

Impact of Industrialization on Socio-cultural and Health Aspects of Tribal Groups of South Bihar, India

B.N. Pandey, P.K.L. Das, A.K. Jha and A.K. Ojha

Post Graduate Department of Zoology, Purnea College, Purnea 854 301, Bihar, India

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ABSTRACT Tribes, of Bihar present a picturesque perspective of life and activities. They are to be found at diversified levels of cultural development. The paper aims to look into the impact of industrialization on tribals of Jamshedpur belt. Due to industrialization the social, cultural and ecological changes have occurred in tribals. The traditional tribal communities who had so far depended solely on agriculture and forests as means of livelihood, are now facing the challenge of machine technology. The industrialization has resulted not only in the change in their socio-religious life but also in pattern of settlement and health status. Owing to the impact of various industrial forces the simple natural tribal folks have been exposed to new cultural experiences which resulted in the exertion of a short cultural shock. Besides, industrialization has brought in large number of alien diseases. On the whole industrialization is one of the major factors in the detribalization, and therefore, tribal population needs special attention. Industrialization, urbanization, deforestation and immigration of non-tribals have resulted in deterioration of ecology, socio-cultural and health status of the tribal groups. These factors have also led to increased exchanges of genes between tribal and non-tribal populations.

INTRODUCTION

Human being always strives for a better life. People do not hesitate to leave their mother land for a foreign land that assures them a better standard of living. Mineral ore extracting sites and industrial plants attract people from all directions. All established industrial towns in the map today were either jungles or barren lands of which people were not aware of in the past. But today these are densely populated area. This may in part be due to migration of populations to work in industries and mines and different trades (Patnayak, 1990). Jamshedpur in Bihar is one such example. Once upon a time the area was full of jungles, Where the industrialization

has introduced large scale, migration of people in search of livelihood from different corners of the state as well as of the country. This has resulted in increased population growth. With the growth of the industrialization and urbanization, the forest area has been reduced to a large extent and an ever increasing biotic pressure can be felt. This has eventually resulted in multifarious problems like housing, sanitation and health problems. Industrial activities are known to disturb the ecological system by creating pollution of different kinds (Swamynathan, 1991). Materials production and consumption had always led to environmental degradation, but this becomes a problem when industrialization and population enormously increased the scale operation (Botkin, 1989). Many production processes such as mining, extraction, refining or smelting pollute the air, water and land. Wastes or "residuals" discarded from production result in pollution of various kinds. It is to be noted that, human activities have and will continue to modify the patterns and biological impact of diseases. Environmental changes are invariably associated with the emergence of new diseases and other problems.

Industrial enterprises have been, in general, accused of upsetting the ecological balance comprising air, water, soil, flora and fauna. Everyday auto emissions, industrial smokestacks, and utility plants hurl tonnes of pollutants into the air. Simultaneously, factories dump enormous quantity of waste materials into rivers and streams. It is not merely the ecological balance which is at stake, the very existence of mankind faces a threat from the menace of the industrial pollution. This is because industries have introduced harmful substances in our environment. As a result, the highly delicate balance between

the components of nature such as air, water and soil, is on the verge of collapse. The reckless felling of trees has resulted in climatic changes, reduced rainfall, enhanced soil erosion and reduced availability of wood. Similarly, the release of harmful chemicals into the environment has threatened the thin Ozone layer which surrounds the earth. This layer of Ozone absorbs the ultraviolet radiations from the sun. Reductions of this layer may result in extinctions of a large number of biological species and can cause harm to human beings. A coal based thermal plant pollutes the atmosphere by gaseous emissions of Sulphur dioxide, Nitrogen Oxide etc. It causes acid rain, which is known to damage soil, vegetation and aquatic lives of the region and also produces a tremendous amount of solid wastes, flyash and bottomash. A superthermal plant using even normal or low sulphur coal emits about 100 tonnes of sulphur dioxide a day (Sahu, 1994). The gaseous pollutants have an impact on biotic as well as abiotic components of ecosystem. A similar environmental degradation process can be seen in the context of Jamshedpur belt of Bihar, as well.

Jamshedpur is a highly industrialized region having a large number of factories such as TELCO, TISCO, Indian Steel and Wire Products, Indian Hume Pipe Construction Ltd., Tin plate Company of India Ltd., Jamshedpur Engineering and Machine Manufacturing Company Ltd., Indian Oxygen and Acetylene Company Ltd., Indian Tube Company Ltd., National Metallurgical Company are established here. The area lies between 21.58 and 25 N and East longitude 83 and 88. The highest rainfall goes up to 150 cm and the average annual temperature varies between 45° F to 100° F. The area is very rich in industrial raw materials. Its Archaean terrain possesses the largest concentration of ore deposits such as Iron, Manganese, Copper, Aluminium, Chromium, valuable industrial mineral like Mica, Sillimanite, Phosphates and over 3/4 of India's resources of coal including cooking coal. Moreover, occurrence of Kaoline terracotta, fine clays, Bauxite, Stibnite, Beryl, Uranium and other atomic energy developing minerals and other subsidiary resources have rich potentiality of modern and industrial socio-economic growth. The area is also abundantly provided with inland water resources capable of

meeting any demand of human and industrial consumption as well as for hydroelectric purpose. About 13 km from Jamshedpur, nestling at the foot of the Dalma hills, is the Dalma lake, the reservoir which supplies water to the steel city and the steel work.

