HEALTH HAZARDS DUE TO ASBESTOS EXPOSURE IN INDIA

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Asbestos is well known for its deadly effects such as lung fibrosis, malignant mesothelioma and bronchogenic carcinoma. Consequently, the use of all forms of asbestos has been banned in most developed countries. Unfortunately, not only has India failed to impose such a ban, it has greatly increased asbestos use in recent years, with asbestos imports surging by around 47% between 2004 (172,397 tonnes) and 2006 (253,382 tonnes), according to USGS supplied data. Meanwhile, domestic production of asbestos, resulting from largely illegal mining, has been maintained at an estimated 18-20,000 tonnes per annum.

India is reported to have 33 large-scale units, manufacturing mainly asbestos-cement sheeting, and 673* small-scale units producing other asbestos products or grinding asbestos ore. It has been estimated that 100,000 people are occupationally exposed to asbestos in the Indian asbestos industry,[1] with many more, possibly millions, receiving some level of exposure in the construction sector.

As with other industries in India the asbestos industry is divided into "organized" and "unorganized" sectors. Strictly speaking, according to the Factory Act, such divisions for manufacturing businesses are based primarily on size, with concerns employing more than nine people (or 19 for non-powered operations) accorded "organized" status. However, these terms are also applied to workers, with those not covered by labor agreements and with no occupational entitlements, such as sick pay, pensions, etc., being described as "unorganized."† While the core of organized-sector workforces comprise relatively well paid "organized" workers, many industries, including the asbestos industry, are heavily reliant on "unorganized" contract laborers who enjoy little protection under the law.

The organized sector consumes large quantities of mainly imported asbestos; however, the manufacture and processing of many asbestos products takes place in unorganized-sector enterprises. The operation of such units is frequently accompanied by high asbestos fiber releases, both into the workplace and the external environment, exposing workers and local populations to serious health hazards.[2,3] This is not to say that workers in organized-sector plants are safe: the national permitted exposure limit (PEL) has been set higher than the internationally recognized standard and it is alleged that many enterprises exceed this limit. Even in well-regulated establishments, with exposures well below the permitted value, asbestos-related malignancies may result from prolonged low-level exposure. In addition, products from these plants pose a danger to end-users and tradesmen handling them.

Sources of particularly high exposure are asbestos mines and the small-scale units that process the mined asbestos. Although there has been a moratorium on granting new leases for mining, the fact that illegal mining continues unabated means that many of these units still exist, particularly in Rajasthan, where 95% of India's asbestos production has occurred. Nearly half of all small-scale asbestos processing units are in Rajasthan; even if they were all closed down now, there would still exist a legacy of asbestos disease due to past exposure. Traditionally, underground mining was carried out by male workers while for opencast mining both men and women were employed. Many women work in small milling and processing units where fiber concentrations are very high. Milling involves the use of small crushing machines with little exhaust ventilation provided.

In order to bring to light the health status of current and former asbestos industry workers the Central Pollution Control Board sponsored a project under my leadership entitled "Human Risk Assessment Studies in Asbestos Industries in India." The project was an in-depth study involving determination of asbestos fiber type and airborne concentration outside and inside the surveyed units, occupational exposure, and the health impacts of asbestos exposure on workers and populations adjacent to the units. The presence and effectiveness of control measures within the units were also reported. In what follows, the results of this investigation are outlined and the implications of India's continued use of asbestos are addressed.

