertension by 1.114 OR (95% CI = (1.011, 1.228)) whereas the increase in NDVI results in decreasing the risk of hypertension by 0.053 (95% CI = (0.005, 0.602)), after adjusting for age, BMI, gender, total cholesterol, fasting blood glucose, high income, alcohol use, physical activity, and years of education. Access and availability of Urban Green Spaces may have a positive effect on Hypertension.

BUILT ENVIRONMENT AND CARDIOMETABOLIC DISEASE RISK FACTORS IN URBAN DELHI

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Cardiometabolic disorders are a major cause of mortality and morbidity among South Asians. Built environment, which includes all things developed and altered by humans may influence the health behaviours related to the development of cardiometabolic disorders. While we know much about the causes and individual level risk factors of CMDs, the relationship between neighbourhood built environment and CMDs and their risk factors has been sparsely investigated in low- and middle-income countries. We explored the use of global positioning system (GPS), Google Earth, and Geographic Information System (GIS) to determine the relationship between built environment, CMDs and its risk factors in urban Delhi. Household locations of participants of the CArdio Metabolic Risk Reduction study in South Asia (CARRS) were geocoded using hand-held GPS devices, followed by data collection on the neighbourhood built environment features around participant households (health care facilities, food outlets, transport infrastructure, green spaces etc) by field workers. Supplementary data on road networks, land usage etc. was derived from Open Street Maps (OSM). The relationship between these objectively measured built environment features and health related data collected in the CARRS study was analysed. CMDs and its risk factors – specifically obesity and low physical activity – are significantly associated with built environment features in urban Delhi. For example, hypertension is inversely associated with green space availability, high levels of physical activity clusters around areas of high access to green spaces, and residents living in areas with high density of restaurants tend to eat more refined grains and consume less fruit. Clustering of CMD risk factors were also observed. In summary, analysis of built environment features provide important information regarding neighbourhood level risk factors of CMDs, which would enable researchers to design suitable interventions that go beyond the individual level focus commonly reported in the literature.

SPATIAL AND TEMPORAL VARIATION OF ATMOSPHERIC CARBONACEOUS AEROSOLS DURING A YEAR-LONG MEASUREMENT IN RAIPUR, INDIA

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Air pollution has become a serious health issue in many developing countries including India and could generate adverse effects on human beings. This study describes year-long Particulate Matter (PM_{2.5}: aerodynamic diameter of less than 2.5 μm) sampling campaigns which were conducted (gravimetrically) during October 2015 to September 2016 (once in a week) using a set of two parallel PM_{2.5} cut-off impactor consisted MiniVol air samplers in Urban, Industrial and rural environment of Raipur, Bhilai and Kosmarra (a village of Dhamtari District), Chhattisgarh, India, respectively. Weekly PM_{2.5} sampling in the urban site was carried out, separately, for day and night time to evaluate the impact on selected meteorological parameters on occurrences of PM_{2.5} masses. Filter deposited ambient PM_{2.5} samples, collected during the sampling period, were analyzed for carbonaceous aerosols using DRI Thermal/Optical carbon analyzer and operated on IMPROVE-A Protocol. The annual average PM_{2.5} mass concentrations were found to be ~2 to 5 folds higher than the Indian National Ambient Air Quality Standard (NAAQS) value. Average concentrations of organic carbon (OC) and elemental carbon (EC) were higher during the night time and winter season. On comparing reported studies of other Indian locations, the highest percentage of Total Carbonaceous Aerosols (TCA) in ambient PM_{2.5} of Bhilai and Raipur has been observed. The OC/EC and char/soot ratios, evaluated in this study, have shown significantly higher variation in spatial and temporal scale of all three sites. The high percent contribution to the secondary organic aerosol (SOA) is also observed which is greater than 50% to total organic carbon. The highest concentration of SOA was at Bhilai area which is due to impact on industrial activity. Bhilai is a well-known major Industrial area of Chhattisgarh, more than 350 majors and minor industrial units are located here.

IMPORTANCE OF COMMUNITY AWARENESS IN EFFICIENT SOLID WASTE MANAGEMENT – A CASE OF NEW DELHI

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Waste can be considered as nothing but valuable material at wrong place. There is no substantial in this world, which is not useful in one-way or other. It's man's ignorance that he considers certain things as waste and other thing as useful. With the development as types of waste are changing, the attitude of people towards waste should be changed. People must realize that the waste which they throwing in the streets are not actually waste it is the raw material for some other processes.

This study has identified various issues at the collection, transportation and disposal facilities near the residential areas close to Okhla, New Delhi which has one of the oldest and largest landfill sites of Delhi. It could have possible consequences to health and environment. The methodology involved surveying, conducting focus group discussions (FGDs) with the urban waste generators, Municipal Corporation officials, people living in the vicinity of the landfills and the waste pickers..

SCOPING REVIEW FOR CHILDREN'S ENVIRONMENTAL HEALTH AND WATER SANITATION AND HYGIENE (WASH) OUTCOMES IN INDIA

Samayita Ghosh, Poornima Prabhakaran¹

Background:

The accrued effects of infection, multi-systemic illnesses, morbidity, mortality, adverse physiological and neurological developments during the early life stages could be a result of exposure to environmental risk factors such as poor WASH. This, as a programmatic objective requires a multi-sectoral response necessitating the need for an evidence-base to address systemic and knowledge gaps. The aim of this scoping review is to develop a research portfolio in the context of children's environmental health in India, locate evidence gaps and scope for cross pollination of knowledge, recognize priorities and inspect the role and scope for expanding stakeholder engagements.

