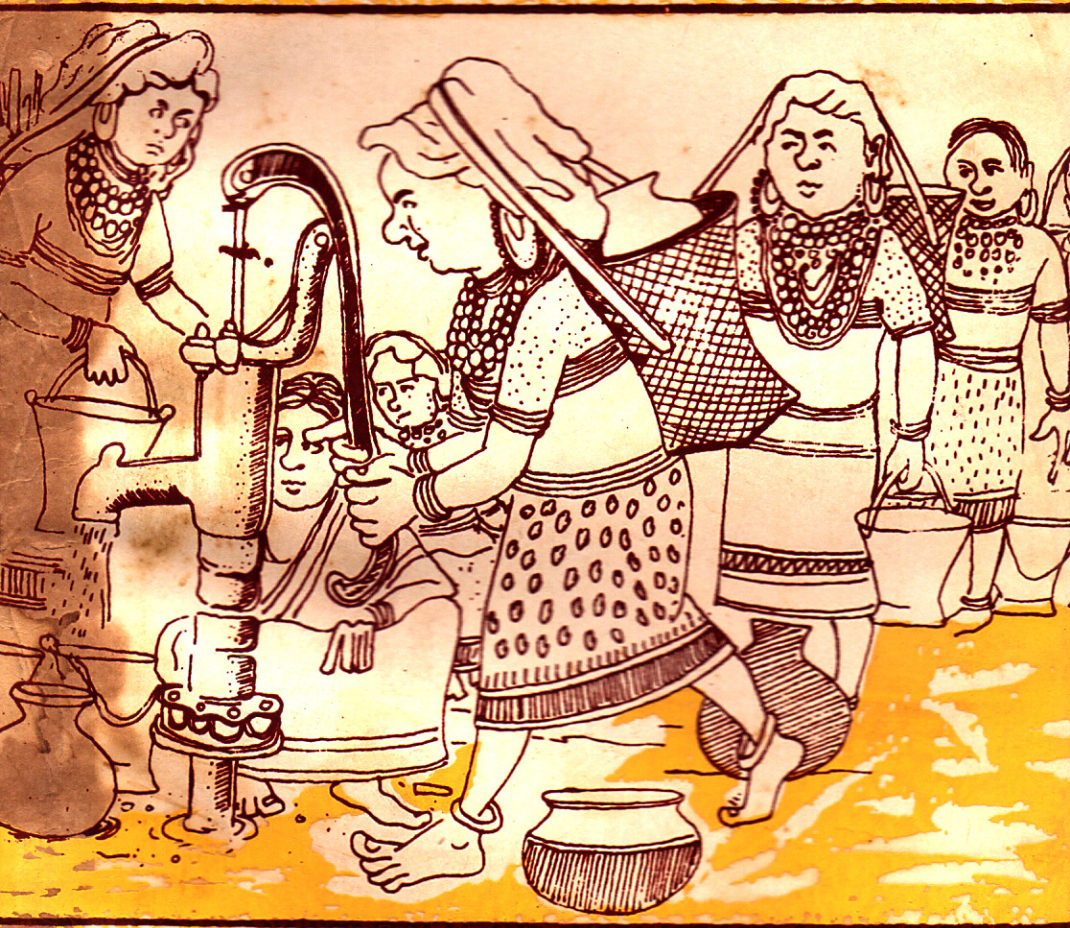
PROBLEMS OF DRINKING WATER IN TRIBAL AREAS, ITS EFFECTS ON THE HEALTH AND HYGIENE AND REMEDIAL MEASURES.



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&

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PROBLEMS OF DRINKING WATER IN TRIBAL AREAS, ITS EFFEGTS ON THE HEALTH AND HYGIENE AND REMEDIAL MEASURES.

(The final report submitted to the Directorate of Tribal Research Institute, Government of Tripura.)

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FOREWARD

In Tripura, majority of the tribal population are residing in the hilly areas. Naturally, the tribals are facing scarcity of water specially safe drinking water almost through the year round. To make the matter worse, water-borne diseases frequently spread in the tribal areas. Dr. Amitabha Deb Ray and Dr. Swapan Kumar Ray have done a commendable study on "Problems of Drinking water in Tribal Areas, its effects on their health and hygiene and Remedial measures". They have given some remedial measures for tackling these problems which will be very useful for chalking out programmes for solving these acute problems in tribal areas of the state.

