



Original Article:

Genetic Disease Burden, Nutrition and Determinants of Tribal Health Care in Chhattisgarh State of Central-East India: A Status Paper

Balgir RS, Division of Human Genetics, Regional Medical Research Centre (ICMR), Bhubaneswar-751 023, Orissa.

Address For Correspondence:

Dr. RS Balgir,

Scientist-F/Deputy Director (Senior Grade) & Head,

Department of Biochemistry,

Regional Medical Research Centre for Tribals,

Indian Council of Medical Research,

Near NSCB Medical College & Hospital,

P.O. Garha, Nagpur Road,

Jabalpur-482 003,

Madhya Pradesh, Central India.

E-mail: balgirrs@yahoo.co.in

Citation: Balgir RS. Genetic Disease Burden, Nutrition and Determinants of Tribal Health Care in Chhattisgarh State of Central-East India: A Status Paper. *Online J Health Allied Scs.* 2011;10(1):4

URL: <http://www.ojhas.org/issue37/2011-1-4.htm>

Open Access Archives: <http://cogprints.org/view/subjects/OJHAS.html> and <http://openmed.nic.in/view/subjects/ojhas.html>

Submitted: Mar 16, 2011 Accepted: Mar 31, 2011; Published: April 15, 2011

Abstract:

Tribal health is an important aspect of development and progress of the people. This study pertaining to genetic disease burden, nutritional status and biomedical anthropological assessment with particular reference to determinants of tribal health care has been carried out among the four tribes, namely, Bhatra, Gond, Kondh and Paraja of Orissa residing adjacent to the bordering districts of Chhattisgarh. The population genetic structure of a tribe is the outcome of socio-cultural practices, bio-psychological behavior, genetic constitution, and eco-environmental conditions. Tribal communities in India, in general and of Chhattisgarh state in particular, are highly vulnerable to various genetic diseases, nutritional deficiencies and unrealistic practices and lack of access to basic health facilities. A total of 815 blood samples comprising of 166 Bhatra, 219 Gond, 254 Kondh and 176 Paraja tribes were collected randomly under aseptic conditions. The frequency of sickle cell hemoglobinopathy (3.2-22.5%), β -thalassemia trait (0.5-8.5%), and G6PD enzyme deficiency (6-16%) is very high among the tribes of Chhattisgarh. However, the prevalence of Rhesus negative blood group is very low (0-0.6%). The frequency of hereditary hemolytic anemia is also high among the tribals of Chhattisgarh. Both communicable and non-communicable diseases harbor the tribal population. The nutritional deficiencies are rampant. Tribal people are engrossed with superstitions and have faith in traditional healers who practice magico-religious rites along with indigenous herbal treatment for the common ailments. Traditional folk medicine and health culture play a significant role in shaping tribal life. These health practices differ from one tribe to another. Unless locality specific, tribe specific and need-based health care system is evolved which should be appropriate, acceptable, accessible, and affordable, the true goal of health for all cannot be achieved in India.

Key Words: Tribal health; Genetic disease burden; Nutrition; Communicable disease; Non-communicable disease; Biomedical anthropology; Chhattisgarh.

Introduction:

It has been enumerated that there are nearly 635 tribal communities in India of which Bhils and Gonds represent the largest number. Tribal populations constituted 8.08% (about 68 million) of the total population of India according to 1991 census. The projected tribal population was more than 83 millions by the year 2001. Their largest concentration (about 87%) is comprised of the states of Rajasthan, Gujarat, Maharashtra, Madhya Pradesh including Chhattisgarh, Andhra Pradesh, Orissa, Bihar including Jharkhand, and West Bengal. About one-fourth of the total tribal population of India lives in Madhya Pradesh including Chhattisgarh (23.7%), followed by Maharashtra (11.3%), Orissa (10.8%), Bihar including Jharkhand (10.2%), Gujarat (9.5%), Rajasthan (8.4%) and so on in the decreasing order. (1) Out of these 635 tribes, there are about 75 tribes which are extremely in under-developed stage, and have been listed under primitive tribes in India.

The state of Chhattisgarh is situated in between the states of Madhya Pradesh and Orissa in the Central-East part of India which came into existence on 1st November 2001. It borders with the state of Jharkhand in the North and, Andhra Pradesh and Maharashtra states in the South. There are about 30 scheduled tribes in the state of Chhattisgarh (Table-1). The tribal populations constitute about 32.46% of the total population of the state, which means that every 3rd person of the state is a tribal. The forest reserve covers 44% of the total area of the state and comprises 12% of the forests of India. The state is famous for the cultivation of rice and is known as rice bowl of India. It has rich biodiversity and has been declared as the herbal state of India.

Table 1: Distribution of different scheduled tribes in old districts of Chhattisgarh before the reorganization of the state on 1st November 2001.

