

EXAMINING ENVIRONMENT AND HEALTH INTERACTIONS

Responding with communities to the challenges of our times

A SOCHARA-SOPHEA Publication



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EXAMINING ENVIRONMENT AND HEALTH INTERACTIONS

Responding with communities to the challenges of our times

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Chapter 2: STORY OF BHOPAL

The first major call for environmental health work came suddenly and unexpectedly in December 1984 in the form of the Bhopal Gas Disaster. At that time, CHC³ was taking over as convener of the medico friend circle⁴ (mfc) and as the editorial office of the mfc bulletin for the years 1985-86.

The disaster was unprecedented, killing thousands of people overnight and permanently injuring several thousand more. While the local residents and the rest of the world were still coming to terms with the disaster, mfc received requests from local groups and civil society organisations for their involvement with the relief efforts. These requests started arriving when the mfc annual meeting was being held in December 1984, where it was decided unanimously that the group will get involved with the campaign for relief and justice at Bhopal. The reasons for their involvement were many and urgent.

Confusion was aplenty. Doctors had various theories on how the affected should be treated. The guilty company, Union Carbide, had refused to share information on the nature of the gas that had leaked, and the government was not making any serious efforts to enquire or communicate the information either. Without this information, whatever treatment regimes had been initiated were based on whims, and several lives were being lost due to inappropriate treatment. Groups from the affected community and the society at large questioned the stance taken by the government and the company.

CHC along with several other members of mfc initiated a process of research, communication and rehabilitation of the victims of the disaster. The monthly mfc bulletin carried updates of these activities from the field. The priority was to identify and address the gaps in the ongoing process of relief and rehabilitation.

In an effort to empower the affected communities and the local physicians with the necessary information, a unique and innovative communication effort was made in the form of an informative illustrated manual called 'Hamari Sehat Hamari Ladai' was also drafted with the Ekalavya trust.

mfc was also one of the first civil society groups to initiate a detailed research exercise at Bhopal. This study systematically revealed the health impact on the exposed

³ The society (SOCHARA) was registered in 1991. Until then, CHC was the only identity of the organization.

⁴ mfc or medico friend circle is a national platform for health practitioners to discuss and act on issues of equity-oriented public health importance. For more information, visit their website at: <http://www.mfcindia.org/main/perspective.html>

communities. The nature of these health effects suggested a chronic cyanide poisoning like mechanism, which added evidence to the existing controversy about how the health effects were caused. Several recommendations were given to the government and other groups based on this study, and a call was made for the use of evidence-based sensitive action. One recommendation was the controversial support to the use of a compound called 'sodium thiosulphate' to detoxify the victims. Later on, the results of a detailed study by the Indian Council of Medical Research supported the use of thiosulphate for the treatment and rehabilitation of victims. An epidemiological review paper was also published with the available evidence on mortality and morbidity due to Bhopal tragedy. The evidence generated through these processes was continuously updated and presented at international conferences including the Permanent Peoples Tribunal. Later that year, mfc also organised a meeting on Pesticides and Health where the health impacts of the production and use of chemicals in agriculture was discussed.

Shiv Vishwanathan, a well known anthropologist wrote later about mfc's scientific report on the health situation in Bhopal as "probably the most sane, compassionate piece of scholarship on the problem of relief in Bhopal" (8). An excerpt from that article is provided in Box.2, which is followed by a detailed report on CHC's involvement in the Bhopal campaign.

Box.2: Excerpt from 'Imagination of a disaster', by Shiv Vishwanathan (8)

"But what is most fascinating is the manner in which text and context are related. Voluntary health specialists have repeatedly advocated that the focus of study should be suffering in the community, rather than the patient as an isolate in the hospital. The first they argue, leads to a holistic view of disease while the latter propagates a reductionist view of illness and an atomistic view of the patient. The latter view which underwrote the pulmonary model, is based on numerous vertical studies rather than an integrated search for interconnections. In a telling paragraph the MFC report suggests, 'The approach of examining say 200 eyes or 200 lungs and so on independent of one another lacks this integration. Strange it may sound, but it seems to derive the rationale – unconsciously – from the pulmonary model, wherein toxic gas directly hits the target organ (lungs, eyes etc) to produce damage without any intrinsic connections – which is at the heart of the 'cyanogen pool' model'.

