

Environmental and Occupational Health

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Research in the field of environmental and occupational health is being carried out through the Council's National Institute of Occupational Health (NIOH) at Ahmedabad and its regional centres (ROHC) located at Bangalore and Kolkata.

During the year under report priority was given to the occupational health problems of the vulnerable groups like women, children and the workers of unorganized sector of industries such as farmers, salt workers and workers engaged in quartz crushing units in Gujarat.

Health Problems of Women in Fish Processing Industry

Fish processing industry employs nearly 2 lac women workers in the coastal regions of India. Due to the nature of the job, women in fish processing work are exposed to cold environment, chlorinated water and other fish protein related bioagents. Use of improper hand tools and implements and awkward working postures are the contributory factors for musculo-skeletal pain and discomfort of the body parts. A study was initiated in coastal Gujarat to explore the work related problems of such workers. These women (67%) had high prevalence of musculo-skeletal pain and discomfort. The lower back is the most affected area, followed by shoulder and upper back. The cold induced blanching and numbness of hands and Raynaud's like phenomena were observed among these women workers.

Suitable ergonomic interventions were introduced in order to mitigate the work-related hazards. Data indicated that the wearing of gloves substantially improved the skin temperature profile of the hand (Fig. 1). As large as 84% women did not show any blanching of fingers and Raynaud's phenomena with the wearing of gloves. With the continuing use of the gloves for the rest of the workday all the

women including those who had developed cold-induced symptoms expressed satisfaction in their voting in comfort scale.

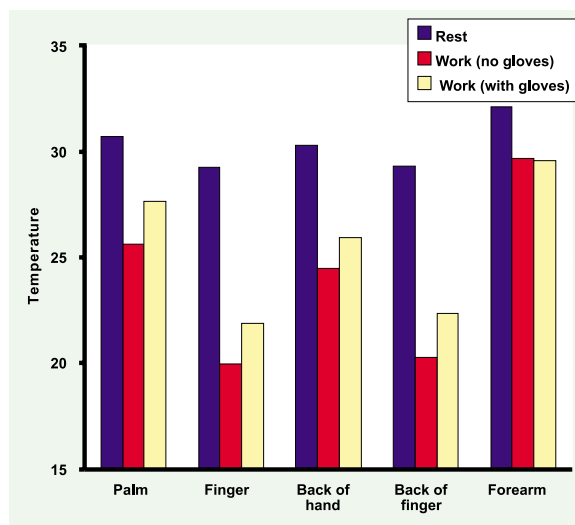


Fig. 1. Temperature of different areas of hand before and after using the gloves.

Occupational Health Problems of Child Labour-A study in Gem Polishing Industries

Child labour is an important social, economical and occupational problem. A study of 586 child labourers of gem polishing industry was carried out. Among the exposed group the common symptoms included respiratory problems, eye strain, headache and repeated finger injuries (Fig. 2 & 3). Around 75% child labourers had one or the other complaint. Chest radiography revealed tuberculosis in 4% children.

The environmental monitoring suggested that in few places the noise levels were above threshold limit values (TLV) while in most of the places the illumination levels were below TLV (Fig. 4).





Fig. 2. Drilling processes may result in piercing finger injuries.



Fig. 3. Polishing process being carried out using chromium powder.



Fig. 4. Child labourers at work in poor illumination.

Assessment of Persistent Pollutants (PCDDs and PCDFs) in Biological Media

Polychlorinated dibenzo-p-dioxins (PCDDs) and furans (PCDFs) are byproducts of incineration, uncontrolled burning and industrial processes. They are persistent in nature and bio-accumulate through food chain. Residues of these toxicants have been detected in human adipose tissue, blood and milk. They are known endocrine disruptors, induce stillbirths, cancer and skin disorders. Biological and food samples collected from Ahmedabad, Vadodara and Surat cities were analyzed for PCDD/F residues. The total equivalent quotient for *desi* and farm eggs and *desi* and broiler chicken and human milk were determined. High correlation was observed between lipid and residues of dioxin in human milk samples (Fig.5).

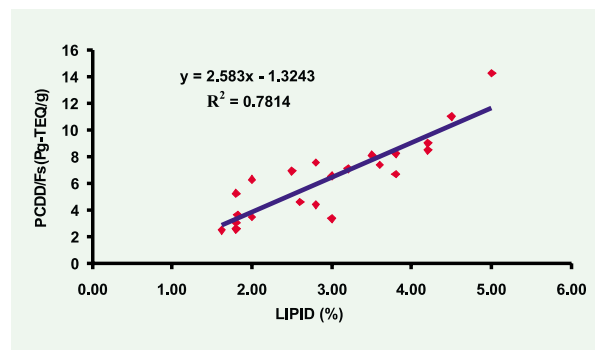


Fig. 5. Relationship between total PCDD/Fs and lipid in human milk.