Name of district	Names of scheduled tribes
Surguja	Baiga, Bharia-Bhumia, Binjhyar, Dhanwar, Gond, Kawara, Kasalwal, Kol
Bilaspur	Baiga, Bhajua, Bharia-Bhumia, Binjhyar, Dhanwar, Gond, Kawara, Kasalwal, Kharia, Kol, Korwa, Majhwar, Nagesia, Oraon, Pardhan, Pardhi, Saonta
Raigarh	Bhajua, Bharia-Bhumia, Binjhyar, Birhor, Dhanwar, Gond, Kawara, Kasalwal, Kharia, Kol, Kondh, Korwa, Majhwar, Munda, Nagesia, Oraon, Saonta, Sawar
Durg	Gond, Halba, Kawara, Pardhi
Raipur	Bhunjia, Binjhyar, Gond, Halba, Kamar, Kawara, Kharia, Kondh, Oraon, Sawar
Bastar	Bhatra, Gadaba, Gond, Halba, Kannar, Korwa, Maria, Muria, Pardhan, Pardhi, Paraja

The diseases of genetic origin in man are manifested, in general, in interaction with the environment. The delineation of causative factors behind a disease requires in depth investigations into socio-cultural and bio-psychological milieu of the people. It may include diverse factors such as the sanitation, hygiene, parasitic load, breeding pattern, preferential marital alliances, nutritional pattern, perception about a disease, health seeking behavior, prevalence of inherited diseases, and the alikes.(1) All these socio-economic and cultural, psycho-biological and eco-environmental correlates which play a significant role in the health and disease process must be taken into consideration in drawing up any conclusion about a particular population or tribal group. Further, these concomitant factors vary from one population group to another.

Tribal communities, in general, and the primitive tribal groups in particular are highly disease prone, and do not have required access to basic health facilities. They are mostly exploited, neglected, and vulnerable to various diseases with high degree of malnutrition, morbidity and mortality.(1) Their misery is compounded by poverty, illiteracy, ignorance of the causes of diseases, hostile environment, poor sanitation, lack of safe drinking water and blind beliefs, etc.(2)

The article in hand is designed with a view (i) to present a status paper in general on the tribal health, genetic disease burden, and nutritional status; and (ii) biomedical anthropological assessment and development among the tribals of Chhattisgarh in general and Bhatra, Gond, Kondh and Paraja tribal people of Orissa in particular belonging to the adjoining area of the state of Chhattisgarh.

Subjects and Methods:

For the present study, 815 Ashram-school-tribal students aged 6 through 15 years were randomly selected from different schools from the districts of Koraput (Paraja =176), Nawarangpur (Bhatra =166), Kalahandi (Gond =219), and Kandhamal (Kondh =254) in the state of Orissa. Most commonly encountered tribal groups in these areas are Bhatra, Paraja, Gond and Kondh in the districts. These are bordering districts of adjoining state of Chhattisgarh and have high concentration of tribal people inhabiting both in the states of Chhattisgarh and Orissa. In other words, these tribals represent the similarities in socio-cultural traditions and genetic homogeneity because they share a common genetic pool with the tribals of adjoining states of Chhattisgarh and Orissa.

About 2-3 ml. of intravenous blood samples were collected from unrelated students (children) after taking informed consent from each individual under aseptic conditions in ethylene diamine tetra acetic acid (EDTA) coated vials in the presence of a medical doctor. Blood samples so collected were transported

within 24 hours of collection under ice-cold conditions to the laboratory at Bhubaneswar where the analyses were carried out following the standard procedures and techniques. Background information was collected from each individual as well as from each tribal community.

The sickling test was performed by wet sealed method using 2% freshly prepared sodium metabisulphite solution following the methodology of Daland and Castle.(3) Further, routine hemoglobin (Hb) electrophoresis was performed using cellulose acetate membrane (CAM) in Tris-EDTA-Borate (TEB) buffer at pH 8.9 (4,5) and fetal hemoglobin as per standard procedures.(4) The hemoglobin A₂ was estimated by elution method and the value of more than 3.5% was taken as the cut off point for β -thalassemia trait. The glucose-6-phosphate dehydrogenase (G6PD) enzyme deficiency was detected by using dichlorophenol indophenol (DCIP) dye as described by Bernstein (6) and, subsequently, confirmed by WHO procedures (7) and Beutler et al.(8)

Results and Discussion:

It has been observed that the tribals, unlike the general populations in Chhattisgarh, are vulnerable as well as have major threat of biomedical health problems. The genetical diseases pose a major burden on them. Hereditary disorders of blood like hemoglobinopathies, β -thalassemia, G6PD enzyme deficiency, hemophilia, and color blindness, chromosomal aberrations, congenital malformations, inborn errors of metabolism, etc. among others take a high toll of life.(9) The preventive and control strategies along with remedies for some of these hereditary disorders have also been highlighted elsewhere.(10-16)

Analysis of ABO blood groups among the four tribes showed that the blood group B predominates over A among Bhatra, Kondh and Paraja except the Gond tribe (Table-2). The frequency of blood group O is the highest among the Bhatra, Gond and Paraja except in the Kondh tribe. The frequency of Rhesus negative blood group is very low (0-0.6%) among these four tribes (Table 2) than the average frequency in other Indian population groups. Low frequency of this gene among the tribals of Chhattisgarh is a pointer to the high selection pressure at this locus with a resulting loss of fetuses and newborns at various stages of life.(17)