93.6 per cent of Tribals in Bihar are concentrated in this area. In comparison to the neighbouring plain area the population of Jamshedpur belt was comparatively thin. Thick forests are very rich in timber and animal food resources, surrounded by tribal settlement. People lived, moved and died in the area of their birth. Ideally social life was generally immobile and more or less isolated. Movement was restricted to villages of the marriage ring as well as to weekly markets where almost everybody knew one another personally and their social interaction was direct. But now -a-days due to urbanization and industrialization the entire scenario of the area is changed. An estimated 8,73,393 MT of solid wastes and 32,75,78,375 KL of liquid municipal wastes considered highly toxic and hazardous pollutants is produced, out of which 121842 MT/year and 125180 liquids are produced alone by Jamshedpur. The population of this area reveals increased growth rate. Emigration and Immigration have become a common feature. Inter-tribal marriages are not uncommon especially among the Christians.

The total tribal population of Jamshedpur is 4,66,572 (Male-2,36,318 and female-2,30,254). The literacy rate among male is 38.36% while in female is 13.84% (Fig. 1).

MATERIALS AND METHODS

All the demographic data are available in the census office. For different aspects of life such as food habits, dresses, socio-economic variables, health status, drinking water and household schedules were prepared.

The field work for the study was conducted between the August 1997 to March 1998. The data were collected through observation and interviews with the help of schedules in villages. Jamshedpur district comprises of 9 blocks. The present work was carried out in four blocks namely-Potka, Dhalbhumgarh, Musabani and Chakulia.(Fig. 2)

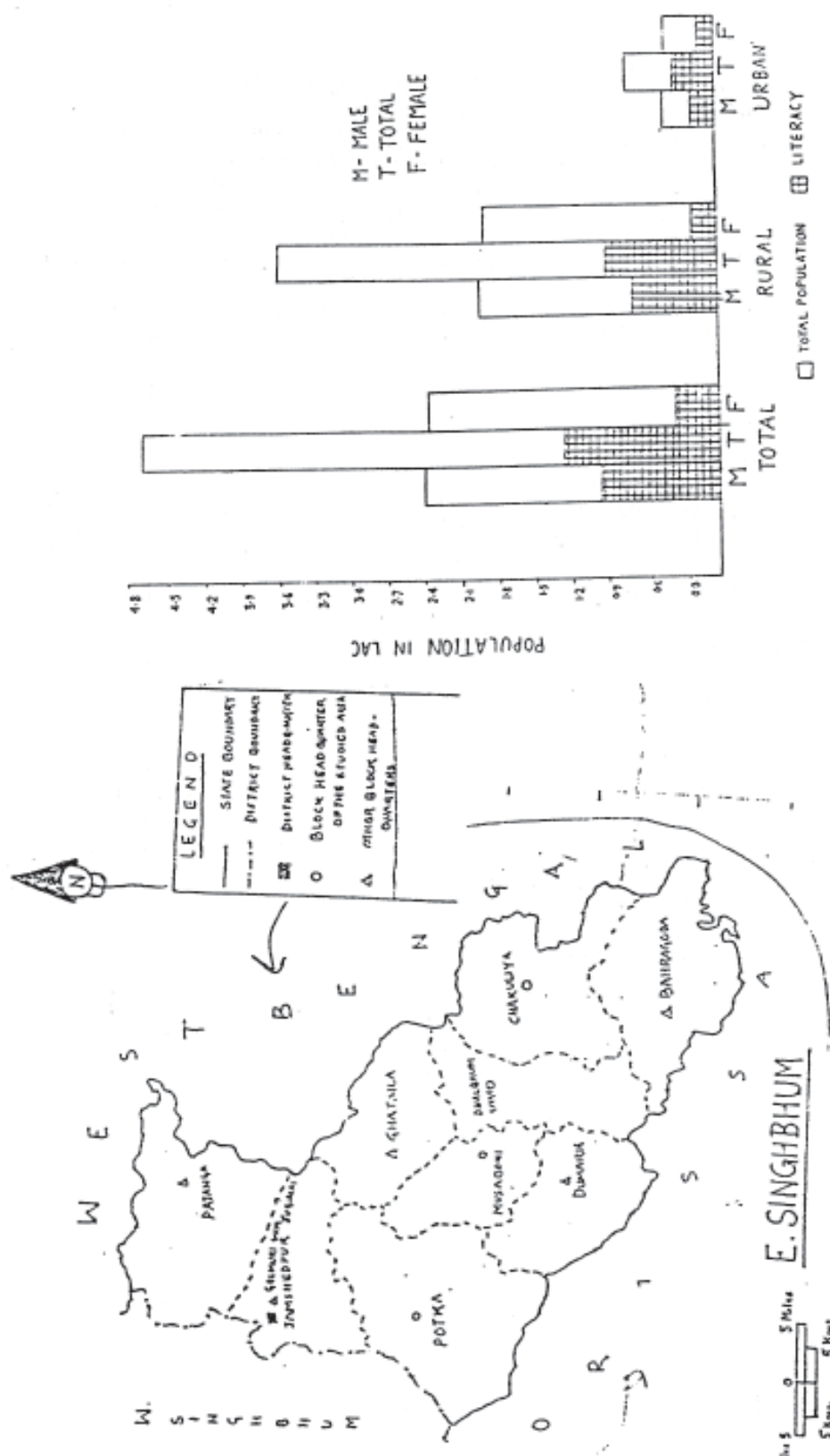


Fig. 1. Histogram showing literacy in Tribal Population in E. Singbhum (Jamshedpur)

Fig. 2. Map of Jamshedpur (E. Singbhum) showing studied blocks

PATTERN OF SETTLEMENT IN E. SINGHBHUM

Pattern of settlement is the adaptation of human population in terms of environment, depends mainly upon following factors :

- (i) Physical feature of inhabitate area
- (ii) Means of economical resources
- (iii) Water resources

But the pattern of settlement in E. Singhbhum can be studied in terms of Pre-and Post-industrialization.

