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**WATER POLLUTION: A CASE STUDY OF NATIONAL MINERAL
DEVELOPMENT CORPORATION MANGAMPETA BARYTES INDUSTRY
OF YSR KADAPA DISTRICT OF ANDHRA PRADESH**

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Abstract

Barytes industries play a pivotal role in improving countries economic growth and its generating employments of the people. On the other hand Barytes industry has the potential to cause environmental health problems and diseases. Barytes mineral available is richly available in YSR Kadapa district and widely used in several industries. Thus Barytes industries using pulverizes, Barytes rock are grinded to prescribed mesh size and products and are transports to different parts of the country and export. A barites industry was taken as a case study to study the water pollution problems and diseases of water pollution. The present study was aimed at investigate the effects of environmental pollution on the health impacts of the industrial workers and their families. Out of 240 workers 50 workers only are selected for in this study using simple random sampling method. The result showed that significant health problems and diseases of respondents found skin diseases, typhoid, gastroenterites and jaundice.

INTRODUCTION

It is a well known fact that clean water is absolutely essential for health living. Adequate supply of fresh and clean drinking water is a basic need for all human beings on the earth. Yet it has been observed that millions of people worldwide are deprived of this. Fresh water resources all over the world are threatened not only by over exploitation and poor management but also by ecological degradation. The main source of fresh water pollution can be attributed to discharge of untreated waste dumping of industrial effluent and run-off from agricultural fields. Industrial growth, urbanization and the increasing use of synthetic organic substances have serious and adverse impacts on fresh water bodies. It is a general accepted fact that the developed countries suffer from problems of chemical discharge into the water sources mainly ground water while developing countries face problems of agricultural run-off in water sources polluted water like chemicals in drinking water causes problem to health and leads to water diseases which can be prevented by taking measures can be taken, even at the household level (<http://edugreen.teri.res.in>).

India is a second largest production of barytes in the world after China and is one of the important exporters in the world market. The worldwide demand for barytes would continue to grow till petroleum products are preferred as chief source of energy. (Indian mineral year book 2011) In the domestic front, however, ore exploration is necessary to locate new deposits of barytes especially in Rajasthan, Himachal Pradesh, etc. The apparent domestic demand of barytes is estimated to be 1.36 million tonnes by 2011-12 and 2.09 million tonnes by 2016- 17 and is expected to grow at 9 per cent growth rate. About 85 per cent of the world's barites are used in the petroleum industry. (Economic survey of India Year book 2013) Mining industry is an important sector in the growth of the country's economy. It provides most of the raw materials for industrial process and products. Mining is being carried out in around 0.5 million hectares which forms 0.15 per cent of the total land mass of the country. The mining of minerals, from the time of independence –mainly involved in coal, iron, oil and gold with a worth of 58 crores has increased tremendously to leave of producing around 89 crores mineral of worth around 1,27,900 crores in 2009-10. Mining sector contributes around 4 per cent to the Gross Domestic Product (GDP) and is one of the largest employer of our country, providing employment to around 1 million 4 per cent of the India's workforce(Ravi Kumar, P. and Sridar Reddy, M., 2012).

Barytes or barite is the mineral form of barium sulphate. Approximately, 85 per cent barites produced worldwide is used for oil and gas drilling as weighting agent in drilling mud because of its unique physical and chemical properties and magnetic neutrality. (C Ragu 1998)It is also used as a feedstock for production of various barium compounds, and is also utilized as filler, extender and aggregate. Another application after its conversion to barium carbonate is in the manufacture of ceramic and glass. The Mangampet deposit in YSR Cuddapah district of Andhra Pradesh is the single largest barites deposit in the world. India is one of the leading producers and exporters of barytes in the world (Report of Indian Mineral Year Book, Review of AP 2011).