Methodology:

Database is categorized into systematic and grey literature of published texts including journals, documentations and reports categorized on the basis of type, methodology, conclusiveness and relevance. Systematized databases such as PubMed, Cochrane central, CORE, Shodhganga, JSTOR, Google Scholar, institutional websites up-to the last ten years was searched. All human studies investigating any health outcomes of a WASH intervention, or exposure were eligible for inclusion and none were excluded based on language, study design or methodological quality.

Results:

Systematic databases significantly suggest correlations of poor WASH with the burden of infections primarily diarrhea and sub-optimal nutrition is a major determinant. This theme is seen recurring in grey literature, gaining currency on the work of development practitioners. Diarrhea is attributed to insufficient access to safe WASH infrastructure and improper hygiene of the caregiver therefore elucidating on the need for diarrhoeal management and surveillance. Studies, mostly region-specific, look at hand-hygiene through a behavioural and systemic lens and its intercepts such as respiratory infections; featuring in nutritional and anthropometric studies, tool standardization exercises, randomized control, case studies, documentation and guidelines, recognizing food safety, institutional care and capacity building as priorities. Some region-specific studies on enteric diseases, identify pathways of exposure and type of contaminants. Studies focusing on social determinants have identified women's autonomy as an enabler. Despite scientific evidence, the lack of contextual studies assessing neurological outcomes and other infections such as schistosomiasis, malaria, Hepatitis A, E, F, encephalitis, methemoglobinemia (outbreaks during the *holi* festival), and their connections with poor WASH outcomes are abysmally low.

THEMATIC DISTRIBUTION ACROSS STUDIES FOUND IN SYSTEMATIC DATABASES

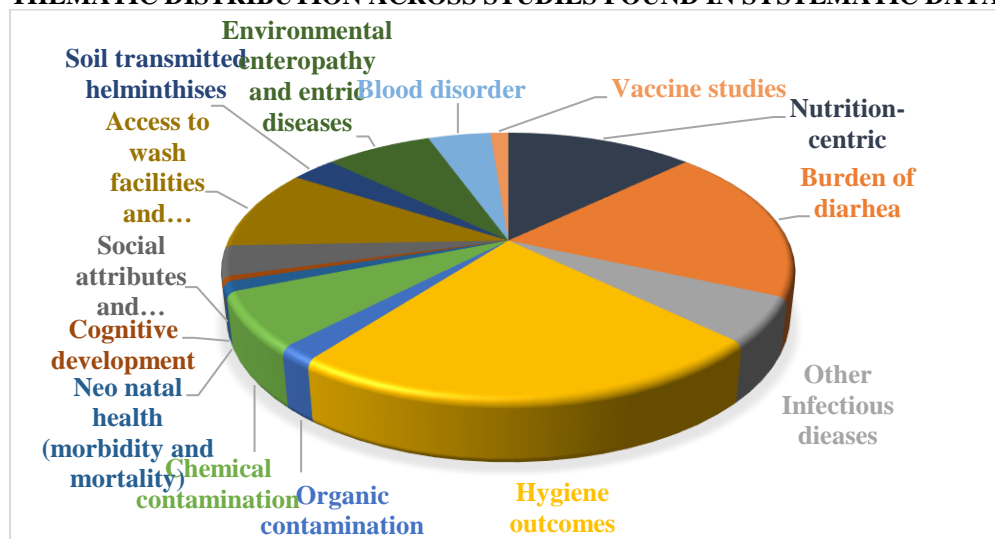


CHART LEGEND

Nutrition-centric

- Food hygiene and nutrition
- Diarrhea and malnutrition
- Weaning practices
- Breast Feeding practices

Burden of diarrhea

Other Infectious diseases

- Multidrug resistant typhoid fever
- Hepatitis A, E, F
- Malaria
- Pneumonia and other respiratory diseases
- Encephalitis

Hygiene outcomes

- Hand Hygiene
- Other Personal Hygiene

Organic contamination

- Fecal contaminant
- E coli

Chemical contamination

- Fluorosis
- Arsenicosis

Neo natal health (morbidity and mortality)

Cognitive development

Social attributes and mental health

Access to wash facilities and management of waste

Soil transmitted helminthiases

Environmental enteropathy and enteric diseases

Blood disorder

- Status of women and women autonomy
- Violence and psychosocial stress

Vaccine studies

Key Factors Affecting Children's Health India: Results from NFHS-4 study

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Abstract: The National Family Health Survey (NFHS) is a large-scale, multi-round survey based on representative state level sample of households throughout India. The most recent NFHS-4 provides district level information on several essential data on health and family welfare which can subsequently be used for policy and programme purposes by identifying emerging health and family welfare issues. In our study we use data from all 640 districts in India with the goal of identifying some of the key factors affecting the children health. In particular, using multiple linear regression models, we explore the variability in proportions of stunting, wasting underweight in children (under the age of 5 years) across states. We also examined the associations of these health outcomes with a host of determinants of health which represent parental factors, household factors, child susceptibility status, morbidity status, access to care, and mortality. Among many other interesting findings, we have observed that the prevalence of underweight, stunting and wasting for children (under 5 years of age) have statistically significant negative association with percentage of children in the age group of 6-23 months receiving adequate diet, percentage of households with improved sanitation, literacy rate of women in the household and access to clean cooking fuel. For instance, a multiple linear regression model (with an adjusted R-square of 77%), suggests that adjusting for state level variations, if we were to keep other considered factors unchanged, just a 10% increase in children (aged 6-23 years) receiving adequate diet is likely to decrease the prevalence of underweight by 1.3% at district level. Similarly, another multiple regression model (with an adjusted R-square of almost 70%) indicates that an increase of 10% literacy rate in women is likely to decrease the prevalence of stunting by about 2.4%. Many other interesting and key findings are reported using charts and tables. It is imperative for the ministries and responsible departments to liaison, partner and take joint responsibility of transforming health outcomes for India.