Health Risk Assessment and Development of Intervention Programme in Quartz Crushing Units

Quartz stones are mined and crushed to powder which is used as a raw material in the manufacture of glass. Of the 28 crushing units in Godhra (Gujarat) 20 are in operation. Study was undertaken to evaluate the efficacy of control devices in three units. The exposure occurs mainly at three locations *viz*, crusher, screening/bagging and disintegrator. Dust control systems have been installed in about 15 units except crushers which are usually outside the factory shed and require separate control system.



The mean reduction in total dust concentration at different locations like disintegrator and screening/bagging processes was 85-86% (Fig. 6) whereas reduction in

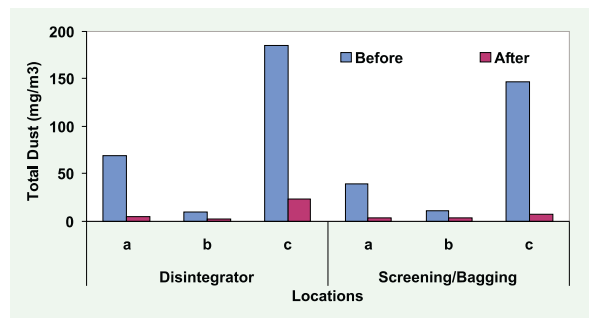


Fig. 6. Total dust concentrations before and after the installation of engineering control.

respirable dust levels was around 69-75% (Fig. 7). The dust levels, however, are still higher than the permissible level of exposure for quartz, which is 0.3 mg/m³ for total dust and 0.1 mg/m³ for respirable dust. Therefore, workers were advised to wear disposable masks. Management of the quartz crushing units has been advised to use these measures compulsorily. Dust control system on crushers is under installation.

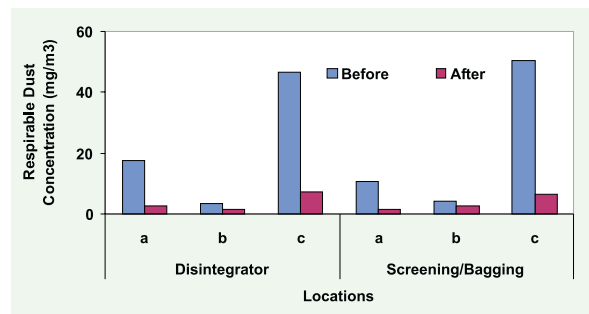


Fig. 7. Respirable dust concentrations before and after installation of engineering control.

Health Risk among Spray Painters

Twenty-five spray painters exposed to paint (Fig. 8) were examined to evaluate its effect specially on reproduction and thyroid. Results indicated some notable neurological (tingling and numbness, irritation in eyes, fatigue, asthenia, and headache) and psychological symptoms (loss of temper, lack of memory, worrying and disliking and insomnia) and clinical findings



Fig. 8. Spray painters exposed to solvents and chemicals.

(tremor, hypertension and vision defects—myopia, hypermetropia, presbyopia). Thyroid stimulating hormone levels were high (Fig. 9) while T₄ levels were low in spray painters. Impairment in the levels of LH and FSH was also observed in some individuals.

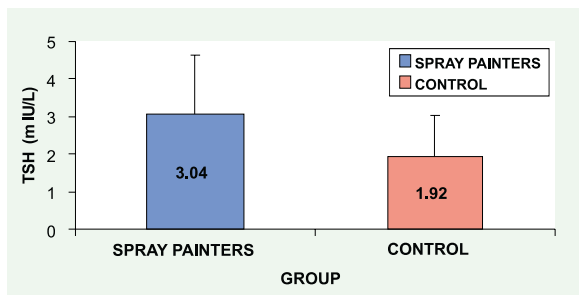


Fig. 9. Levels of TSH in spray painters.

Pesticide Exposure in Chilli Cultivators of Gujarat

Pesticide related-illness forms one of the major health hazards in the developing countries including India. Maximum amounts of pesticides are being used on vegetables and cotton crop in





Fig. 10. Chilli farm workers.

India. A study of pesticide exposure in 256 chilli cultivators (Fig. 10) showed that 73% of them had 11-20 rounds and 15% had 21-30 rounds of pesticide spray during the season which resulted in high pesticide exposure (Fig. 11). Majority of the pesticides belonged to organophosphate group. Plasma and RBC cholinesterase activity was found to be significantly inhibited after exposure to pesticides. Eight workers gave history of severe pesticide poisoning and hospitalization in the past.