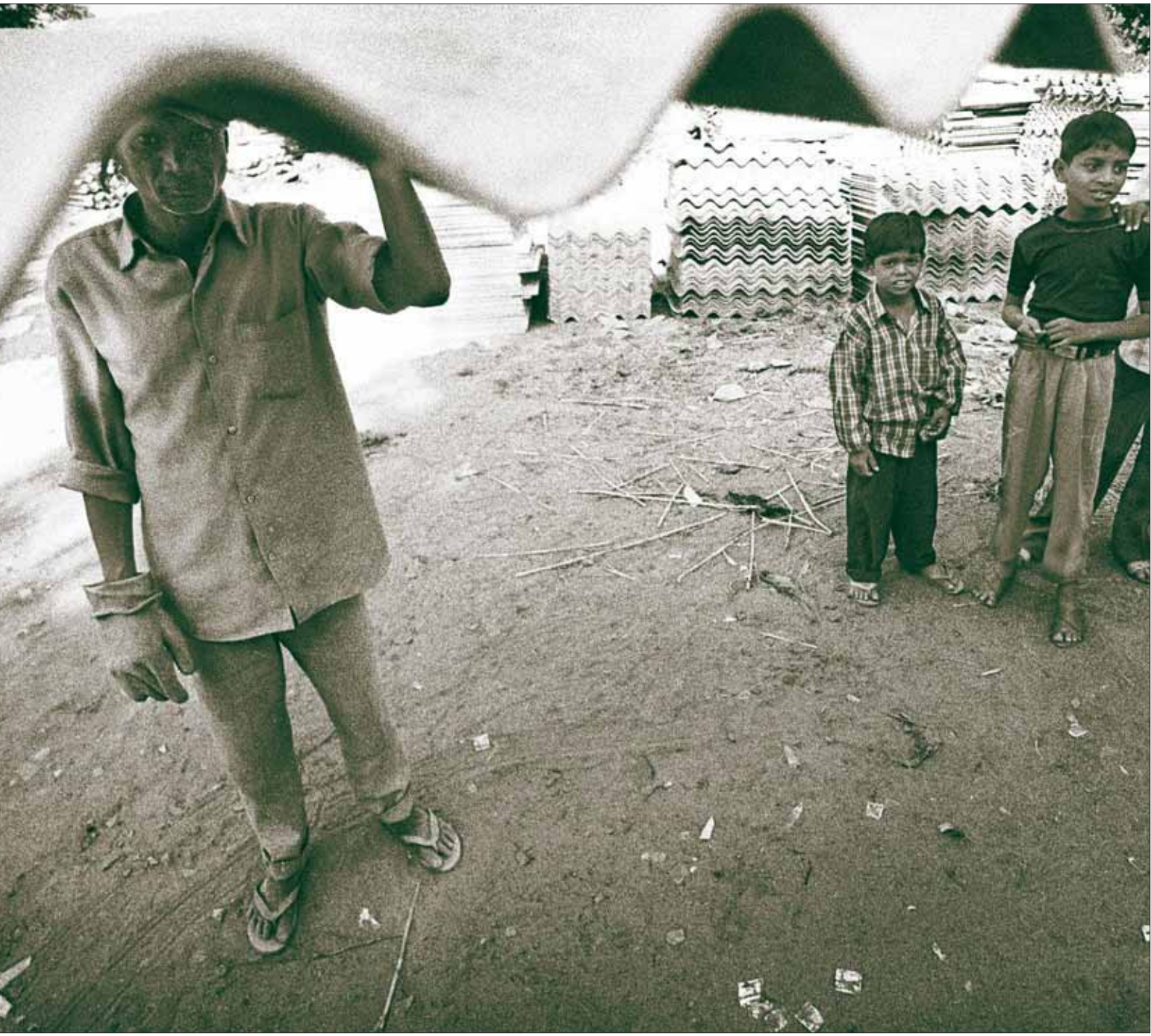
The project focused on 18 small-scale units in Rajasthan and 8 large-scale units in Maharashtra, the state with the highest concentration of large-scale asbestos units. Among the small-scale units, nine were involved in grinding or milling asbestos, two in both milling and manufacturing and seven units in manufacturing asbestos-based products, including asbestos-cement pipes, jointing, fittings, electric heater plates, and water tanks, etc. The large-scale units produced clutch plates, brake shoes, asbestos-cement sheets, water tanks, rope, and other asbestos-based products.

For each unit studied, the type of asbestos used was identified, airborne fiber concentration and size distribution measured, and health impacts of exposure assessed. To determine personal exposure air sampling was conducted within the "breathing zone" of the worker concerned.

With regard to health effects, the primary concern of the survey was to determine the incidence of asbestosis, in both workers and populations adjacent to asbestos units. Typically, asbestosis results from heavy exposure to airborne asbestos fibers over a prolonged period; symptoms – the first of which is generally exertional dypsnoea (breathlessness) – do not usually appear until 20 years after the commencement of exposure. To diagnose this disease in the individuals studied, radiological examinations and pulmonary function tests, in conjunction with histories of asbestos exposure, were used. In addition, tests for the presence of asbestos bodies and serum markers for chromosomal damage were conducted.

**This figure for the number of small-scale units dates from 2000; more recent estimates could not be found.*

† The term "informal" is used analogously.



The small-scale units surveyed in Rajasthan processed indigenous asbestos available from nearby mines. Analysis of the asbestos used by means of XEDS (x-ray energy-dispersive spectrometry) and phase contrast microscopy showed it to be tremolite. The airborne fiber concentration was 18-22 f/cc in the workplace area, much higher than the prescribed national permissible exposure limit of 0.5 f/ml (Central Pollution Control Board, New Delhi, 2005), which itself is much higher than the internationally accepted Occupational Safety and Health Administration (OSHA) limit of 0.1 f/ml.

