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Attitudes, Acceptance and Stigma of Tuberculosis: A Study Among Muria Tribe in Bastar Division

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Abstract

Tuberculosis (TB) is a global public health problem, approximately 4, 00,000 people die from TB every year, more than 1,000 die every day and 100 million working days are lost. TB also remains as a major public health problem amongst the tribal population of this country. Studies show that socio-economic status, nutrition, family size, customs, beliefs and lack of medical facilities remain as concomitants to the high prevalence of TB among the tribal communities of this country.

The study aims to investigate the incidence of tuberculosis (TB) with its nature and stigmatic affect on health. Researchers selected 100 households by purposive sampling method from Muria tribal community residing in Karmari village, Jagdalpur (Chhattishgarh) for study. A village-wise resource data were gathered through a structured schedule, interview, observation and focus group discussion. Further along with opinion of representatives and local leaders/ knowledgeable persons of village were also interviewed at the time from March to September, 2014.

The findings of the study shows that in spite of various plans and programs and projects taken up by the government machinery, the result has been far from satisfactory. The knowledge about TB and its situation amongst Muria tribal population is scanty; due to isolation, illiteracy, socio-culture factors. Thus, there is a need to maintain and further strengthen TB control measures along with awareness and management of TB related stigma on a sustained and long term basis.

Introduction

Worldwide every second 1 person is infected with tuberculosis (TB) and every 10 seconds someone dies as a consequence (Lonnroth K, Raviglione M, 2008). India alone accounts for one-third of the global burden of TB and every year more than 1.8 million new cases appear in the country. Approximately 4,00,000 people die from TB every year in India, more than 1,000 die every day and 100 million working days are lost. The situation in the remote tribal areas is still grim. Among the tribals the prevalence of tuberculosis was found to be affected by socioeconomic status, nutrition, family size, customs, beliefs and less use of medical facilities (Tungdim et al, 2008). T.B. remains a major public health problem amongst the tribal population and there is a need to study related physiological factors and stigma of patients as well as society to maintain and strengthen T.B. control measures and T.B. affected peoples on a sustained and long-term basis.

Current situation of Tuberculosis

According to WHO T.B. program, in the next 10 years, 90 millions are expected to become sick with tuberculosis; 30 millions will die of T.B. which is the

most common cause of death due to a single infectious agent in adults worldwide. In developing countries three fourth (75%) of infected persons are less than 50 years of age (Grigg, 1999). In India, according to the WHO's Global TB Report 2009, the country ranks first among the 22 high-burden TB countries worldwide with the highest number of TB cases annually. In 2007, it was reported that there were 331,000 deaths and approximately 1.96 million new TB cases, which represented more than 21 per cent of all TB cases worldwide[19]. The prevalence of Tuberculosis in 2000 was quoted as 3.8 million case, with 1.7 million new smear positive cases (ww.tbcindia.org/pdfs/KeyFactsand Concepts).

In the 1950s, the Indian Council of Medical Research (ICMR) conducted a large scale study to estimate the prevalence of tuberculosis nation-wide. Following this, half a decade later in 2000–2003, there was another survey that was conducted to study the prevalence of infection in different regions of the country (J. Bhat, V.G. Rao, P.G. Gopi, R. Yadav, N. Selvakumar, B. Tiwari, V. Gadge, M.K. Bhondelay, F. Wares., 2009). NFHS-3 shows that the prevalence of TB is higher in Tribal/rural areas than urban areas. Reports show that 469 out of every 100,000 persons have been medically treated for TB in rural areas as compared to 307 in urban areas.

Objectives

- 1. To ascertain the socio-economic and demographic characteristics of Muria Tribe.
- 2. To find out the nature and its affect on health due to Tuberculosis.
- 3. To analyze the factors involved in transmission of tuberculosis among Muria Tribe.
- 4. To assess the tuberculosis (TB) stigma among Muria tribal community.
- 5. To measure the prevalence of primary and acquired resistance of tuberculosis.
- 6. To make suggestions, if any, for policy and practice.

Methodology

The process of data collection was based on documentary and field resources, where documentary sources include material already collected whether published or unpublished. In field resources, it includes structured schedule interview, focal group discussions and observation as the tools of research. After collection of data through the primary source it has been coded and a code article was prepared. The data were entered into a master chart very meticulously. Thereafter, it was processed into the computer through MS EXCEL package. Later, the computerized data was taken in print form and the same was cross checked with the master chart to find out error(s), if any. After getting the processed data, percentage and other statistical measurements were derived.

Sample Design

The Muriya Tribe however, as four villages from each setting was chosen for the purpose of study, the following conditions were stipulated for selection of a beneficiary:

- 1. Any one of the members of the family from the Muria Tribe.
- 2. The respondents, between 15–70 Age groups.
- 3. The respondents, whether using DOTS or not under allopathic medication.
- 4. The respondents probably identified or symptomatic of T.B.

Sampling Frame

For the purpose of identification of respondents, the investigator followed purposive sampling method wherein the respondents were indentified with the help of other respondents. Only after ascertaining that the respondents fit into the sampling frame they were selected. As the study took place in one village. As such 100 households were selected for the purpose of study from March to September, 2014.

Study Area

For the purpose of the study researcher had selected Karmari Village, Jagdalpur in Bastar because Muria tribals are the inhabitant of this place in higher frequency.

Result and Discussion–Major Findings

Indian population is composed of people of diverse cultural, linguistic, biological, ethnic and genetic backgrounds, living in different socio-cultural and socio-economic settings. Chhattisgarh, a state in central India, is a home to more tribes, most of which

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have been given the status of Primitive Tribal Groups (PTGs) by the Government of India. The health status of these tribes is extremely poor due to malnutrition, lack of proper hygiene and illiteracy. Lack of proper nutrition, especially protein-deficient diet in children, very often predisposes them to diseases. Thus, Tuberculosis is recently reported higher among Muria Tribe. To investigate tuberculosis disease and their present situation in the remote tribal areas and prevalence status among tribals, it is pertinent to study socio-economic status, nutrition, family size, customs, beliefs and use of medical facilities, demographical variables and stigma for actual database. The major findings are given below:

Level of Education

Table 1 shows, the level of literacy of the selected Muria tribes. It can be seen that out of the total 202 (5⁺ age in year) population, Majority (57.92) were literates whereas illiterates were only (42.08%). Out of the total literates (40.17%) had ability to read & write only which followed by (21.36%) respondents had primary level of education as formal education. It is closely seemed that approximately same percentages of aspirants were middle passed whereas less than 10 percent were high school and higher secondary passed. Thus, it can be seen that the literacy status is not up to the marks, they cannot able to use their education to understand biological environment as well as disease.

