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Occupational exposure and health problems in small-scale industry workers in Dar es Salaam, Tanzania: a situation analysis

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Background	Workers in informal small-scale industries (SSI) in developing countries involved in welding, spray painting, woodwork and metalwork are exposed to various hazards with consequent risk to health.
Aim	To assess occupational exposure and health problems in SSI in Dar es Salaam, Tanzania.
Methods	Focused group discussions (FGD) were conducted among SSI workers. Participants were assessed for exposure to occupational and environmental hazards, the use of protective equipment and health complaints by interview. The findings were discussed with participants and potential interventions identified.
Results	Three hundred and ten workers were interviewed (response rate 98%). There was a high level (>90%) of self-reported exposure to either dust, fumes, noise or sunlight in certain occupational groups. There was low reported use of personal protective equipment. There was a high level of self-reported occupational health problems, particularly amongst welders and metalworkers. Workers reported their needs as permanent workplaces, information on work related hazards, water and sanitation, and legislation for SSI.
Conclusions	In SSI in Tanzania, our study suggests that workers have high levels of exposure to multiple health hazards and that use of protective equipment is poor. This group of workers warrants improved occupational health and safety provision.
Key words	Environmental health; informal sector; occupational health; small-scale industries; Tanzania.
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Introduction

Urbanization and urban health in Dar es Salaam

The population of Dar es Salaam has increased from 356 000 in 1967 to 1.36 million in 1988 and 2.5 million in 2002 [1]. The rapid urbanization has increased urban poverty and many citizens lack access to safe drinking water and proper sanitation [2]. Many people seek work in the informal sector, defined by the The International Labour Conference of 1995 as: 'small-scale units producing and distributing goods and services, and consisting largely of independent, self-employed producers' [3]. The informal sector workforce was

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estimated to be 2.4 million in Tanzania in 1991 and Dar es Salaam accounted for 13% of this total [4]. Many informal sector workers are urban poor, include women and children, lack access to medical care and are not covered by employment legislation [5,6]. The objectives of our study were to assess occupational exposures and perceived health risks of workers in small-scale industries (SSI) in the informal sector enterprises of Dar es Salaam and to identify possible interventions.

Methods

We carried out a descriptive study between September 1994 and February 1996. We selected three wards in low-income areas of Dar es Salaam, each having a high concentration of informal sector SSI and no history of recent study being conducted. We then randomly selected 60 SSIs following a walk-though survey of each ward. SSIs selected included: garages in open areas with activities of car repair including welding and painting; wood workshops of two types, permanent workshops with fixed wood machines carrying out sawing, planing, cutting, mortising and carving and simple shelter workshops having workbenches with four to five workers polishing wood for furniture. Metal workshops were shelters with usually five workers, using heavy hammers, metal cutting scissors and soldering equipment working on scrap metal and soldering lead from old car batteries producing buckets, kerosene stoves, basins, rakes and hoes.

We used the following operational definitions. Excessive noise: noise that makes it difficult to communicate with your neighbour without shouting. Wood dust: coarse to fine particles well seen when wood machine is in operation. Fumes: smoke produced when welding (from substances in the welding rod or impurities in the iron), soldering (from chemicals used to clean surfaces to be soldered or the soldering material itself like lead) or painting (when a flame is used to remove old paint).

To collect the data we used a combination of focus group discussions, observations and interviews. We visited the enterprises and listed all possible exposures and personal protective equipment used by welders, metalworkers and wood workers using a pretested checklist [7,8].

In the three study areas, nine focused group discussions (FGDs) were carried out among employees and employers of the enterprises of SSI. The FGD focused on: introducing the study and the research team to the study population in order to familiarize themselves and establish a basis for further collaboration; identification of perceived health problems related to working in SSI; and identification of work related health issues. We randomly selected the SSI, but the heads of SSI selected the participants. A moderator (a social scientist) used a checklist in Kiswahili to guide the discussions and two observers noted down important comments. At the end, the participants were interviewed on their demographic characteristics. We recorded all the discussions; the tapes were transcribed into a hard copy in Kiswahili and then translated into English.

After the FGD, observation of exposures, use of protective equipment and interviews took place. We interviewed and observed workers at their workplace using a pretested checklist for exposures and protective equipment. A structured interview using a questionnaire was administered face to face to all observed workers. It consisted of four parts: personal and work characteristics; types of risks they were exposed to; use of protective equipment; and health complaints.

Data entry was done using dBase IV and data analysis by Statistical Package for Social Science (SPSS) software. In addition, a semi-quantitative scale of measurement showing different degrees of exposures was used. If an individual was not exposed to the hazard or once only, the exposure was categorized as 'never', if it was two times as 'sometimes' and if three to five times as 'always'.