Table 2: Distribution of ABO and Rhesus (D) blood groups, sickle cell disorders, β -thalassemia trait, and G6PD deficiency in four tribes of Orissa adjoining Chhattisgarh

Parameters of Study	Name of Tribe			
	Bhatra (N=166)	Gond (N=219)	Kondh (N=254)	Paraja (N=176)
ABO Blood groups:				
A (%)	25.3	33.3	29.5	27.8
B (%)	25.3	21.5	37.0	33.5
AB (%)	9.6	6.8	10.6	9.7
O (%)	39.8	38.4	22.8	29.0
Allele frequency:				
p	0.301	0.227	0.243	0.214
q	0.301	0.154	0.293	0.251
r	0.398	0.619	0.464	0.535
Rhesus (D) Blood groups:				
Rh +ve (%)	99.4	99.5	99.6	100.0
Rh-ve (%)	0.6	0.5	0.4	0.0
Allele frequency:				
D	0.923	0.929	0.937	1.000
d	0.077	0.071	0.063	0.000
Genetic Disorders:				
Sickle cell disorders (%)	18.1	22.4	3.2	14.8
β -thalassemia trait (%)	6.6	0.5	6.3	8.5
G6PD deficiency (%)	6.6	5.9	6.7	15.9

The prevalence of genetic disorders like sickle cell hemoglobinopathy, β -thalassemia, and G6PD deficiency among the tribals of Chhattisgarh state is very high (Table 2). The frequency of sickle cell hemoglobinopathy ranges between 3.2% to 22.5% and that of β -thalassemia trait between 0.5% to 8.5%

among the Bhatra, Gond, Kondh and Paraja tribes belonging to bordering districts of Chhattisgarh and Orissa. The deficiency of G6PD is also very high (6-16%) among these four tribal populations (Table 2). The enzyme in all tribes appears to be similar, with more or less 10-20% of the normal enzyme activity and normal electrophoretic mobility, which has been found to be a new variant named "G6PD Orissa".(18) The Michael's constant (KmNADP) for the substrates which actually translates roughly into five-fold lower activity at limiting substrate concentrations is high and shows the increased thermostability than the normal enzyme.

These abnormalities co-exist in the population living in hyper endemic zones of malaria.(19) The other side of this health problem is even more alarming. Instead of saving tribals from the grip of malaria, a medical doctor can do a great harm by giving antimalarial drugs to persons who are G6PD deficient, leading to some serious complications, resulting in severe jaundice or anemia, and sometimes, resulting even in death.(20,21) Indiscriminate use of such drugs for treatment as well as for prevention should be done with utmost precaution, considering this factor. While eradicating malaria, antimalarial drugs like primaquine and many other compounds such as phenacetin, furadantin, certain sulphonamides and acetyl salicylic acid (aspirin), etc., should be administered with caution to subjects deficient in G6PD enzyme among the tribes of Chhattisgarh. This may produce hemolysis of the red blood cells, causing severe anemia and health hazards, and sometimes, fatal also. This is a problem not only for geneticists, public health authorities, but also for the Tribal Health, Tribal Welfare and Tribal Development personnel as well.(20-22)

The tribals of Chhattisgarh have been exposed to infection of malaria for the last several hundreds of years with the introduction of agriculture and, as a result, the mutation of red cell enzyme and hemoglobinopathies might have occurred in them to cope with the environmental threats.(19,23,24) The heterozygous advantage in affording protection against malaria, particularly of the *Plasmodium falciparum* type, must have been possibly the cause of a high incidence of such genetic disorders. The study of different variants of hemoglobinopathy and G6PD deficiency is an important area of research among the tribals of Chhattisgarh.

The tribals of Chhattisgarh state follow territorial exogamy in marriage alliances. The population of each tribal clan is not large enough and in course of time, even though, the marriage takes place outside the clan, it results in inbreeding at certain stage due to cross and parallel cousin marriages.(14,16) Moreover, the marriage distance between the two partners is very small which also leads to lack of genetic variety or variations, in addition to genetic inbreeding in the population. This brings the recessive or hidden characters on the surface and leads to increased homozygosity (by bringing the defect in double dose) and affects the health because of the combination of lethal traits in homozygous condition. It is, therefore, necessary to carry out detailed surveys to find out the disease profile and disease burden (cause and effects, and economic and manpower loss) and dietetics of the tribals of Chhattisgarh so that a comprehensive health promotive, health care and prevention of genetic diseases as well as nutritional programme may be planned and intervention strategies formulated for the vulnerable population in a befitting manner.

The steps suggested to be taken for the prevention and palliative treatment of sickle cell disease (11), β -thalassemia (13) and G6PD deficiency (10) are as following:

1. The patient is advised to be warm, avoid cold bath or cold drinking water or drinks.
2. The patient should consume adequate amount of fluids especially during summer in order to prevent from dehydration and excessive hot temperature.