Label of Education	1	Male	Fer	nale	То	tal
	No.	%	No.	%	No.	%
Population (5^+)	110	54.45	92	45.54	202	100.00
Illiterate	33	38.82	52	61.17	85	42.08
Literate	62	53.00	55	47.00	117	57.92
Read & Write	22	46.80	25	53.20	47	40.17
Primary	15	60.00	10	40.00	25	21.36
Middle	13	50.00	13	50.00	26	22.22
High School	7	77.80	2	22.20	9	7.69
H.S.	5	71.43	2	28.57	7	5.98

Pattern of Occupation

It's noted on table 2, the agriculture occupation was prevalent among large group of Muria families (36.00%) while 20.0 per cent of families depend on agriculture as well as labor occupation because they didn't have proper resources to utilise in self farming, so they work as a labour in others farms. (16%) families had not any agricultural land and they worked as a labor only. Very few percentages of Muria families were engaged in both Agriculture and Services. According to this data, it is clearly understood that Muria were suffering from poor economy with lower level of occupations.

Table 2: Occupational status of Muria household

Types of Occupation	Total families (n=100) %
Agriculture	36.00
Daily Labor	16.00
Service	8.00
Business	10.00
Agriculture and Labor	20.00
Agriculture and Service	10.00

Annual Income Range

Table 3 depicted that 34.0 per cent of the families come under poverty line with >12000 and (18%) families' income ranges were between Rs.12001-20000. Less than 20 per cent families have Rs. 20001-50000 annual income. Only 14 per cent families' incomes were more than 100000 Ru. And they were living in better condition among Murias in the village.

Level of Knowledge on Tuberculosis

The knowledge about causes of tuberculosis among Murias, only (66%) respondents reported that they had heard about tuberculosis while 14% individuals were the sufferer of tuberculosis. 80 percent population of Murias heard about B.C.G. vaccine but they didn't know why it is important for health. It is observed in table 4 that higher percentage of population reported that they were living in epidemic range by tuberculosis.

Table 3: Annual	Income	Range	of Surve	ved	Household

Annual Income Range (in Rs.)	Total Families (n=100) %
>12000	34.00
12001-20,000	18.00
20,001-50,000	16.00
50,001-1,00,00	18.00
< 1,00,000	14.00

Table 4: I	Knowl	edge	about	Tubercu	losis
------------	-------	------	-------	---------	-------

Variables	Respondents (n=100)		
	Yes	No	
	%	%	
Heard about Tuberculosis	66	34	
Heard about B.C.G.	20	80	
Visited/lived in Tuberculosis area	24	76	
Suffering from Tuberculosis	14	86	

Knowledge and Perception on Mode of Transmission of tuberculosis

It is depicted from table 5 that among the respondents, knowledge and perception on mode of transmission of tuberculosis were not satisfied because only (24%) individuals had knowledge that tuberculosis can be transmit from person to person,

its followed by (22%) considered, the infection is transmitted through contact. Below 15 percent asserted, that the infection is transmitted through breathing whereas very less percent had knowledge about real cause of tuberculosis and how it can be transmitted from Bacteria while one forth population did not know how tuberculosis transmit from one to another.

Table 5: Knowledge and Perception about Mode of Transmission of Tuberculosis

Variables	Respondents (n=100)		
	Yes No		
	%	%	
Bacteria	10.00	90.00	
Contact (sweat, Cloth, Saliva, Vomit, Sleep, Eating with Patient)	22.00	78.00	
Tuberculosis transmit from person to person	24.00	76.00	
Breathing	14.00	86.00	
Do not Know	26.00	74.00	

Knowledge about Reasons of Tuberculosis

Table 6 shows that knowledge about reasons of Tuberculosis among Murias where majority of participants knew that Tuberculosis can attack males and females as well as all age groups. Only (30%) respondents agreed that not having B.C.G. vaccine was the main cause of tuberculosis while (24%) reported that using of unhygienic water and food was main reason. Very few respondents (10%) also believed that tuberculosis was infectious disease. Less than 25 percent of the respondents said Smoking / Drinking was also one of the reasons of tuberculosis. And 70.0 per cent of the respondents stated that they don't have any idea about the tuberculosis.

Table 6: Knowledge about Causes of Tubercule	osis
--	------

Variables	Respondents (n	
	Yes	No
	%	%
Do not Vaccination(B.C.G)	30.00	70.00
Taking Unhygienic water and food	24.00	76.00
Infection	10.00	90.00
Smoking, Drinking etc	20.00	80.00
Do not know	70.00	30.00

Knowledge about Signs and Symptoms of Tuberculosis

Table 7 depicts that the community awareness about signs/symptoms of tuberculosis in the study area. More than half (58%) of the population reported that continue coughing is the most common symptom of tuberculosis while others mentioned symptoms like high fever (24%) is prevalent sign. 10.0 per cent of the respondents stated that vomiting and headache, continue pain in whole body were pertinent of the symptoms of T.B. (44%) respondents had do not knowledge about sign and symptoms of tuberculosis due to illiteracy.

 Table 7: Knowledge about Signs and Symptoms of Tuberculosis

Variables	Respondents (n=90)	
	Yes %	No %
Continue coughing	58.0	42.0
Continue high fever	24.0	76.0
Abdominal discomfort, diarrhea, vomiting, headache, cont. pain whole body	10.0	90.0
Do not know	44.0	56.0

Knowledge on Side Effects from TB

Side effects are one the ripple effect of the tuberculosis. Sometimes the patient cannot notice the problem by side effects. The table 8 explains the knowledge about the side effects from the T.B where more than 80 percent of the respondents stated that they have knowledge about the side effects due to TB and rest of the respondents had no knowledge.

A majority of the respondents (92.0%) stated that side effects frequently arise and only 32.5 per cent of the respondents stated that they talks to DOTs provider for help. It has been observed that one fourths of the respondents (26.0%) stopped the medicine due to side effects. Most of the tribes were unaware of the symptoms of T.B and the seriousness of the malady.