GREEN NANO TECHNOLOGY FOR ENVIRONMENTAL REMEDIATION: PHOTOCATALYTIC DEGRADATION OF PHARMACEUTICALS PRESENT IN WATER AND WASTEWATER

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Pharmaceuticals emerging in the aquatic ecosystems have become an important public health issue over the past few years. To evaluate the impact of those pharmaceuticals in drinking water the World Health Organization already reviewed scientific evidence to address this issue. They are mostly introduced in the sewage system through excretion of unmetabolized compounds after medical use or inappropriate disposal and then transported into the wastewater treatment plants. Due to low removal levels in conventional wastewater treatment plants, there is a need to develop technologies that promote an easier degradation of these pollutants. Among various treatment technologies, advanced oxidation process with nanotechnology has become very popular and demonstrated high effectiveness in the degradation of pharmaceuticals in water and wastewater. Semiconductor photocatalytic oxidation technology has several merits such as green, environmental protection and high efficiency, which draws great interests in the aspect of environmental pollution control. In our laboratory, we developed various nanostructured materials such as zinc oxide (ZnO), Cerium doped ZnO, cadmium sulfide (CdS) microsphere and indium sulfide (In₂S₃) nanoflower by adopting various synthetic techniques such as solution phase, hydrothermal, solvothermal and microwave assisted method for water and wastewater treatment. In order to understand the physical properties of the prepared materials, the structure and morphology of the prepared products were characterized by X-ray power diffraction (XRD), Raman spectroscopy, scanning electron microscopy (SEM), energy-dispersive X-ray diffraction (EDX), and X-ray photoelectron spectroscopy (XPS). Various pharmaceuticals such as acetaminophen, levofloxacin and nizatidine were used as pollutants to investigate the photocatalytic activity of the prepared nanostructured materials. The mineralization of pharmaceuticals over nanostructured materials by photocatalytic degradation has been investigated in this study. We observed that more than 95% of pharmaceuticals (acetaminophen, levofloxacin and nizatidine (5mg/L, 100 ml) has been mineralized within 4 h of photocatalytic reaction. The influence of operating parameters on the degradation has also been evaluated systematically. A number of findings were: (1) optimal loading of the photocatalyst is 1 g/L; (2) the mineralization of pharmaceuticals over nanostructured materials and (3) the mineralization process was decreased with increasing initial concentration. These indicate that enough reaction site and appropriate circumstance accelerate the mineralization of pharmaceuticals over nanomaterials. Further, the development of photocatalytic reactor and application of Green Nanotechnology for the degradation of pharmaceuticals containing wastewater will be discussed during my lecture.

ENVIRONMENTAL NANOTECHNOLOGY: A GREEN METHOD FOR THE REDUCTION OF HEXAVALENT CHROMIUM PRESENT IN WATER AND WASTEWATER

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Leachate of toxic metals from landfills and industrial effluents is a serious environmental concern, where much of these metal ions end up in surface water sources in trace but potent concentrations. Most of the toxic metal ions such as Pb(II) and Hg(II) that have been banned from many industrial applications. However, hexavalent chromium (Cr(VI)) still finds widespread applications despite its carcinogenic and mutagenic nature. Hexavalent chromium (Cr(VI)) is a common heavy metal pollutant in the wastewaters, which mainly comes from electroplating, pigments, mining and chromate manufacturing industries. Cr(VI) is mobile and highly toxic, whereas Cr(III) is less toxic and can be readily precipitated with alkaline or neutral solutions. Cr(VI) has attracted considerable attention from society and regulation authorities around the world because of its high acute toxicity and strong carcinogenic activity to humans. The world health organization (WHO) has regulated that the concentration of Cr(VI) should be below 0.05 mg/L in drinking water. Hence, it is of great importance to explore how to remove the Cr(VI) in water effectively. Recently, the photocatalytic reduction of Cr(VI) using the semiconductor photocatalysis technology has received considerable attention. The development of high performance photocatalysts is an indispensable for the application of the photocatalytic process to large scale Cr(VI) wastewater treatment. Unfortunately, most of the semiconductors have a major drawback stemming from its large band gap, which means it can absorb mainly UV light. For overcoming this problem, intensive research efforts have been recently focused on the development of visible light active photocatalysts. In this study, photocatalytic reduction of Cr(VI) was investigated by using an indium sulphide (In₂S₃) hollow microsphere under visible light in aqueous solution. In this work, we demonstrate that the one step solvothermal synthesis of three-dimensional (3D) hierarchical like In₂S₃ hollow microspheres, which are composed of two-dimensional (2D) nanosheets. The synthesized products have been characterized by a variety of methods, including X-ray powder diffraction (XRD), field-emission scanning electron microscopy (FE-SEM), energy-dispersive X-ray (EDX) analysis, and ultraviolet visible diffused reflectance spectroscopy (UV-vis DRS). The optical properties of In₂S₃ were also investigated by UV-vis DRS, which indicated that our In₂S₃ microsphere samples possess a band gap of ~2.0 eV. Furthermore, the photocatalytic activity studies revealed that the synthesized In₂S₃ hollow microspheres exhibit an excellent photocatalytic performance in rapidly reducing more than 95% aqueous Cr(VI) to Cr(III) under visible light irradiation. These results suggest that In₂S₃ hollow microspheres will be an interesting candidate for photocatalytic detoxification studies under visible light radiation.