3. Always prevent from getting any infection, i.e. viral, bacterial or parasitic infection including malaria.
4. Prophylactic antibiotics, immunization and anti-malarial drugs are useful in crises.
5. Care and caution should be taken to avoid those drugs causing hemolytic anemia for G6PD deficient cases.
6. Vascular stasis should be avoided in routine activities.
7. For normal life, prevention of infarcts and formation of clotting or thrombi in circulatory system is necessary.
8. Administration of magnesium sulphate or simple saline during crisis prevents from critical condition. They prevent clotting process and delay thrombi formation and act as vasodilatory agents in dislodging nests of sickled cell in small vanules.
9. To avoid intra-vascular sickling, the pH of the body should be kept alkaline with oral administration of sodium bicarbonate (2-3 gms per day) in divided doses as a precaution to prevent crisis especially during infections. It should be ensured that the intake of sodium bicarbonate should be such that the urine reaction with litmus paper remains alkaline. Consumption of adequate quantity of local made squash (sharbat) from bill fruit will prevent sickling and enhance soothing effect.
10. Folic acid supplements without iron are useful. Iron supplements should follow the serum iron estimation to avoid iron overload.
11. Hemoglobin level should be maintained between 6-9gm/dl. This degree of anemia with low oxygen affinity helps in efficient release of oxygen to the tissues and sufficient to maintain active life.
12. Blood transfusion is required only if the hemoglobin level falls below 5 gm/dl.
13. At the time of delivery protracted labour or cesarean operation should be avoided.
14. Ulceration especially of leg ulceration, in some cases, may be resistant to treatment. In cold weather, warm stockings should be worn. Circulation should be improved by elastic bandages or stockings and advising the patients to put up their legs raised for some time at night. Poor vascularisation facilitates infection.
15. Regular check up and follow up of these cases is highly essential for monitoring the progress.

Nutritional Status

Nutrition is prime concern of all living organisms. The quality and quantity of food available play an important role in determining the health and well being of individuals and the populations in general. Its applications involve social, physical, biological and medical sciences.(25) These encompass from food production, procurement and consumption, socio-economic institutions, cultural practices and beliefs associated with food to biological needs of food, nutritional deficiencies affecting growth and development, fertility, mortality, morbidity, health and disease, nutritional variations as a mean as well as consequences of adaptation, natural selection and, in short, the whole process of biological evolution.(26) One of the major areas of nutrition is intimately connected with health and well being of the people. It is said that healthy people are a nation's most valuable asset on whom rests the nation's future. Children of today are the builders of tomorrow who will man different walks of the national life. The caliber of each of them will depend on their state of mental and physical growth. It is well es-

established that the course, both body and mind takes to grow, is determined by heredity but to a large extent influenced by environmental (epigenetic) factors particularly the nutrition.

Individuals differ in their morphology because of their differences in genetic make up and, therefore, carry various metabolic activities at different rates. Similarly, some individuals may need more nutrition while the others need less to achieve a similar morphology. The nutritional needs for energy expenditure vary with age, sex, weight, body proportions, hormonal and physical activity of an individual.

Understanding of the nutritional needs of adult humans is important not only because the healthy people are more efficient and more productive in all spheres of life but also in the national economic growth as well. Healthy people are also capable of producing healthy progeny too who, in turn, will grow up to become future healthy adults. The nutritional status of adults is an index of nutritional status of a community and by comparison with normal or standards can bring out nutritional deficiencies in population due to either inadequate or inappropriate diet or due to ecological, ideological, socio-economical or epidemiological factors.(27)

The clinical assessment of tribal communities shows one or more signs or symptoms of common deficiencies as listed in the Table-3. Numbness and tingling of hands and feet due to vitamin B1 deficiency is very common. High incidence of nutritional deficiency in some cases especially among vulnerable segments like infants, children, pregnant women, and nursing mothers is a matter of concern among the tribals of Chhattisgarh. These signs and symptoms are largely non-specific and clinical examination alone is not sufficient to establish a clear and definite diagnosis of nutritional diseases and deficiencies, but dietary surveys and biochemical data incorporated with clinical assessment may confirm the findings of inadequate nutritional standard.(26) Future studies will throw more light on the health problems of tribals of Chhattisgarh.

Body part examined	Clinical signs	Interpretation
Hair	Thin, dry with change of colour to brown, red or even white	Protein energy malnutrition
Neck	Enlargement in front of neck (thyroid)	Endemic goiter
Eyes	Whitish triangular patch on the conjunctiva lateral to the cornea (Bitot's spot: dry cornea)	Xerophthalmia
Lips	Ulceration at the angle of the mouth (Angular stomatitis and chelosis)	Riboflavin deficiency
Tongue	Enlargement of the papillae, pal colour with fissures, pale like blotting paper	Riboflavin deficiency and nutritional anemia
Gums	Swollen, spongy, bleeding on pressure, petechiae	Ascorbic acid (vitamin C) deficiency
Skin	Reddish or brownish pigmentation patches with peeling of skin	Protein energy malnutrition
Nailbed	Pale or white in colour (Koilonychia)	Nutritional anemia
Chest	Narrow, protruded forward or bead like swelling on ribs. Ootomalacia in adults with local skeletal deformities, pot belly	Rickets (vitamin D deficiency)
Limbs	Muscle and fat wasted; loss of ankle jerks, calf muscle tenderness	Marasmus (Protein energy malnutrition); Thiamin (vitamin B deficiency)
Ankles and Feet	Swollen and pitting on pressure	Kwashiorkor (Protein energy malnutrition)

The four tribes, namely, Bhatra, Gond, Kondh, and Paraja in the present study manifested variable nutritional status with regard to levels of hemoglobin and different grades of anemia among both boys and girls separately as well as in combination (Table 4). Maternal malnutrition is common among the tribal women.

