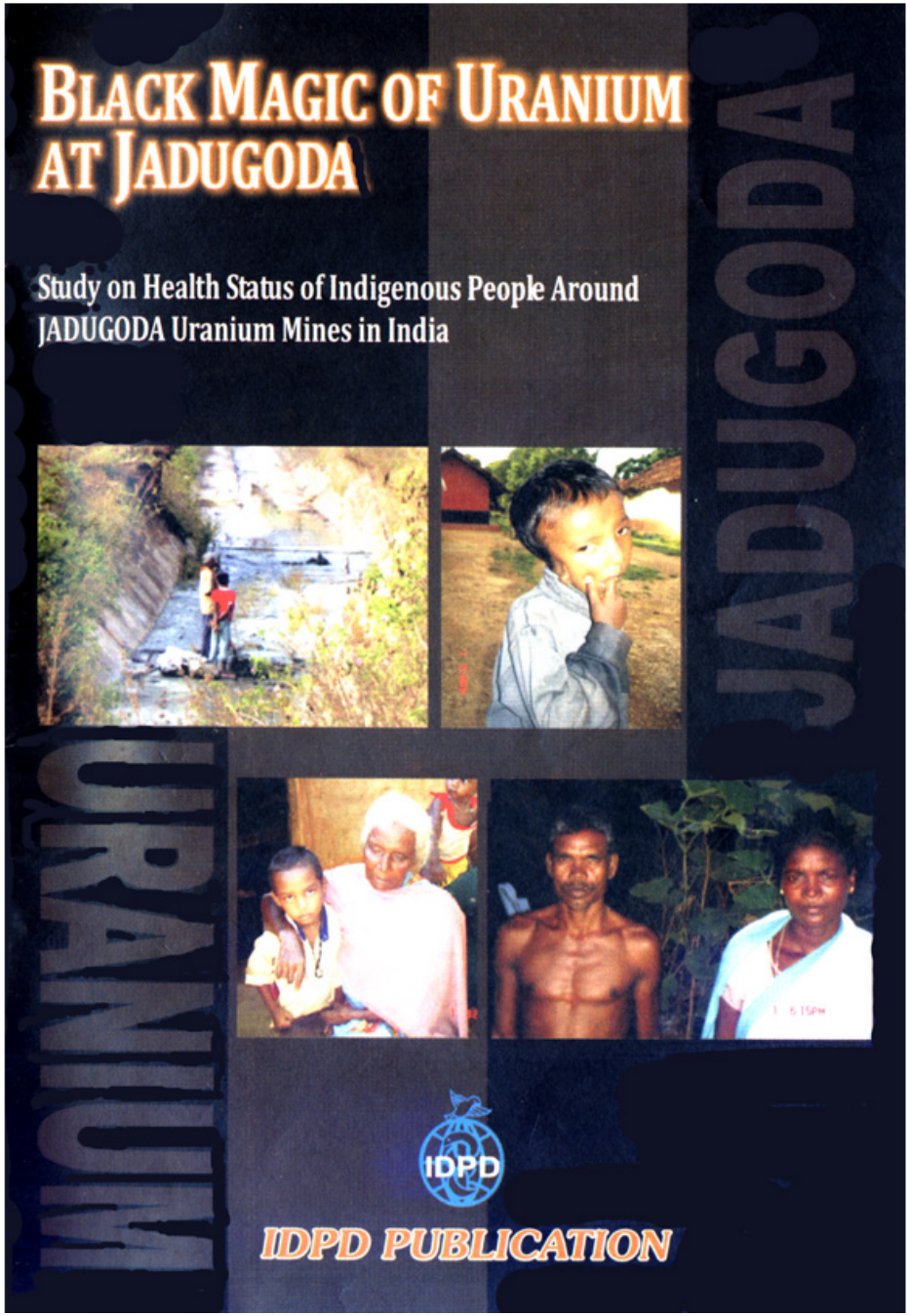

Study on Health Status of Indigenous People Around JADUGODA Uranium Mines in India

Dedicated To...

This study is dedicated to the hard working people of Jadugoda who have been subjected to the adverse effects of Uranium. The study is meant to inform general public of our country and world over, sufferings of these innocent people at the hands of those who wrongly think nuclear energy to be the panacea for all problems but have cared little about those involved in its production from the very first step. The study is also meant to refute the claims of champions of nuclear power that this is a safe form of energy. It is also meant to arouse concern for these toiling people in the minds of decision makers of our country and to convince them to change their thinking after going through facts and figures.

