

ENVIRONMENTAL AND OCCUPATIONAL HEALTH

Exposure to industrial chemicals and environmental pollutants results in serious health hazards among the factory workers and general public. The National Institute of Occupational Health (NIOH) at Ahmedabad and its two regional centres located at Kolkata and Bangalore are studying the health problems of workers engaged in various industries as well as effect of pollution on local populations.

Occupational Health Hazards among Salt Workers in Remote Salt Sites in Rann of Kutch

A total of 2104 subjects including 1549 salt workers (majority with over 10 yr exposure) working

at different salt sites in the little Rann of Kutch and 555 control subjects from the nearby villages were studied. The work related general symptoms and skin and eye symptoms were significantly higher among the salt workers. Overall, the production workers had higher prevalence of these symptoms / morbidities than the non-production workers. The mean systolic and diastolic blood pressure among different categories was comparable. A significant increase in urinary sodium excretion and serum pH was observed in salt production workers.

Intervention study showed significant decrease in pre and post shift systolic blood pressure and post shift diastolic blood pressure following use of personal

protective equipments (PPE). There was decreased excretion of sodium and potassium per milimole of creatinine in the urine. Intervention measures such as gumboots and goggles were acceptable to the salt workers and they felt more comfortable with PPE while working with salt (Fig.1).

Postural Load in Computer Work - Time-frequency Representation of Surface Myoelectric Signals of Back Muscles

Survey of nearly 500 professional computer operators, in computer-based tasks, such as, telecommunication, call centres



Fig. 1. A) workers are working without protective devices. B) Skin lesions in feet and hands

and banks elucidated multiple stressors (e.g., material interfaces, job characteristics, pointing devices, chair-desk complex, working conditions and environment, work time schedules). The material interfaces and workplace factors caused musculoskeletal problems among the operators, with moderate to severe pain and discomfort in body parts. In order to examine the mechanistic aspects of postural load in computer work, the longitudinal study elucidated loading characteristics on spinal and para-spinal muscles and tissues. A special test rig was designed to simulate experimental set up for assessment of postural load in different categories



Fig. 2. Subject in experimental set up

of tasks, such as text processing, graphics manipulation and data entry. (Fig.2). The long-term experimentation (21 experimental condition x 3 task varieties x 15 volunteers x 8 muscles) included systematic recording of surface myoelectric signals (EMG) from the lower and upper back muscles. The muscle activities analyzed with respect to timing and amplitude characteristics, as well as frequency contents (spectral density) were analyzed. The continuing activity of a muscle resulted in decrease in median frequency of the power spectra of the signal, which was attributed to reduction in the propagation velocity of depolarization along the muscle fibres and fatigue of the muscle. For chair height of 18 inch and keyboard heights 24 to 30 inches, the median

frequencies of the upper trapezius fibres stayed at higher level with the increasing keyboard height in different types of computer tasks. The median frequencies of the right and left erector spine indicated the load sharing of the muscles. The decrease in the median frequency in case of graphics application at 21-inch chair height was a distinctive fatiguing trend, in comparison to other computer tasks. Studies will further refine and optimize the numerical methods of analysis for characterizing the activity pattern and assessing the state of the muscle during prolonged activity.

Health Risk Assessment and Development of Intervention Programme in Slate Pencil Workers of Mandasaur

Study was carried out for finding the prevalence of silicosis and other dust related morbidities among slate pencil workers and the community residing in the vicinity. Of the 514 subjects (25-55 yr) included in the study, 194 were occupationally exposed to silica, 159 were residing in the vicinity of the state pencil units and 161 were living 5 kms away (unexposed group). Mean duration of exposure was 18 yr for males and 20 yr for females. Among occupationally exposed group 21% subjects had silicosis, 2% had silico-tuberculosis and 10% had tuberculosis while 43% subjects showed normal chest radiographs. Similarly, among the para-occupationally exposed group 13% subjects had silicosis, 6% had silico-tuberculosis and 8% showed features of tuberculosis while 73% subjects had normal X-ray. Among the unexposed group 3% subjects showed nodular opacities on chest X-ray, 2% had features of tuberculosis along with nodular opacities and 12% showed symptoms of tuberculosis while 84% had normal X-ray.

The ambient air monitoring in the vicinity of slate pencil cutting units revealed dust concentration to be around 284.74 while in control village it was 138.07. Similarly, the silica concentration was high in slate pencil factory area compared to control area. The results indicated inadequacy of the local exhaust system in protecting the health of the slate pencil workers. It also highlighted that the use of local exhaust system without

proper air cleaning device results in silicosis and silico-tuberculosis in the community living around such factories.