Variable	Respondents (n=90) %
Knowledge about Side Effects	
Yes	82.0
No	18.0
How often had side effects	
Ever	92.0
Never	8.0
If had side effects	
Talked to Doctor	17.0
Talked to DOTs provider	32.5
Talked to Local Health Worker	24.5
Stopped Medicine	26.0

Table 8: Knowledge on Side Effects from TB

Perception among Muria about Best Treatment of Tuberculosis

Table 9 reveals that 34.0 percent of the participants said that modern anti tubercle drug is best treatment of tuberculosis and (30%) reported, traditional healer can give better treatment. (62%) respondents availed traditional healer and modern anti tubercle drug, both is best treatment of tuberculosis because it is consider as a curse in life. Less than one forth respondents reported that they had no information what is better treatment of tuberculosis.

 Table 9: Perception of Muria about Best Treatment of Tuberculosis

Type of Treatment	Respondents (n=80)	
	Yes %	No %
Modern Anti tubercle drug	34	74
Traditional Healer	30	70
Traditional Healer & Modern anti tubercle drug	62	38
Do not know	22	78

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Perception among Muria about Preventive Method of Tuberculosis

It is recorded in table 10 that (50%) believed to keep their houses clean to prevent T.B. A very small population (6%) had having Vaccination against T.B while (44%) of the respondent reported that they had no information about preventive methods of tuberculosis. Under one forth population believe that it is preventable after taking ant tubercle drug and uses of hanky in front of sneezing and T.B. affected persons.

Table 10	: Perception	of Muria	about	Preventive	Method	of
		Tuberci	ulosis			

Type of treatment	Respondents (n=90)		
	Yes %	No %	
Anti tubercle drug	20.0	80.0	
Cleaning house properly	50.0	50.0	
Take nutritional food	26.0	74.0	
Sneeze with hanky	10.0	90.0	
Vaccination	6.0	94.0	
Do not know	44.0	56.0	

Perception among Respondents about Tuberculosis

Its clear from table 12 that the majority of the respondents reported (52%), it is very serious disease if not treated in time while 22.0 per cent stated that it is ordinary disease whereas (16%) do not know about the seriousness of T.B while (10%) replied, it is a serious disease.

Responses	Respondents (n=90)
	%
Ordinary disease	22.00
A serious disease	10.00
Serious disease if not treated in time	52.00
Do not know	16.00

Media Role for Tuberculosis Information

Table 14 shows that role of media has important to increase the awareness level of the public. Majority (30%) of Muria respondents had taken information regarding T.B. from their relatives and other knowledgeable literate persons of village or neighboring village followed by only(22.00%) respondents got knowledge from radio and (10.00%) from posters. Very insignificant numbers of Muria followed the newspaper, T.V., and radio for getting information about T.B.

Perception among Muria on Tuberculosis Control Program

Table 11 depicts the perception of Muria respondents about tuberculosis control programme which is carried out by different agencies. Majority (68%) of them favour to Govt. agencies followed by both Govt. agencies & Private agencies. (22%) like to prefer only private agencies because they get proper attention and care in this section whereas (40%) of the participants reported that they had no idea regarding tuberculosis control program.

Table 11: Perception of Muria About Tuberculosis Control programme

Type of Agency	Respondent (n=90)		
	Yes	No	
	%	%	
Govt. agencies	68.00	32.00	
Private agencies	22.00	78.00	
Govt. & Private agencies	38.00	62.00	
Public	12.00	88.00	
Do not know	40.00	60.00	

Types of Medicines used for Tuberculosis

Table 13 reveals that D.O.T.S were taking by below one fourth of the population while (10%) respondent were taking streptomycine and Pyrazynamyde (8%) respectively.(88%) of the Muria population reported that they had no idea about the uses and names of medicine in tuberculosis.

Table 13: Types of Medicines used for Tuberculosis

Name of Medicine	Respondents (n=55)		
	Yes	No	
	%	%	
DOTS	24.00	76.00	
Straptomycine	10.00	90.00	
Pyrazynamyde	8.00	92.00	
No idea	88.00	12.00	

Tuberculosis Service in the Village

The following Table 15 depicts the Tuberculosis service availability and its proximity. Most of the respondents (44.0%) use auto services to get TB services and a significant number of respondents (22.0%) stated that they used bus services. Most of them have to travel more than one hour (48.0%) to get the TB services and a significant number of respondents (37.5%) stated that they had suffered 30-60 minutes for transportation services. The TB services which provided by government transport in least rate, and large number of patients under poor economic background use the Government services.

 Table 14: Role of Media for Tuberculosis Information

Responses	Respondents (n=67	
	%	
Television	16.00	
Radio	22.00	
Newspaper	4.00	
Poster	10.00	
Television & Radio	12.00	
Newspaper, T.V. & Radio	6.00	
Others	30.00	

Table 15: TB Service Characteristics

Variable	Respondents (n=90) %
Mode of Transport to get TB service	
Bus	22.0
Car	5.5
Bicycle	17.5
Auto	44.0
Walk	11.0
Time to get to the TB services	
< 30 minutes	14.5
30–60 minutes	37.5
> 1 hour	48.0

Availability of hospital for TB treatment

The admission in to hospital for TB is very risky and also rare among the Muria people. A majority of the respondents (84.5%) opined that there was no patient admitted in hospital for TB treatment and a small sample stated that some of them were admitted. As regards to period of staying in hospital, 45.0 per cent of the patients stayed in hospital from one week to one month. Most of the patients cannot resort to admission due to some prohibition and socio-economic conditions. These reasons definitely hindering their health and promoting mortality and morbidity. Table 16 may be consulted for better understanding.

Table 16: Admitted to the hospital for TB treatment

Variable	Respondents (n=9 %	
Admitted		
Yes	15.5	
No	84.5	
Duration of admitted		
>4 months	2.0	
3–4 months	3.0	
1–2 months	12.0	
1 month	23.0	
>1 week <1 month	45.0	
<1 week	15.0	

Stigma and Social Acceptance

The social stigma of tuberculosis has been known for a long time and the disease has been labeled as a "polluted disease", "a death punishment" or a punishment meted out to "culpable people" for ages. Table 18 revealed that very higher frequency of the respondents stated that they

Reasons for Missing Treatment

Table 17 explains the reasons how and why tribals were missing treatment. Most of the respondents (36.0%) opined that due to busy schedule in work and not able to leave from work was the main reason for missing treatment and more than one fourths (28.0%) of the respondents stated, their working location is too far from the T.B clinic. A significant number of the respondents stated that they don't know about their disease so they missed treatment of T.B. The side effects also one of the major reasons to stop the allopathic treatment.