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Dated, Agartala.
the 1st Feb., 1995.

CONTENTS

INTRODUCTION

water is one of the most essential nutrient for living organism, which constitutes more than 80% of the body. Not all the water in the world are safe for drinking. Drinking water should not be having impurities in hazardous concentrations. In any community it must be regarded that a certain number fo individuals will get diseased and thus capable of contaminating the water with various infectious agents. Water has been a potential carrier of pathogenic micro-organisms and can endanger health and life. The pathogens most frequently transmitted through water have been those responsible for infections of the intestinal tract (typhoid and paratyphoid fevers, dysentery and cholera) and those responsible for polio and infectious hepatitis (Chhatwal et al, 1989). Infections leading to reduce appetite and disorders due to non-availability of pure drinking water are the major contributing factors in development of malnutrition directly or indirectly (shukla, 1982). Moreover, drinking water contained organic chemicals and metals, besides the biological origin, the concentration of which more than the tolerable limit causes physiological and pathological effects such as diarrhoea, flurosis,homolysis, anemia, convulsions, damage of brain, liver and kidney,injury of central nervous system, hypertension, sporadic fever, paralysis, blindness and even death, (Chhatwal et al 1989).

An UNICEF/WHO Joint Committee on Health Policy Report in 1953 stated that 75'/. of the world's population drank unsafe water. In a recent WHO report it was stated that barely 9.7'/. of India's rural population had access to safe water and that unsafe water remained a "block to development, a drain on health, often a killer". In a report it was estimated that not more than 9'/. villages in India had a protected supply of water from tubewells and the least that the remaining could boast of were open wells or shallow hand operated lift pumps, which are more prone to pollution. The population of many hilly and rural areas has to drink water that is available from the only sweet water will in the vicinity which may be even a few kilometer away. Moreover, scarcity of safe drinking water during major part of the year are common (Shukla, 1982). The worst impact of unsafe drinking water is on children below 12 years of age (Phadke et al, 1971).

The State of Tripura, previously known as hill Tripura, lies to the South-West of Assam and is one of the States in North-Eastern Region. It is Surrounded by Bangladesh on three sides and total area is 10,477 km^2. Tripura has an underlying topography, the proportional distribution of hills and plains in the State being roughly 2 : 1. There are seven main hill ranges in the State running from North to South and separated from one another by narrow valleys. Tripura has a subtropical climate with an average annual rain fall of 2100 mm and relative humidity are

between 50 and 85%. The temperature of the State varies between 10 and 35°C. The area under forests are 6300 km² and constitute over 60% of the total area of the State (Ray, 1990).

The people of Tripura is heterogeneous, diverse ethnic elements can be traced in it. The Bengali and Tribal people constitute the two major ethnic groups of Tripura making the bulk of the population. According to 1991 census about 29% of the total population are of tribal communities. The major tribal communities are Tripuri, Reang, Jamatia, Halam etc. Needless to say that majority of the tribal populations live in hilly region of this State. Due to the hill dwellers, poor socio-economic condition and scarcity of pure drinking water in the major part of the year are common (Roy, 1990).

However, not much systematic work has been done to evaluate the exact problems caused due to consumption of unsafe drinking water by various tribal communities living in rural and hilly regions of this State. The present investigation, therefore, has been undertaken to evaluate the source, quality and pattern of use of drinking water and its effects on health, hygiene and nutritional status of the population.

MATERIAL AND METHODS :

A list of all Gaon-panchayates of Matarbari Block of Udaipur Sub-division and Satchand Block

of Subroom Sub-division with their population as per 1981 census and from Block Development Offices were obtained. From Matarbari block, Dakhin Maharani Gaon-panchayate was selected due to their predominent population of Jamatia tribal communities. Similarly, Chatakchari Gaon-panchayate from Satchand block was selected due to their predominent population of mixed tribal communities. Out of about 500 fimilies living in two selected gaon-panchayates, 100 tribal families of various communities were selected following simple radom selection method (Ullman, 1972).