IDPD took up this challenge even in the wake of reports of several hurdles in carrying out such a work. IDPD leaders, Dr Shakeel Ur Rahman, Dr Satyajit Kumar Singh and Dr Abhay Gour worked tirelessly for several months to carry out the project along with Mr Shriprakash and other leaders of Jharkhandi Organisation Against Radiations (JOAR) with valuable inputs from Dr. M.V. Ramana, Mr. John Loretz.

IDPD wishes to thank The Ploughshares Fund (www.ploughshares.org) for the financial support that has enabled us to conduct this study and to continue working with the indigenous communities around the Jadugoda uranium mines.

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Foreword

Over the last decade, India has acquired a new adjective: nuclear. "Nuclear India" plans to build on this and embark on major expansions of its nuclear weapons (often euphemistically described with the factually incorrect term: a minimal credible deterrent) and energy capabilities. For the most part, what passes off as the history of how the country came to achieve this status, in the words of scholar Itty Abraham, is the Indian State's "sanitized official narrative of scientific and peaceful progress." Beneath this official history is an unofficial one, which figures little in the newspapers and television channels, of the men and women who contributed to this effort and in the process paid a dear price: the ill health and death of their children.

Just as the nuclear fuel chain begins with uranium mining, similarly the chronicle of the human costs must begin with uranium miners and their communities. The report by the Indian Doctors for Peace and Development on the health status of the inhabitants of the villages around Jadugoda in Singhbhum, Jharkand the source of most of the uranium mined in India so far is a valuable addition to this sparse but important record.

One of the features of the official narrative is the total denial of any kind of health impact from any activity relating to the nuclear pursuit. In particular, the Uranium Corporation of India Limited's (UCIL) website avers, "there is no adverse effect on health of residents around Jadugoda due to UCIL's operation. In fact the health status of the persons living in and around Jadugoda is better than in other parts of the area due to their improved economic condition and medical facilities provided by UCIL".

The IDPD study clearly and rigorously contests such assertions.

Yet another instance of denial is in the case of occupational health of miners. These miners are eligible for medical treatment at the UCIL's health facilities. And yet, in 1999, A. N. Mullick, who had served as UCIL's chief medical officer for 25 years, was reported to have said: "I have not come across any radiation-related ailments during my entire career." Such assertions are untenable in the face of numerous epidemiologic studies of underground miners from around the world that have conclusively shown that uranium miners are at increased risk of lung-cancer due to inhalation of

Context

All mining operations have related occupational health and safety hazards. Uranium mines present another hazard to workers and to members of the public. That is, a radiation hazard. There are three types of exposure paths in the surrounding of uranium mine.

1. Uranium mining and milling operations produce dust and gas (Radon) having radioisotopes that are inhaled by miners and deliver an internal radiation.
2. Through the ingestion of uranium series radioisotopes transported in surface waters discharged from the mine delivering an internal radiation.
3. The gamma-ray exposure by approaching tailing ponds or mine-tailings[1].

In addition to radiological hazards, uranium and its progenies also present chemical hazards. For the first time, a study on the effects of chronic ingestion of uranium with drinking water *on humans* is available [Zamora1998]. It finds that kidney function is affected by uranium uptakes considered safe in the publications based on animal studies. The study concludes - "The present investigation suggests that long-term ingestion of uranium by humans may produce interference with kidney function at the elevated levels of uranium found in some groundwater supplies." "These observed effects may represent a manifestation of sub clinical toxicity which will not necessarily lead to kidney failure or overt illness. It may, however, be the first step in a spectrum which with the chronic intake of elevated levels of uranium may lead to progressive or irreversible renal injury"[2].

In another study with people who consumed drinking water with elevated uranium concentrations [Kurttio2005], the same authors found some indication that, in addition to kidneys, bone may be another target of chemical toxicity of uranium in humans[3].

The effects of radiation may occur in both exposed individuals and their offspring through effects on the exposed individual's germ

cells. The effects are classified as either deterministic or stochastic. Tissues with actively dividing cells are particularly sensitive to ionizing radiation. Bone marrow, gonads, gastrointestinal mucosa, lenses of the eyes, lung and central nervous system, skin and thyroid are commonly effected organs[4].

Biologic effects of radiation are both somatic and genetic. Leukaemia, carcinogenesis, foetal development anomalies and shortening of life are somatic effects and chromosome mutations are genetic effects of radiation[5].

