

SUMMARY

During the night of December 2-3, 1984 the world's worst industrial disaster took place in the city of Bhopal in Central India. Large amount of toxic gas leaked from the plant into the surrounding area, which was densely populated. More than 2,000 died immediately and over 200,000 populations were directly affected in a city of 700,000 population. The disaster-affected population have been investigated for the effect of the disaster on their physical and psychological health. Community level studies carried within one month of the disaster to 10 years after the disaster report higher levels of physical and mental health morbidity. Though efforts to provide psychological support to the affected population were initiated using the primary care personnel by focussed training programmes, a system of comprehensive community based health care in general and mental health care in particular, is still not in place. In addition there is need for continuing the research studies into the long-term effects of the disaster and the morbidity in the affected population. The magnitude of the Bhopal disaster and the research efforts to understand the health effects have resulted in greater awareness in India of the psychological aspects of disasters and to include psychological support as part of relief and rehabilitation activities following all disasters.

The Setting:

Bhopal gas leak disaster is the greatest industrial disaster in human history .On the night of 2/3 December 1984, about 40 tons of methyl isocyanate (MIC) from tank 610 of Union Carbide India Limited (UCIL) factory at Bhopal, in central India, leaked into the surrounding environment. This leak of an " *extremely hazardous chemical* " which occurred over a short span of few hours killing more than 2,000 people covered the city of Bhopal in a cloud of poisonous gas.

The Bhopal disaster is of importance from mental health point for a number of reasons.

Firstly, it is one of the largest man-made disasters in a developing country.

Secondly, the disaster effects were a combination of both the substances inhaled and the psychological effects of living through a disaster experience.

Thirdly, no formal mental health infrastructure was available to provide post-disaster mental health care.

Fourthly, a number of innovative approaches were developed to provide mental health care, especially suitable for use in developing countries.

Fifthly, this disaster was the subject of intensive health research in a prospective manner for the first five years.

This research included mental health aspects of the disaster on the population.

The scope of the article will be to describe the mental health effects, the interventions undertaken and identify issues for future research and interventions. A detailed description of the disaster is covered by other authors in this volume and elsewhere (Srinivasa Murthy,2002).

HEALTH EFFECTS:

The immediate impact of the exposure to the toxic chemical affected mainly the eyes, lungs and the gastrointestinal systems. The health effects have been recorded systematically by individual doctors, researchers from India and abroad as well as the *Indian Council of Medical Research*, New Delhi (ICMR). The reported effects of the toxic chemical inhalation involved eyes¹, respiratory system² and general health³. They all report a higher morbidity in the affected population and a gradient of the adverse effects in relation to the exposure amount. The other health studies included gynaecological and obstetric problems⁴, incidence rates of cancer⁵, chromosomal variations⁶, and immunological changes⁷. These have been extensively reviewed in this document and elsewhere (SrinivasaMurthy, 2002)

IMPACT ON MENTAL HEALTH

Bhopal disaster is the first disaster in India to be studied systematically for the mental health effects. Information is available about the mental health effects from a number of sources. These are from studies as part of general health surveys as well as specific studies on mental health. The direct involvement of the psychiatrists/neurologists at the

field level did not occur till about 8 weeks after the disaster. This delay was in spite of the recognition of the importance of mental health effects of the disaster within the first fortnight of the disaster. By coincidence the Fourth Advisory Committee on Mental Health of ICMR was meeting on December 12-14, 1984. The experts in the meeting recognised the need of the affected population as follows:

*"the recent developments at Bhopal involving the exposure of 'normal' human beings to substances toxic to all the exposed and fatal to many, raises a number of mental health needs. The service needs and research can be viewed both in the short-term and long-term perspectives. The acute needs are the understanding and provision of care for confusional states, reactive psychoses, anxiety-depression reactions and grief reactions. Long term needs arise from the following areas, namely, (i) psychological reactions to the acute and chronic disabilities, (ii) psychological problems of the exposed subjects, currently not affected, to the uncertainties of the future, (iii) effects of broken social units on children and adults, and (iv) psychological problems related to rehabilitation"*⁸.

However, in spite of this early recognition of the need for mental health interventions there was a delay of 6-8 weeks before mental health professionals were involved. An important reason for this was the lack of mental health professionals in the state of Madhya Pradesh and the city of Bhopal. At that point of time none of the 5 medical colleges had a psychiatrist in their faculty.