Socio-economic and demographic profile of the fa nilies wear investigated by means of Questionnaire method as described by Hartog and Staveren (1983). A questionnaire schedule (Appendix-I) was prepared and data were collected on family size, sex, age, education, language spoken, occupation, medical faciilities, source of drinking water, way of purification and its availability etc.

Following anthropometric measurements were made on all the infant and childrens upto 5 years of age from the selected families in the morning after light breakfast.

i) Weight :—Body weight (kg) of the subject wearing light clothing were measured by standard portable weighing scale (Satter Scale). This scale can be hung on any beam in a room or a branch of a tree. The swing seat made out of cloth or canvas

can be used to held a child. The child is placed in the swing seat, and the weight was read to the nearest 0.1 kg (Jelliffe, 1966).

ii) Standing height :— Standing height (cm) of the subject was measured by reliable anthropometric rod (Made in England). At the time of measurement the Subject was asked to stand erect, arms hanging by the sides, fell together, heel in contact with the measuring device and was instructed to stand as tall as possible. The subject was also asked to take a deep breath and looked towards the horizon. The maximum height was recorded when the anthropometric beam was brought down firmly on the vertex, as nearest to O.1 cm range (Jelliffe,1966, ICMR,1984).

iii) Sitting height :— The subject was made to sit as far back as possible on a broad bench with the legs hanging freely and the buttocks firmly in contact with the table top. In this position the spine was straightened and the head was poised, and the measurement was taken as in standing height. The distance between the table top and the vertex give the sitting height which was measured in nearest to the 0.1 cm (Jelliffe, 1966, ICMR, 1984).

iv) Mid upper arm circumference (MUAC) : The MUAC (cm) was measured at the level of the mid point of the upper arm (left arm), between the acromian process and the tip of the olecranon, with the arm hanging relaxed by an accurate soft metalic tape (stanely, Made in England) to the nearest 0.1 cm.

the wells were only 4 to 9 ft. deep and the rain-water run over through these wells. Moreover, various algae, fungi and several living organisms were obsereved there. Although, the drinking water from these wells were not available throughout the year.

Some of them fetched river water for drinking purposes mainly in the winter season in the following way: Firstly, they selected the suitable sanded river basin, than they dugged it up to 2 to 3 ft. After one to two hours the water stored in that area were collected and used for drinking purposes. Needless to say that the water collected from river basin was unsafe for health .

After fetching water from various sources they stored it mainly in a earthen pot. But some of the families used aluminium pot for storage purposes. It was found that almost 58·/. families of Dakhin Maharani gaon-panchayate and 56./· families of Chatakchari gaon-panchayate used unsafe drinking water and may be more prone to infections and infestations. Moreover, more than 90·/. families in both gaon-panchayates used drinking water without any purification i. e. without boiling and/or filtering.

Some clinical symptoms related to water borne diseases observed in the present study in Tribal families are presented in Table-3. This table indicates that diarrhoea and dental flurosis were prevalent in both the gaon-panchayates which was 54·/. and 56·/. of families respectively. Of them diarrhoea was

more common (62·/.) in both Dakhin Maharani and Chatakchari gaon-panchayates. Dental flurosis was also prevalent in both the gaon-panchayates. It was also found that evidences of Goitre was considerable.

The average height and weight of both male and female pre-school children of selected tribal families with their Indian and American standards are listed in Table 3. It was found that heights of male children in all age groups are comparable to Indian average but slightly lower (5-10·/.) than the American standards, whereas, heights of female children are lower (5-15·/.) than both the Indian average and American standards. All the values lies with in 85 to 95th percentage of Harvard standards. On the other hand it was found that weight of both male and female children in all age groups are lower (8-25·/.) than both of Indian average and American standards. All the values iies with in 70-77th percentage of Harvard sfandards.