Methodology

The study was conducted in five revenue villages around uranium mines, tailings ponds and ore processing plant that is functioning for the last four decades under the aegis of Uranium Corporation of India Ltd. (UCIL) and is under the administrative control of Department of Atomic Energy (DAE). The indigenous people living in these villages are mostly from Santhal, Munda and Ho tribes[6]. The study villages fell under Potka and Musabani CD blocks and were within 0 to 2.5 kilometers of uranium mines/tailings ponds/mill.

Investigators during training

The investigators collected information from all the 2118 households falling under these five revenue villages during May-June 2007. 14 villages in Potka CD block with similar ethnic distribution and 30-35 kilometers away from mining activities were selected as reference villages[7].The investigators also gathered information from all the 1904 households falling under reference villages.

A structured questionnaire was developed with valuable inputs from Department of Preventive and Social Medicine, Patna Medical College Hospital, Patna and was introduced on the heads of the families of each household by a team of investigators, each comprising of a male and a female. The investigators, 34 in number, were men and women from the vicinity of Jadugoda and were imparted classroom and field training by a team of doctors from IDPD. Two supervisors from IDPD monitored the investigator teams through out the period of data collection.

At the end of data collection, the supervisors and the investigators used to facilitate freewheeling Focused Group Discussion (FGD) with villagers in each village.

Wall writing showing IDPD during survey

Responses to some of the variables in few of the interview schedules were not found to be satisfactory and such responses were not considered for data analysis. The data generated were entered in Microsoft Excel software. The data was analysed and then Z- score, P- value and odds ratio were calculated to measure the significance of the results. The study restricts itself to those findings which were statistically significant at $p < 0.05$.

Background Characteristics of the Study Population

The total population of the study villages is 9511, of which 51.3% (N=4881) are males and 48.7% (N=4630) are females. The proportion of people over 40 years of age in study villages is 19.8% (N=1887). Whereas the total population of the reference villages is 8490 with 49.6% (N=4211) being males and rest 50.4% (N=4279) being females. The proportion of people over 40 years of age in reference villages is 20.8% (N=1762).

More than one-third (38.8%) of the respondents in study villages but nearly two-thirds (59.8%) of the respondents from reference villages are illiterate.

The income category of the respondents reveals that 34% in study villages and a meagre 3% in reference villages are earning more than Rupees five thousand a month (Fig 1).

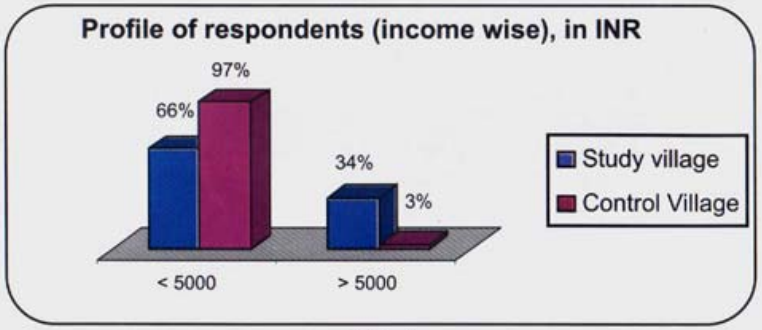

Fig 1

Nearly half (46%) of the respondents in the study villages are engaged with uranium mining, with more than two-thirds (68%) of them working as mine workers, rest being mill workers (23%), contract workers (7%) and truck drivers (2%). None of the respondents from reference villages are engaged with uranium mining.

The Findings

The findings of the study show the following:

Congenital Deformities

A child with congenital deformity from a village near Jadugoda

The investigation shows that babies from mothers, who lived near uranium mining operation area, suffered a significant increase in congenital deformities. While 4.49% mothers living in the study villages reported that children with congenital deformities were born to them, only 2.49% mothers in reference villages fell under this category (Fig 2). It shows an odds ratio of 1.84. The difference is highly significant (at $p < 0.05$).The result confirms a similar investigation performed at the Shiprock, New Mexico, uranium mine that showed that mothers suffered a significant increase in birth defects by a factor of 1.83[8].