Grades of anemia	Name of Tribe			
	Bhatra (%) (N=166)	Gond (%) (N=219)	Kondh (%) (N=254)	Paraja (%) (N=176)
Boys:				
Severe	5.5	2.6	2.4	2.5
Moderate	23.6	31.4	26.5	10.0
Mild	41.7	54.9	41.0	49.2
Normal	29.2	11.1	30.1	38.3
Girls:				
Severe	0.0	0.0	0.0	3.7
Moderate	12.6	30.0	11.8	5.6
Mild	46.3	57.1	35.3	51.8
Normal	41.1	12.8	52.9	38.9
Boys and Girls Combined:				
Severe	2.4	1.8	1.7	2.9
Moderate	17.4	30.9	22.2	8.6
Mild	44.3	55.6	39.3	50.0
Normal	35.9	11.6	36.8	38.5
Severe= Hb <7.0 g/dl; Moderate = Hb 7.1-10.0 g/dl; Mild= Hb 10.1-12.0 g/dl; Normal= Hb>12.1 g/dl				

Tribes in Chhattisgarh cultivate land; grow cereals and millets such as ragi. The staple food among the tribals is rice, maize, millet, wild fruits, etc. though they are fond of ragi gruel. They prepare a concocted material which is known as "Madia Paje". It is made from grounded rice and millets that is kept overnight for fermentation after boiling.(17) Vegetables, cereals (dal), fish, etc. are added to develop taste. Liquor (Mahua) forms one of the most important constituent of their daily diet which is taken by women as well as children. They are addicted to mohua and salap liquor. Consumption of such alcoholic drinks aggravates liver diseases prevalent amongst them due to endemicity of malaria. This causes hepato-splenomegaly (enlargement of liver and spleen). Cirrhosis of liver has been found to be common among the tribals of Chhattisgarh.

The non-vegetarian foods such as pigs, mutton, chickens, fish, crabs, field rats are taken as and when available. They take buffalo, goat and pork meat, though irregularly. These animals are not slaughtered in hygienic or healthy conditions. In their daily diet, fats and proteins are inadequate; this leads to various types of deficiencies. Inferior diet, semi-starvation and unhygienic living conditions give rise to several diseases. Their farm produce suffices for hardly 5-6 months requirements; for remaining 6-7 months every year, they have to depend upon wild roots, fruits, flowers and leaves of wild plants. Fruits such as mango and jack provide food to tribals for about 1-2 months. Food values, and harmful effects, if any, of these wild items of forests are unknown; they may cause several types of allergies and physiological impairment.(27,28)

Tribals have their dwelling on the hill-top, sub-mountainous region or barren land which is deprived of iodine, resulting in iodine deficiency. This leads to various iodine deficiency disorders. The oil of wild seeds "Tora" is used for cooking and other purposes including applying on injuries.

Slash and burn type of shifting cultivation resulted in considerable degradation and shrinking of forests. The disappearance of wild life in turn has deprived them their traditional sources of proteins. Such deficiencies, both qualitative and quantitative, have resulted in under – and malnutrition.

Communicable Diseases

Tribes in general do not maintain good health and sanitation. Some of the preventable diseases such as tuberculosis, malaria, gastroenteritis, filariasis, measles, tetanus, whooping cough, skin diseases like yaws, scabies, etc., are also high among the tribals.(28,29) Most of the diseases are due to insanitary conditions, lack of personal hygiene and ignorance. Consciousness regarding bodily cleanliness is lacking, particularly among the women and children. They do not even brush their teeth. Lack of personal hygiene causes skin and infectious diseases. Scabies and yaws top the list among all skin diseases.(29) Leprosy is rampant. Patients are not segregated from their society and the disease spreads because of close contact with infected patients. The incidence of some viral diseases is quite high, particularly of the upper respiratory tract with symptoms of rhinitis (running nose), pharyngitis, bronchitis, cold, cough and fever. The incidence of tuberculosis is also high, the most common type being pulmonary tuberculosis.(2,28) Poor ventilation and close contact with infected members, because of the single room accommodation, are largely responsible for the wide spread contagion.

The hill streams, ponds or ditches serve many purposes. They provide water for drinking, cooking food, cleaning utensils. These are places where people take bath, wash their body after defecation, and clean cattle. The hill streams, ponds or ditches which are highly polluted, are the only source of drinking water, and are potent source of water borne diseases. The incidence of diarrhoea and dysentery (amoebic and bacillary), typhoid and other gastric diseases is very high.(27) Occurrence of helminthic (worm) infections, viz. *Tenia solium*, *T. bovis*, *Ascaris lumbricoides* (tape worm and round worm), etc., is high due to their food habits. They consume domesticated piggyery. Dental diseases are also very common among the tribals of Chhattisgarh.