EFFECT OF PERSISTENT HOUSEHOLD POOR SANITATION STATUS ON STUNTING: EVIDENCE FROM LONGITUDINAL STUDY

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Despite reducing the stunting significantly in the past decade, India is the home of more than one-third of the world's stunted children. NFHS-4 shows that currently 38.4% of under five year children are stunted in the country. Many studies have been done associating stunting and nutritional status of the child, maternal factors. Much have been talked in the sense of poverty, socio-economic status and stunting still there is lack of studies talking about the vulnerability and severity of the relationship between stunting and sanitation. There are multi-risk factors associated with poor sanitation as poor sanitation may lead to diarrheal diseases and then stunting or deaths too. In this paper, it has been tried to show the changing status of sanitation practices and its effect on stunting. A birth cohort from the first round of the survey was followed to the second round. The present analysis is based on this cohort only along with the changing background characteristics over this period. It was found that the prevalence of stunting was higher among those who practiced open defecation than those who either didn't practice open defecation or practiced open defecation in only one round of this longitudinal survey (IHDS). Similarly, it was found in case of safe drinking water. The prevalence of stunting was low among those who accessed safe drinking water in comparison with those who either didn't access safe drinking water in any of the rounds of the study or could access in only one round (IHDS).

Impact of Bharat Standard fuel types on Air Quality of Bangalore City: A Case Study

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Air pollution has been recognized as the most important risk factor for health impacts. It has been studied and observed across the globe that with rise in air pollution levels causes increase in the deaths number. Exposure to particulate matter (PM) 2.5, the leading environmental risk factor for death has become major concern for urban areas. Moreover, studies have shown that air pollution (PM) is the cause for most of the respiratory, cardiovascular and stroke diseases.

Presently, air quality (AQ) of Bangalore city, India, has become a matter of concern. Vehicular traffic has been estimated to be responsible in major sense for degradation of cities local AQ. Bangalore is one among Indian cities facing issues related to air quality. The AQ monitoring stations of the city has already shown Air Quality Index (AQI) crossing permissible limit. In latest source apportionment study on Bangalore AQ has concluded traffic as the major contributor to city level emission (40%). Due to rapid growth at different sectors, the traffic also has grown drastically making 78% growth in 10 years. The impact along with other sectors like waste burning, DG sets has shown the alarming air quality throughout the city.

Policies like Bharat Stage (BS) fuel, Electric Vehicle (EV) are being implemented towards curbing emission levels for the transportation sector. In this regard this study investigates the BS fuel policy (BS III and BS IV), comparison of PM emission levels from BS III and BS IV fuel type and scenario for emission level for 2021. The study estimated the PM emissions from the BS III (Base year 2015) and BS IV (from April, 2017) fuel type for the transportation sector (two wheeler, 3 wheeler - auto rickshaw, 4 wheelers – cars, and public transportation - Bus) for Bangalore city. Few of the studies did found about the positive side of reduced air pollution on human health. Therefore, the study also looked at the PM emission levels from BS VI (to be implemented in future) too, to estimate the PM emission scenario for 2021. It was found that there is significant reduction in the level of PM emissions with variation in the fuel type. It was observed that with implementation of BS IV fuel type there would be approximately 4-5% reduction in PM emission level. Moreover, with implementation of BS VI fuel type there would be around 45% reduction in the PM emission level for the city. Hence, with proper policy implementation and measures there could be significant reduction in the PM emission levels

Modern Agricultural Practices And Their Impact On Environment And Human Health

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Background: Gross value added by agriculture and allied services industry to India's income is Rs. 2,318,239 crores which has 3rd highest contribution to India's economy. This signifies that India's economy is largely dependent on agriculture. Various agriculture practices were introduced during the era of Green Revolution to address the food security issues which along with its boon to agriculture sector in India ultimately created havoc by causing environmental pollution and dangerous health outcomes associated to it. The excessive use of chemical fertilizers, pesticides and heavy metals diffusion into groundwater can be a cause of cancer. The crop burning practices are the reasons behind huge amount of air pollution witnessed every year and also it leads to loss of soil fertility.

Objectives: 1. To study the harmful effects of various agricultural practices on the environment and human health.
2. To study the case of Malwa region of Punjab where agriculture practices were the reason behind Cancer.
3. To provide recommendations around good agricultural practices for safeguarding human health and environment.

Methodology: Present research has systematically reviewed research papers, case studies, epidemiological studies via online database 'PubMed', 'Google Scholar' and 'Web of Science'. Various ill practices were identified and the impact they have on environment and health was assessed. Several good agriculture practices were also identified which would be helpful in reducing the damage caused by earlier invasive practices.

Results: There are various agriculture practices that are responsible for water, air and also soil pollution. Various diseases are attributed to the environmental pollution caused by such practices like: respiratory and cardiovascular diseases due to air pollution caused by crop residue burning, cancer due to accumulation of harmful metals in the ground water due to excessive use of fertilizers and pesticides, aquatic ecosystems are also disturbed due to polluted waters etc.

Conclusions: Agriculture practices have many implications on human environment and health. There is an urgent need to address such issues and provide the farmers with alternatives which are environment friendly and also sustainable.