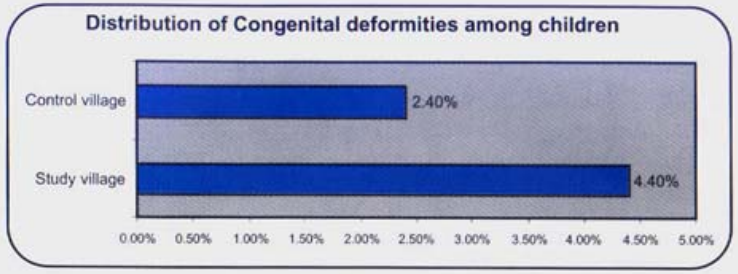

Fig 2

The Ministry of Social Justice, Government of India stipulates that the people with disabilities constitute 3% of the total population. The Government of India has several criteria for defining disabilities; congenital deformities are only one of them[9]. The study when seen in this background reveals that the people with disabilities in the study villages is significantly more than the all India average.

Moreover, increased number of children in the study villages is dying due to congenital deformities. Out of mothers who have lost their children after birth, 9.25% mothers in the study villages reported congenital deformities as the cause of death of their children as compared to only 1.70% mothers in the reference villages (Fig 3). The result shows that the children born to mothers who lived near uranium mining operational area are more likely to die due to congenital deformities. With an odds ratio of 5.86 the results are statistically extremely significant (at $p < 0.05$).

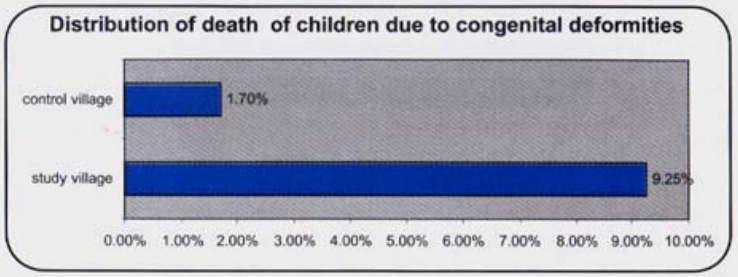

Fig 3

Primary Sterility

A married woman for last 10 years who has not conceived

For the study purpose, the criteria of primary sterility were laid down to be a married couple not having conceived for at least three years after the marriage, and not using any method of contraception. The result shows that while 9.60% of couples in study villages have not conceived even after three years of marriage, only 6.27% of couples from reference villages fell under this category (Fig 4). The finding demonstrates that couples living near uranium mining operational area are approximately 1.58 times (odds 1.58) more vulnerable to primary sterility and this difference is statistically significant (at $p < 0.05$).

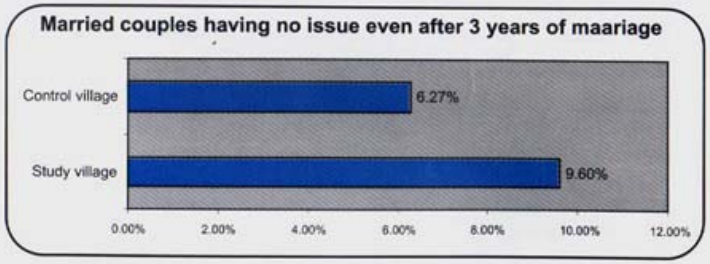

Fig 4

Cancer

On being asked the cause of last death in the household, 2.87% households in study villages attributed the cause of death to be

cancer, whereas, 1.89% households in reference village fell under this category (Fig 5). The study reveals that the cancer as a cause of death among people living near uranium mining operational area is significantly high. The difference was found to be significant (at $p < 0.05$; odds 1.53).

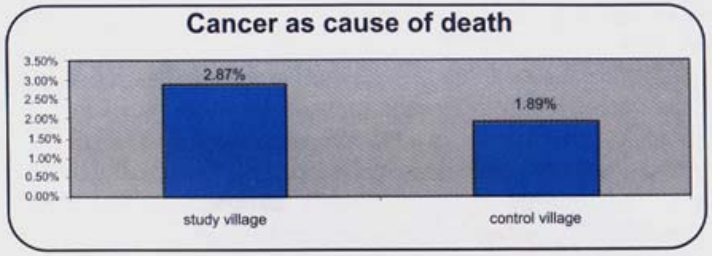

Fig 5

Life Expectancy

The study shows that increased numbers of people living near uranium mining operational area are dying before completing 62 years of age. The average life expectancy in the state of Jharkhand is 62 years[10]. The study shows that 68.33% of the deaths in the study villages were happening before attaining 62 years of age, whereas 53.94% deaths were reported in reference villages under this category (Fig 6). The findings are discerning and the difference is significant (odds 1.84).