It is this anthropology of gestalts that is fascinating about the report. What it offered were two clusters which deserve further exploration:

Patient as an analytical grid --> patient as a person
 Clinical gaze of the doctors --> victim's speech aids diagnosis
 Focus of diagnosis is the hospital --> focus of diagnosis is the community
 Diagnoses as mechanics of cause and effect --> diagnosis as an analysis
 of inter-relationships
 Pulmonary Model --> Cyanogen Pool Model
 Anti Thiosulphate --> Use of Sodium Thiosulphate as a critical tool"

"How many Bhopals will it take to shake us out of our apathy?" (9)

Advocacy for the right to health of the affected community

CHC took up the editorial chair of the mfc bulletin at the end of 1984. Following the Bhopal⁵ Gas Disaster⁶, the editorial of the January 1985 edition of the mfc bulletin (10) expressed that it was time to question:

- the corporations, about their ethics and functioning,
- the government, about transparency and their role in protecting people, and
- the people, about their awareness and role in remediation.

mfc was a signatory to the public statement released on December 22, 1984 by 14 civil society groups in Bombay (now Mumbai). Stating that the tragedy at Bhopal was not an accident but a crime against people, civil society was urged to press for the following demands made in the statement:

- Establish citizens committees for monitoring rehabilitation work



Figure 2: mfc bulletin - January 1985

5. Bhopal is the capital of Madhya Pradesh state of India.
 6. The factory responsible for the disaster was owned by Union Carbide, an American based multinational company. This facility produced compounds which would eventually be used in manufacturing pesticides.

- Punishment for guilty parties, including the corporation, state governmental authorities and central governmental authorities
- Rehabilitation, compensation, and aid for victims
- Upholding the right to information
- Review existing laws
- Conducting environmental and epidemiological studies around existing and proposed industrial sites
- Upholding rights for workers, unions and citizens committees

Health problems of the victims

Several health problems were noticed by victims, doctors and researchers. The mortality itself was high, but morbidity reflected multiple target organs – problems with vision, breathing, digestion, aches and pains, generalised weakness, menstrual abnormalities, in-utero problems, lactation failure and psychological effects (11). These were managed symptomatically by the medical fraternity. Breathing problems persisted amongst many of the exposed, even months after the disaster. No information was made available to women who were pregnant at the time of the disaster about the potential effects of the chemical on the outcome of pregnancy. The option of Medical Termination of Pregnancy (MTP, or elective abortion) was not discussed with them by the medical officers.

Gaps in knowledge and communication

The mfc study in Bhopal⁷ and other research revealed that a lack of communication was a major obstacle in the intervention and rehabilitation activities there (12). A continuing education strategy for the local doctors and the affected people was recommended as a necessary intervention to meet this gap. The lack of translation of existing knowledge into supportive intervention was another major gap. Mental health too was identified as a neglected dimension of the rehabilitation efforts. These shortcomings led to ignorance, confusion, controversy and anarchy, and reduced the effect of intervention at the field level.

A community health approach was suggested as the best method of communication between various levels of stakeholders, keeping the participation and needs of the

⁷. Details of this mfc study are available in the next section of the report titled ‘Research efforts to guide and support remediation’

community in mind. It was recommended that one “must see the situation in totality to understand true measure of the problem”. Integrated community based epidemiologically sound research and collaboration between governmental and voluntary agencies was also suggested.

However, availability of information did not improve greatly with time (13). To make matters worse, there was rampant miscommunication in media, and withholding of information by the company and the government. An effort was made to inform the local doctors, victims and health workers about the health situation following the disaster, through a Hindi publication by Eklavya and mfc called *Hamari Sehat Hamari Ladai* (*Our Health, Our Struggle*) (14).