Table 17: Reasons for Missing Treatment

Variable	Respondents (n=80) %
Too work/not sufficient time to leave job	36.0
Work too far from TB clinic	28.0
Employer did not allow	7.5
Did not want coworkers to know	12.5
Had to move to keep job	5.0
Side effects interfered with work	11.0

have knowledge on social stigma and rest 16 percent of the respondents had no knowledge about stigma where 52.0 per cent people reported that they take away themselves and their relatives from TB affected persons and not allowed patients in festivals and ceremonial functions due to discrimination (33.0%).

Table 18: Stigma and Discrimination pertains to Tuberculosis

Variable	Respondents (n=90) %
Knowledge about Stigma	
Yes	84.0
No	16.0
Type of Stigma	
Away from Relations	52.0
Discrimination in Rituals	15.0
Abstinence form Festivals and Functions due to discrimination	33.0

TB makes it more difficult for patients to continue with care, because their fears of being identified as

being, or having been infected with TB hinder their access to services on a daily basis. Again, this can

lead to serious symptoms and increased transmission. It has been observed in the family and society patients' are suffering from social isolation, both outside the family, where the person may be avoided by former friends and acquaintances and inside the family where the patient may be forced to eat and sleep separately. Patients often isolate themselves to avoid infecting others and to avoid uncomfortable situations such as being shunned or becoming the subject of gossip. Unmarried women often find it difficult to get married, due to discrimination by prospective husbands and in-laws, while married women may find they are divorced because they have TB or if a history of TB is subsequently revealed in Disability Discrimination Act 1995.

Suggestions

- A base hospital in a tribal area that should offers up to the secondary level of health services serves multiple roles: providing clinical services, promoting health and wellness, and acting as an operations base through which hospital-based health workers and village-based health auxiliaries should be trained to provide health services.
- The focus on primary healthcare necessitates further intervention at the community level to increase awareness, and preventive and early medical care from the allopath, thus reducing the need for secondary management of morbidities at the base hospital.
- Additionally, traditional healers can be trained by the hospital in the basics of allopathic and integrated into the health system, such that other tribal groups will not hesitate to avail of modern medicine in addition to traditional healing practices.
- On a larger scale, the diversity among scheduled tribes of India as well as in terms of social, cultural and economic development requires that the healthcare model be holistic in nature, taking into consideration the socio-cultural pattern of the tribe in the specific ecological setting, when designing and deploying preventive and curative measures.

Conclusion

The problem of tuberculosis draws a serious attention as short course chemotherapy or DOT therapy seems to be still out of reach for these tribals. In spite various plans, programs and projects taken up by the government machinery but the result has been far from satisfactory. This is, no doubt, an enormous challenge to the effective control of tuberculosis in India but strengthening of PHC's is essential for effective implementation of DOT's at micro level. The findings show gross deficiencies in medical education in India for tribals with the largest numbers of tuberculosis cases by reasons of poor socio-economic status, low level literacy, poor awareness, ignorance, cultural and ritual factors with stigma. It had been revealed that tuberculosis is a disease affect mainly lower economic people in the more than 45 years age group and higher prevalent among males in Muria tribal community. Thus, tuberculosis remains a major health problem among tribes, so instant tuberculosis control activities should be continued.

References

- 1. Calmitte, Albert. Guerin, Chemilli; BCG Vaccination against Tuberculosis by Roy Rosenthal, London 1957.
- 2. Citron K. M., Girlin, D. J.; Tuberculosis, Oxford university Press Oxford 1987.
- 3. Coovadia, H. M., Benatar, S. R.; A Century of Tuberculosis, Oxford University Press 1991.
- 4. Davidson P.T., Hanh Quoc Le; Drug Treatment of Tuberculosis 1992.
- 5. Frieden T.R Sterling T; The Emergence of Drug Resistance Tuberculosis in New York City 1993.
- 6. Grigg, E. R. N; Tuberculosis in ancient Egypt, Amer. Rev. Res. Dis. (tuberculosis)1958.
- 7. Henson.; Streptomycin Resistance in Mycobacteria, Antimicrobe, Agent Chemother 1873.
- 9. ICMR Report; Second Drug Resistance Investigation, England 1969.
- 10. ICMR Report; First Drug Resistance Investigation, England 1968.
- 11. Indian Council of Medical Research; *Tuberculosis in India*—A *sample survey* 1955–58, Special report series No. 34, ICMR; New Delhi: 1–21, 1955-58.
- J. Bhat, V. G. Rao, P. G. Gopi, R. Yadav, N. Selvakumar, B. Tiwari, V. Gadge, M. K. Bhondelay, F. Wares; *Prevalence of pulmonary tuberculosis amongst the tribal population of Madhya Pradesh, central India* Int J Epidemiol. 2009 Aug;38(4):1026-32, 2009.

- 13. Jenold J. E., Alan R; Tuberculosis Symposium: Emerging Problems and promises 1993.
- 14. John Buniya quoted & Rene and Jean Dubos; The white plague, Boston, Little Brown 1952.
- 15. Koch Robert; Die Aelogic der tuberculose, Berliner Klinische Wochenschrift, No.15, Montag, Den. 10 1882.
- 16. Lehmann, j, Neuman, R.; Lancet, 250:15 1946.
- 17. Leyden N.; Tuberculosis current concepts and treatment CRC Press, India 1994.
- Menon, M. P. S. ; Pulmonary Tuberculosis, National book trust, India A-5, Green Park, New Delhi 1983.
- 19. Michael D., Iseman M.D.; Treatment of Multidrug Resistant Tuberculosis 1993.
- 20. Neville K., Bromberg A; The Third Epidemic-Multidrug Resistant Tuberculosis1994.
- 21. NFHS-3; International Institute for Population sciences, Vol.3, Deonar Mumbai 2005-6.
- Omerod L. P., Harrison J. M., Wright P. A.; Drug Resistance in Mycobacterium Tuberculosis: A survey over 25 years in Blackurn, Thorax 1986.
- 23. Omerod L. P., Harrison J. M., Wright P. A.; Drug Resistance Trends in *Mycobacterium tuberculosis* in Blackburn during 1990.