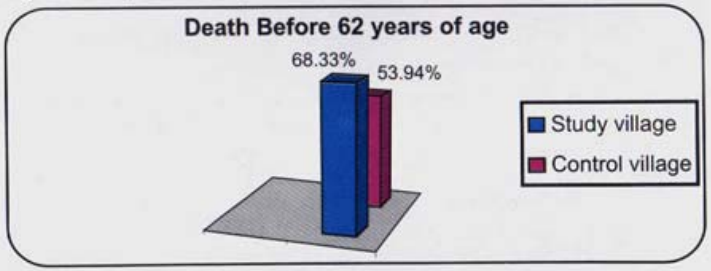

Fig 6

Other variables

The study tried to look on few other health variables as well, like prevalence of spontaneous abortion among married women, still births and chronic lung diseases. The prevalence of all these health

variables was definitely more in the study villages as compared to reference village, but the results were statistically not significant (significant at $p > 0.05$).

Discussion

The study on health status of people living near Jadugoda uranium mining operation area confirms that health problems related to uranium mining like congenital deformities, sterility and cancer was affecting the indigenous people disproportionately in the study villages as compared to reference villages. The study also suggests that increased numbers of people living near uranium mining operational area are dying at younger age (before completing 62 years of age) as compared to reference village. The health of indigenous people around uranium mining areas is more vulnerable in spite of the fact that their economic and educational status is better as compared to reference villages (refer to background characteristics of the study population).

The FGD (Focused Group Discussion) helped us in understanding the health issues involving the people living near uranium mining operation area more holistically. For example let us examine the issue pertaining to spontaneous abortion among married women living near uranium mining operation area. Although our study shows that spontaneous abortion among married women in study villages is high but statistically not significant. But during FGD, several married women in study villages reported repeated spontaneous abortion. It necessitates further investigation.

Interestingly the members of public living near uranium mining operation area reported a very high prevalence of Pulmonary Tuberculosis. Several TB patients are being treated at government/UCIL health facilities for years together, with no relief in most of the cases. With such an effective treatment of TB being available, that can cure most of the patients in just six months, why the patients are continued to be treated for such a long period? One wonders whether these patients are suffering from Pulmonary Tuberculosis at all or not! UCIL health facilities need to provide the justification for treating the patients of Pulmonary Tuberculosis for such a long duration.

There have been reports in past indicating that members of public living near Jadugoda mines are facing radiation problems. An environment committee of Bihar legislative council, headed by Mr. Gautam Sagar Rana, had pointed out in its report the health hazards to which miners working in the uranium mines and the tribals (residing close to the tailings ponds used for dumping of nuclear wastes) are exposed[11]. Another study by Sanghamitra Gadekar has also concluded that indigenous people residing in the vicinity of Jadugoda uranium mines are victims of radiation.

A study on health impact of release of radioactive elements from Rajasthan Atomic Power Station (RAPS) located at Rawatbhata near Kota in central India conducted in 1991 lead to health consequences for the local population. The study observed that there has been an increase in the rate of congenital deformities and more cancer deaths in villages near the plant[12].

Leakage site tailing pond Jadugoda

The safety standards maintained by UCIL authorities can be gauged by an incident which happened on the 24th of December, 2006, when thousands of liters of radioactive waste spilled in a creek because of a pipe burst at a Uranium Corporation of India Limited facility at Jadugoda. It is disquieting that UCIL did not have its own alarm mechanism to alert the company in cases of such a disaster. But for the vigilance of the villagers who had arrived at the scene of the accident soon after the pipe burst the UCIL would not have come to know about the toxic spill. UCIL took nine hours

before the flow of the radioactive waste was shut off that had spewed into a creek. Consequently, a thick layer of toxic sludge on the surface of the creek killed scores of fish, frogs, and other riparian life. The waste from the leak also reached a creek that feeds into the Subarnarekha river, seriously contaminating the water resources of the communities living hundreds of kilometers along the way. This is not the first such accident. In 1986, a tailing dam had burst open and radioactive water flowed directly into the villages[13].

Till the 90's the tailings ponds (where uranium mine liquid waste is stored to evaporate) in close vicinity of the villages were used as children's playground, open grazing area and other public use. UCIL in its own wisdom supplied mine-tailings for construction material to villagers[14]. It shows the utter disregard they have for safety of indigenous people. As Low As Reasonably Achievable (ALARA) principle has been thrown to winds by UCIL authorities.