The total resources of barytes in India as on 1.4.2010 as per UNFC system are placed at 73 million tonnes constituting 43 per cent reserves and 57 per cent remaining resources. By grades, 40 per cent resources are of oil-well drilling grade followed by 6 per cent of chemical grade 1per cent of paint grade and 33 per cent constitute low grade. About 20 per cent resources are of other, unclassified and not-known categories. Andhra Pradesh alone accounts for 94 per cent of the country's barytes resources (www.unfc.org)

The production of barytes at 2,334 thousand tonnes in 2010-11 registered an increase of 8 per cent as compared to that in the previous year. There were 6 reporting mines during the year under review as against 11 in the preceding year. (www.ibm.gov.in) Andhra Pradesh continued to be the premier state in barytes production and accounted for almost the entire production of barytes. Very nominal production was reported from Rajasthan. The Andhra Pradesh Mineral Development Corporation (APMDC) Ltd, is the sole producer in public sector, which accounted for 98 per cent of the total production during 2010-11. The remaining two percent output of barytes was contributed by 5 private sector mines. Among them contribution of two mines was only 68 tonnes. The rest was contributed by two mines with an annual production range of 5 thousand to 20 thousand tonnes each and one mine having annual production above 20 thousand tonnes. Almost the entire production of barytes was of off-colour variety. Only nominal production was reported in snow white variety which was mainly from Udaipur district of Rajasthan. The mine-head stocks of barytes at the end of year 2010-11 were 5,236 thousand tonnes as against 4,007 thousand tonnes in the beginning of the year. The average daily employment of labour in 2010-11 was 516 as against 507 in the previous year. Domestic prices of barytes are furnished in the General Review on 'Prices'.(Report of the APMDC, 2012). The reported consumption of barites decreased to 192

thousand tonnes in 2010-11 from 200 thousand tonnes in 2009-10. The Oil-well drilling Industry, the main consumer of barytes, accounted for 78 per cent consumption, which was followed by Chemical Industry with 18 per cent consumption. Other barytes consuming industries like paint, asbestos products, glass, rubber, paper and cement accounted for the remaining 4 per cent consumption. (<http://mines.nic.in>)

2. WATER POLLUTION

Water is the second important component of the biosphere after air. In India water resources are abundant but most of it is highly polluted. Water and air are basic amenities of human life with tremendous growth and fast urbanization and industrialization degrade the water. Water pollution is defined as, “the addition of any substance to water or changing of water’s physical and chemical characteristics in any way which interferes with its use for legitimate purposes”. Normally water is never pure in a chemical sense. It contains impurities of various kinds – dissolved as well as suspended. These include dissolved gases (H₂S, CO₂, NH₃, and N₂), dissolved minerals (Ca, Mg, Na, and salts), suspended from matter (clay, silt, sand) and even microbes. (<http://www.indiawaterportal.org>) These are natural impurities derived from atmosphere, catchment areas and the soil. But we call water polluted when water is turbid, unpleasant, bad smelling, unfit for drinking, bath and washing or other purposes such as irrigation. They are harmful and are vehicles of many diseases for human beings, vegetation and animals. The water bodies polluted could be located on any part of the earth—surface water; industries discharged water, underground water, soil water, rivers, lakes, estuaries, coastal waters and open sea. ([http://en.wikipedia.org/Environmental issues in India](http://en.wikipedia.org/Environmental%20issues%20in%20India))

2.1 Sources of water pollution

The major source of water pollution is the waste water discharged from industries into water bodies. Industrial water pollution amounts to several times that of domestic waste water and continues to increase every day. The industries which are the source of water pollution include mineral industries food-related industries, textiles, chemical industries, metallurgical industries, paper mills, sugar mills, rubber industry, plastic industry, oil refineries, tanneries, slaughter houses etc. These major industries use water in industrial plants for cooling, sanitation, manufacturing and processing. The quality of water varies with the type of industry and type of use. The industrial units discharge several inorganic and organic waste materials. (P.D. Sherma 2010) Pollutants may prove highly toxic to the living beings. The inorganic pollutants are tiny particles of different metals, chlorides, sulphates,

cyanide, thiocyanate, oxides of iron, copper, cadmium, mercury, chromium, acids and alkalies. The organic pollutants include cellulose fibers, carbohydrates, proteins, oils, fats, phenols, neptha, organic acids, aromatic compounds, antibiotics and several other putrescible organic compounds (<http://envofor.nic.in>).