Figure 3: Cover of *Hamari Sehat Hamari Ladai*



Figure 4: A collage prepared from the pages of *Hamari Sehat Hamari Ladai*

Figure 4 presents a sample of the illustration and text from *'Hamari Sehat Hamari Ladai'*. It was a comprehensive illustrated manual on the health problems faced by the affected communities. The intention was to empower them with the requisite knowledge. The information provided was not just about the diseases and treatment, but also about the peoples' right to information and the right to appropriate healthcare. The manual was an innovative intervention in communication, and was probably the first time in the country where such an effort was made in knowledge translation for people affected in an environmental health tragedy. mfc, through this and other efforts, may have provided the only credible medical and health related information to the community (8).

Continued discussions within mfc

The theme for the January 1986 mfc meeting at Khandala was *'Issues in Environmental Health – a case study of Pesticides'*. The theme was decided due to concerns that emanated not just from the Bhopal tragedy, but by the developmental model being adopted in India which appeared to neglect health impacts to marginalized communities. The focus of the discussion was the researching of environmental health problems, using pesticide exposure as case study. An issue of the mfc bulletin (15) was dedicated to this topic, excerpts from which are presented in Box.3. A compilation of papers (16) was also released during the meeting.

Advocacy efforts in the Bhopal Campaign continue to be strong, and this campaign has exposed the shocking lack of accountability of the government. Though there have recently been some small positive turns for the affected community, the events following this disaster leave a disturbing question in mind: For whom is the government really for - People or Corporates?

Box.3: Contents and Excerpts from the “Pesticides and Health” issue of the mfc Bulletin (15)

Health of the Environment: A Statement of Concern -

“The question clearly is: What sort of development do we want?”

Editorial

“Why Environmental Health? Why Pesticides?”

Those of us involved in health and health care issues cannot fail to recognize the gravity of this situation or do we? Since this ecological insensitiveness is at the cost of human health.”

Common pesticides: The Health and Environmental Hazards

“DDT – Environmentally persistent; virtually non-degradable; suspected carcinogenicity; hazardous to avian life”

Pesticides used in India and banned abroad

DDT: banned in Australia, Colombia, Greece, UK, USSR, Poland, Switzerland, USA

Pesticides and Health: some case studies

Occupational Health: “...found that there is an unnecessary risk to workers health”.

Environmental Health: “This crippling deformity, later given the rather long winded name of ‘Endemic Familial Arthritis of Malnad’ (EFAM) appears to be linked with pesticide use.”

Beating the pesticide mafia – need for consumer action

“As consumers we should ask ourselves whether we wish to continue allowing ourselves to be poisoned.”

The Dirty Dozen Campaign

“The selection of the 12 most hazardous pesticides have been made to carry out an international public education, media and lobby campaign to pressure governments and manufacturing industries to act more responsibly...”

“The disaster became a tragedy only later” (8) due to the poor decisions and rehabilitation efforts made by the government, for which, the affected communities continue to pay the price.

Research efforts to guide and support remediation

From the mfc bulletin

Updates from ongoing research work by mfc members and the rest of the scientific community were published in the mfc bulletin. Abhay Bang of mfc reported that the symptomatic treatment given to victims of the tragedy, and the lack of documentation and certification of victims was making the situation worse (17). Findings of a study on Womens’ Health (18) by Rani Bang and Mira Sadgopal of mfc found that gynaecological symptoms and signs were significantly higher among the affected population in

comparison to a ‘control’⁸ population. The Nagrik (citizen) Study (19) facilitated by the Voluntary Health Association of India highlighted that the thiocyanate levels were relatively high in the subsoil lakes, filtered water and blood (where they were three times as compared to controls from Bombay). This was the first clear evidence of the magnitude and nature of environmental contamination in the area. A plea was made to the research community to share findings with the affected community.