GENERAL HEALTH STUDIES INCLUDING MENTAL HEALTH ASPECTS:

Andersson et al. (1988) reported the first community survey within two weeks of the disaster. The survey was conducted in eight exposed areas and two non-exposed clusters of households. There was a two month follow-up. The focus of the survey was eye and lung problems. As part of this study authors note that the pupillary reflex was normal. Based on this they conclude, *"the fact that this reflex was normal in all groups can not be taken as evidence that neurotoxicity did not occur"*.

Misra et al (1988) report on 33 adult patients treated during the acute phase at the Medical College Hospital. They found that symptoms of severe cough and dyspnoea were followed by fainting in 55% of the patients. The duration of unconsciousness ranged from 30 minutes to 3 days. One patient who had suffered from prolonged

unconsciousness had myoclonic jerks localised to the right upper extremity and generalised hyperreflexia, suggestive of encephalopathy. Three patients who had prolonged unconsciousness and brisk deep tendon jerks and extensor plantar response. Mild to moderate headache (55%), giddiness (46%), burning sensation in hands and feet (9%) and hypoanaesthesia (3%) were also reported. At the 3 month follow-up of this group of patients, depression and irritability were the commonly reported symptoms.

Gupta et al (1988) studied systematically 687 affected persons of various age groups and from different affected areas at two months after the disaster and another 592 persons after the 4 month period. These studies included "behavioural studies". There was a control population. The behavioural studies were carried out in 350 adults. The psychological tests used were to "detect non-intellectual personality disturbances, changes in mood, readiness for affective reactions, neuroticism and the dimension of extroversion/ introversion. The specific tests administered were digit span test, Benton visual retention test, digit symbol test, Bourdon Wiersma vigilance test, simple reaction time, Santa Ana test, Rorschach and Eysenck personality inventory. The behavioural tests showed that memory, mainly visual perceptual and attention/response speed along with attention/vigilance were severally affected in the gas-exposed population. Further statistically significant differences were observed between the controls and the exposed groups on all the parameters tested. The gas exposed groups; especially the females had poor scores in the auditory memory tests. The exposed male group showed significant low visual memory as compared to controls and females. The visual memory was more affected than the auditory memory. Perceptual motor speed was significantly lower in the gas-exposed group. All these changes were associated with subjective complaints of lack of concentration and poor attention. In the manual dexterity tests there were no differences across the groups. The questionnaire (EPI) results showed that 79.6% had poor scores on general lability items, whereas 88.6% with poor scores had a tendency to general fatigue with somatic complaints. Only 4.5% had neurotic tendencies. As a group women were more affected than men and this difference was statistically significant.

Cullinan et al (1996) carried out an epidemiological study of a representative gas-exposed population, nine years after the disaster, in January 1994. They studied 474 subjects and a control group. Of this sample, 76 were subjected to detailed neurological testing which included vestibular and peripheral sensory function and tests for short-term memory. In this study a high proportion of subjects reported a wide variety of neuropsychiatric symptoms like abnormal smell, abnormal taste, faintness, headache, difficulty to stay awake and abnormal balance. Headache was reported by 80% of the subjects as compared to 50% in the control population. Neurological examination showed

that a high proportion was judged to have clinical evidence of central, peripheral or vestibular neurological disease. The mean short-term memory scores were lowest among those heavily exposed (1.0 Vs 3.0). There was some evidence of impaired extrapyramidal functions. There was also abnormal vertical drawing test among the exposed.

In this group the psychological symptoms reported were fatigue (88%), anxiety (65%), difficulty in concentration (64%). Difficulty in decision-making was reported in 80% as compared to 35% in the control population. Irritability was reported by 33% as compared to nil in the control group. There was a consistent gradient across the separate exposure groups for all symptoms except depression. Approximately 25% reported symptoms of depression.

MENTAL HEALTH STUDIES:

The initial assessment of in the first week of February 1985 (about eight weeks after the disaster). R. Srinivasa Murthy (RSM), of the National Institute of Mental Health and Neuro Sciences (NIMHANS), Bangalore, and Professor B. B. Sethi (BBS), of K.G. Medical College (KGMC), Lucknow. They visited the City had interacted with the general population, the patients attending the health facilities and the medical personnel to understand the magnitude and nature of the mental health problems in the affected population. Their observations, over a week's time, were based on clinical and unstructured interviews. These initial observations led to an estimate of the magnitude of mental health needs of the population at 50% of those in the community and of about 20% of those attending medical facilities (SrinivasaMurthy, 1990).