The areas where the tribals reside are hyper-endemic for malaria, particularly of the *Plasmodium falciparum*, *P. vivax*, *P. ovale* types.(27) The slide positivity rate is as high as 15.6% for *P.falciparum*. Mostly the children suffer from typical signs and symptoms of high fever of intermittent type with shivers and profuse sweating. Adults generally manifest asymptomatic malaria. Mortality rate from malaria is not high among the tribes of Chhattisgarh.

Non-communicable Diseases

High fertility is related to high infant mortality among the tribes of Chhattisgarh. Infant mortality rate has been found to be very high among many tribal groups (22) such as among Bhatras (148), Murias (123), Kutia Kondh (175 per 1000 livebirths). Bearing more children is a pride as they will add to their income in future. The practice of consanguinity has an impact on their fertility, mortality and morbidity profile.(16,30) Among the tribes of Chhattisgarh, a higher incidence of reproductive wastage, i.e. abortions and stillbirths has been recorded with neonatal deaths occurring more frequently.

In some places especially near the mining areas, the water of hill streams and ponds is not only polluted, but also contains graphite, causing irritation in the gastro-intestinal tract, resulting in gastric discomforts, abdominal pains, hyper-acidity and constipation. The water contents have not yet been analyzed and the effect of graphite on the human body needs thorough investigations.

Night blindness, sexually transmitted diseases, etc. are also well known public health problems of the tribals. Venereal diseases (syphilis and gonorrhoea), cardiovascular (heart) diseases, diabetes mellitus, and renal (kidney) diseases are not common among the tribals of rural areas except the urbanite tribals. Similarly, high blood pressure is a rare but low blood pressure is common among the tribals of Chhattisgarh.

Biomedical Anthropology, Tribal Health and Development

Health is a universally cherished goal. Health cannot be forced upon the people. It is a positive attribute of life and the organization of health services to all people is considered to be the key step towards development.(31) The study of health culture of tribal communities belonging to the poorest strata of society is highly desirable and essential to determine their access to different health services available in a social set up. It is an important input for the development of man and, thereby, to social and economic development of the country. Health is widely linked with development. A rapid and equitable economic development is a good health input and an adequate and equitable health care system stimulates development with improving human productivity. That is the reason; the investment in health is, sometimes, called an investment in human capital.

Health care is one of the most important of all human endeavours to improve the quality of life especially of the tribal people.(1,2,9,20) It implies the provision of conditions for normal, physical and mental development and functioning of human being individually as well as in a group. A great realization has come from the medical scientists that human being can no longer be treated as an anatomical and physiological entity, and that man's individuality should be understood in terms of perceptions, culture and belief system. Tribal health system and medical knowledge over the ages, which is known as traditional health care system, depend both on the herbal and psycho-somatic lines of treatment. While flowers, plants, seeds, animals and other naturally available substances formed the major basis of treatment, this practice always had a touch of mysticism, supernatural and magic, often resulting in specific magico-religious rites. Faith healing has always been a part of the traditional treatment in the tribal health care system. Studies by anthropologists indicate that traditional medicines do exist and persist even though the health consumer has now access to western medicine. There is a need to scientifically study the traditional tribal medicine and healing systems and combine them with modern allopathy system so as to make it available and affordable for the poor tribal population.

Health problems and health practices of tribal communities have been profoundly influenced by the inter-play of complex social, cultural, educational, economic and political practices. (9) The common beliefs, customs, traditions, values and practices connected with health and disease have been closely associated with the treatment of diseases. In most tribal communities, there is a wealth of folklore associated with health belief. Knowledge of folklore of different socio-cultural systems of tribals may have positive impact which could provide the model for appropriate health and health and sanitary practices in a given eco-system. The health culture of the community does not change so easily with the changes in the access to various health services. Hence, it is required to change the health services to conform to health culture of tribal communities for optimal utilization of health services.

As we know that the health comes by evolution, not by revolution. Health must meet the people's needs as they perceive them. Health cannot be imposed from outside against people's will. It cannot be dispensed to the tribal people. They must want and be prepared to do their share and to cooperate fully in whatever a community develops the health program. It is rightly stated that

Go to the people
Live among the people
Learn from the people
Plan with the people
Work with the people
Start with what the people know
Build on what the people have

Teach by showing; learn by doing
Not a showcase but a pattern
Not odds and ends but a system
Not piecemeal but integrated approach
Not to conform but to transform
Not relief but to release
From the scourges of life! (1)

The tribes of Chhattisgarh generally believe in benevolent and malevolent spirits which affect and control their daily activities of life. These beliefs pervade not merely their health practices but also their whole lives. They have faith in their taboos, totems and beliefs, which shape their thoughts, ideas and practices. (1,28) They call on their village priests or religio-magical practitioners. These wisemen diagnose the disease as due to the anger of a deity or evil spirits. In their belief system, the etiology and pathogenesis of all diseases is nothing more than the anger of evil spirits. Hence, the priest performs rituals, with animal sacrifice to please them. It starts with small animals, hens, pigeons, etc. and ends with bigger animals. Buffalo sacrifice is very common in some tribals. They depend upon the priests and witchcraft doctors rather on modern medicines.