The tribal settlement was in and around forest lands. Here they were free to convert forested lands into agricultural lands and forest products were used as their livelihood resources. Water needs were met either through the smaller river or through self made pit wells. Post industrialization settlers are certainly equipped with better livelihood facilities.

Rural clusters are somehow scattered and each cluster is made up of sub-clusters of 10-15 houses. It seems that these sub-clusters have been settled to look after their agricultural lands and crops, as house holders have their land near by to their clusters. Industrialization has given them a good nearby market for their forest and handicraft products. Although the post industrialized clusters have not much problems of drinking water due to community development work run by the companies owning the industries or mines. But pre-industrialised clusters are still facing drinking water problems. Life is tough. They had to go miles for water. Deforestation has affected their lifeway. The things, they used to get from forest, now have to purchase from markets. Single crop agriculture has become the only means of their livelihood. They have to go to nearby places in search of Jobs.

Post industrialized settlers are enjoying the facilities provided by the company existing in the area concerned. There are two types of post-industrialized settlers :

One group comprising the persons who got employments in the company. Second group of settlers are the immigrants who came after setting up of industries or opening of the mines. It is realised that the local tribals working in the industries or mines are enjoying the facilities provided in the colony of the company concerned. So, it is clear that tribals like other

human beings accept changes and are also fond of new World.

Certainly the environment has given prosperity to the aboriginal people of E. Singhbhum. Human settlers of E. Singhbhum in general have adapted this environment. But ecological imbalance has upset the Man and Environment relationship up to the great extent. Summing up the entire work in this regard till date it can be said that Bhumijis and Kharias are unable to make balance between them and changing environment due to deforestation, urbanization and industrialization. Their settlements are on the verge of disintegration.

HOUSING TYPE

Tribals live in clusters and sub-clusters. Generally one cluster comprises of 50-80 houses while sub-cluster consists 20-25 houses. In E. Singhbhum two types of houses have been observed. The houses of tribal area built of mud walls having roof of either *Khapra* (tiles) or *Khar*. A typical tribal house consists of two moderately sized rooms, one of which used as living room and other as kitchen and at least one *Varandah*. Generally the height of the room is 2 to 2 ½ metres (7'-8'). The earthen walls of the hut are made up of local soils (red and yellow). There are double purposes of the use of these soils in the wall. Firstly, they strengthen the walls from falling during the rainy season. Secondly, they soften the walls and keep them dry and pleasant some. Houses are provided with a wooden door of about 1 to 1 ½ metres (4' to 5'). Generally houses do not have windows except 1 or 2 ventilators. Generally inside the house there is a small area which is used as cattleshed. In houses there are no facilities of latrines and bathrooms. The houses are painted with lime, burnt leaves of *Mahua* mixed with cow dung and straw (Fig.3 A-B-C). The drainage system is not proper.

The tribal houses in hilly area are made up of walls of small pieces of rocks having roof of *Khapra* (tiles) or *Khar*. The tribals residing in hilly areas are settled in scattered fashions.

In concluding remarks it can be said that areas nearer to industries or towns have higher population density while in remote areas population density is very low.