Immediately following these observations, during February-April 1985, a KGMC team carried out systematic studies. As a first step, ten general medical clinics in the disaster-affected area were chosen. A team consisting of a psychiatrist, a clinical psychologist, and a social worker visited one clinic a day, by rotation in a randomized fashion, on three occasions and screened all the newly registered adult patients with the help of a self-reporting questionnaire (SRQ). Subjects identified as probable psychiatric patients were then evaluated in detail by the psychiatrist with the help of a standardized psychiatric interview, the Present State Examination (PSE)⁹. Clinical diagnoses were based on the International Classification of Diseases (9th revision) (ICD-9)(WHO, 1975).

During a period of 3 months (February-May 1985), of the 855 patients screened at the 10 clinics, on the

basis of their SRQ scores, 259 were identified as having a potential mental disorder. Of these potentially mentally ill people, 44 could not be evaluated, and 215 were assessed using the PSE. The confirmed number of psychiatric patients was 193, yielding a prevalence rate of 22.6%. Most of the patients were females (8.11%) under 45 years of age (74%). The main diagnostic categories were anxiety neurosis (25%), depressive neurosis (37%), adjustment reaction with prolonged depression (20%), and adjustment reaction with predominant disturbance of emotions (16%). Cases of psychosis were rare, and they were not related to the disaster⁹.

During the same period, in the third month of the post-disaster period, neurological studies were carried out¹⁰. This was a survey of the gas-affected patients admitted to the various hospitals in the Bhopal City. A total of 129 adults and 47 children were studied for neurological problems. Evidence of involvement of the central nervous system was present in three patients in the form of stroke, encephalopathy and cerebellar ataxia. Affection of the peripheral nervous system was observed in 6 patients. Vertigo and hearing loss occurred in 4 patients. Many patients reported transitory symptoms like loss of consciousness (50%), muscle weakness, tremors, vertigo, ataxia and easy fatigability. Most of these symptoms cleared up after varying periods of time. Of the 47 gas affected children, loss of consciousness at some time or other occurred in half of the patients. Fits occurred during the course of the illness in 3 children. Mental regression was observed in one child who had commenced speaking in sentences but stopped talking after the disaster. There were no abnormalities in the neurological examination in all of the children. An important observation by the doctors who had examined the children during the early phase of illness was generalized hypotonia and weakness. Two children were noted to be "floppy" with weakness of limb movements and had difficulty in getting up from the ground. Of the 3 patients who had central nervous system involvement, the patient with stroke died. His autopsy showed intense congestion and petechial hemorrhages of the gray and white matter with frank hemorrhage in the circle of Willis area, perhaps indicating the sustained microvascular damage by the circulating MIC.

Subsequently, from June 1985, the Lucknow team with the funding from ICMR, New Delhi team conducted a detailed community-level epidemiological study, along with the community level epidemiological study for other health effects. This study included recording of the complaints of subjects, and the record of illnesses and deaths in 100 000 population in the different areas of Bhopal. A fresh census of the total population was undertaken prior to the study. The sampling frame was drawn in such a manner that populations variously exposed to the disaster were included along with a control group located far away from the gas-exposed area, but from the City itself.

The methodology used for screening of the households was interview with the head of the household for the presence of symptoms from a standardized checklist. Those found to have symptoms were further seen by a qualified psychiatrist who administered a detailed mental status examination instrument (PSE-9th version) and arrived at the ICD- 9th Version diagnosis. Each year a new set of families were sampled and studied in addition to follow-up of the patients diagnosed in the previous years.

The results of the first-year survey involved 4,098 adults from 1,201 households. A total of 387 patients were diagnosed to be suffering from mental disorders, giving a prevalence rate of 94/1,000 population. Most of the population consisted of females (71%); 83% were in the age group 16-45 years. Ninety-four percent of the patients received a diagnosis of neurosis (neurotic depression, 51%; anxiety state, 41% and hysteria, 2%) and had a temporal correlation with the disaster. For the next three years, the team repeated the annual surveys and follow-up of the initial patients identified by the community survey. Detailed case vignettes and descriptive accounts of the patients from the Bhopal disaster were prepared.

These general population psychiatric epidemiological studies show that the gas exposed population were having significantly higher prevalence rates for psychiatric disorders in comparison to the general population. The gradient relationship of higher rates of psychiatric morbidity with severity of exposure to the poisonous gas was maintained throughout the 5 years of the survey period. At the end of the five-year period the number recovering fully recovered was small and large numbers continued to experience the symptoms along with significant disability in functioning.

MENTAL HEALTH INTERVENTIONS

One of the challenges faced by the team of psychiatrists was the provision of psychiatric services to the affected population. For a total population of 700,000 and the affected population of about 200,000, there was no psychiatric help available in the city.

A number measures were taken to meet this challenge.