The mfc Bhopal Study

The field work for the mfc Bhopal study (20) was carried out in March 1985 and the report (21)(22) was published in October 1985. CHC was involved in the analytical and advisory roles of this cross-sectional study. The objectives of the study were to:

- assess the current health status on a sound epidemiological basis,
- assess findings in the light of the controversy between the *pulmonary pathology theory and chronic cyanide poisoning (cyanogen pool) theory*
- evolve a critique of the ongoing medical research and relief, identify important factors influencing the relief and rehabilitation,
- assess peoples’ perceptions about the ongoing health services, and
- make suggestions for more meaningful relief, research and rehabilitation policy.

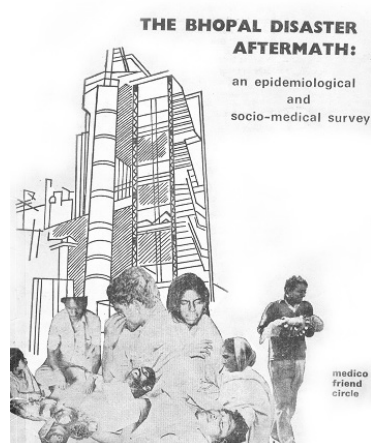


Figure 5: Cover of the mfc Bhopal study report

Summary of the study report:

JP Nagar and Anna Nagar, two areas of Bhopal, were selected as the ‘study’ and ‘control’ areas respectively, due to their similar socio-demographic structures but different exposure histories to the gas. Study participants were questioned on various symptoms (covering all organ systems), following which physician examination, lung-function tests and haemoglobin tests were conducted. The collected information was quantified and statistical comparisons were made between the study and control areas. A survey was

⁸. One of the methods in Environmental Epidemiology is to compare the health situation in two similar areas, one which is exposed to the hazard/intervention in question and one which is not exposed. This may help the researchers further understand the health impact of the hazardous exposure.

also conducted with a Peoples' Perceptions questionnaire to evaluate ongoing relief and rehabilitation services.

The analysis showed that 21 of the 26 symptoms inquired about were significantly⁹ higher in the study area, and that "every individual from the study area reported at least one serious symptom whereas there were many who did not report any symptom from the control area" (21:p.26). "The simultaneous presence of all serious symptoms suggesting involvement of not only lungs but gastro-intestinal tract, brain and vision in as large as 62 percent of the sample population of the study area cannot be explained by the Pulmonary Theory" (21:p.40). The evidence supporting the cyanogens pool theory¹⁰ was mainly indirect (21:p.41), but the presence of a wide variety of unconnected symptoms was its main support.

Questions were also raised about victims' compensation, the thiosulphate controversy and on further health research in Bhopal. Several recommendations were made to improve the situation of ill-health and injustice at Bhopal, and these have been summarized in Box.4.

Box.4: Recommendations from the report of the Bhopal epidemiological study by mfc (21)

Research

1. Focus should shift from hospital based studies of seriously ill patients to family/ community based ambulatory patients.
2. Clinical studies to validate use of sodium thiosulphate for mass therapy.

Care, Surveillance and Rehabilitation

3. Psychosocial assessment, counselling and rehabilitation are urgently required
4. Mass treatment with thiosulphate based on ICMR guidelines, maintaining good records.
5. Monitoring and surveillance programmes for assessing risks to pregnant mothers, unborn babies and newborn babies, and gynecological problems.
6. Important to have long term surveillance of lung function and eye symptoms

⁹. Statistical tests are applied to check if the difference in proportions of a particular health problem between two areas can be explained as a chance occurring. The outcome of these statistical tests is a probability figure or 'p-value'.