Moreover, to go to a medical doctor or hospital means to cover a long distance on foot through dense forests and hills. There are no pucca (metalled) roads or modern communication or transport facilities. Thus, the natural geographical barriers prevent them from utilizing the meager available medical services. Then it all depends upon the availability of the doctor who exploits them by charging exorbitant fee and providing inadequate medicines. Most of the times, the tribals remain unattended to by the doctor for hours together and kept waiting isolated because of stinking smell coming out of their unhygienic bodies and clothes, if they arrive at the hospital at all. However, the attitude has now been gradually changing among the tribals during the last few years due to the efforts of some devoted social workers of non-governmental organizations (NGOs) who live with them.

The biomedical anthropological approach is a new dimension, arising out of the tradition of holism in anthropology. It implies sufficient knowledge about the culture, environment, natural and human resources, skill endowments and the belief systems of a set of people. (9,25) This approach is best suited to study the behavior of the people in health and disease, encompassing the biological, biocultural and eco-environmental aspects of the tribal population concerned.

The Government of Chhattisgarh state is providing health care services to tribal people through a three tier rural health infrastructure comprising sub-centres, Primary Health Centres, Upgraded Primary Health Centres, and Community Health Centres, etc., under the Minimum Need Program. Besides these, the Ayurvedic and Homoeopathic systems are also well accepted by the rural and tribal folks, mainly because of cheapness, eco-friendly and familiar to their indigenous way of treatment. The emphasis is being given by the state government for wider application of the Indian systems of medicine and treatment rather than the western allopathic medicine.

The preamble of the Charter of the World Health Organization defines Health as "a state of complete physical, mental and social well being, and not merely the absence of a disease or infirmity".

Therefore, the health of the tribals cannot be viewed in isolation from the over all goals and the health policies of the state. The tribes of Chhattisgarh are not one uniform and compact mass, but present a wide linguistic, ethnic and cultural variety. Any formula approach for health care among the tribals is not only unsuitable but unrealistic also. Each tribe has its own distinct concept, ideas, religions, dialects, superstitions, beliefs, values and practices which govern their daily lives.

It is now increasingly realized that the development process must be initiated from below, and that the people must identify their own felt needs, that they must have a role in executing the schemes meant for their development and benefit and in fashioning their life in the way they like it. There is a great deal in the people's own traditions, their indigenous ways that can be harnessed to ensure prosperity and happiness for a local tribe. Any tribe must be encouraged to organize itself in order to take advantage of the program designed for its development and health in the light of human genetics, socio-cultural traditions and eco-friendly environment. Unless locality specific, tribe specific and need-based health care delivery system is evolved which is appropriate, acceptable, accessible, and affordable, the goal of health for all would remain a Utopian dream!

Acknowledgements:

Author is grateful to Dr. V.M. Katoch, Secretary, Department of Health Research, Government of India and Director General, Indian Council of Medical Research, New Delhi for providing the necessary facilities and to Headmasters and Teachers of Ashram Schools, and students of Orissa for their cooperation during the study. Thanks are also due to Mr. R.K. Mishra, Laboratory Technician for laboratory work.

References:

1. Balgir RS. Human genetics, health and tribal development in Orissa. In: Environment, Health and Development: Anthropological Perspective. Dash Sharma P. Ed. Ranchi: SC Roy Institute of Anthropological Studies. 2000. pp 87-104.
2. Balgir RS. Tribal health problems, disease burden and ameliorative challenges in tribal communities with special emphasis on tribes of Orissa. Jabalpur: Regional Medical Research Centre for Tribals (ICMR). 2007;161-176.
3. Daland GA, Castle WB. Simple and rapid method for demonstrating sickling of red blood cells, use of reducing agents. *J Lab Clin Med* 1948;53:1082.
4. Weatherall DJ. The Thalassemias. In: Methods in hematology. Weatherall DJ. Ed. Vol. 6. New York: Churchill Livingstone. 1983. pp 27-53.
5. Dacie JV, Lewis SM. Practical Hematology. 7th Edn. Edinburgh: Churchill Livingstone. 1991. pp 227-258.
6. Bernstein RE. A rapid screening dye test for detection of G6PD deficiency in red cells. *Nature* 1962;194:192.
7. WHO Report. Standardization of procedures for study of glucose-6-phosphate dehydrogenase. WHO Tech Rep Ser 366. 1967. pp 1-53.
8. Beutler E, Blune G, Kaplan JC, Lohr GW, Ramot B, Valentine WW. International committee for standardization in hematology: recommended screening test for glucose-6-phosphate dehydrogenase deficiency. *Br J Hemat* 1979;43:465-467.
9. Balgir RS. Biomedical anthropology in contemporary tribal society of India. In: Contemporary Society: Tribal Studies (Tribal Situation in India). Vol.6. Behera DK, Pfeffer G. (Eds). New Delhi: Concept Publishing Company 2005. pp 292-301.
10. Balgir RS. Ethnic and regional variations in the red cell G6PD deficiency in India. *Indian J Hemat* 1989;7:101-109.
11. Balgir RS. The prevalence of sickle cell hemoglobinopathy in India. In: Madhava Menon T, Sivathanu C, Prasanth KP, Sasikumar M, Mathur PRG. (eds.) Encyclopedia of Dravidian Tribes. Trivendrum: The International School of Dravidian Linguistics. 1996. pp 21-29.
12. Balgir RS. The prevalence of colour impairment disorders in India. *Indian Pract* 1999;52:256-268.