Fig. 11. Pesticide spraying on chilli crop.

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

Health risk assessment due to indoor air pollution was carried out in rural population.

The result showed that the geometrical mean of benzene exposure for cooks during cooking hours in indoor kitchen using mixed fuel was 69.5 mg/m³, while the exposure was 114.1 mg/m³ for cooks in indoor kitchen using dung fuel. Similarly the benzene exposure was 36.5 mg/m³ for cooks using wood fuel. This study revealed that wood used as cooking fuel had significant impact on the occurrence of age dependent cataracts.

Occupational Health Problems of Cycle Rickshaw Pullers and Redesign of Cycle Rickshaw on Ergonomic Principles

The study of occupational health problems of cycle rickshaw pullers showed high prevalence of musculo-skeletal and respiratory diseases. The new design of cycle rickshaw is being made at ROHC, Kolkata, based on ergonomic principles and three models have been developed (Fig.12). The initial results are very encouraging. The comparative assessment of energy cost of the various models (M1, M2 and M3) of cycle rickshaw pulling showed that the energy cost of model M3 is significantly lower than the existing old model (Fig.13). Research work to assess the efficacy of the new model is in progress.

Assessment of Health Hazards of Arsenic Exposed Population of West Bengal

A pilot study on environmental-cum-biological monitoring of arsenic exposed population of West Bengal was carried out. The result showed that about 15% of the tube-wells had arsenic level above 50µg/l. Most important observation in exposed population was skin pigmentation. The level of arsenic in hair and nail samples was also high. Higher prevalence of anaemia, angular stomatitis, glossitis and cough was present in exposed group. Clinical examination revealed liver enlargement and rise in serum SGOT/SGPT and alkaline phosphatase in exposed population.

Health Problems in Workers Exposed to Toxic Metals from Electroplating Process

A pilot study of 50 workers engaged in electroplating process was carried out by ROHC, Bangalore. They were examined for liver





Fig. 12. Various models of cycle rickshaw.

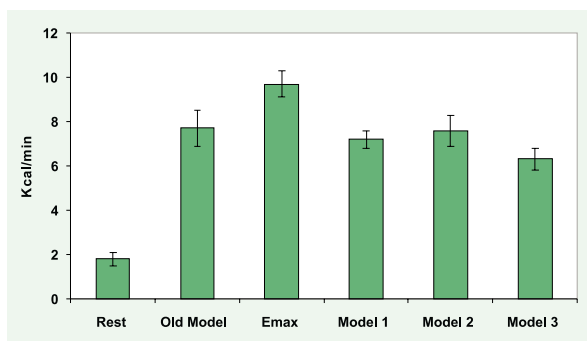


Fig. 13. Comparison of energy cost of rickshaw pulling with existing old model and redesigned model.

function, renal tubular dysfunction and level of nickel and chromium in urinary samples.

The levels of nickel and N-acetyl - β -D-glucosaminidase were significantly higher in workers exposed to toxic metals. Synthetic and cellular functional integrity of liver was found to have decreased in exposed subjects.

National Environmental Health Profile and Health Risk Assessment

The volume and variety of toxic agents in air, water and food have shown an increasing trend particularly in urban areas. Exposure to such agents on long-term basis even at very low level has been found to cause variety of health effects. The results of the study suggest that the average annual level of suspended particulate matter (SPM) in the selected commercial areas in Bangalore has decreased in recent years and is within the prescribed national ambient air

quality standards (NAAQS). The level of SO₂ increased in industrial zone due to rapid increase in vehicular traffic. However, level of CO in the commercial and industrial areas is significantly higher compared to residential areas.

Further, proportion of subjects whose COHb exceeded the limit was 2.5% more for the smokers in industrial areas. The water quality parameters measured were well within the prescribed limits. Higher levels of oxidants were recorded among firewood and kerosene users compared to LPG users.

The morbidity conditions *viz.* cough in the morning was significantly higher among the smokers in all the areas. The other morbidity conditions identified in all these areas were non significant. However, more number of individuals residing in slum and residential areas complained of sputum. Further study is in progress.

Morbidity among Workers of Textile Industry of Rajasthan

Study was conducted among the workers of textile industry in Pali and Jodhpur districts. Around 53% workers were found to suffer from various kinds of sickness. Main morbidities reported included aches, respiratory and gastric complaints such as abdominal pain and fever. Chronic energy malnutrition, protein calorie malnutrition vitamin A, B complex and C deficiencies and anemia were reported by many workers.