Firstly, the senior psychiatrists (RSM and BBS) worked to prepare clinical vignettes of patients to sensitize the

medical professionals and the administrators. Because of the issues of compensation, majority of the administrators and medical professionals considered that the complaints, especially the psychiatric symptoms were imaginary and compensation related. This misconception was corrected by demonstrating the real nature of the symptoms and the universality of the disaster aftereffects on the mental health of the affected population.

Secondly, starting from February 1985, teams of psychiatrists, clinical psychologists, psychiatric social workers from Lucknow were located in the city for periods of 2-4 weeks to provide psychiatric care to the affected population. This was a short-term measure (Sethi et al, 1987).

Third measure was to take up the training of the general medical officers working with the affected population with the essential skills for of mental health care. This was indeed very challenging but was a rapid way of increasing the mental health care in the city.

In view of this importance and it was carried out for the first time in India, and possibly in a developing country, it is described in detail.

Soon after the disaster, additional medical officers were moved to the city and located in the different gas affected areas to provide general medical care to the population. In April 1985, about 50 medical officers were working in the various health facilities in the gas-affected areas. Most of the doctors had no training in mental health as part of their initial medical training, as there were no teachers of psychiatry in the State medical colleges. This lack of training was reflected in their poor perception of the emotional needs of the disaster-affected population. The basic orientation of these doctors was highly medical/biological. In the pre-training interviews most of them expressed the view that distribution of monetary compensation would solve the physical complaints of a large number of their patients. Some expressed the view that the free rations (food grains and other essentials) provided by the state was the reason for the complaints of weaknesses and inability to work reported by most patients. The medical officers believed that the "lethargy" of their patients would disappear not by treatment from doctors or by the use of drugs but by *"stopping the free rations and distribution of compensation money"*.

The basic aim of the training was to enhance the sensitivity of the medical officers to the emotional needs of individuals and to provide the skills to recognize, diagnose, treat and refer (when required) the mental health problems¹¹. The period of initial training was six working days. It was decided that the training should be as

practical as possible and should be imparted to groups not exceeding 20 persons. The methodology of training took into account principles of 'adult learning' viz., an open learning environment in which participants were free to share their needs and experiences, with greater stress on interactive learning. The predominantly lecture approach was changed to case studies and group discussions facilitated by audio-visual, audio taped material of affected population with maximum learner involvement.

The actual training was carried out in two batches by two consultant psychiatrists (i.e. the authors). A manual was prepared for this training on the basis of our experience of training on the basis of experience of training primary care physicians medical officers at National Institute of Mental Health and Neurosciences (NIMHANS), Bangalore. (Issac, Chandrasekar & Srinivasa Murthy, 1984). Additional sections on 'emotional reactions to sudden severe stress'; 'emotional reactions of children to stress and emotional reactions to physical problems' were written and incorporated in the manual. The manual in its draft form was used for the training. A revised manual incorporating the experience of the training and the needs of the medical officers was prepared subsequently and distributed to all the doctors working with the gas affected population (Srinivasa Murthy et al, 1987). For the purpose of the evaluation of the existing pre-training psychiatric knowledge, video presentation of 10 cases was utilized. These included video interviews of the gas-affected population and standard interviews with those having different psychiatric problems.

Each day in the morning, the two faculty members visited the different health facilities and worked with the medical officers to help them learn the interview techniques and counseling methods. This 'live' experience was considered to be very useful by the medical officers. Post-training evaluation of the training was carried out by a simple questionnaire. A total of 38 medical officers took part in the training.

Some of the comments of the participants in the post-training evaluation supported the usefulness of the training. Most of them felt that with the training, they could be of much more capable of treating psychiatric illness and other patients having medical problems as well. Some doctors expressed that earlier, they used to give the patients only symptomatic treatment, but after the training they were able to think and diagnose the condition in terms of a psychological approach. Some doctors mentioned that earlier to the training, they were not aware of any psychiatric problems and were of the opinion that the patients were malingering and giving vague symptoms to evoke sympathetic response and get more medicines. All the doctors who took part in the training agreed that there was

need for privacy for interviews support from psychiatrists for difficult cases and there should be a regular supply of psychotropic drugs.

UNRESOLVED ISSUES:

There are a number of unresolved issues of the Bhopal disaster. Bhopal disaster continues to occupy the public space and the people cry out for relief and rehabilitation.

Three of them are of importance.

Firstly, there is an international level debate about the right to know. The Bhopal disaster jolted activist groups around the world into renewing their demands for right-to-know legislation granting broader access to information about hazardous technologies¹².