The study on radioactive contamination around Jadugoda uranium mine by Hiroaki KOIDE of Kyoto University, Japan, published in 2004, confirms that the amount of air-gamma dose exceeds 1 milli Sievert (1mSv) per year in the villages and reaches 10 mSv/y around tailing ponds. The strength of pollution in the tailing ponds is 10 to 100 times higher than the place without contamination and radon emanated from tailing ponds etc. spreads contamination[15].

There is no level of radiation exposure below which we are at zero risk: even very low-level medical exposures such as chest X-rays (0.04mSv per test) carry a quantifiable risk of harm, such as cancer promotion. Radiation health authorities use scientific modelling to calculate and set "permissible limits" for ionizing radiation exposure. As our understanding has increased, the recommended exposures for both the public and for workers in the nuclear industry the workforce have steadily been reduced. Levels once regarded as safe are now known to be associated with health risks[16].

Conclusion

Health problems persisting for generations

The finding of the study confirms the hypothesis that the health of indigenous people around uranium mining is more vulnerable to certain health problems. The major finding of the study shows that

- Primary sterility is more common in the people residing near uranium mining operations area.
- More children with congenital deformities are being born to mothers and congenital defect as a cause of death of a child is also high among mothers living near uranium mining operations area.
- Cancer as a cause of death is more common in villages surrounding uranium operations.
- The life expectancy of people living near uranium mining operations area is less; as a result more people are dying in their early ages in villages around uranium mining operation area.

The health of indigenous people around uranium mining areas is more vulnerable in spite of the fact that their economic and educational status is better as compared to reference villages.

In addition to radiation hazards, the chemical hazards of uranium need a close scrutiny. The Uranium Corporation of India Limited and the Department of Atomic Energy, Government of India have a bounden duty towards the indigenous people of Jadugoda to provide all information on radiation and chemical hazard affecting them.

radon; there is supporting evidence from experimental studies of animals and from molecular and cellular studies.

Another reason for why the IDPD study is significant is that it addresses the public health rather than the occupational health implications of uranium mining. The study does not explore the question of the causal linkage between uranium mining and the observed health patterns. It is not possible to definitely discern the reason for the increases in congenital deformities and untoward pregnancy outcomes. One obvious, but by no means proven, hypothesis is radiation exposure. However, proving or disproving this hypothesis is difficult because there is still considerable controversy around the world about the impacts of radiation on end-points other than cancer. While animal research and laboratory experiments suggest that inherited genetic effects of radiation exposure should occur in humans, studies of the offspring of the Japanese atomic bomb survivors have not detected inherited genetic effects. However, it is quite possible that the sample size was inadequate for detecting such effects. At the same time, there is some epidemiological evidence that uranium mining does result in increases in birth defects, stillbirths, and other adverse outcomes of pregnancy. One important study in this regard was conducted in the Shiprock uranium mining area in United States. The IDPD study adds to this small but slowly growing body of evidence.

The IDPD study's significance may extend to well beyond the local area. Thus far uranium has been mined only in the Jaduguda area. But production from that area is no longer capable of keeping up with the growing number of nuclear power stations. The Department of Atomic Energy now plans to start mining in Andhra Pradesh and Meghalaya. Karnataka is also being considered. It is vitally important that the record of Jaduguda be widely known before other communities are subject to similar experiences.

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Study on Health Status of Indigenous People Around JADUGODA Uranium Mines in India

Executive Summary

Introduction

A descriptive cross-sectional study on indigenous people living in villages around Jadugoda uranium mines in East Singhbhum district of India was conducted by Indian Doctors for Peace and Development (IDPD) with the objective to find out their health status in respect to selected health variables. We found that specific health problems were observed disproportionately in the study villages as compared to reference villages. These include fertility related issues like infertility, still birth, abortion & birth with congenital deformities, congenital deformity as cause of death in children, chronic lung diseases, cancer as cause of death and life expectancy.

A tribal couple

Nuclear issues in India are the sacrosanct holy cow. It has been kept out of the purview of ordinary citizen. A nuclear India has been made to be the symbol of national pride by the successive Indian governments. Anybody raising the issue of nuclear safety is either ridiculed or branded as anti national. The media in India and USA is going gung-ho on Indo-US nuclear deal. This exhilaration cannot cloak the miseries of thousands of indigenous people suffering the effects of uranium mining in India due to poor technical and management practices in existing mines.