- 24. Park, J. E. and K. Park; 1991 Text Book of Preventive and Social Medicine, M/S Banarsidas Bhanot 1167, Prem nagar, Nagpur Road, Jabalpur, (India) 1986.
- 25. Vareldzis B. P., Grosset, J., Corftonj, Laszlo A.; Drug Resistant Tuberculosis, Laboratory issues, WHO Recommendation, Tuberc 1994.
- 26. Waksman, S. A. et al. ; Proc. Staff Meeting, Mayo Clinic 1944.
- Warburton A. R. E., Jenkins P. A.; Watson J.M.: Drug Resistance in the Initial Isolates of *M.tuberculosis* in England and wales during 1993.
- 28. World health organization A Clinical Manual for South East Asia1997.
- Zhang, L. X., Kan, G. Q., Tu, D. H., Li, J. S., Liu, X. X; Trend of Initial Drug Resistance of Tuberculosis of Tubercle Bacilli Isolated from New Patients with Pulmonary tuberculosis Oxford university 1995.
- 30. www.tbcindia.org/pdfs/KeyFactsandConcepts

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Nutritional Status of Hakkipikki and Iruliga Tribal Children in Mysore District, Karnataka

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Abstract

A cross-sectional study was undertaken on 400 tribal children (200 populations in each tribe), 202 boys and 198 girls aged 0 to 5⁺ years through purposive sampling method. Anthropometric measurements were used to analyze the nutritional status. Assessment of nutritional status using WHO recommended anthropometric indicator and Z-score interpretation revealed, different grades of malnutrition.

Keywords: Iruliga; Wasting; Stunting; Nutrition.

Introduction

Early childhood, that is the period below the age of six years, is most crucial in an individual's life. A child's future is shaped during this period. Its behaviour and personality, physical and mental growth depends largely on the care that it receives during the period. Though in all societies parents look after their young children the practices followed by them for rearing children varies from culture to culture.

In India 20 per cent of children less than five years of age suffer from wasting due to acute undernutrition. More than one third of the world's children who are wasted live in India. 43 per cent of Indian children under five years are underweight and 48 per cent (i.e. 61 million children) are stunted due to chronic undernutrition, India accounts for more than 3 out of every 10 stunted children in the world. Undernutrition is substantially higher in rural than in urban areas. Short birth intervals are associated with higher levels of undernutrition.

Children from scheduled tribes have the poorest nutritional status on almost every measure and the high prevalence of wasting in this group (28 per cent) is of particular concern. Under-nutrition is associated with more than half of all child deaths throughout the World. It is a source of major waste of resources and lost productivity, because children who are undernourished are less productive both physically and intellectually as adults. In developing countries like India, which accounts for about 40% of undernourished children in the World, under-nutrition is largely due to dietary inadequacy in relation to children's needs. In India, many children live in backward and drought-prone rural areas, urban slums and those belonging to the socially backward groups like scheduled caste and tribal communities who are highly susceptible to under-nutrition. But conditions are worst among the scheduled tribal communities. Most of the tribal people of India have their own geographically isolated life style. Inadequate food habits, along with traditional sociocultural and biological activities, may lead to a high proportion of child under-nutrition (Suman Chakrabarty et al, 2010). Keeping this in view, the objective of present study was to access the nutritional status of Hakkipikki and Iruliga tribal children of Mysore district, Karnataka state.

Hakkipikki

The Hakkipikkis, a tribal population of Mysore district are known by different names in different regions; in their own dialect the Hakkipikkis call themselves as Raj Pardhi. In Kannada speaking areas of Mysore they are named as Hakkipikkis, people in Nilgiris call them Guddi Bethe. In the Hindi speaking regions this tribe is known as Mel Shikari. They speak a dialect known as Vaghri, which is a mixture of Gujarati, Hindi, Marathi and Rajasthani languages (Mann, 1980). It is originated from Indo-Aryan languages. The descent of the family is patrilineal type. A preferred form of family in Hakkipikki society is the nuclear one. The joint family among the Hakkipikkis is a recent introduction, especially after their being colonized at one place and given land and houses. They are multioccupational. It is difficult to categorize, in absolute terms, the occupation as the main and subsidiary ones. The main occupation of the Hakkipikki is flower making and doll making, those owing land as well as bullocks, switch on to agriculture in the season and then primarily may appeal to an outsider only as cultivators. Occasionally and partly they go in for trapping of birds and animals and selling of combs, safety pins, hair remover and the indigenous medicines.

Iruliga

The Iruligas are a Jungle tribe, speaking a mixture of Kannada and Tamil. They are found in the districts of Mysore and Bangalore and also on the slopes of the Mysore side of the Nilgiris. The term Iruliga might have been derived from Irul (night) perhaps from their dark colour. Those living in and the neighbourhood of the Bangalore district prefer to call themselves Pujaris or Kadu Pujaris, probably on account of their worshipping silver deities, such as Mastamma, Mudalagiriappa or Madamma (Iyer, 1988). The Irulas, as their name indicate (Irul-black) are the darkest of the hill tribes of southern India. They possess the Negroid traits (short stature, flat nose, and prominent cheek bones, curly or wavy hair, and narrow foreheads). In some localities their marriage ceremonies are simple. Where they live in contact with the lower casts of the plains, they have imbibed their customs. The primary occupations are hunting, collection of honey, cultivation, basket making and agricultural labourers.

Materials and methods

The cross-sectional investigation was carried out on 400 tribal children, Hakkipikki (92 boys, 108 girls) and Iruliga (110 boys, 90 girls) tribal children belonging the age group of 0⁺ to 5⁺ years during the month of February to May 2008. The samples were collected from different tribal settlements of Hunsur and H.D. Kote taluks of Mysore district, Karnataka state, following purposive sampling technique.

Anthropometry offers a reliable method to assess the nutritional status of the children (Bhasin et. al. 1990). Nutritional anthropometry is concerned with the measurement of the variations of the physical dimensions and the gross composition of the human body at different age levels and degree of nutrition.

The anthropometric measurements like height, weight, and skin fold thickness were recorded, Height was measured with the help of anthropometric rod and weight by personal weighing balance with minimum clothing. The scale was calibrated against known weights regularly. The thickness of skin fold at triceps was measured using Holtain's skin fold caliper. Height and weight measurements of the children, taking age and sex in to consideration were expressed in terms of Z-score relative to National Center for Health Statistics reference data recommended by World Health Organization (De Onis et al, 2007). On each individual, four anthropometric measurements were taken and the indices are calculated.