ASSESSMENT OF LEAD AND CADMIUM IN PLACENTA OF INDIAN WOMEN AND ITS ASSOCIATION WITH BIRTH WEIGHT

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Both developed and developing countries are in bed with the foremost problem of less birth weight of 2,500 grams and together pose to be a major health trouble in infants. A number of risk factors have been correlated to low birth weight including socioeconomic status, race/ethnicity smoking, environmental contaminants such as toxic metals. In pregnant population, toxic metals are circulated mother to foetus by placenta. In addition, accumulation of Cd and Pb in placental tissue may result in abnormal placental function, leading to impaired nutrient transport. The latter could result in altered growth of fetus. Keeping this in mind we have planned a hospital based case-control study to seek association between toxic metals (Pb and Cd) and low birth weight. Total 80 pregnant women were selected for this study i.e., 32 women who had delivered low birth weight babies (<2500 gm) serve as case group and 48 women who delivered normal birth weight babies (>2500 gm) serve as control group. Metals (Pb and Cd) were extracted from placental tissue and analyzed by ICP-MS (Inductive coupled Plasma- mass Spectroscopy). Levels of lead and cadmium in placenta were observed higher in cases compared to controls. Placental Pb and Cd levels were 2.71 ± 2.62 and 0.52 ± 0.64 $\mu\text{g/dl}$ in pre-term group whereas, level of Pb and Cd in full term group 2.29 ± 2.20 and 0.26 ± 0.44 $\mu\text{g/dl}$ (mean \pm S.D). Placental Cd was significantly higher in cases than controls. Similarly, placental Pb level was found higher in low birth weight babies compared to normal birth weight babies but difference was not statistically significant. On the basis of these observations, we conclude that elevated levels of placental Pb and Cd were linked with reduced birth weight of neonates and suggest that further studies with larger sample size needed to draw statistically sound inference.

THE OCCURENCE OF DENGUE HAEMORRHAGIC FEVER IN BENDUNGAN HILIR AND TANAH ABANG DISTRICT, JAKARTA 2014-2015

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Dengue hemorrhagic fever (DHF) has become endemic in Jakarta and many big cities in Indonesia. The geography, the population growth, the low level awareness and knowledge have caused the DHF cases tend to increase in Jakarta.

The many identified environmental factors have an effect on the ongoing DHF disease, so an indicator is needed to predict the occurrence of the disease.

The aim of this study was to analyze the environment dominant factors that caused DHF cases in Bendungan Hilir and Tanah Abang District, Jakarta.

The study was conducted in two districts in Jakarta, used ecologic study design with hypothesis test model and statistical analysis. Cluster design sampling was used to calculate house sample, based on WHO standard to survey larva and mosquito. Calculation of the maturity Aedes was performed by calculates man landing rate by people feedback.

Early study is performed in interview by residential occupant about existence of DHF patient between them, to measure the rainfall, temperature and humidity in the districts location. Then observation about daily living attitude of patient which contributes occurrence breeding places location of Aedes aegypti. The possible contact between mosquito and human is identified by calculating man landing rate and resting habit of Aedes.

The result of multivariate analysis shows that the risk of DHF transmission had 6.7 times if inside the house there are breeding places of Aedes aegypti. If the resting places inside the house there had risk 4.3 times.

These variables had high significant, breeding places had p value: 0.001 and resting places had p value: 0.002. In the district location man landing rate had p value: 0.002 and resting had p value: 0.000.

Breeding places, resting places, man landing rate and resting could be used to predict the population of Aedes aegypti. Environmental factors that could be used to predicts outbreak DHF cases were rainfall (p: 0.001), temperature (p: 0.017) and humidity (p: 0.003) which measured in the district location. Those variables could be used as early warning system to predict the outbreak of DHF in Jakarta.

STUDY ON ASSESSMENT OF NUTRITIONAL STATUS OF SCHOOL GOING CHILDREN (6-8 YEARS) IN DELHI

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Background: School age, also known as middle childhood (6–10 years of age), is the fourth developmental stage in one's life span. School age acts as the preparatory period with adequate nutritional reserves for the rapid growth and development in adolescence. Nutritional imbalance in school-age children can have serious health implications for their lifetime. Most of the health and nutritional surveys and interventions focus on children under 5 years of age and/or adolescents, and school-age children are usually neglected. Consequences of childhood under-nutrition have been explained as growth failure, impaired intellectual, lower resistances to infection. The exposomes such as environmental factors, urban environment, physical activity lifestyle contributes to undernutrition.

Methodology:

AIM: To assess the nutritional status of school-going children in the age group of 6 to 8 years in Delhi schools.

Objectives: (1) To assess the prevalence of underweight, stunting and wasting among children studying in Delhi schools within the age group of 6 to 8 years, using standard anthropometric measurements. (2) To assess the dietary habits and patterns of these children. (3) To review school records for most recent status of haemoglobin levels of these children. (4) To conduct a systematic narrative review of literature on nutritional status of school going children.

Study will be carried out in schools of Delhi on permission basis. Children in Classes 1 to 3 (6 to 8 years) will be included. Considering the prevalence of malnutrition as being 50%, the estimated sample size is 384. Anthropometric measurements based on height, weight and MUAC will be done. A questionnaire related to the pattern of dietary habits and other related lifestyle habits of children will be administered to mothers. Data on nutritional assessment would be analysed using WHO Anthroplus software. Results will be reported using WHO Z scores.

Expected Results: Prevalence of malnutrition is expected with stunting, wasting, underweight and overweight.

Discussion: Relationship between dietary patterns and lifestyle can have significant effect on health and existence of malnutrition in this age group.

KNOWLEDGE AND PRACTICES ON MANAGEMENT OF PLASTIC WASTE AMONG MAIN FEMALE HOUSEHOLDERS IN MEDICAL OFFICER OF HEALTH AREA, KALUTARA, SRI LANKA

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Background:

Plastic waste is a growing problem in Sri Lanka and is aggravated in the absence of a proper management system. It is well known that improper management of plastic waste creates environmental and health issues.

Objectives:

To describe the knowledge and practices in managing plastic waste at domestic level among main female householders in Medical Officer of Health (MOH) area Kalutara, Sri Lanka and challenges faced by them.

Methods

A community- based descriptive cross sectional study was carried out among 630 female householders. Twenty one clusters with 30 subjects were selected randomly by cluster sampling technique. Data collection was done using an interviewer administered questionnaire. Data entry, processing, and analysis were performed using the statistical package for social sciences (SPSS) 20.