Acknowledgments

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E-mail: Shakeel456@rediffmail.com

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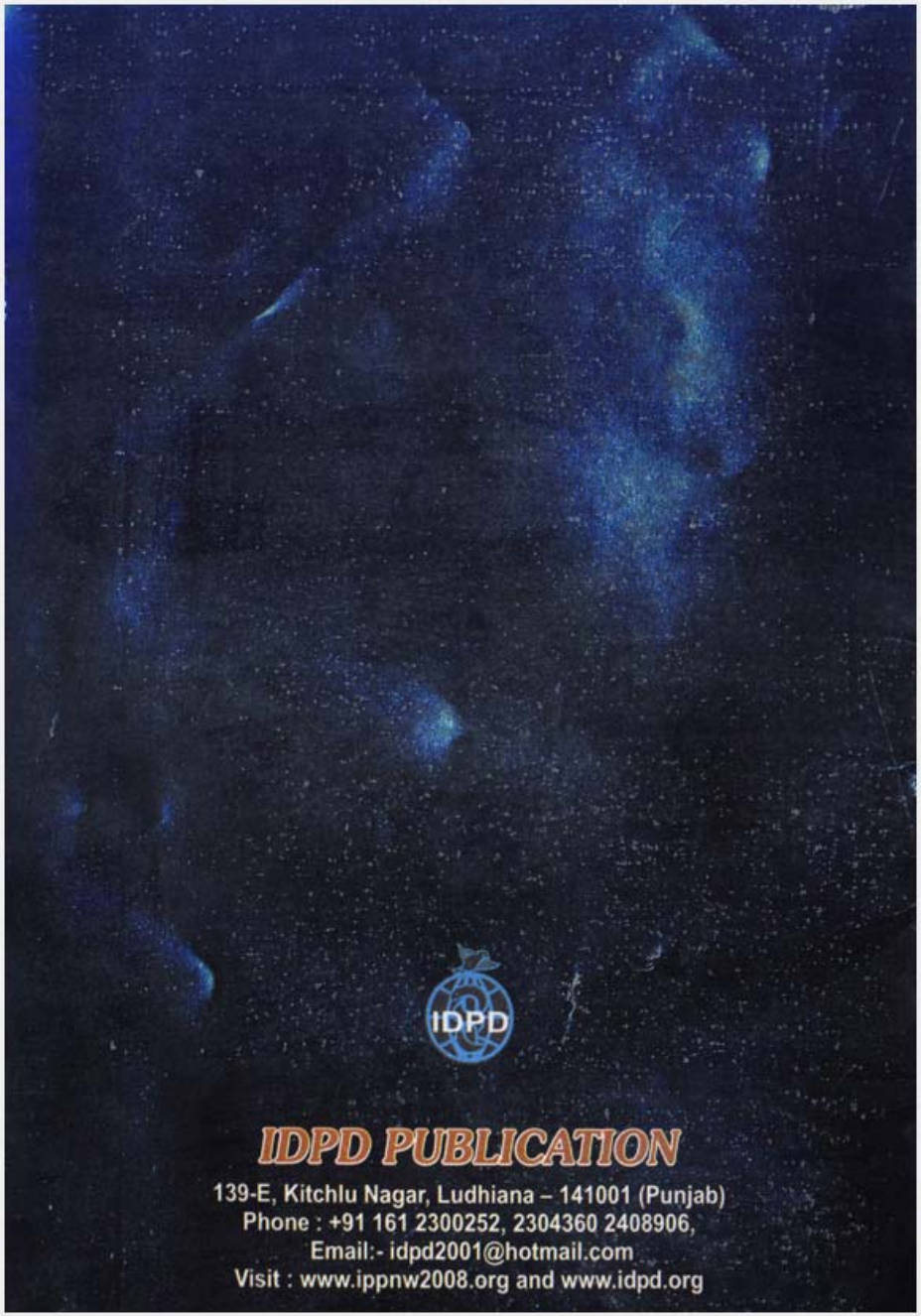
16) International Campaign to Abolish Nuclear Weapon (ICAN), http://w.w.w.ippnw.org

Annexure

Names of Study villages

BHATIN
MECHUA
TILAITANR
HARTOPA
ITCHRA

Name of reference villages

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Tiksirij
Janumdih
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Magdu