Results and discussion

The result by analysis of growth parameters according to age, sex among Hakkipikki and Iruliga tribal children were presented in table. The findings are discussed as follows. Table 1 shows the prevalence of stunting of Hakkipikki and Iruliga children, majority of the below 1 year Hakkipikki girls constitute under severe (86.70%) category against 50.00% of boys. With respect to children of 1⁺ year, 73.90% of girls fall under severe and 26.10% moderate level of stunting and all the boys come under severe category. At the age of 2+ years all boys and girls come under severe level. While majority of the 3⁺ year boys come under normal (42.90%) level and girls come under moderate (45.50%) level. Among the age group of 4⁺ years 57.10% of girls and 54.50% girls fall under moderate category. With respect to the age group of 5⁺ years, 67.70% of boys constituted under normal, moderate (22.60%) and severe (9.70%), but 73.10% of the girls come under severe level, 15.40% moderate and 11.50% under normal category.

Height for age of Iruliga children shows that majority of the girls of below 1 year (62.50%) constitute

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	Age (Years)	Gende		= -3SD Severe	< -2SD Moderate	> -1SD to < +2SD Normal	CC Value	P Value
		Boys	No.	02	01	01		
		N= 4	%	50.00	25.00	25.00		0.050
	Below I Year	Girls	No.	13	01	01	0.344	0.279
		N=15	%	86.70	6.70	6.70		
		Boys	No.	19	00	00		
	.+	N= 19	%	100.00	0.00	0.00	0.348	
	I.	Girls	No.	17	06	00	0.348	0.016*
		N=23	%	73.90	26.10	0.00		
		Boys	No.	17	00	00		
	2+	N= 17	%	100.00	0.00	0.00		
	2	Girls	No.	22	00	00		-
Halds alds		N= 22	%	100.00	0.00	0.00		
паккіріккі		Boys	No.	02	02	03		
	2+	N= 7	%	28.60	28.60	42.90	0.175	0.752
	3	Girls	No.	02	05	04	0.175	0.755
		N=11	%	18.20	45.50	36.40		
		Boys	No.	01	08	05		
	4+	N= 14	%	7.10	57.10	35.70	0.020	0.081
	4	Girls	No.	01	06	04	0.039	0.981
		N = 11	%	9.10	54.50	36.40		
		Boys	No.	03	07	21		
	<i>e</i> +	N= 31	%	9.70	22.60	67.70	0.550	0.000**
	5	Girls	No.	19	04	03	0.558	
		N=26	%	73.10	15.40	11.50		

Table 1: Age and Gender wise Height Deficit Classification (Stunting) of the Tribal Children

					Height for Age (Z-Scor	e Classification)		
Population	Age (Years)	Gend	er	= -3SD Severe	<-2SD Moderate	> -1SD to < +2SD Normal	CC Value	P Value
		Boys	No.	21	00	00		
	Deleve 1 Vees	N=21	%	100.00	0.00	0.00	0.482	0.002**
	Below I Year	Girls	No.	05	03	00	0.482	0.003**
		N= 8	%	62.50	37.50	0.00		
		Boys	No.	18	00	00		
	1+	N=18	%	100.00	0.00	0.00		
	1	Girls	No.	15	00	00	-	-
		N=15	%	100.00	0.00	0.00		
		Boys	No.	15	00	00		
	2 ⁺	N=15	%	100.00	0.00	0.00		
	2	Girls	No.	23	00	00	-	
Imilian		N= 23	%	100.00	0.00	0.00		
Irunga		Boys	No.	03	12	01		
	2 ⁺	N= 16	%	18.80	75.00	6.30	0.612	0 000**
	3	Girls	No.	00	02	09	0.012	0.000
		N=11	%	0.00	18.20	81.80		
		Boys	No.	00	04	05		
	4+	N= 9	%	0.00	44.40	55.60	0 302	0.233
	-	Girls	No.	05	08	07	0.302	0.235
		N= 20	%	25.00	40.00	35.00		
		Boys	No.	03	14	14		
	5+	N= 31	%	9.70	45.20	45.20	0.426	0 008**
	5	Girls	No.	06	06	01	0.720	0.008**
		N= 13	%	46.20	46.20	7.70		

under severe level and 37.50% under moderate level but none of them fall under normal category. In boys all come under severe grade no Iruliga boys fall under normal and moderate level of stunting. With respect to 1⁺ and 2⁺ years all the girls and boys fall under severe category. Among 3⁺ year's children, 81.80% of the girls constituted normal and 18.20% moderate category. None of them fall under severe form of stunting. About 75.00% of the boys observed under moderate form of stunting. Among the children of m 4⁺ years 55.60% of the boys constitute normal level against 35.00% of girls. 40.00% of moderate girls found against 44.40% boys. None of the boys come under severe category, while 25.00% of the girls fall under severe category. However the level of stunting of 5⁺ years children shows that same percentage (45.20%) of normal and moderate level of height for age is found among boys and the same percentage (46.20%) of moderate and severe form of stunting observed among girls of 5 years.



Fig. 1: Age and Gender wise Height Deficit Classification (Stunting) of the Tribal Children

Weight for age indicates the underweight of the child, (Table-2) an important indicator of severe degree of malnutrition. According to Z-score classification, majority of Hakkipikki boys of below 1 year come under mild (50.00%) form of underweight followed by moderate (25.00%) and severe (25.00%) form, and girls constitute 60.00% moderate, 25.00% severe and 20.00% mild, and none of the children constitute normal grade. About 52.20% girls of 1⁺ year were moderate, 39.10% were mild and only 8.70% were normal. However, majority of the male children fall under severe grade of underweight (94.70%) and only 5.30% were moderate category. Among the boys of 2⁺ years, all the children fall under severe category and majority of the girls fall under moderate (72.70%) category followed by mild (27.30%). About 45.50% of girls of 3⁺ year were moderate, 27.30% were mild, 28.20% were severe and

9.10% were normal, but majority of the male children fall under normal category (57.10%) followed by moderate (28.60%) and severe (14.30%). Among the boys of 4⁺ years, majority of them fall under mild (42.90%) category. Whereas the girl's constitute equal percentage (18.20%) of mild and moderate form of underweight and 36.40% were normal and 27.30% were severe. Whereas, boys of 5⁺ year comes under severe form of underweight (41.90%) against 19.20% of girls. There was highly significant association between the age group of 1⁺ and 2⁺ years, a significant association was observed in 5⁺ year age group children.