After analysis of the data, one workshop with 20–25 participants for each ward was held to discuss the study findings and to get inputs for identification of priorities for intervention and further study. Ethical approval for the study was obtained from the Commission for Science and Technology in Tanzania. Verbal consent was obtained from both the employers and workers.

Results

Three hundred and ten workers participated out of 315 available (response rate 98%). 101 were welders, 61 were metal workers, 86 were spray painters and 62 were wood workers. The mean age was 27.9 years (range 13–66). Of the workers, 56% were single and 44% married. Fifteen per cent had <7 years of education, while 85% had 7 years or more. Nearly 70% of the workers had worked in SSI for <10 years; the maximum was 40 years.

All groups of workers reported very high exposure levels to at least one hazard (Table 1). In addition, during the FGDs workers reported exposure to sharp metals, exhaust fumes, welding fumes, electric shocks and fumes due to spray painting and soldering. Use of personal protective equipment was poor, with only welders reporting significant use of face shields (50%) and boots (21%) (Table 2). Lack of protective equipment was singled out in the FGDs to be the main perceived reason for health problems.

Self-reported health complaints, reported during interviews and FGDs are summarized in Table 3. At least half of every occupational group reported at least one

Table 1. Percentages of different exposures and duration of exposure among 310 male workers in SSI by job title in Dar es Salaam, Tanzania

Exposures	Welders (n = 101) (welding fumes[a])	Painters (n = 86) (paint fumes)	Woodworkers (n = 62) (wood dust)	Metalworkers (n = 61) (soldering fumes)
Fumes/dust				
Never	3.0	5.8	3.2	62.3
Sometimes	4.9	82.6	6.5	37.7
Always	92.1	11.6	90.3	0.0
Duration of exposure to fumes/dust (h/day)				
<2	43.6	79.1	100.0	62.3
≥2	56.4	20.9	0.0	37.7
Excessive noise				
Never	34.7	11.6	48.4	4.9
Sometimes	12.9	2.3	6.4	1.6
Always	52.4	86.1	45.2	93.4
Duration of exposure to excessive noise (h/day)				
<2	46.5	n.a.[b]	88.7	9.8
≥2	53.5	n.a.	11.3	90.2
Direct sunlight/heat				
Never	0.0	12.8	0.0	85.2
Sometimes	0.0	3.5	0.0	14.8
Always	100	83.7	100.0	0.0

[a]Exposure also includes sparks and welding flame radiations.

[b]Not applicable.

Table 2. Use of protective equipment (%) among 310 male workers in SSI by job title in Dar es Salaam, Tanzania

Type of equipment	Welders (n = 101)	Painters (n = 86)	Woodworkers (n = 62)	Metalworkers (n = 61)
Gloves/mittens	0.9	1.2	0.0	1.6
Overalls	9.9	15.1	0.0	1.6
Boots	20.8	9.3	0.0	6.6
Goggles/spectacles	9.9	3.4	0.0	0.0
Protective face shields	49.5	n.a.[a]	n.a.	n.a.
Nose/mouth masks	0.0	5.8	3.2	0.0

[a]Not applicable.

Table 3. Self-reported occupational health problems (%) in the previous month among 310 male workers in SSI by job title in Dar es Salaam, Tanzania

Health complaints	Welders (n = 101)	Painters (n = 86)	Woodworkers (n = 62)	Metalworkers (n = 61)
Skin burn	86.1	12.8	3.2	29.5
Backache	60.4	0.0	22.6	78.7
Nose irritation	52.5	43.0	41.9	0.0
Skin irritations	29.7	25.6	29.0	75.4
Eye problems	81.2	46.5	0.0	75.4
Headache	76.2	62.8	14.5	0.0
Hearing problems	9.9	0.0	53.2	57.4
Chest/throat pains	71.3	60.4	0.0	0.0
Tetanus	0.0	0.0	11.3	21.3

health complaint and skin burn, red eyes, headache and chest/throat pains were reported by >70% of welders. In the FGD, painters reported headaches when in contact with paint and thinner and when working in direct sunlight. Woodworkers reported mainly respiratory and eye problems. Workers in garages reported exposure to oil, grease and petrol, which they associated with skin problems and abdominal pain. Exposures to chemicals from car batteries were associated by the workers with respiratory tract problems, dizziness and headache. Workers in the metal workshops felt the need to reduce excessive noise.

Immediate needs of the study population

During the FGD, employers of the various enterprises mentioned the problem of obtaining permanent workplaces, as plots allocated to them by the Dar es Salaam City Council were only temporary and were often demolished.