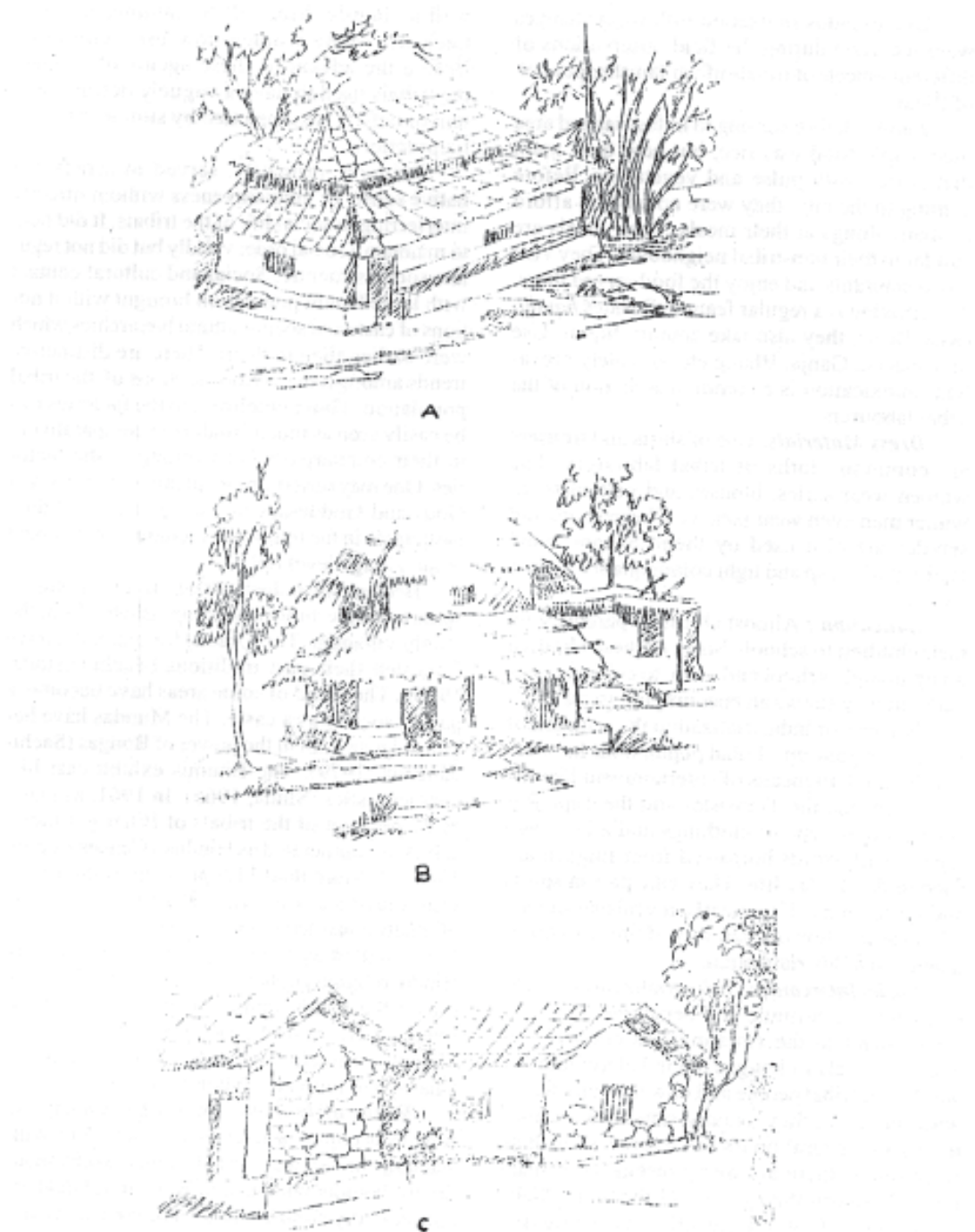


Fig. 3. Typical Tribal houses of E. Singhbhum

Due to industrialization following changes were recorded during the field observations of different aspects of tribals life in Jamshedpur belt of Bihar.

Food : Before coming to industrialized area their staple food was rice, but now their main diet is rice with pulse and vegetables. Before coming to the city, they were not able to afford so many things at their meals. Their meals are similar to their non-tribal neighbours. They visit city restaurants and enjoy the food served there. Tea drinking is a regular feature. Besides *handia* (Rice Beer), they also take country liquor. Use of Tobacco, Ganja, Bhang etc. is widely prevalent. Intoxication is a common addiction of the tribal labourers.

Dress Materials: Use of shirts and trousers are common cloths of tribal labourers. The women wear saris, blouses and petticoats. In winter men even wear jackets. Cheap shoes and sandals are also used by them. Second hand clothing of cheap and light colour quality is quite common.

Education : Almost all tribal parents send their children to school. Some of these children go up to high school and even to colleges. Female literacy shows an encouraging trend.

Because of industrialization the standard of living has gone up. Tribal populations have access to modern means of entertainment like the T.V., Cinema, the Transistor and the Tape Recorder. Alien type of clothings and a language replete with words borrowed from English are used in day to day life. They take part in sports and go to clubs. This clearly reveals an impact of modernization on their way of life as a consequence to industrialization.

Social Intercourse : Industrialization has led to changes in attitude and behaviour as per to the demand to the situation and atmosphere. They have also changed their behaviour towards non-tribal people and now they mix freely with them. As they usually remain with non-tribals for several hours in factories as well as in colonies, there are many instances of marriages between the tribals and the non-tribals. This type of marriage alliance indicates the exchange of gene flow with their neighbouring population. Not only this but the industrialization has also influenced their religion as

well as family. Most of the families are now nuclear. Many women now use vermillion. Before the advent of these agents of change, the tribals used to have a vaguely defined system of beliefs accompanied by simple, ritualistic practices.

Religion, primarily, served to satisfy the native sense of inquisitiveness without directly interfering in social life of the tribals. It did help to maintain a social order vividly but did not regulate social structure. Social and cultural contact with large Hindu population brought with it notions of caste and socio-cultural hierarchies which were earlier alien to them. There are distinctive trends amongst the various sections of the tribal population. Those employed in the factories can be easily seen as much Hinduized comparatively to their counterparts not working in the factories. One may observe more pictures of the Hindu Gods and Goddesses in their houses. But they participate in the religious ceremonies performed at the village level only.

Because of industrialization, the tribals of some areas are almost indistinguishable from the Hindu villagers. The Oraon, for example, have forgotten their past traditions (Sachidananda, 1970). The Gond of some areas have become, a part of society as a caste. The Mundas have begun to loose faith in the power of Bongas (Sachidananda, 1979). The Bhumjs exhibit cast like characteristics (Sinha, 1965). In 1961, as many as 72 per cent of the tribals of Bihar got themselves as enumerated as Hindus (Census Report, 1968: 2). More than 11.8 per cent of the tribals were Christians (Census, 1980). Only 20 per cent of them considered their religion as of tribal. Many settled agricultural tribes have adopted Hindu religious beliefs and practices. They propitiate the Hindu deities such as Kali, Durga, Lakshmi etc. and observe Hindu festivals like Phagua, Dussehra, Diwali, Makar Sankranti, Chaiti Sankranti etc. (Mandal, 1970).

Status of Women : In a tribal society, the female occupies a nuclear position. Notwithstanding the fact that a tribal woman works shoulder to shoulder with men in agricultural field and substantially contributes to economic activities. With the opening of mines and growth of industries in tribal areas of Bihar a large number of woman have been drawn into occupation

unknown to them previously. Their status in labour market has changed. They are employed in such jobs which give them ready cash. They now work at time in isolation from their own men. This has led to abuses. In many cases they have been subjected to sexual exploitation.

The study of some women of the industrialized area gives a very interesting picture. These working women work under private contractors who get contract work from industrial units. These women leave their home early in the morning and return late in the evening. They remain out of home for more than twelve hours. They follow this schedule because of two reasons. Firstly, the number of female workers exceed the work available. So, they try to come as early as possible to get the work. Secondly, they have to travel a long distance from their home to the place of work.

Most of them work to supplement family income. In some cases, they are the only earners in their families. During present survey work, it was realized that some of them worked for self maintenance and self satisfaction also. Those who foster the idea of self maintenance define it in terms of self entertainment and better dress (Mandal and Sahoo, 1992). This also reflects their aspirations which they have developed from the non-tribals around them. Due to paucity of resources, they are unable to follow the life style of well-to-do nontribal women and this prompts them to take up work.