In these small-scale units, asbestos is processed using obsolete technologies and workers did not wear masks or gloves. Housekeeping was found to be very poor in these units; during the survey it was noticed that children and pets were playing on the asbestos heaps and a number of workers were smoking. There were no effective control measures in evidence.

In the large-scale plants the type of asbestos used was almost exclusively chrysotile. While airborne fiber concentrations were found to be lower in these organized-sector units (1.71 f/ml), possibly due to wet processing, housekeeping was also unsatisfactory. It was noted that workers did not change their clothes after a shift; fibers on their clothing were carried into their homes, contaminating that environment also.

The incidence of asbestosis in the unorganized-sector workers was found to be 21%. Of the workers diagnosed with asbestosis, 59% had less than 5 years of exposure to asbestos; 22% had 5-10 years, 15% had 11-20 years and 4% had 20-30 years exposure.

Lung function tests on these workers revealed high levels of obstruction, but only somewhat lower levels of obstruction were found in an unexposed control group. It was possible that individuals in the control group had been exposed to asbestos through living in close proximity to asbestos units, or by having worked with asbestos in the past. Since any such employment would have been unrecorded there was no way to verify the history of such persons.

It should be noted that all the diagnosed workers were domestically exposed to unprocessed cooking fuel smoke. Hence, the reason for them developing asbestosis earlier than normally found may be either, high exposure to tremolite asbestos, generally acknowledged to be highly fibrogenic, or double exposure: domestically to cooking fuel smoke[4] and occupationally to asbestos. Further predisposing factors also cannot be ruled out.[5]

In the organized-sector plants, 26% of the workers tested were diagnosed with asbestosis; their exposure was mostly 25 to 40 years. Most of these workers used clean gas in their domestic environments.

However, conditions in the organized sector were also found to be poor: housekeeping was bad and we found torn-open asbestos bags in some units allegedly using all the modern technologies. For both sectors, the survey revealed little concept of the proper disposal of asbestos waste.

Many studies have demonstrated that asbestos can exhibit genotoxicity alone[6,7] or act as a carrier for additional carcinogens, like benzo-a-pyrene from cigarette smoke. The survey demonstrated an enhanced induction of chromosomal aberrations and micronuclei in the peripheral blood lymphocytes of workers from small-scale asbestos units compared to control groups of smokers and non-smokers. Lohani et al. 2002 have demonstrated an enhanced genotoxic effect in smokers as compared to non-smokers both exposed to asbestos fibers in an organized-sector asbestos-cement factory.[8] Chromosomal aberrations and micronuclei formation are strong indicators for risk prediction at the genetic level.

The survey demonstrates that neither small- nor large-scale asbestos-based industries follow the so-called "safety norms" laid down by the Indian government or reputable international agencies. By not doing so they are greatly increasing the risk of their workers developing debilitating diseases and fatal asbestos-related malignancies. The processing of asbestos (mainly tremolite) and manufacturing of asbestos products in the small-scale units of Rajasthan with workers using no personal protective equipment, presents a grave health hazard. Due to the latency of asbestos-related diseases it may be decades before the true consequences of such reckless handling of this dangerous material become evident. Although the study described above was conducted in 2001-02, visits to asbestos-using industries shows that, even today, many workers involved in these industries are not adequately aware of the severe consequences of asbestos exposure. (Dave and Beckett, 2005 have also described the lack of occupational hygiene in small-scale asbestos mines and manufacturing units in India.[9])

Countless studies have shown that all varieties of asbestos are fibrogenic, co-carcinogenic and carcinogenic. Accordingly, many countries have banned the use of asbestos and are embarked on the difficult task of eliminating asbestos hazards in their infrastructure and buildings. It is now very important for countries where asbestos is still in use to impose similar bans, not only to protect workers being currently exposed but also to safeguard coming generations.

Both small- and large-scale manufacturing units for asbestos-based products have turned out to be extremely profitable for their owners, but a deathbed for the poor workers who, particularly those working in small-scale units, either have no knowledge of asbestos hazards or have to keep their mouths shut to preserve their jobs and avoid destitution.

The only way for the government to remedy the situation in these industries is to implement a complete ban on the mining and use of asbestos and promote the use of alternative materials. Members of the EU and other enlightened countries that have banned asbestos have shown that life without asbestos is perfectly feasible.