13. Balgir RS. The burden of hemoglobinopathies in India and the challenges ahead. *Curr Sci* 2000;79:1536-1547.
14. Balgir RS. Genetic epidemiology of sickle cell anemia in India. *Indian Practr* 2001;54:771-776.
15. Balgir RS. The genetic burden of hemoglobinopathies with special reference to community health in India and the challenges ahead. *Indian J Hemat Blood Transfus* 2002;20:2-7.
16. Balgir RS. Genetic dimensions of sickle cell hemoglobinopathy among five scheduled caste populations of Orissa, India. *Indian Practr* 2002;55:503-514.
17. Basu Salil. Genetic, socio-cultural and health care among the tribal groups of Jagdalpur and Konta Tehsils of Bastar district (Madhya Pradesh). In: Anthropology Development and Nation Building. Kalla AK, Singh KS. Eds. New Delhi: Concept Publishing Company. 1987. pp 87-105.
18. Kaeda JS, Chhotray GP, Ranjit MR et al. A new glucose-6-phosphate dehydrogenase variant, G6PD Orissa (44 Ala>Gly), is the major polymorphic variant in tribal populations in India. *Am J Hum Genet* 1995;57:1335-1341.
19. Balgir RS. Indigenous and independent origin of the β^S -mutation in ancient India: Is it a myth or reality? *Mankind Quarterly* 2001;42:99-116.
20. Balgir RS. Genetic markers in the tribal health, development and welfare with special reference to North Eastern India. In: Anthropology, Population and Development. Sharma JC.(Ed.) New Delhi: Inter-India Publications 1995. pp 151-171.
21. Balgir RS. Genetic burden of red cell enzyme glucose-6-phosphate dehydrogenase deficiency in two major scheduled tribes of Sundargarh district in Northwestern Orissa. *Curr Sci* 2007;92:768-774.
22. Basu Salil, Mitra K. Health development of tribal communities of India: Need for action research. *Indian J Social Develop* 2001;1:134-156.
23. Balgir RS. The spectrum of hemoglobin variants in two scheduled tribes of Sundargarh district in Northwestern Orissa, India. *Ann Hum Biol* 2005;32:560-573.
24. Balgir RS. Genetic diversity of hemoglobinopathies, G6PD deficiency and ABO and Rhesus blood groups in two isolates of primitive Kharia tribe in Sundargarh district of Northwestern Orissa, India. *J Community Genet* 2010;1:117-123. DOI 10.1007/s12687-010-0016-y.
25. Balgir RS. Biomedical anthropology in the service of mankind in the new millennium: Are we ready? In: Anthropology: Trends and Applications. Bhasin MK, Malik SL. (Eds). New Delhi: Kamalaraj Enterprises 2002. pp 141-147.
26. Sharma JC. Role of nutrition in physical growth and development. In: Anthropology Development and Nation Building. Kalla AK, Singh KS. (Eds.) New Delhi: Concept Publishing Company. 1987. pp 175-188.
27. Balgir RS. Khonds – Health Status. In: Madhava Menon T, Sivathanu C, Prasanth KP, Sasikumar M, Mathur PRG (Eds.) Encyclopedia of Dravidian Tribes. Trivendrum: The International School of Dravidian Linguistics. 1997. pp 21-29.
28. Balgir RS. Biomedical anthropology and health status of the tribal Muslim Gujjars of Himachal Pradesh, India. In: Health, Healers and Healing: Studies in Medical Anthropology. Sengupta Sarthak. (Ed) Dibrugarh: National Library Publishers. Chapter: I. 1999. pp 1-19.
29. Balgir RS, Kerkatta AS, Murmu B and Dash BP. Clinical assessment of health and nutritional status of Gond children in Kalahandi district of Orissa. *Indian J Nutr Dietet* 2002;39:31-37.
30. Balgir RS. Detrimental intrinsic factors contain population explosion for sustainable development in 18 indigenous communities of Orissa, India. In: Pati RN & Jain Atul Kumar. Eds. Biodiversity and Sustainable Development. (40th Chapter). New Delhi: Sarup Book Publishers Private Limited. 2010. pp 507-516.
31. Srinivasan S. Health care in rural India: Problems and Challenges. In: Anthropology Development and Nation Building. Kalla AK, Singh KS. Eds. New Delhi: Concept Publishing Company. 1987. pp 211-220.