Table 5 represents the different grades of malnutrition in pre-school children ot selected Tribal families based on precentage weight of the Harvard reference standard (according to the Nutrition subcommittee of the Indian Academy of Paediatries) . It was found that 23.6,47.3 and 7.3 percent of pre-school children in all age groups are grade-I, grade-II and grade-III type of malnutrition respectively, whereas none one can found for grade-IV type of malnutrition. This table also indicates that in the age groups of 1

and 2 years none can found for grade-III type of malnutrition. It means that in early age the childrens are less effected. Whereas maximum children were found for grade- II type of malnutrition.

The average values of certain other anthropometric measurements and their indices such as sitting height, mid upper arm circumference, quetlet index, relative sitting height index and body mass index of selected Tribal pre-school children are listed in Table-4. It was found that the average values of mid upper arm circumference lies within 78 to 90 percent of Wolanski standard (Shah, 1974). Also for all the children except the ages of 3 and 5 for male children and the age of 4 for female children, the values are fallen below 5th percentile value of Hane-survey I (USA) data (Frisancho, 1981). The relative sitting height index of both Tribal male aud female pre-school children were 57.4 and 56.3% respectively which was higher than the average Indians. Body mass index values are found within the normal range of Indian average.

DISCUSSIONS

The demographic profile of selected Tribal families in the present study showed that average family size was almost similar to the average Tribals of Tripura (Census, 1991) and Tripura averages but slightly higher than Indian average (Ganguly, 1983). The literacy rate of the Tribal families was almost similar with the Tripura averages (1991 Census) but higher than the Reang Tribes (Ray,1990) and also higher

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than the Tribal averages in Tripura (Census, 1991). The higher literacy observed in the tribal families was primarily due to the higher literacy rate among the children and the adolescent population of ages 6 to 17 years. Similar pattern of observation was also found by Ray (1990) for Reang tribals of Tripura.

As could be expected the drinking water scarcity was most common in study areas where 57'/. of population suffers acutely. Similarly Ray (1990) observed that in Amarpur area 85'/. population of Reang community suffers from similar problem. It was observed that 91'/. of tribal families in the present study used drinking water without any purification. This might be due to ignorance and lack of social education which reflects on the existancs of a high rate of infection and infestations. The high rate of diarrhoeas (54'/.)observed in the present study might be due to the effects of intestinal parasites which developed by using unsafe drinking Water. It could be well argued that chronic diarrhoeas caused mainly by intestinal parasites and are one of the most important factors leading to the development of latent or overt malnutrition. In a survey in the Bombay area where among children below 12 years, 62'/. had stool positive for either one or more of round worms, thread worms, giardia, hookworm and entameba histolytica, caused by unsafe drinking water and poor environmental hygiene (Phadke et al, 1971). Studies were done by many workers that various intestinal parasites can produce growth retardation of children and diseases reducing the absorption of vita-

mins and other nutrients (Shukla, 1982). Apart from intestinal infestations, systemic parasite and bacterial infections which is developed from unsafe drinking water also produce a deleterious effect on nutritional status (Shukla, 1982).

High rates of dental flurosis (39·/.) observed in the present study reflects the higher fluoride content of water. Also lower intake of iodine either directly from water or from other foods can be evidence by their iodine deficiency goitre (Table-3). In a study in Panjab, the incidence of flurosis was found to be roughly proportional to the fluoride content of drinking water (Jolly et. al. 1969). Davidson and Passmore (1969) showed that villages with 2.3 ppm of fluoride in drinking water had 30·/. cases of dental flurosis.

In the present study it was observed that the height of both male and female pre-school children are almost similar with the values of Indian average but lower than the American standards. Whereas for weight, the values was slightly lower than the Indian average and American standards. From this study it was found that weight loss is more than height. One of the probable reasons is the nutritional cost of infective diseases were higher in the poorly nourished children. Similarly, several workers high lighted various aspects of the over all mechanism such as the nutritional cost of infective diseases is higher in the poorly nourished and consequent higher repletive requirements with resultant more weight loss (Keusch,

1977; Mata et. al. 1977; Jackson et. al. 1977).

