



### ABSTRACT

**Objective** - To determine the health problems and the associated risk factors of brass workers in the district of Kandy in comparison to a control group.

**Design** - Cross-sectional, analytical study.

**Setting** - Gadaladeniya, in the district of Kandy, where the maximum number of brass villages are clustered.

**Subjects** - Study group consisted of currently employed brass workers, selected randomly, irrespective of the duration of service.

Control group consisted of male members, who are not employed in the brass industry, matched for age from a population residing in villages, which are situated in the same " Medical Officer of Health" area, beyond a hypothetical line of 3.2 Km (2 miles) from the border of the cluster of brass villages. Selection was by cluster sampling and each control member was matched for the age.

**Study instruments** - An interviewer administered questionnaire, which was structured with a few open questions was used to determine some demographic data, prevalence of symptoms, accidents, awareness of occupational health hazards, smoking habits and occupational history. Blood was examined for haemoglobin levels, presence of basophilic stippling, and whole blood copper and zinc levels. A clinical and an ophthalmological examination was performed. Audiometry was carried out, on the two sides, for the frequencies of 250, 500, 1000, 1500, 2000, 3000, 4000, 6000 and 8000 Hertz, having excluded any otological pathology. Lung function was conducted to determine the forced vital capacity (FVC),

forced expiratory volume in the initial second of expiration (FEV), forced expiratory flow rate in the middle 50% of the vital capacity (FEF) and peak expiratory flow rate (PEFR). The brass workers with 5 or more years of service had chest radiography in addition.

A trained interviewer, 3 experienced technicians, an ophthalmologist, two radiologists and the author, conducted these tests. All the investigators, except the two radiologists were blind to the exposure status of the subjects. Heat, noise and air-borne copper and zinc levels were conducted in 10 randomly selected brass workshops using standard techniques.

**Results** - Certain acute and chronic symptoms, metal fume fever, and accidents were significantly more among the brass workers than among the control. Protective measures were used by less than 20% of the brass workers. There was no difference in the clinical abnormalities and eye defects. The mean haemoglobin levels were almost similar, in the two groups while none had basophilic stippling.

On analysis, using as the "norm", the median of the combined groups, those with higher blood copper and zinc levels were found to be significantly more among brass workers. The risk of developing overall hearing impairment for the left and right ears, were 3 (95% CI, 1.6-5.8) and 5 (95% CI, 2.3-10.4) times higher respectively, in comparison to the control group. The brass workers had a FVC of 3.12 litres and FEV of 2.67 litres, FEF of 3.12 litres/sec and PEFR of 496.9 litres/min. The above figures for the control group were 3.15, 2.87, 3.81 and 532.8 respectively. Except FVC the rest were significantly more in the control group.

The permissible WBGT level of  $26.1^{\circ}\text{C}$  for heavy work was exceeded in two of the ten workshops where the environmental measurements were conducted. The noise levels in different sections of the workshops ranged between 84 to 103 dB. In the

grinding area the air-borne copper levels were found to exceed the threshold limit values, in all the workshops.

**Recommendations** - Health education programmes are necessary to improve the knowledge on occupational health hazards. It is suggested that an association be formed to channel requests of the brass workers to the authorities, to provide effective protective gear at a low cost.