The status of women can also be ascertained by the educational achievements of women. The literacy rate among females of Jamshedpur belt is very low (13.84%) as against India's female literacy rate of 24.82% (Fig.1). Girls are not sent to school as they are needed at home to look after small children or to do other jobs at home. Increased employment of women may also alter the nature of relationship between husbands and wives (Bhasin, 1990). During our field work at Dhalbhumgarh and Chakulia, we noticed tensed relationship between many husbands and wives.

Such as Lakhi Soren, Nimai Murmu, Kanu Munda, Radha Charan Munda, Sudhir Singh of Dhalbhumgarh block and Haral Kisku and Somra Hansda of Chakulia block. Certainly the main reason behind this tensed relationship was

noticed due to lethargic nature of male members who do not want to work and the whole family affairs are managed by the female counterparts.

Socio-Economic Factors : There are social and economic factors which intensify the problem of infant mortality. Education not only reduce fertility directly but indirectly also through reducing mortality (Cochrane, 1980). Maternal education may reduce infant mortality by hygienic practices and child survival (Wave, 1984). No doubt, as far as education is concerned it is very low among tribes of Jamshedpur and it is negligible in women. Obviously they do not provide proper hygienic care to children. Further, it has been reported that labourers and farmers have higher infant mortality than lawyers and doctors (Bhasin, 1990). Most of the tribal population in the present study are labourers. As they remain outside the house throughout the day they are not able to provide proper care to their children. As a result their children suffer from a large number of health related problems like infections, diseases and malnutrition.

Entertainment : The idea of entertainment is closely related to the concept of pleasure which has an important place in the tribal life. Indian tribals conceive of good life as one with simple scope for indulgence in pleasure (Sinha, 1959). Pleasure is vertically synonymous with dancing, singing, playing and listening to music, drinking rice beer and implicitly sexual activities (Oraons, 1965). But with the advent of industrialization the opportunity for pleasure seeking in the form of community events has declined. The modern avenues like Cinema, Restaurants, Radio, Tape Recorder etc. provide the pleasure. Thus, due to industrialization the self maintenance and entertainment or pleasure show a departure from the accepted norms of the tribal communities. Sexual union on account of cash or kind has been gaining ground among the tribal women in industrial areas. The major reason behind may be unhappy family relationship, bad influence of relatives, sexual urge, poverty and ambition of high living standard. Thus industrialization appears to have got profound impact upon the social status of tribal women.

The process of industrialization and technological revolution has been regularly debated in the social scientific forums. Some treat

industrialization as negative, causing constant damage to tribal cultural heritage and create an identity crisis. According to Srivastava (1979) tribals have not benefited by industrialization though the nontribals have. This has led to another conflict between tribals and nontribals. Similar observations have been made by Sachidanand (1969), Sharma (1974) and Mandal and Sahoo (1992).

According to Vidyarthi (1964) industrialization is the major cause of detribalization. He also states that industrialization gives an opportunity to tribal population to get assimilated into the urban industrial civilization. Thus, he supports the process of detribalization due to industrialization as in his opinion this would bring about assimilation.

In short it may be said that the rapid industrialization had brought about a complete disintegration of the preindustrial culture which was characterized by forest ecology and homogenous folk life. These traditional tribal communities who had so far depended solely on agriculture and forest products as means of livelihood, are now facing the challenge of machine technology, which demand not only a change in an economic pursuit, but a total reorientation of their socio-religious life.

Sexual Practice : The sexually transmitted diseases are very common all over the world. In industrialized countries these are major medical and social problems and their incidences are steadily rising. Rates in Africa are alarmingly high e.g. in Ibadan, Nigeria, the prevalence of Gonorrhoea among asymptomatic women was about 5% while among prostitutes and female hospital patients it was 15-20%, Taylor, 1991). Venereal syphilis is increasing in many industrialized countries. Syphilis is one of the trepaninatoses which is caused by spiral organism called spirochaetes. During the present survey work sexually transmitted diseases were also found in Dhalbhumgarh, Chakulia, Potka and Musabani. The highest frequency of STD was observed in Musabani (28.08 %) and lowest in Dhalbhumgarh (10.47 %).

Leprosy : Leprosy is said to be a chronic infectious disease, caused by *Myobacterium leprae*. It appears to result from the interactions between the bacillus and the immune system of

the infected host. The variation of the host's resistance in infection has been shown to be genetically controlled in animal models (Skamene et al., 1982) and there is now enough evidence which shows that genetic factors also play a significant role in human leprosy. A number of studies in human have suggested the influence of genetic factors in leprosy (Beiguelman, 1972; Smith, 1979; Haile et al., 1985; Demenais et al., 1985, 1988; Van Eden and Devries, 1984; Van Eden et al., 1985).

Genetic constitution may also be important in the responsiveness of human subject to various antigens. It is observed that subjects suffering from lepromatous leprosy do not become lepromin positive and it is hypothesized that these individuals do not carry in their system, immune component cells capable of recognizing and reacting with some key *Myobacterium leprae* antigens. The block may be functional or genetic. The latter remains to be proved in a convincing manner, although suggestions to this effect have been made based on a higher incidence of the coincident form of leprosy in both members of identical twins, as compared to non-identical twins. A functional block in the ability of an individual to respond to some *M. leprae* antigens can also be due to the presence of suppressor cells (Talwar and Bamezai, 1989).