Results

Majority of the respondents were Sinhalese (94% n=578) and Buddhist (87% n=536). The 76.8 % (n=470) of the study sample were currently unemployed. The mean age of the sample was 40 years (SD=12).

Burning was the most commonly practiced method of disposal of plastic waste (72% n=444) followed by handing over to local authorities after segregation 38 % (n=233).

The main challenge was unavailability of the convenient place to handover plastic waste (78% n=477). Most of the participants have good knowledge on plastic waste and its harmful effects (78% n=477).

There was a statistically significant association between the level of education and the knowledge on managing plastic waste ($p < 0.001$).

There was no significant association between the knowledge and the disposal methods of the sample ($p = 0.136$).

Conclusion and recommendation

Despite the good knowledge (78% n=477), Majority in the sample burn plastic waste (72% n=444). Non availability of the proper plastic waste collecting system is the main challenge identified by them (78% n= 477). To prevent unsound plastic waste disposal methods such as burning, implementation of plastic waste collection system is a timely need.

PARTICULATE MATTER AND HEAVY METALS BETWEEN COARSE AND ACCUMULATION RANGE IN DIVERSE INDOOR MICROENVIRONMENTS OF AGRA, INDIA

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The size distribution of airborne particulate matter and associated heavy metals in different particulate fractions (2.5 μ , 2.5-1.0 μ , 1.0-0.5 μ and 0.5-0.25 μ) were determined in different indoor microenvironments (locality and socio-economic strata) through SKC Cascade Impactor in the city of Agra, India during summers of 2016. Most of the particulate mass (55.55%) was found to accumulate in the finer size range among which PM_{0.5-0.25} accounted for 22.5% of total PM mass concentration. Characteristic size distribution of metals allowed its identification in three different patterns: metals whose mass was concentrated in (a) coarse range (Fe, Ca, Cr, Cu) (b) in finer range (Zn, K, Al, Pb, Ni) (c) displaying irregular distribution pattern (Mn, Mg). Their sources were further confirmed through exploration of enrichment factor and Pearson correlational analysis. The calculated bioavailability revealed higher value for smaller size (PM_{0.5-0.25}) fraction for metals that followed the order: Pb > Zn > Ca > Mg > K. Identification of Health risk analysis through inhalation pathway showed Mn and Cr (VI) among all metals to produce carcinogenic and non-carcinogenic risk well above the acceptable limits. Moreover, the study highlighted that people residing in low income households relying on solid fuels are subjected to higher risk than those using safer means.

NEIGHBOURHOOD BUILT ENVIRONMENT, CARDIOMETABOLIC DISEASES AND THEIR RISK FACTORS IN SOUTH ASIA: CARRS – GIS STUDY

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Background

Cardiometabolic diseases (CMD) is a major cause of mortality and morbidity worldwide, including among South Asians, the onset of CMD is at a much younger age and is involves almost every sections of the society. A major risk factor for CMD is physical inactivity. 'Built environment' which includes all things developed and altered by humans, play a vital role in influencing people's physical activity. However, the association between neighbourhood built environment (NBE) and CMD and its risk factors has not been investigated in low and middle income countries (LMIC).

Method

This work is a part of the Cardio Metabolic Risk Reduction Study (CARRS), which is primarily designed to estimate the population based incidence of CMD and their risk factors in 3 South Asian cities including New Delhi, Chennai and Karachi. The Geographic Information System (GIS) component of CARRS surveillance study aims to investigate whether NBE characteristics such as access to parks and other recreational facilities are associated with CMD and their risk factors. We proposed to spatially locate CARRS study households (N > 8000), capture location details of selected NBE features and perform GIS analysis of participants data overlaid on geographic data.

Analysis

Analysis would be carried out at both individual and neighbourhood level. Association of built environmental factors such as green spaces, parks etc. with CMD risk factors such as low physical activity would be studied in detail. Spatial analytic techniques such as distance calculation, spatial aggregation, clustering, smoothing and spatial regression methods would be employed.

Conclusion

The CARRS- GIS study would help us better understand the complex relationship of neighbourhood built environment factors with CMD and its risk factors in South Asia.

REMOVAL OF DISEASE CAUSING PATHOGENS FROM WASTE WATER USING BIOREMEDIATION TECHNIQUES

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Bio remediation techniques are used to clean contaminated water effectively, inexpensively efficiently, without use of any chemicals, hence keeping the environment green.

In these techniques living organism are used as an exciting alternative to conventional clean up of water. This is very important for sustainable development and the by-products are managed in a ways that will not jeopardize present and future generation. The total effluents in the waste water has the following types of matter.

(1) Organic Wastes (2) Chemical Pollutants (3) Sediments (4) Nutrients (5) Pathogens

The primary treatment cleans debris, grit and organic pollutants, whereas secondary treatment involves Biological treatment for colloidal and dissolved organic matter

(BNR)

Biological Nutrient removal

The method is Biological as it uses living organisms, natural decomposers and detritus feeders. An environment is created that enables these organisms to feed in colloidal and dissolved organic material and break it down to carbon Dioxide and mineral nutrients and water via their cell respiration. The waste water from the primary treatment is a food and water rich medium for the decomposers and detritus feeders. The only thing that needs to be added to the water is oxygen to enhance the organism, respiration and growth. This can be added by using either of the two systems Trickling -Filter Systems. Activated sludge System.

Both the systems are natural without using any chemicals and both clean the water wastes from Active Pathogens.

Activated Sludge System

Here the water from primary treatment enters a large tank that is equipped with an air bubbling system, or churning system of paddles.