Secondly, the need for continuing study of the health effects on the population. This need has been voiced by a number of researchers and human rights activists. However, except for limited efforts, large-scale systematic studies are not forthcoming. Long –term monitoring of the affected community has to be done for at least the next 50 years. Formal studies of ocular, respiratory, reproductive, immunologic, genetic and psychological health must be continued to elucidate the extent and severity of long-term effects¹³.

Thirdly, the need to provide appropriate medical services to the affected population. 17 years after the disaster, thousands and thousands of men, women and children are still suffering from respiratory illnesses, precocious blindness, cancers and so many other related ailments for which they receive no treatment¹⁴.

The efforts to date are to set up specialized centers¹⁵ without a clear link to community services. It has been repeatedly emphasized that a health-care-pyramid approach be adopted to deal with health problems resulting from the gas leak. Community-level health units should be developed to serve only a maximum of 5000 people. Local hospitals with specialised departments may be used provide secondary care. A specialised medical centre should be established, dedicated to treatment of research into the more serious problems arising from the gas leak. There is clearly an urgent need to develop standard protocols of treatment for the unique problems of the gas-affected population.

(The International Medical Commission on Bhopal, 1990, Srinivasa Murthy, 2001).

LESSONS FROM BHOPAL DISASTER

Importance Of Mental Health:

One of the big challenges for a mental health professional is the low priority given to mental health. This is mainly because it is thought of as marginal affecting a small proportion of people without any voice. However, the recognition of mental health of disaster affected populations' switches the value of mental health, from a deviant model to a normalcy model. The recognition that each and every person has a potential risk for mental health problems, following severe stress, makes mental health important to everyone both in terms of its importance as well as community level interventions. For example, in India in the state of Madhya Pradesh, with a population of over 60 million, there were less than a handful of psychiatrists at the time of the disaster. Following the disaster, there was greater awareness of mental health. There has been a significant improvement in the mental health infrastructure; most of it created as a consequence of the disaster. Currently all the medical colleges have psychiatrist in their faculty.

This innovative approaches to utilize study the mental health effects of disasters and to utilize the existing health personnel provide mental health care, initiated at Bhopal, has become the accepted pattern in the country to meet the mental health needs of the subsequent disaster-affected populations¹⁶. The populations affected by the Orissa supercyclone and the Gujarat earthquake have received attention to mental health and psychosocial needs more promptly than in the earlier disasters¹⁷.

Integration Of Mental Health With Other Services:

It is important to recognize the mental health needs and interventions as part of the other needs of the disaster population. The integration has significant advantages in terms of utilizing the available resources, providing psychiatric care without stigma, and as well as harmonizing the physical, social and psychological services. This

requires training of all personnel who are working with disaster populations in mental health care.

Simplification Of Knowledge And Skills:

The mental health professionals have the challenge of simplifying the information as well as the intervention skills suitable to the affected population, community level helpers, school, teachers, primary care health workers, primary care doctors and other developmental personnel. These programs have to be short, focused and practical rather than theoretical. In addition, they have to be routed in the local cultural ethos of the affected population. Already a number of examples are available in this area.

Training Of Non-Professionals:

As noted above non-professionals particularly from the local area should be the primary care providers. In this approach the professionals will have to accept this partnership with the people so that there is no conflict between professionals and nonprofessionals. The training should be located in the field area, should include lot of practical work and the professionals should be able to demonstrate the interventions in the actual community situation.

Evaluation:

Mental health professionals have a very important role in evaluating interventions. Currently most of the interventions are based on face validity. Short term and long term evaluations have not been done beyond evaluation of the training programs. Such evaluation should not only look at clinical symptoms but the quality of life of the affected population. There is also need for developing simple tools for evaluation that can be used by non-professionals.

Research:

There is a need to study various aspects of the psychiatric problems in disaster-affected populations. Recent reviews of literature in this area have identified the variables like family support, kinship help, and subsequent events in the affected populations as being important in the long-term outcome¹⁸. The cross-cultural aspect of disaster is only recognized as being important¹⁹.

CONCLUSIONS

Disasters are a challenge everywhere for the affected populations as well as the professionals. However, they represent special challenges and opportunities in India. Bhopal disaster is a milestone in understanding the mental health aspects of disasters. The research has shown the high physical and mental morbidity in the general population and the continuing need for longitudinal health studies. Using a public health approach in priority setting, identification of interventions and training of existing personnel, utilizing the community resources the needs of the population can be addressed. Such situations offer mental health professionals both challenges and opportunities for innovation.

R. Srinivasa Murthy

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