In India, there are 5,41,809 registered cases of leprosy of which 1,04,114 cases are in Bihar (Ministry of Health and Family Welfare, Govt. of India, 1997). According to the WHO there are 10-15 million cases of leprosy in the whole world. It is highly prevalent in Africa, India and South East Asia. India harbours a vast majority of leprosy patients, ranging to about 4 million cases (Parikh, 1992). In Jamshedpur belt itself high incidence of leprosy was noticed (24.35%). The highest frequency of Leprosy was noticed in Potka (36.15%) and lowest in Musabani (18.32%) blocks of Jamshedpur. The exact causes of prevalence of this disease is yet to be known. But it might be possible that deforestation and presence of various types of industries may have some bearing on the presence of this disease in the industrial belt. The out break of vector borne diseases is determined by the complex interaction of three agents - namely, parasite, host and vector in a particular environment (Physical,

socio-economical and cultural). Ecological changes associated with population growth and development are often responsible for any out break of vector borne diseases. The growth in population facilitates host-parasite-vector interaction by bringing the two together. Industrialization in its process involves deforestation and ultimately urbanization that triggers large scale migration. This facilitates the movement of parasite carriers or men immune people, creating a new foci or an epidemic of vector borne diseases. The mass movement of the people towards industrialized areas result in over crowding. This creates problem of shelter, food and water. When horizontal expansion is not possible we construct multistoried buildings. This results in permanent changes in an area by replacing the natural ecosystem with man-made one. This results in the expansion of mosquito breeding habitats. Modern home appliances like Airconditioner, Coolers, Refrigerators and Heater etc. provide an ideal condition for breeding of the *Aedes* mosquitoes which transmit dengue and yellow fever. Because of irregular water supply people store water in containers. This also facilitates breeding ground of the *Aedes* mosquitoes which increase the out break of dengue. Leprosy has been found at all altitudes and temperatures. Though hot, has been favoured as an important influencing factor the evidence is anecdotal not conclusive. Further, improvement in living condition, nutrition, housing, clothing, sanitation, personal hygiene etc. reduce the chance of leprosy.

Tuberculosis : Tuberculosis (T.B.), an infectious disease was known as the dreaded white plague. Fifty years after independence, it is still India's biggest health problem, claiming an estimated 5,00,000 lives every year and causing disease in about 17 millions. Nearly 2 out of 5 T.B. cases in the world are found in India. In our country about 22 lakhs new cases of T.B. occur each year, taking annual number of sufferers to 140 lakhs, out of which about 35 lakhs are highly infectious. An estimated 5 lakhs people in India die every year of Tuberculosis, more than thousand every day - a patient a minute. (T.B. Division, Ministry of Health and Family Welfare, Govt. of India, 1998), *Mycobacterium tuberculosis* is the causative agent of tuberculosis. The work of several researchers suggest that tubercle

bacillus has co-existed with human beings since early times. Like other organisms in the process of evolution it has developed complex ecological relationship. Animals harbour species of *Mycobacteria*. From the human diseases point of view cattle are the most important.

Industrialization and period of transmission of agriculture and cattle domestication followed by population growth are two possible reasons for the spread of the disease. The work place provides an important environment which could predispose to or facilitate the development of T.B. Miners and quarry workers exposed to various kinds of dust are likely to develop Silicosis, Asbestosis, Pneumoconiosis and are at a great risk of developing T.B. In crowded industrial sheds and factories, with poor ventilation, inadequate sunshine and fresh air, if one or some workers have untreated sputum positive T.B., there are definite chances of spread of the infection. During our present work it was noticed that men and women working in various industries have developed T.B. or are suffering from some sort of lung infection. It has been reported that when industrialization started in England and Europe in 16th century, it resulted in a process of urbanization with overcrowded, unhygienic living conditions for the working class in new industrial and mining towns. Research indicates that this process was repeated in the U.S.A. and Africa and that industrial and urban growth were correlated with T.B. The growth of small unregulated factories closed to domestic sites or the growth of slums next to large factories add to the problem. Such instances can be very well seen in Jamshedpur area also. In study areas nearly 63.58 per cent population was found to be victim of this disease. The highest frequency of T.B. was found in Dhalbhumgarh block (77.90 %) and lowest in Chakulia (42.82 %) blocks of Jamshedpur.

The disease thus seems closely linked to the social history of human kind mediated through its effect on the environment and on the living standard.

Radiation Hazards : The most interesting thing noted in the present work is the effect of radiation on reproductive fitness. It was noted that villages located near the UCIL (Uranium Corporation of India Limited) have high rate of

abortions as well as disturbance in menstrual cycle. Many cases of male sterility were also noticed. Genetical abnormalities in the area were very high. Cases of Thalassaemia and Leukemia were also observed. There are some trees which are bearing seedless fruit. According to some villagers, the production of vegetables and crops has been decreased. Cases of Leukemia are prevalent. It might be due to radiation of Uranium. During present survey work, it was noticed that 5.16 per cent population suffers from Musculo-skeletal abnormalities, highest being in Potka (20.19%), where UCIL is located.

In course of our survey we had come across with 6 cases of pregnancies at the age of 9 to 11 years. But on the request of anonymity of parents of such cases we are unable to say about the places and identity of cases.

It has been reported that 1 in every 200 live born babies has a gross abnormality of chromosome number or structure. High as this figure is, it does not indicate fully the frequency with which chromosomal abnormalities occur at fertilization for in a study early spontaneous abortions chromosomal aberrations occurred in over 50 per cent. Many of these chromosomal anomalies are rarely found in live born babies and are therefore, presumably lethal and the cause of a significant number of early abortions (Emery, 1983). High abortion rates among tribals residing near UCIL complex may be attributed to chromosomal anomalies which has taken place due to radiations.