2.2 Effects of Water Pollution on Human Health

Notable effects of water pollution include those involved in human health. Nitrates (the salts of nitric acid) in drinking water can cause disease in infants that sometimes results in death. Cadmium in sludge-derived fertilizer can be absorbed by crops; if inserted in sufficient amounts, the metal can cause an acute diarrhea disorder and liver and kidney damage. The water contaminated with heavy metals can cause serious heavy problems. Mercury compounds in waste water are converted by bacterial action into extremely toxic methyl mercury, which can cause numbness of limbs, lips and tongue, deafness, blurring of vision and mental derangement. (Report State of Environment Report 2009) The water polluted with sewage usually contains pathogens like virus, bacteria, parasitic protozoa and worms. The sewage-contaminated water, therefore, is a source of water borne diseases like jaundice, cholera, typhoid, amoebiasis etc. Excess fluoride in drinking water causes teeth deformity, hardening of bones, as also stiff and painful joints (skeletal fluorosis). Over-exploitation of groundwater may lead to reaching of arsenic from soil and rock sources and contaminate groundwater. Continuous exposure to arsenic cause 'black foot disease'. It also causes diarrhea, peripheral neuritis, hyperkeratosis, as also lung and skin cancer (<http://www.moef.gov.in>).

Table.1.1
Water quality affected problems in habitations of Andhra Pradesh, 2012

Andhra Pradesh	0	332	0	64	0	396
India	3481	17400	53029	22529	2941	99380

Source: Rajya Sabha Unstarred Question No. 3417, dated on 08.05.2012.

The table presents that there are 396 habitations in Andhra Pradesh have been affected by water quality and of them 332 habitations have been affected by fluoride and 64 habitations have been affected salinity. On the contrary, 99380 habitations in India have been affected by water quality and of them 3481 by arsenic, 17400 habitations by fluoride, 53029 by iron, 22529 by salinity and 2941 by nitrate.

3 OBJECTIVES OF THE STUDY

Thus the main objectives of the study are

1. To examine the age groups of health issues of the workers engaged in barytes industry due to occupational hazards.

4. HYPOTHESIS

1. Health issues of the workers in barytes industry significantly affected

5. METHODOLOGY

The study is designed to be a case study of one barytes industry in Mangampeta National Mineral Development Corporation of YSR Kadapa District of Andhra Pradesh. The village and households residing around this industry were listed, out of 265 households 50 were selected using simple random sampling method without replacement. Above all 50 households were selected for the present study. Specially designed and pre-tested interview schedules were used to collect required information and data from the sample households.

5.1 Source of data

The data for this study were collected from both primary and secondary sources. The secondary sources include the publications of government of India; Reports of Indian Minerals Year book 2011; Annual Reports of Barytes industry in India; Andhra Pradesh Mineral Development Corporation (APMDC); Ministry of Environment and Forest (MoEF Annual reports); Department of Environment (State of Environment Reports); YSR Kadapa District profile. Websites like <http://www.moef.gov.in>, <http://envofor.nic.in>. The Primary data were collected for this study from the selected sample respondents living in the industrial polluted Area of Mangampeta barytes industry of YSR Kadapa District by conducting a survey through a well-designed structured questionnaire.

6. RESULTS AND DISCUSSION

The results of the present paper have been presented in the Table 1.2.

Table 1.2
Demography profile of respondents living in industrial water pollution area

Sl. No.	Demographic Variables	Number of respondents	Percentage
1.	Age		
	(a) 20-30 yrs	17	34.00
	(b) 30-40 yrs	23	46.00
	(c) 40-50 yrs	09	18.00
	(d) 50-60 yrs	01	02.00
	Total	50	100.00
2.	Educational Status		
	(a) Up to 10 th Class	28	56.00
	(b) Intermediate	12	24.00
	(c) Degree & above	4	08.00
	(d) Technical (ITI / Diploma)	6	12.00
	Total	50	100.00
3.	Occupational Status		
	(a) Labour	27	54.00
	(b) Operator	14	28.00
	(c) Supervisor	4	8.00
	(d) Electrician	3	6.00
	(e) Clerk	2	4.00
	Total	50	100.00
4.	Economical Status		
	(a) Below 60,000	24	48.00
	(b) 60,000-70,000	18	36.00
	(c) 70,000-80,000	3	6.00
	(d) Above 80,000	5	10.00
	Total	50	100.00
5.	Distance from the industry to the residence (km)		
	(a) Below ½	24	48.00
	(b) ½ - 1	21	42.00
	(c) 1 – 2	5	10.00
	Total	50	100.00