Among Iruligas 87.50% girls of below 1 year were moderately malnourished, and majority of the boys fall under severe grade of malnutrition followed by moderate (28.60%) and mild (4.80%) form of underweight. Whereas 94.40% of boys of 1+ year constitute severe form of under nutrition and only 5.60% come under moderate. Among girls, 53.30% fall under moderate form followed by mild (46.70%) category. None of the boys and girls comes under normal category. Majority of the boys of 2+ years comes under severe (93.30%) category and only 6.70% were moderate. Whereas 56.50% of the girls fall under moderate and 43.50% were mild. With respect to 3+ year age group majority of boys (50.00%) fall under

moderate category followed by equal percentage (12.50%) of mild and normal. Among girls, 54.50% come under normal category followed by mild (36.40%) and moderate (9.10%). With respect to 4⁺ years, majority of the boys (77.80%) fall under normal category against 35.00% of girls. At the age of 5⁺ years, 53.80% girls were found to be under moderate category. Highly significant association was found between below 1 year, 1⁺, 2⁺ and 3⁺ year age group children.

Population	Age (years)	Gende	er	<-3SD Severe	<-2SD Moderate	< -1SD Mild	<-1SD to <+ 2SD Normal	CC Value	P Value
		Boys	No.	01	01	02	00		
	D 1 1 1	N=4	%	25.00	25.00	50.00	0.00	0.000	0.207
	Below I Year	Girls	No.	03	09	03	00	0.298	0.396
		N=15	%	20.00	60.00	20.00	0.00		
		Boys	No.	18	01	00	00		
	1+	N=19	%	94.70	5.30	0.00	0.00	0.691	0.000**
		Girls	No.	00	12	09	02	0.071	0.000
		N=23	%	0.00	52.20	39.10	8.70		
		Boys	No.	17	00	00	00		
	a +	N=17	%	100.00	0.00	0.00	0.00	0.505	0.000**
	2	Girls	No.	00	16	06	00	0.707	0.000**
		N=22	%	0.00	72.70	27.30	0.00		
		Boys	No.	01	02	00	04		
Hakkipikki	3+	N=7	%	14.30	28.60	0.00	57.10	0 494	0 121
	5	Girls	No.	02	05	03	01	0.174	0.121
		N=11	%	18.20	45.50	27.30	9.10		
		Boys	No.	01	04	06	03		
	4+	N=14	%	7.10	28.60	42.90	21.40	0.350	0 321
		Girls	No.	03	02	02	04	0.550	0.521
		N=11	%	27.30	18.20	18.20	36.40		
		Boys	No.	13	05	03	10		
		N=31	%	41.90	16.10	9.70	32 30		
	5+	Girle	No	41.50	10.10	5.70	52.50	0.400	0.013*
		GIIIS	NO.	05	12	06	03		
		N=26	%	19.20	46.20	23.10	11.50		

Table 2: Age and Gender wise Weight Deficit Classification (Underweight) of the Tribal Children

					Weight fo	or Age (Z-Score Classific	ation)		
Population	Age (years)	Gender		< -3SD Severe	<-2SD Moderate	< -1SD Mild	<-1SD to <+2SD Normal	CC Value	P Value
		Boys	No.	14	06	01	00		
	Below 1 Vear	N=21	%	66.70	28.60	4.80	0.00	0.512	0.006**
	Delow 1 Tear	Girls	No.	00	07	01	00	0.512	0.000
		N=8	%	0.00	87.50	12.50	0.00		
		Boys	No.	17	01	00	00		
	1+	N=18	%	94.40	5.60	0.00	0.00	0.686	0.002**
	1	Girls	No.	00	08	07	00	0.080	0.002
		N=15	%	0.00	53.30	46.70	0.00		
		Boys	No.	14	01	00	00		
	2+	N=15	%	93.30	6.70	0.00	0.00	0.688	0.001**
		Girls	No.	00	13	10	00		
		N=23	%	0.00	56.50	43.50	0.00		
Iruliga		Boys	No.	04	08	02	02		
	2+	N=16	%	25.00	50.00	12.50	12.50	0.549	0.000**
	3	Girls	No.	00	01	04	06	0.348	0.009**
		N=11	%	0.00	9.10	36.40	54.50		
		Boys	No.	00	02	00	07		
	A^+	N=9	%	0.00	22.20	0.00	77.80	0.403	0 131
	4	Girls	No.	06	06	01	07	0.405	0.151
		N=20	%	30.00	30.00	5.00	35.00		
		Boys	No.	10	08	05	08		
	c +	N=31	%	32.30	25.80	16.10	25.80	0.220	0.171
	5	Girls	No.	01	07	03	02	0.320	
		N=13	%	7.70	53.80	23.10	15.40		

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Fig. 2: Age and Gender wise Weight Deficit Classification (Underweight) of the Tribal Children

Weight for height refers to wasting which is an indicator of past and long term under nutrition. The table 3 indicates that, majority of the below 1 year boys of Hakkipikkis (75.00%) comes under normal category followed by 25.00% mild category. However, none of the boys fall under severe and moderate form of wasting. Among girls, 73.30% fall under normal category and 13.30% fall under severe category. On the other hand, same percentage (6.70%) of moderate and mild form of wasting was observed. With respect to children of 1⁺ year, majority of the boys constitute mild (52.60%) form followed by moderate (26.30%) and normal (15.80%) and 5.30% boys come under severe form of wasting. Whereas majority of the girls (95.70%) constitute normal and only 4.30% come under moderate level. None of the girls come under severe and mild category.

Among the age group of 2⁺ years 70.60% of boys fall under mild category and same percentage (11.80%) of severe and normal category was observed. Among girls majority (72.70%) comes under normal category and 27.30% are moderate level but none of the girls fall under severe and mild category. Among the children of 4⁺ years, 64.30% constitute normal category followed by mild (21.40%) and moderate (14.30%) category and none of the boys fall under severe category. Among girls, 36.40% fall under moderate level and 27.30% under normal category, while same percentage (18.20%) of girls fall under mild and severe form of wasting. In the age group of 5+ years, about 22.60% of boys and 53.80% of girls constitute normal grade and remaining children have mild, moderate and severe form of wasting. Overweight (3.80%) and obese (11.50%) girls are also found among this age group.