¹⁰. Health effects due to long term exposure to cyanide compounds within the body following environmental exposure

7. Comprehensive list of all victims for mass treatment, compensation and rehabilitation.

Communication

8. Evolve a continuing education strategy for all governmental and non-governmental health personnel through newsletters and informal group meetings. Identified areas include:

- i) Sodium thiosulphate therapy; Management of lactation failure
- ii) Identification and management of psycho-social stress
- iii) Risks to mothers and unborn foetus and need for surveillance
- iv) Family planning advice till completion of detoxification
- v) Role of respiratory physiotherapy, Caution against overdrugging
- vi) Need for surveillance of high risk groups, Importance of medical records

9. Dynamic creative nonformal health education of affected community with information built around their lifestyle, culture and socio-economic status. The areas identified include:

- i) Sodium thiosulphate therapy; Respiratory physiotherapy
- ii) Ongoing research programmes and informed consent
- iii) Risk to unborn and new born babies; Family planning advice
- iv) Management of lactation failure including low cost weaning foods
- v) Importance of records and regular checkups

10. Occupational rehabilitation and compensation: to be done imaginatively keeping in mind their previous occupations and the residual disabilities.

Coordination

11. The government must adopt a policy of enlisting the help of all non-governmental agencies and groups wishing to work in Bhopal. This process must be active and supportive.

12. It is imperative that the victims as well as the entire country must be provided with all the details of how the accident occurred, of the nature of the chemicals released and of the reasons why the detoxification by sodium thiosulphate has been so badly mismanaged.

Addressing gaps in knowledge

The pathogenesis¹¹ due to gas exposure was argued around three hypotheses in the mfc report:

- Lung damage
- Increased cyanide in the body (cyanogen pool)
- Psychological effects post disaster

Following the mfc study, attempts were made to address the identified knowledge gaps. A literature review was conducted on the use of the hypothesised antidote sodium thiosulphate¹² (23). Symptoms and signs in victims indicated that the causative factor for the health problems was cyanide poisoning. The results of three other studies also suggested multi-system findings. Also, in several separate cases significant improvement in health was noticed following treatment with thiosulphate. A double-blinded clinical trial¹³ by ICMR also clearly suggested that thiosulphate significantly reduced symptoms in patients. Guidelines were prepared and provided to local doctors on the use of thiosulphate for treating victims.

A literature review titled '*Health impact of Bhopal disaster – an epidemiological perspective*' (24) was prepared 1987¹⁴. The paper summarised the health situation in Bhopal.

There was limited knowledge of the health effects of the chemical exposure that occurred. The identity of the released chemicals itself was a subject of debate. Medical personnel also found themselves unable to handle this unusual situation, pointing towards the inadequate training and preparation for industrial disasters. The economically disadvantaged communities bore a double burden of disease – malnutrition and exposure to hazards of industrialization. Therefore there was an urgent need for a toxicological investigation to aid rational therapeutic care (treatment and rehabilitation) of the victims. The symptoms and signs of exposure in victims, pathological findings in organ systems during examination and autopsy, and analysis of chemical agents provided clues to answer the above questions.

¹¹. Pathogenesis implies the mechanism through which a disease evolves

¹². Sodium thiosulphate reacts with the cyanate ions in the body to produce thiocyanate, which gets excreted through the urine.

¹³. This method is considered the gold standard in Epidemiology. An intervention is randomly allocated to the study population, and results provide evidence on the effectiveness/efficacy of the intervention.

¹⁴. This was prepared by Dr Thelma Narayan as a part of her MSc thesis at LSHTM

The report described the disaster as an explosive, acute, point epidemic. The state government classified the degree of exposure of various areas using mortality rates of each area. Many additional factors were not taken into consideration though. For example, each grave used on the night of the tragedy was counted as one death though several bodies were buried in each.

Also, many families had fled from the scene, which led to the victims list being incomplete. Information on wind direction and atmospheric conditions were neither disclosed nor considered while classifying exposure. The demarcation of the total exposed area itself was a difficult exercise, the reasons for which were:

- No clear idea about the distance beyond which there was no exposure/effect¹⁵
- Mass migration post disaster led to a decrease in exposed population.

Box.5 shows the data on death counts following the Bhopal disaster from published reports. The variations in the figures illustrate the importance of defining the method of estimation when such data is presented. Without adequate description, such figures become non-interpretable.