Note: Figures in parentheses indicate percentage total

Source: Field survey data

Age Status

The age of the respondents living in the polluted areas of barytes industry is presented in table 1.2. The data reveals that out of the total respondents living in the polluted areas of Barytes industry, 80 percent of the respondents are below 40 years of age while 20 percent of

the respondents are above 40 years but below 60 years. Therefore, most of the respondents are below 40 years of age.

Educational Qualification

The education qualifications of the respondents living in the polluted areas of barytes industry are presented in table 1.2. Out of the total respondents in the study area, 56 percent up to 10th class, about 24 per cent intermediate a few of 4 per cent degree and higher studies and about 12 per cent of respondents technical education like it ITI and Diploma.

Occupation

Occupation of the respondents living in the polluted areas of Barytes industry is shown in the table 1.2. Out of the total respondents in the study area 42 percent of them belongs to technical occupations and 4 percent of them belongs to non-technical occupation, while 54 percent of them belongs to other occupations, a significant proportion of the respondents belong to technical occupation.

Income Status

Income of the respondents living in the polluted areas of barytes mineral industry is presented in table 1.2. Out of the total respondents living in the study area 90 per cent of the respondents are having income below Rs.80, 000 per annum while 10 per cent of the respondents are having income above Rs 80,000 per annum, therefore a significant proportion of the respondents are getting very low level of Income and a small proportion of the respondents are getting somewhat better income per annum in the study are.

Distance

Distance from the barytes industry to the residence of the respondents living in the polluted areas of barytes industry is presented in table 1.2. Out of the total respondents, 90 per cent of them are residing below 1km distance from the Barytes industry, while only 10percent of the respondents are residing above 1km distance in the study area. Therefore most of the respondents are residing nearest to the work place (industry) and a small proportion of the respondents are residing far away from the work place.

Table 1.3
Age of the family members and the respondents in the industrial polluted area

Family Member With Respondent	<9	10-19	20-49	>50	Total
	37(18.97)	42(21.54)	105(53.85)	11(5.64)	195(100.00)

Note: Figures in parentheses indicate percentage total

Source: Field survey data

The age of the family members of the respondents living in the polluted areas of barytes industry is presented in table 1.3. Out of the family members and respondents, 41 per cent of the family members and the respondents are below 20 years of age group while 59 per cent of the family members and the respondents are above 20 years of age group. Thus, less than half of the family members and respondents belong to young age while the rest of the family members and the respondents belong to adult age.

Table 1.4
Effects of water pollution problems on family members of the
due to barites industry

Age (yrs)	Typhoid	Diarrhoea	Dysentery	Enteric disorders	Skin diseases	Stomach ache	Total
< 9	2 (9.09)	4 (18.18)	7 (31.81)	6 (27.27)	3 (13.63)	-	22 (100.00)
10-19	1(8.33)	-	2 (16.66)	5 (41.66)	4 (33.33)	-	12(100.00)
20-49	-	-	2(18.18)	3(27.27)	6(54.54)	-	11(100.00)
> 50	-	-	1(20.00)	1(20.00)	2(40.00)	1(20.00)	5 (100.00)
Total	3(6.00)	4(8.00)	12(24.00)	15(30.00)	15 (30.00)	1 (2.00)	50(100.00)

Note: Figures in parentheses indicate percentage total

Source: Field survey data

The effects of water pollution problems on family members of the respondents living in the polluted area of barites mineral industry is presented in table 1.4. Out of the total affected family members of the respondents 84 per cent of them are suffering with the problems like dysentery, skin diseases, enteric disorders, while 16 Per cent of them are suffering with typhoid, diarrhea and stomachache. Of the total affected family members of the respondents 68 percent of them are below 20yrs of age group. While, 32 per cent of them are in the age groups of 20-50 years and above. Hence, a significant proportion of the affected family members of the respondents are suffering with dysentery, enteric disorders, skin diseases, while a considerable proportion of them are suffering with typhoid, diarrhea, and stomachache etc. due to water pollution. A significant proportion of the affected family members are of the age group of below 20yrs and a considerable proportion of them are of the age group of 20yrs and above.