From the Table-5 it was found that almost 55 '/. of children are having Grade-II and Grade-III type of malnutrition. Of them almost 11 '/. of the pre-school children are suffering from marasmic kwashirkor. It was found that the children suffering from marasmic Kwashiorkor are between the ages of 3 and 5 years. So, it can be said that just after the starting of weaning period the deleterious effect of poor environmental hygiene. Unsafe drinking water, faulty feeding practice and other factors starts which ultimately lead to the severe malnutrition. Shukla (1982) started that faulty weaning practice developed malnutrition in case of pre-school children .

The present study could not provide to any definite conclusions about the quality of drinking water. Because, the analysis of water was not done. The analysis of water is not possible in a short phase of study and it is most expensive one. Need less to say that water analysis is the most vital part of any study to assess acurately the effects of water on the nutritional status of a community, individually or as a whole. Therefore it is suggested that elaborate studies are required to analyse the quality of water in certain areas of Tripura so tnat a definite conclusion can be arrived at.

SUMMARY

1. Most of the Tribal populations of the studied areas drink unsafe drinking water possibly because of non-availability or due to their ignorance of knowledge of low cost purification method in spite of higher literacy rate.

2. Higher incidence of Dental Fluorosis and Goiter indicate possibly higher fluoride and lower iodine contents of the drinking water; however it needs further investigation for coming to some definite conclusion.

3. Higher incidence of diarrhoea in the studied areas suggests contamination of drinking water with some pathogens; however it also needs further investigation to identify the specific pathogens and to suggest remedial measures.

4. Consumption of unsafe drinking water directly affecting the health of the population particularly the pre-school children (3-5 years of age).

5. Wide spread health education by means of posters in local languages, exhibitions & dramas, showing Video and Audio cassessts etc. are suggested. Gaon-panchayates and local voluntary health organisation may be actively involved in the process.

Table-1 : Demographic profile and Educational status of Tribal families in Dakhin Maharani and Chatakchari Gaon-panchayate of South Tripura.

Parameters	Dakhin Maharani Gaon-panchayate	Chatakchari Gaonpanchyate	Total
A. Total families (No.)	50	50	100
B. Average family size	5.88	4.92	5.40
C. Male : Female ratio	1 : 1.085	1 : 0.821	1:0.957
D. Pre school children (%. of total)	11.56	17.07	14.07
E. School children upto 18 yrs. (%. of total)			
i) Boys	13.95	17.48	15.56
ii) Girls	18.71	13.01	16.11
F. Literacy rate(%.) (From 6 yrs. of age)			
i) Total	62.69	69.12	65.52
ii) Male	70.73	80.36	75.32
iii) Female	55.47	55.43	55.46

Table-2 : Sources of drinking water and its use among the tribal families in both Dakhin Maharani and Chatakchari Gaon-Panchayate of South Tripura.

Sl. No.	Parameters	Dakhin Maharani Gaon-Panchayat (%. of family)	Chatakchari Gaon-panchyt (%. of family)	Total (%.of family)
1.	**Sources of drinking water**			
a)	Shallow well	52	36	44
b)	Shallow tube well	—	44	22
c)	Deep tube well	42	—	21
d)	Ring well	—	20	10
e)	River water	6	—	3
2.	Pattern of drinking water use :			
a)	Purified	10	8	9
b)	Non-Purified	90	92	91

Table-3 : Clinical signs of Malnutrition among the tribal families in both Dakhin Maharani and Chatakchari Gaon-Panchayate of South Tripura.

Sl. No.	Parameters	Dakhin Maharani Gaon-Panchyate (*/.* of family)	Chatakchari Gaon-panchyate (*/.* of family)	Total (*/.* of) family
1.	Diarrhoea	62	46	54
2.	Dental flurosis	42	36	39
3.	Goitre	12	10	11
4.	None	20	10	15

Table-4 : Mean Heights and weights of pre-school children among the tribal families of Dakhin Maharani and Chatakchari Gaon-panchayates of South Tripura as compared with Indian average and American standards.