Results of workshops

The results from our study were discussed with participants at a workshop in each ward selected. The focus was on 'healthy workplaces', 'raising awareness among SSI workers and policy makers', 'prevention' and 'further research.' Participants said that healthy workplaces and permanent plots were indispensable. They also emphasized the need for legislation of the informal sector and distribution of study findings to raise awareness among other workers and residents. The need for health information on work related exposures, accidents, respiratory symptoms and availability of protective devices was expressed. Also, the necessity to provide treatment for affected persons, screening of workers, tetanus vaccination and first aid boxes, and to make protective equipment available was emphasized.

Discussion

We found that workers in SSI were exposed to a variety of work-related hazards, were not using protective equipment and had health complaints perceived to be related to their work. Workers and employers were both aware of occupational and environmental health hazards, but absence of a clear policy on the informal sector and the lack of permanent workplaces do not encourage investment in occupational health and safety.

The different data collection tools complemented each other. The SSI were randomly selected, but the heads of the SSI chose the participants for the FGD. It is difficult to know whether they were an adequate representation. Also, the sample size was relatively small and, in view of the descriptive nature of the study, it was difficult to assess relationships between variables. Selection bias and information bias were likely to occur, although before starting the FGD or any observations we declared that the information collected was confidential. The researchers were associated with the City Council, which caused suspicion and made people initially reluctant to participate. In workplace observations, workers were informed in advance of the observations, but the checklist was not shown and workplace interviews were done at the end of observations.

Workers perceived themselves to be exposed to many occupational and environmental health hazards. In China, Zhi and colleagues reported that 83% of the SSI surveyed in county towns had at least one type of occupational hazard and noise-induced hearing loss was one of the seven types of occupational diseases cited [9]. A follow-up study in small mechanical enterprises in Norway showed that use of personal protection devices reduced accidents at work [10]. Contact with sharp objects, excessive noise, welding, spray paint and soldering fumes were not regarded as harmful, while exposures to wood dust and oil were, because it could make someone dirty. This demonstrates again the subjective character of the self-reported health problems. Our findings are similar to those of Gomes *et al*. [11] where foundry workers were exposed to high levels of noise and heat. Almost all welders were exposed to welding fumes, sparks and radiation, and only a few used protective devices (Table 3).

During the FGD, the workers in SSI did not perceive health complaints as their immediate problem. Workers and employers were more concerned with acquiring permanent workplaces. The temporary nature of many SSI reduces the priority of occupational health and safety. Further research into the health of SSI workers and the environmental conditions of the living areas is warranted. In particular, the perceived health problems need objective evaluation.

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References

1. URT. *Population and Housing Census. General Report*. Dar es Salaam: National Bureau of Statistics, Ministry of Planning, 2002. http://www.tanzania.go.tz/census/dsm.htm
2. Blair A, Stewart PA, Hoover RN. Mortality from lung cancer among workers employed in formaldehyde industries. *Am J Ind Med* 1990;**17:**683–699.
3. International Labour Organization (ILO). *A Pilot Survey on Occupational Safety and Health in the Informal Sector, Dar es Salaam, Tanzania*, African Safety and Health Project INT/89/M16/FIN. Geneva: ILO, 1994.
4. URT. *Tanzania National Informal Sector Survey*. Dar es Salaam: Planning Commission, Ministry of Labour and Youth Development, 1991.
5. Das PK, Shukla PK, Ory FG. An occupational health programme for adults and children in the carpet weaving industry, Mirzapur, India: a case study in the informal sector. *Soc Sci Med* 1992;**35:**1293–1302.
6. Packard MR. Industrial production, health and disease in sub-Saharan Africa. *Soc Sci Med* 1989;**28:**475–496.
7. Boleij J, Buringh E, Heederik D, Kromhout H. *Occupational Hygiene of Chemicals and Biological Agents*. Amsterdam: Elsevier, 1995.
8. Molyneux MK, Wilson GE. Assessments and the assessor:

a company approach to occupational health risks. *Ann Occup Hyg* 1992;**36:**71–78.
9. Zhi S, Sheng W, Levine SP. National Occupational Health Service policies and programs for workers in small-scale industries in China. *AIHAJ* 2000;**61:**842–849.
10. Bull N, Riiise T, Moen BE. Work-related injuries and occupational health and safety factors in smaller enterprises—a prospective study. *Occup Med (Lond)* 2002;**52:**70–74.
11. Gomes J, Lloyd O, Norman N. The health of the workers in a rapidly developing country: effects of occupational exposure to noise and heat. *Occup Med (Lond)* 2002;**52:**121–128.