Mixture of detritus feeding organisms, referred to as activated sludge, is added to the water as it enters the tanks, and the water is vigorously aerated as it moves through the tank. Organisms in this well-aerated environment reduce the biomass of organic materials, including pathogens as they feed on organisms. The settled organisms are pumped back into the aeration tank (activated sludge) that was added in the beginning

References:

1. L. K. Wang, Y. T. Hung, and N. K. Shamas (eds.), Physicochemical Treatment Processes, The Humana Press, Inc., Totowa, NJ. 723 p. (2005).

2. R. E. McKinney. Proc. 3rd Conf. on Biological Waste Treatment. Manhattan College NY, NY (1960)

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PROFENOFOS RESIDUES AT HOLTIKULTURA FARMERS, GARUT, WEST JAVA, INDONESIA

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The fulfillment of food needs with the acceleration of intensification and extensification of agriculture led to the emergence of the use of pesticides as an effort to avoid agricultural pest problems. Pesticides are pest control chemicals with impact on human health both acutely and chronically. Profenofos is the dominant type of pesticide used by tomato vegetable farmers. This study aims to estimate health risks due to consumption of tomatoes containing profenofos residues. The research method is an observational study with the design of Environmental Health Risk Analysis. The research lasted for three months, April - June 2016. The research population includes all horticultural farmers in Cikandang Village, Garut regency. Samples were collected through non random sampling, resulting in 97 samples of horticultural farmers, while sampling of tomato was done on cultivated land ready for harvesting, with a total of three locations. Data were collected through questionnaire and measurement interview, with weight variable, intake rate, concentration, exposure time, exposure frequency, exposure duration, so that the value of intake of profenofos exposure and risk quotient (RQ) could be obtained. Tomato samples were put into plastic or sterile containers before being taken to the laboratory. To obtain the risk level, samples were analyzed using Gas Chromatography technique. The highest concentration of profenofos existed in sample II of 0.189 mg/kg and the mean concentration was 0.129 mg/kg with a health risk value of 2.912 mg/kg. Based on these results, the concentration of profenofos in tomato vegetables has exceeded the normal limit according to EPA (2006), that is 0.00005 mg/kg/h. The calculation of risk quotient (RQ) on 97 horticultural farmers shows that they all have non-carcinogenic health risks, because the value of $RQ > 1$.

EMISSION ESTIMATION OF AROMATIC- AND HALOGENATED-VOCS FROM HOUSEHOLD SOLID FUEL BURNING PRACTICES

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This is the first study conducted in India, based on real world situation to evaluate the emissions of gaseous pollutants including volatile organic compounds (VOCs). All selected solid fuels were collected from various parts of Indian subcontinent. In this study, the emission factor represents the total period of burning (including flaming and smoldering) during cooking activities and plume sampling were adopted. Benzene, toluene, isomers of xylene have shown higher emission among VOCs from all selected solid fuels which is also significantly higher than the test chamber studies.

Key words: benzene, cooking activities; emission factor (EF); real world; Volatile organic compounds (VOCs)

Biography

I Madhuri Verma pursuing Ph.D from Pt. Ravishankar Shukla University, Raipur (C.G.) under the guidance of Dr. Shamsh Pervez. Dr. Pervez expertise on air quality monitoring and assessment. Major part of his work on source apportionment by using different advance receptor models (PMF5.0, UNMIX6.0, CMB8.2). My research work is based on emission characterization and impact studies of Indian household solid fuel burning activities. I have 2 years research experience of this field and 2 papers communicated in sci and Scopus journal.

ELECTRONIC AND ELECTRICAL WASTE AND ITS MANAGEMENT AMONG GRADE TEN STUDENTS IN MEDICAL OFFICER OF HEALTH AREA NIVITHIGALA, SRI LANKA; CURRENT DISPOSAL MODALITIES, KNOWLEDGE, ATTITUDES AND ITS CORRELATES

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Background Information

Economic and social development due to technological and industrial revolution has led to the high demand for the production and consumption of Electronic and Electrical equipments. To achieve the desired e-waste management, community participation is essential as it should start from the household level. In Nivithigala, used equipments with shorter life span which are brought from other countries are freely available due to the rising trend of foreign employment. This would result in a rapid generation of e-waste in their households that can cause adverse impact on environmental and health unless they are properly managed.

Objectives

This cross sectional study was conducted to describe the current disposal modalities, knowledge and attitudes on e-waste and its management and to determine its correlates, among grade ten students in the MOH area of Nivithigala.

Methods

Data was collected among all the eligible 570 students in type 1AB, 1C and type 2 schools in Nivithigala MOH area without sampling, using pretested self-administered questionnaire. Analysis was done using SPSS version 20 while associations were assessed by using chi-squared test at 5% significance level.

Results

High usage pattern of equipments at household level was found among two thirds of the study participants. With regards to disposal, 32.5% store their e-waste at home, 25.8% recycle the e-waste, and 22.1% dump the e-waste into a garbage pit. Though overall knowledge was satisfactory in 55.6% it was revealed that 54.5% had unsatisfactory attitudes on e-waste and its management. However, 65.5% positively responded that they could promote safe practices among the family members. Attitudes and knowledge showed a statistically significant association ($\chi^2 = 27.9$, $p < 0.001$).

Conclusions and recommendations

A supportive environment should be created to improve the knowledge and attitudes of students while encouraging active participation in e-waste management in the households.