Poison Information Centre

An episode of mass organophosphate (OP)-poisoning in a remote village of Ahmedabad, characterized by abdominal pain, vomiting, diarrhoea, excessive secretions and respiratory distress was investigated in 15 persons who developed signs and symptoms of OP poisoning.

Role of Environmental Chemicals in Human Reproduction

Study was carried out to assess the effect of exposure to toxic metals on semen quality and reproductive hormone status in 212 subjects. High levels of lead and cadmium were detected in blood and seminal plasma of subjects indicating that these metals persist in the environment. A negative correlation was observed between seminal plasma lead levels and sperm count and seminal plasma lead levels and sperm DNA integrity. Lead was observed to be toxic at 30µg/dl. Higher serum copper levels were found in asthenozoospermic and teratozoospermic subjects indicating toxic effect of copper on male reproductive function. Subjects with occupational exposure to toxic agents were found to have a higher risk of developing subfertility. The study suggested that occupational and environmental exposure to lead and copper can lead to deterioration of semen quality.

Assessment of Air Pollution due to Adulteration of Petroleum Fuels

A study was undertaken for estimation of different types of air pollutants emitted at source level from different types of vehicles due to adulteration of petroleum fuels with kerosene and other solvents. The result of the pilot study showed that with increase in percentage of kerosene in petrol the concentration of SPM increased while reverse trend was observed for common volatile organic compounds (VOCs) like benzene, toluene, xylene and ethyl benzene (Fig. 3).

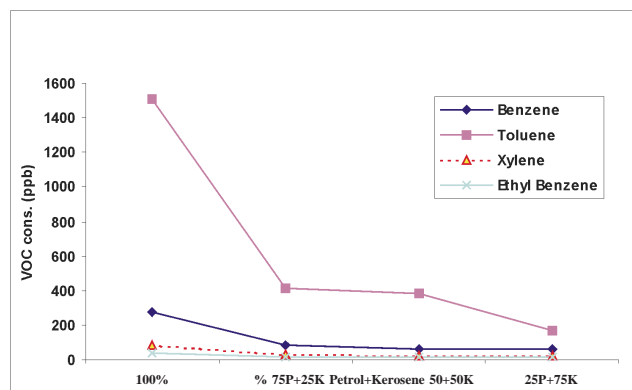


Fig. 3. VOCs concentration in different composition of petrol with kerosene

Environmental Health Study in Jodhpur

The levels of air, water and soil pollution were measured and a population based cross sectional health survey was carried out in Jodhpur city by DMRC, Jodhpur. High to critical level of air pollution was observed in all seasons at traffic intersections/commercial sites, more so in winter. These traffic intersections were surrounded by residential settlements and population living nearby is likely to be exposed to these critical levels of air pollution. Majority (71.3%) of households were exposed to medium level of vehicular traffic pollution followed by low (17.6%) and high (11.1%) vehicular pollution. Prevalence of asthma/COPD was 4.4% in households exposed to high vehicular pollution, 3.2% in those exposed to medium and 2.6% in those exposed to low vehicular pollution. Similarly, 25.5% of the population felt indoor smoke problems in which prevalence of respiratory diseases was 8.1%, as compared to 6.2% in those not having indoor smoke pollution. Prevalence of tuberculosis was 1.5% in former group of households while it was 0.5% in later group. About 8.6% of the population had industrial air pollution in their surroundings (3.6% from mines and 5.6% from other industries). At industrial sites, the values of RSPM and SPM were within limits prescribed for industrial areas, but these also affected nearby residential areas. In the 8.6% population, which had the industrial air pollution in their surroundings, prevalence of respiratory diseases was 9.9% as compared to 6.4% in remaining population. The levels of SPM at industrial sites were higher in winters.

The cases of hypertension, asthma, acute lower respiratory tract infections and cancers showed an increasing temporal trend, which might in part be due to built up of gaseous and particulate pollutants.

Among city residents 25.5% of the population felt indoor smoke problems. Maximum prevalence of respiratory diseases was present in the population dependent on biomass for fuel. It was only 6.1% among LPG users. The other causes of these diseases could be the different habits of individuals as 3.1% were smokers, 3.0% used oral tobacco (*zarda*) and 5.9% consumed *gutka*, though 88.0% of population was not addicted to such habits.