Grosche et al. (1997) have reported increased stillbirths in southern Bavaria during the first 2 years following the chernobyl disaster. High rate of perinatal mortality was observed in Sweden during June and July, 1986 (Kallen, 1988). Iamara et al. (1995) have reported 9-15/100 spontaneous miscarriage in Kiev for Chernobyl effect on pregnancy. According to the data collected in Hiroshima and Nagasaki during the past 40 years on the children of the atomic bombing, no statistically significant genetic effect emerge with respect to eight different indicators (Neel, 1990). But unlike the population clusters near UCIL, Jadugoda the Japanese were exposed to a short intense burst of radiation.

Damage to the foetus by ionizing radiation is a special case of somatic damage. The develop-

ing foetus is particularly susceptible to damage during the period of organogenesis. The period of development from 9th day to the 16th week after conception is known as organogenesis. While organs and limbs are being formed, the embryo is the most vulnerable to disease, to drugs and also to radiation. Modest amount of radiation can also have catastrophic consequences during this time. The whole spectrum of defects can also occur including cleft plate, stunting of the limbs, abnormally developed brain and so on. Growth retardation and neonatal death can also result from irradiation at this time. It also leads to livebirth of a grossly deformed child. Exposure of the developing embryo to ionizing radiation may produce growth retardation, death and congenital malformation. Irradiation during early organogenesis and even more so during late organogenesis, produces growth retardation, stillbirths as well as loss of organs. The predominant types of malformation observed due to radiation are the central nervous system (Microcephaly mental retardation), sense organs and skeletal system and testicular atrophy (Lo Dou, 1990). On the basis of these aspects it can be said that defects in children of Oraons inhabiting in villages near UCIL might be due to radiation. However, causes other than radiation might have influenced the results. A case control study would be necessary to obtain further information.

The bone marrow is a critical tissue most sensitive to the effects of radiation. With increasing dose, gastrointestinal tract, skin, lungs and other organs are also affected. Total body irradiation rapidly produces profound lymphocytopenia and immunosuppression (Iyer, 1996). This might be the reason for prevalence of different types of cancers and other diseases in the area.

Matigora hill acts as a barrier between Kulamara and UCIL (Fig. 4). Kulamara is a cluster of many small tolls as like Beramdera, Borakata, Jobla, Bakai, Rolagora, etc. It is surrounded by hills from three sides and is rich in vegetation. The area is mainly inhabited by Ho, Santal, Bhumij and Kharia. Quite interestingly, in this area we noticed no cases of genetical abnormalities, leukemia, thalassaemia and others. But tribals inhabiting in the villages nearby UCIL have prevalence of genetical abnormalities like

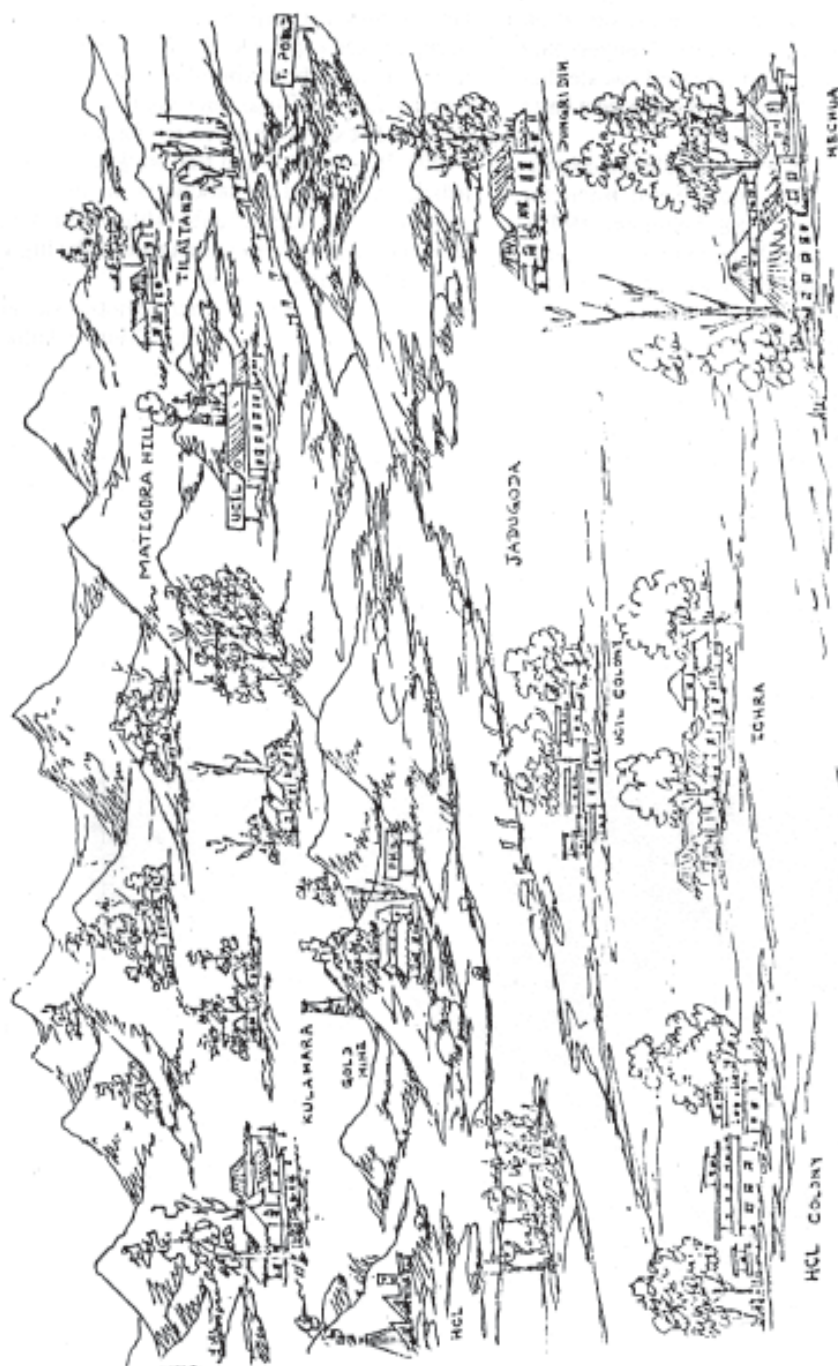


Fig. 4. An aerial view of Kulamara and Jadugoda clusters

Thalassaemia, Leukemia and etc. It indicates that the Matigora hill having rich vegetation protects the inhabitants of Kulamara from the radiation hazard. Further, it was reported by villagers that the children playing in Tailing Pond (waste disposal pond) of UCIL, Jadugoda developed a large number of abnormalities (Fig. 5).