HAZARDOUS WASTE IN INDONESIA

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Indonesia needs to build four Treatment Centres for 229,907 tons per year produced hazardous waste. The four locations chosen by the government are Cileungsi for Jakarta and surrounding areas such as Bogor, Tangerang, Bekasi (Jabotabek), Gresik for Surabaya and its vicinity (Gerbang Kertosusilo), East Kalimantan and Lhokseumawe. Almost all hazardous waste treatment is managed by one company at present, namely PT. PPLI (Prasada Pamunah Limbah Industri). This integrated plant consists of on-site landfill, solidification and physical/chemical plant and incinerator. Jabotabek produces about 68,000 tons of hazardous waste per year. This research is based on collected data which identifies payback period of 0.69 years and rate of return 85 %. PT PPLI is located within the Cileungsi District of the Bogor Regency of West Java Province. This area has monsoonal rains during the months of October to April and a drier season between May and September. Records from nearest rainfall station at Cibinong indicate that annual average rainfall for the site is about 3,600 mm. It is situated on hilly terrain and is characterized by steep slopes as well as has a very complex geological structure. The Tertiary sequence was folded to form an asymmetric anticline with axis trend in an East–West direction. Three major faults cut the middle of the site in a North–South direction with a vertical displacement of about 1.5 meters and a zone width of 1 meter. The youngest rock of the site is the fluvial/alluvial sediments of the Quarter which has high permeability. Risk analysis must be applied to confirm the degree of danger caused by existing faults. The high concentration of Chemical Oxygen Demand (COD) 2500 ppm in Secondary Leachate Collection System (SLCS) indicate a possible failure of the Primary Leachate Collection System (PLCS), which need correct action to prevent groundwater contamination.

MERCURY LEVELS IN HAIR WITH IMPAIRED CENTRAL NERVOUS SYSTEM FUNCTION IN ARTISANAL AND SMALL-SCALE GOLD MINING WORKERS IN BANTEN, INDONESIA

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Artisanal and small-scale gold mining (ASGM) is growing in many regions of the world including Indonesia. The problems in these communities are complex and multi-faceted. To help increase understanding of such problems, this studies was conducted to provide a reference to the impact of mercury and its prevention for public health using mercury levels in hair which related to impaired central nervous system function for ASGM workers.

Cross-sectional design study was used in this research with secondary data from Ministry of Health Republic of Indonesia (119 ASGM workers as samples).

According to the standard from American Conference of Governmental Industrial Hygienists (ACGIH), approximately 77.9% hair samples have mercury level above the Biology Exposure Index ($\leq 3\mu\text{g/g}$).

Hair mercury level have no statistical significant association with impaired function of the central nervous system. Meanwhile, ASGM workers with hair mercury level have risk 3.12 times (95% CI 0.67 - 14.36) toward impaired functioning of the nervous system center.

Between other confounding factors, such as length of exposure, fruit consumption, fish consumption, pesticide and/or insecticide usage, and smoking habits, only the usage of pesticide and/or insecticide has significant association with risk 3.97 times (95% CI 1.51 - 10.43) to have impaired functioning of the central nervous system.

The result of multivariate analysis, high level of mercury in hair had risk 2.82 times (95% CI 0.595-13.379) to have impaired function of central nervous system after controlled with pesticide and/or insecticide usage.

Prevention and control of health impacts due to the use of mercury should involve various parties, government, private and public, through elimination, substitution, technical, and administrative control programs.

DYNAMICS OF CLIMATE-BASED DHF TRANSMISSION IN SURABAYA

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Until now, dengue hemorrhagic disease (DHF) is still a public health problem in Indonesia. Increase in the number of cases in Indonesia during this time occurs during the rainy season due to the increasing earth temperature. Changes in temperature and rainfall patterns can cause mosquitoes to expand their breeding grounds, this is because mosquitoes multiply rapidly.

The purpose of this research is to make dynamic model of DHF transmission with ecological analysis to know the dynamics of DHF incidence in relation to variability pattern climate in Surabaya. The research design used is ecologic study. Interview of 100 respondents to know level of knowledge, attitude, and practice (KAP) of society.

Measurement of climatic factors includes rainfall, temperature, humidity, light intensity. The measured vector aspect is the larvae free rate (ABJ) and the presence of a dengue virus trans-ovarial one other mechanism that contributes to the transmission of dengue hemorrhagic fever (DHF)

The results showed dengue cases affected by rainfall (p: 0,000..), environmental temperature (p: 0,000 ..), environmental humidity (p: 0,001), environmental humidity (p: 0,000..), LFN *Aedes aegypti* (p: 0,000), And community knowledge (p: 0.006). It is concluded that the most influential climate factors for dengue fever case are rainfall, temperature and humidity and low knowledge of society. While LFN *Aedes aegypti* can be used as indicator of increase of dengue cases in Surabaya Indonesia.

APPLICATION OF THE IEUBK MODEL FOR LINKING CHILDREN'S BLOOD LEAD WITH ENVIRONMENTAL EXPOSURE IN A MINING SITE, SOUTH CHINA

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The objective of this study were to determine the blood lead level (BLL) in children 3 to 7 years of age living in a mining site in South China, to apply IEUBK model to determine the major route(s) of exposure to lead. A total of 151 children were included in this study. The geometric mean (GM) BLL was 8.22 μ g/dL, indicating an elevated BLL. The Integrated Exposure Uptake Bio-Kinetic (IEUBK) model has proven useful at many sites for study of routes of exposure. Application of the IEUBK model to these children indicated that the GM difference between observed and predicted BLL levels was only 1.07 μ g/dL. It was found that the key environmental exposure pathway was soil/dust intake, which contributed 86.3% to the total risk. Younger children had higher BLL than did older children. Therefore, of the various low risk-high benefit solutions, interventions for the children living near the site should be focused on the dust removal and soil remediation. Implementation of the China Eco-village Construction Plan and China New Rural Reconstruction Movement of the government may be a better solution.