Box.5: Mortality in Bhopal (24)

Death rates reported in various studies differed from each other based on:

- study design (including time of study) and sample
- reporting of deaths in various hospitals

Table: Data of post-exposure mortality in Bhopal from pre-1986 studies

Investigator	Time of study	Crude post exposure death rates
MP state government	Early post disaster	Severe: 23.4/1000 Less hit: 3.2/1000
ICMR	Shortly after disaster	48.5/1000 (males) 40.5/1000 (females)
Anderson et al	10 days post exposure	Worst hit areas: 30/1000
Banerji et al	1 month post exposure	Severely hit areas: 65.3/1000
Patel A et al	3 months post exposure	Severely hit: 86.6/1000 Less hit: 7.6/1000
Sathyamala et al	9 months post exposure	Severely hit area: 33.8/1000

¹⁵. This is a constant dilemma encountered for most environmental exposures.

A review of the available epidemiological evidence on the health impact of the Bhopal disaster was also a part of the same MSc paper. The conclusions of the paper have been listed in Box.6.

Research following the Bhopal tragedy saw the use of epidemiological, qualitative and participatory techniques. Evidence was built over time, both by the government and the civil society, but translation of knowledge into action was inexplicably and inexcusably lethargic by the government.

Box.6: Conclusion of the paper ‘Health Impact of Bhopal Disaster – An Epidemiological Perspective’, by Dr Thelma Narayan (24)

The Bhopal disaster has been a human tragedy of immense dimensions. The suffering caused is incalculable. Important tasks remain ahead for the provision of the best possible care for the victims and for the prevention of such events in the future.

There is a need, first, for the measurement, understanding and documentation of the impact of the disaster on the health of those exposed, so as to be able to provide rational care. It is necessary also to document the seriousness of the effects so as to prevent an easy erasure from human memory of the event. Epidemiological skills could help in this effort as described in this report.

At the present time it is known that similar small-scale ‘technological disasters’ occur frequently. Larger scale disasters could also occur. Hence, along with the deeper causes of these disasters being tackled, there is a need to have a strategy to deal with such events.

Outlines for this are as follows:

It is necessary to have epidemiological data for an adequate understanding of the effects on human health. This would include data regarding the numbers and demographic structure of the population at risk, the age/sex/area distribution of the fatalities if they occur, and similar data regarding morbidity.

Through collaboration between clinicians and epidemiologists, it would be necessary to evolve simple, standard criteria for assessment and documentation of morbidity.

Similarly, a method to assess exposure needs to be evolved.

Collaboration and communication between administrators, service providers and researchers is important.

Close contact and communication with the affected people is the most important factor. In the absence of this, one could easily slip into esoteric, theoretical exercises, which are meaningless to the problem at hand.

These efforts have to be seen in the context of the broader issues raised by such events. In Bhopal, these would include: the economic relationship between multinationals and countries of the third world which determine factors like technologies and safety systems used; the exploitative relationship with the workforce and the local community to maintain high profit margins; the siting and safety systems of hazardous chemical plants; legislation regarding an implementation of safety controls; the workers, and communities, right to information; the role of pesticides; and the acceptable limits to the chemicalisation of our world. The true causes of the disaster and the scope to prevent such events in the future are/be in the matrix of these issues.

Solidarity with the campaign for community health justice

For their involvement with research and advocacy in Bhopal and encouraging the use of thiosulphate in treating exposed individuals, some mfc members were arrested and monitoring by intelligence officials over a period of few years (7).

Solidarity through media

Mfc constantly reminded the media and society about the impacts and consequences of the Bhopal tragedy (25). They also critiqued the role that was played by the media in communicating news from Bhopal (26)(27), as the media are important stakeholders in campaigns for social justice. Emphasising the importance of availability and accessibility of scientific information, mfc stated that, “*Illness of some people are given more importance than those of poor people and nameless*” (26). It was re-iterated that industrial and environmental hazards were not an unavoidable occurrence but rather organized violence against fundamental rights of humanity, health and access to justice (28). All in all, the “Communicating Bhopal” experience was a mixed bag, the media playing a supportive role in some situations and falling short in some others.