Health Risk Assessment of Rural and Urban Population Due to Indoor/Ambient Air Pollution

A pilot study was undertaken at the selected petrol pumps of Ahmedabad city to know the effect of benzene exposure in 37 petrol fillers. Information about work conditions, smoking habits, alcohol consumption and socio-economic status was collected by pre-designed questionnaire. Air sampling and confirmation and estimation of benzene released in the environment during the process of petrol filling was done. A questionnaire survey along with medical examination of petrol fillers was undertaken to assess the morbidity pattern of such workers. Burning / watering of eyes, cough, headache, fatigue, irritation of throat and skin were the common complaints of workers while icterus and pallor was observed in some workers. These results suggest the presence of benzene, toluene, and xylene in the environment during the process of petrol filling. Presence of trans-trans-muconic acid in blood of petrol fillers reflected presence of benzene exposure.

Assessment of Persistent Organic Pollutants-PCDDs and PCDFs in Biological Media

Polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzo furans (PCDFs) represent a class of organic environmental pollutants containing carbon, hydrogen, oxygen and chlorine that exhibit potential risks for human health. Study was undertaken in Ahmedabad, Vadodara and Surat cities for residue

analysis of dioxin and furans in animal foods and biological samples. The findings of the study show contamination of the environment with residues of dioxin and furan. In the entire sample matrix the concentration of dioxins was greater than that of furans. The total estimated quantity of dioxin in egg samples was 7.49, 9.32 and 13.35 while in chickens it was 7.05, 9.38 and 7.67 in Ahmedabad, Vadodara and Surat respectively. Dioxins were significantly at higher levels in primiparas than in multiparas. A decreasing trend was visible in residue levels of the dioxin in subjects who had their second delivery as compared to those with first delivery. From the correlation regression analysis, positive correlation of dioxin with the age of the subject was seen. The dioxin residues negatively correlated with weight, height and skin fold thickness. The residues significantly correlated with the milk fat.

National Environmental Health Profile and Comparative Health Risk Assessment

The NIOH is participating in a national project funded by Ministry of Environment and Forest and WHO to find out the environmental health profile and comparative health risk assessment in nine important urban cities of the country. The results in Ahmedabad city revealed that the pollutant levels were high in Naroda industrial area compared to residential and commercial area. At all the places the level of sub particulate matter (SPM) was elevated. Higher morbidity from cardio-respiratory diseases was noted. Gastro-enteritis problems were also high. SPM, benzene and other volatile organic compounds were quite high in Kolkata also where major health problems reported by people were respiratory and gastro-intestinal complaints.

Renal Tubular Dysfunction and Oxidative Stress among Electroplating Workers

Study to assess the renal tubular dysfunction and oxidative stress in workers exposed to chromium during chromium plating process was continued at Regional Occupational Health Centre (ROHC), Kolkata in 50 chromium plating workers and 50 office workers (controls). Results of the study indicated that urine

chromium level was significantly increased in chromium exposed workers as compared to controls. However, in both the groups the urine chromium levels were lower than biological exposure indices of 30 µg/g of creatinine. The levels of total urinary N-acetyl-β-D-glucosaminidase and isoenzymes A and B among chromium-exposed workers were significantly higher when compared to the control group.

Assessment of Health Status of Workers Exposed to Storage Grain Dust

Study was continued in 107 load handling, ancillary, quality control and depot administrative workers (of which 29.35% were SC and 70.65% general caste) to assess their health status. The symptomatic changes, joint pain and back pain were high in all categories of workers. All workers had lower total leucocytes count and higher blood IgE and eosinophil count during follow up study. Different categories of workers in storage grain handling had higher lung volumes during initial study in comparison to follow up study. In both the studies non-smokers had higher

values compared to smokers. Only in ancillary and depot administration workers some of the flow rates were higher in smokers compared to non-smokers. Respiratory impairment increased in some categories of workers in the follow up study compared to the initial study. In general caste workers in the initial study, it was 12.98% and in the follow up study it was 27.27% and in the scheduled caste workers, it was 6.25% in the initial study and 18.75% in the follow up study respectively. Mild obstructive types of impairments were found in both categories of subjects in the follow up study.

Clinico-epidemiological Study of Arsenic Exposed Population in West Bengal

A project was conducted with the objective to measure the arsenic content of water and other biological samples to confirm the level of arsenic exposure. Arsenic in drinking water collected from different sources like tubewells and ponds of nine villages of Katlamari Gram Panchayat was measured. It was found that out of the total, 79% showed levels >150µg/l whereas 24% had values between 50-150µg/l.