Several studies have shown elevated spontaneous abortion rates among semiconductor workers (Pastides et al., 1988; Schenker, 1992). Increased spontaneous abortion rates are found in women in jobs requiring heavy lifting, standing long hours or exposures to excessive noise, vibration or cold. Hospital nurses and women in the plastic industry and agriculture are at increased risk. Lo Dou (1990) has pointed out following reproductive outcomes associated with exposures to workplace -Menstrual disorder, Altered fertility, Single gene defects, Chromosomal defects, Spontaneous abortion, Congenital malformation, Intrauterine growth outcome, Late foetal death, Altered gestational time, Altered sex ratios, Perinatal deaths, Developmental disability, Behavioural disorders, Cancers, Reduced libido and Premature menopause. As already pointed that female tribals work as daily

labourers in near by factories or in the agricultural fields. Therefore, they become victims of a large number of reproductive problems due to occupational exposures. Further, increased abortion rates have been found in women in jobs requiring heavy lifting, standing long hours or exposures to excessive noise or vibration (Lo Dou, 1990). It is to be noted that majority of female tribals works as daily labourers in near by factories or agricultural fields. Thus, their occupation may render them vulnerable to the high risk of spontaneous abortions.

In the present study area we noticed a variety of water borne diseases like cholera, Jaundice, Gastrointestinal disturbance etc. During survey work we noticed nearly 82.59 per cent persons suffering from Gastrointestinal disturbances.

Besides these, a large number of diseases were also noticed related with dietary habits, such as Night blindness, Bitott's spot and Xerophthalmia, Goitre, Gingivitis etc.

Malaria : Malaria is a disease caused by protozoa of the genus *Plasmodium*. Nearly 120 species of *Plasmodium* exist of which 22 species are found in primates, only four species of *Plasmodium* *P.malariae*, *P.vivax*, *P.falciparum* and *P.ovale*



Fig. 5. Brother and sister of Ichra village, Jadugoda victim of musculo-skeletal abnormality and mental retardation

inflict human beings. Malaria is characterised by fever, anaemia, headache, body-ache, splenomegaly and wide variety of other anomalies. The definite host of this parasite is the mosquito in which sexual development takes place.

In Jamshedpur belt the frequency of Malaria was found to be 70.30 per cent, the highest being in Potaka 79.80 per cent and lowest in Chakulia 52.95 per cent. The prevalence of malaria in Jamshedpur belt can be explained considering following factors:

Host Factors

1. The ill ventilated and ill lighted houses of tribals provide ideal indoor resting places for mosquitoes.
2. E.Singhbhum/South Bihar is rich in ores that lure different Engineering, Industrial and Hydel projects to be set up. Tribals are common labourer of these projects. Interaction with outsiders causes import of malaria parasites in the blood of tribals.
3. Habits of sleeping out of doors increase Man - Vector contact.
4. Malaria is acquired in most cases by mosquito-bites within the houses. The sites, types of construction, nature of walls, drainage etc. influence the spread.

Environmental Factors

1. Heavy rain generally provides opportunities for the breeding of mosquitoes.
2. Rain increases the humidity which does not have only effect on parasites (*Plasmodium*) but is necessary for the survival of the mosquitoes. Generally 60 per cent humidity is suitable for the longevity and for the voracious feeding of mosquitoes.
3. Heavy rain sometimes causes leaching of moist soil and washing away the larvae, eggs, pupae that causes decrease in mosquito population.
4. Lesser rain also provides opportunities for the spread as in the cases of Sri Lanka. Lesser rain led to the formation of small pools of water in river beds which serve as active breeding places for vector.

Man-Made Malaria: Pits for drinking water, garden pools, irrigation channels, checkdam, Engineering project led to mosquito breeding and increases the malarial incidences.

During summer, when rivers and streams dry up, the villagers of this area used to dig river belt for drinking water (1 ¼ to 2 metres or 5'-6' deep). This pit ultimately becomes breeding ground of mosquitoes.

Miller (1977) showed that individuals lacking the duffy blood group antigens are refractory to invasion by *P.knowlesi*. Duffy blood group is absent in the indigenous population of West Africa where *P. vivax* infections are virtually unknown. It was thus postulated (Livingstone, 1971) and later proved that this antigen was related to a receptor for *P. vivax*. However, Duffy negative red cells are susceptible to *P.falciparum*. Further, it has been reported that the destruction of forest has created more favourable condition (drier and sunnier) for the anopheles mosquitoes, the carrier of malaria to breed. Thus prevalence of malaria in Jamshedpur belt might be due to destruction of forest as well as prevalence of small ditches containing stagnant water which are the suitable breeding ground for mosquitoes. As far as absence of Duffy blood group in the tribal population of this belt is concerned, a more detailed study will have to be worked out before any conclusion is drawn in this direction.

Overall, the general health status of tribal population of South Bihar is not satisfactory. Urbanization, industrialization, deforestation, mining and other patterns of social organization, all have their effects upon the composition of ecological system leading to health hazards.

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