Table 1.5
Effects of water pollution diseases on family member of the respondents
due to barytes industry

Age	Jaundice	Paralysis	Gastro Entities	Total
< 9	4 (100.00)	-	-	4 (100.00)
10-19	5 (45.45)	-	6 (54.54)	11 (100.00)
20-49	5 (16.12)	-	26(83.87)	31 (100.00)
>50	-	1 (25.00)	3 (75.00)	4 (100.00)
Total	14 (27.45)	1 (1.96)	36(70.59)	50(100.00)

Note: Figures in parentheses indicate percentage total

Source: Field survey data

Effects of water pollution diseases on family members of the respondents living in the polluted areas of the barytes industry are presented in table 1.5. Out of the total affected family members of the respondents, 70 percent of them are suffering with the diseases like Gastro Enteritis, while 30 percent of them are suffering with jaundice and paralysis of the total affected family members of the respondents, 29 percent of them are in the age group of below 20yrs and 71 percent of them are in the age group of 20-50yrs and above. Therefore, a significant proportion of the family members of the respondents are suffering with gastroenteritis while a considerable proportion of them are suffering with jaundice and paralysis due to water pollution. A significant proportion of the family members of the respondents are of the age group of above 20yrs and the rest of them are in the age group of below 20yrs.

Table 1.6
Effects of water pollution on respondents and family members of the barytes industry

Problems and Diseases	Age of the inhabitants (years)			Total
	< 9	10-19	720	
Attacked	26	23	51	100
Non-attacked	11	19	65	95
Total	37	42	116	195

Hypothesis, age of the inhabitants and attack of diseases are independent

$$\text{Cal } \chi^2 = 7.461746$$

The critical value of χ^2 for 2 d.f. at 5% level of significance is 5.991

$$\text{Cal } \chi^2 > \text{Crit } \chi^2 \quad 7.461746 > 5.994\chi^2$$

So, we reject the hypothesis and conclude that.

Inference

Age of the inhabitants and attack of diseases are dependent. It is inferred from the analysis that the age of the inhabitants of the respondents and attack of the diseases are dependent with each other.

7. MAJOR FINDING OF THE STUDY

1. Majority of the respondents are in the age of 30 to 40 years
2. About 56 per cent of respondents having up to 10th class qualification.
3. Majority of the respondents were found unskilled labour
4. About 90 per cent of the respondents houses below one kilometer from industry.
5. Majority of the respondents 84 per cent getting problem with skin diseases, gastric disorders and Dysentery, a few of 14 per cent suffering typhoid fever.
6. About 70 per cent respondent are suffering from gastric enteritis and 30 per cent suffering from Jaundice and paralysis.

8. SUGGESTIONS

1. The barytes mining wastes dump should be located on barren lands far away from industry and living households
2. Water pollution treatment plant should discharge water into underground drainage system.
3. The management should provide face masks, hand gloves, shoes to prevent industrial health problems
4. Management should establish good medical facilities and employ a medical officer who has knowledge of skin and gastric diseases.
5. Sound environmental policies should be made to feature environmental policies

9. CONCLUSION

YSR Kadapa District, one of the most backward in Rayalaseema is predominantly agriculture in nature and now the industrial development is picking up through planned development. The industrial development of YSR Kadapa district is dominated by the establishment of barytes, industries based on the local resources available in YSR Kadapa district. The barytes industry development polluted the surrounding atmosphere of the areas and also became injurious to the health of the people working in the industry and also living nearby that industry. It polluted water which ultimately affected the health of the people. The respondents lost their health, the environmental pollution due to barytes industry created a number of diseases and health problems. Majority of respondents are suffering from skin diseases, typhoid, Jaundice, gastric enteritis and enteric disorders.

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