Solidarity through international conferences

The Permanent Peoples Tribunal (29) published two CHC-SOCHARA papers (24)(30) in the tribunal report (Figure 6), one on the epidemiological evidence of health impacts, and the other on industrial hazards.

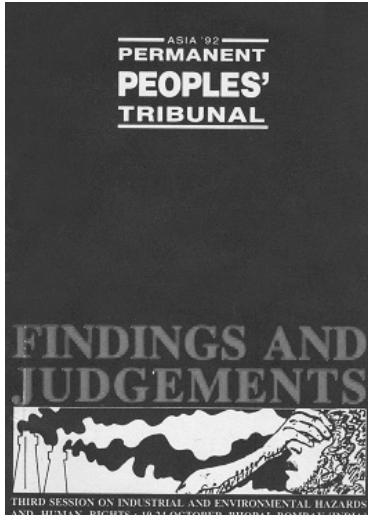


Figure 6: Cover of the PPT-Asia Report

The International Medical Commission on Bhopal, an international advocacy group comprising of doctors originally from Bhopal, organised a conference on the theme, for which a scientific review prepared by CHC-SOCHARA was included. The review was on disaster-related mortality and morbidity in Bhopal, and the response by the government and other groups (31). Additionally, inadequacies of the program, poor delivery of services, lack of documentation, absence of data (which would have helped in planning remediation measures), lack of “social accountability of research” (a feature common to disaster situations) and lack of support for basic needs were highlighted.

Over the years, direct work with the affected community at Bhopal has ceased, but solidarity with the networks for justice in Bhopal, the Sambhavna trust and the Bhopalis still remains. Fellows in the Community Health Fellowship Programme¹⁶ at CPHE-SOCHARA¹⁷ Bhopal are taken for field visits to these organisations and have the option of being posted with them. Events such as Bhopal Remembrance Day are conducted to mark the occasion of the tragedy, which bring together pollution impacted communities from different parts of Karnataka state (32).

Box.7: Pollution by Harihar Polyfibres in Dharwad, Karnataka

It was not much after the Bhopal Gas Tragedy that mfc were approached by Gopi Krishna of the Transnational Centre for Non violent Social Change, Harihar, Dharwad district. The complaint was against a rayon factory Harihar Polyfibres (Grasim) polluting river Tungabhadra and the local environment. Health effects of the toxic pollution occurring there had not been documented. CHC was then just a four member team of which only two had technical knowledge on epidemiology, and so only limited technical guidance was offered. A draft plan to understand the health situation there was also presented at the mfc meeting in 1986 (33). Regional Occupational Health Centre, Bangalore was requested to carry out the project which was conducted later (6)(34) following approval from ICMR.

¹⁶. The two-year fellowship programme at CPHE Bhopal was started in 2008, admitting twenty from Madhya Pradesh who are trained and mentored towards becoming community health practitioners.

¹⁷. CPHE or Centre for Public Health and Equity is another functional unit of SOCHARA started in Bangalore and Bhopal in 2008.

Box.8: Ionising radiation and health

An mfc meeting on *Radiation and Health* was conducted in 1984. Surendra Gadekar, a scholar-activist from North Karnataka and a member of the antinuclear energy network, felt that the Atomic Energy Commission of India had underestimated the health and environmental risks of nuclear energy. CHC, with others, had contributed towards the planning of a health impacts study of nuclear energy plants (7).

Also, Mr. Padmanabhan, a scientist working on cancer in Allepy, Kerala (due to the presence of thorium in the sands) and Kochi (due to the enriching plant, Indian Rare Earth) used technical feedback from CHC while researching the incidence of Mongolism and cancer in the fishermens' community in Allepy (7).