Age (yrs.)	Hight (cm)					
	Male			Female		
	Present study	Indian	American	Present study	Indian	American
0-1	73.0	73.9	75.2	66.7	72.5	74.2
1-2	76.9	81.6	87.5	75.5	80.1	86.6
2-3	88.1	88.8	96.2	85.2	87.2	95.7
3-4	98.2	96.0	103.4	94.7	94.5	103.2
4-5	103.7	102.1	108.7	96.0	101.4	109.1

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Age (yrs)	Weight (kg)					
	Male			Female		
	Present study	Indian	American	Present study	Indian	American
0-1	7.7	8.4	10.1	7.0	7.8	9.8
1-2	9.6	10.1	12.6	8.7	9.6	12.3
2-3	11.0	11.8	14.6	10.9	11.2	14.4
3-4	12.4	13.5	16.5	12.5	12.9	16.4
4-5	14.1	14.8	18.5	13.3	14.5	18.4

Table-5 : Protein calorie Malnutrition of pre-school children among the tribal families of Dakhin Maharani and Chatakchari Gaon-Panchayate of South Tripura.

Age (years)	Normal	Grade-I	Grade-II	Grade-III
0-1	20.0	20.0	60.0	—
1-2	8.3	41.7	50.0	—
2-3	25.0	15.0	50.0	10.0
3-4	36.4	18.2	36.3	9.1
4-5	14.3	28.6	42.8	14.3
1-5	21.8	23.6	47.3	7.3

Table-6 : Other anthropometric masurements and their indices of pre-school children among the tribal families of Dakhin Maharani and Chatakchari Goan-Panchayates of South Tripura.

Age (yrs.)	Sitting height (cm)		Mid Arm Circumference (cm)	
	Male	Female	Male	Female
0-1	45.25	35.50	12.60	13.00
1-2	45.64	46.00	13.67	13.42
2-3	51.25	50.11	14.32	14.06
3-4	54,20	51.92	14.20	14.60
4-5	57.75	53,67	15.50	13.83
1-5 yrs.	50.82	47.44	14.06	13.78

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Quetlet index		Relative sitting height index (%)		Body mass index	
Male	Female	Male	Female	Male	Female
0.15	0.17	58.83	50.77	14.55	16.92
0.16	0.16	60.13	60.64	16.51	15.44
0.14	0.15	58.32	59.21	14.28	14..44
0.13	0.15	55.28	54.88	12.84	14.89
0.14	0.14	54.40	55.91	14.09	14.55
0.144	0.154	57.39	56.28	14.45	15.25

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APPENDIX-I

HOUSEHOLD LEVEL SCHEDULE FOR ORINKING WATER SURVEY

1. Household Number :

2. Name of the head of the Household :

3. Address :

   Vill/Para :

   Gaon-Panchayate :

   P.O. :

   District :

4. Religion :

5. Family Particulars :

Sl. No.	Name	Relationship with head of the household	Sex	Age	Education	Language spoken	Occupation	
							primary	Secondary

6. Source of drinking water : Deep Tube Well/Shallow Tube Well / Ring Well/ Shallow Well/River water /Pond Water/Rural Water/ Supply/Other (Specify).

7. Way of purifying water : Boiling /Filter / Halogen tablets/Other (specify).

8. Is sufficient water available throughout the year. : Yes/No

If no, time of scarcity :

9. Where the water stored :

Signature of Investigator

APPENDIX-II

HOUSEHOLD LEVEL SCHEDULE FOR DRINKING WATER SURVEY

1. Household Number :
2. Name of the Head of the Household :
3. Address :
   - Vill/Para :
   - Gaon Panchayate :
   - P. O. :
   - District :
4. Religion :
4. Medical Facilities available : PHC/Hospital / Dispensary/Pvt./ Quack / Other (Specify).
6. Chronic diseases in the family (last 5 year) :
7. Clinical symptoms :
   - i) Dental flurosis : Present/Absent
   - ii) Goitre : Present/Absent
   - iii) Diarrhoea (Last 5 years) : Yes/No
   - iv) Communicable diseases if any, specify.

v) Current illness if any, specify

vi) Chronic diseases if any, specify. :

8. Anthropometric measurements (for children below 5 years)

)i)	Weigtht (in kg)				
(ii)	Standinб Height (in cm)				
(iii)	Sitting Hight (in cm)				
(iv)	Mid-arm circumference (in cm)				

Signature of the Investigator

Date :

Time :