There was highly significant association found among the age group of 1^+ and 2^+ years children.

Among Iruliga children, majority (81.00%) of boys and girls (87.50%) constitute normal category, while 19.00% of boys and 12.50% of girls fall under moderate category. None of the boys and girls of below 1 year and 1⁺ year children fall under severe and mild category. About 83.30% of boys and 73.30% of girls of 1⁺ year constitute normal form of wasting. At the age of 2⁺ years same percentage (40.00%) of boys were observed under moderate and mild level of wasting and majority (65.20%) of girls fall under normal level. Among 3⁺ years age group, 87.50% of the boys comes under moderate level of weight for height and same percentage (6.30%) of boys fall under mild and severe category. None of the boys comes under normal category. However, 81.80% girls were observed under normal and 18.20% under mild level of wasting. Cent percent of the boys of 4⁺ years fall under mild category against 30.00% of girls. Among the boys of 5⁺ years 41.90% were found to be severe followed by 6.50% moderate, 16.10% mild, 25.80% normal, 6.50% were found to be under risk of overweight, and only 3.20% fall under over weight category. Over all the children of Iruliga tribe shows highly significant association between age and gender of 2⁺, 3⁺ and 4⁺ year children.

Table 3: Age and Gender wise Weight for Height Classification (Wasting) of the Tribal Children

						Weight f	or Height (Z-Sco	re Classification)				
Population	Age (years)	Gend	ler	< -3SD Severe	< -2SD Moderate	<-1SD Mild	<-1SD to >+1SD Normal	> +1SD Risk of Over weight	> +2SD Over weight	> +3SD Obese	CC Value	P Value
	Below 1 Year	Boys N=4 Girls N=15	No. % No. %	00 0.00 02 13.30	00 0.00 01 6.70	01 25.00 01 6.70	03 75.00 11 73.30	00 0.00 00 0.00	00 0.00 00 0.00	00 0.00 00 0.00	0.295	0.613
	1+	Boys N=19 Girls N=23	No. % No. %	01 5.30 00 0.00	05 26.30 01 4.30	10 52.60 00 0.00	03 15.80 22 95.70	00 0.00 00 0.00	00 0.00 00 0.00	00 0.00 00 0.00	0.632	0.000**
	2+	Boys N=17 Girls	No. % No.	02 11.80 00	01 5.90 06	12 70.60 00	02 11.80 16	00 0.00 00	00 0.00 00	00 0.00 00	0.648	0.000**
Hakkipikki	3+	N=22 Boys N=7 Girls N=11 Boys	% No. % No. No.	01 14.30 02 18.20 00	04 57.10 01 9.10 02	0.00 01 14.30 01 9.10 03	01 14.30 07 63.60 09	00 0.00 00 0.00 00	00 00 0.00 00 0.00 00	0.00 0.00 00 0.00 00	0.501	0.110
	4+	N=14 Girls N=11	% No. %	0.00 02 18.20	14.30 04 36.40	21.40 02 18.20	64.30 03 27.30	0.00 00 0.00	0.00 00 0.00	0.00 00 0.00	0.427	0.134
	5+	Boys N=31 Girls	No. % No.	13 41.90 03	07 22.60 04	03 9.70 00	07 22.60 14	00 0.00 01	00 0.00 01	01 3.20 03	0.457	0.020*
		N=26	%	11.50	15.40	0.00	53.80	3.80	3.80	11.50		

	Weight for Height (Z-Score Classification)											
Population	Age (Years)	Gend	ler	< -3SD Severe	<-2SD Moderate	< -1SD Mild	<-1SD to> +1SD Normal	>+1SD Risk of Over weight	> +2SD Over weight	CC Value	P Value	
		Boys	No.	00	04	00	17	00	00			
	Below 1	N=21	%	0.00	19.00	0.00	81.00	0.00	0.00	0.077	0.677	
	Year	Girls	No.	00	01	00	07	00	00	0.077	0.077	
		N=8	%	0.00	12.50	0.00	87.50	0.00	0.00			
		Boys	No.	00	03	00	15	00	00			
	1+	N=18	%	0.00	16.70	0.00	83.30	0.00	0.00	0 121	0 484	
		Girls	No.	00	04	00	11	00	00	0.121	0.101	
		N=15	%	0.00	26.70	0.00	73.30	0.00	0.00			
		Boys	No.	00	06	06	03	00	00			
	2+	N=15	%	0.00	40.00	40.00	20.00	0.00	0.00	0 508	0.001**	
		Girls	No.	00	08	00	15	00	00	01000	0.001	
Irulias		N=23	%	0.00	34.80	0.00	65.20	0.00	0.00			
munga		Boys	No.	01	14	01	00	00	00			
	3+	N=16	%	6.30	87.50	6.30	0.00	0.00	0.00	0.688	0.000**	
	2	Girls	No.	00	00	02	09	00	00	0.000	0.000	
		N=11	%	0.00	0.00	18.20	81.80	0.00	0.00			
		Boys	No.	00	00	09	00	00	00			
	4+	N=9	%	0.00	0.00	100.00	0.00	0.00	0.00	0 544	0.007**	
	-	Girls	No.	03	02	06	09	00	00	0.544	0.007	
		N=20	%	15.00	10.00	30.00	45.00	0.00	0.00			
		Boys	No.	13	02	05	08	02	01			
	5+	N=31	%	41.90	6.50	16.10	25.80	6.50	3.20	0 365	0.237	
	5	Girls	No.	01	03	03	05	01	00	0.365	0.237	
		N=13	%	7.70	23.10	23.10	38.50	7.70	0.00			

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Fig. 3: Age and Gender wise Weight for Height Classification (Wasting) of the Tribal Children

Table 4: Age and Gender wise Distribution of Body Mass Index Classification of the Tribal Children

		-			BMI (Z-Score Classifica	tion)			
Population	Age (Years)	Geno	ler	< -2SD Very low BMI	<-2SD to > +2SD Low BMI	> +2SD Normal	> +3SD High BMI	CC Value	P Value
	Below 1 Year	Boys N=4 Girls N=15 Boys	No % No %	00 0.00 01 6.70 00	00 0.00 03 20.00 01	04 100.00 11 73.30 18	00 0.00 00 0.00 00	0.288	0.509
	1*	N=19 Girls N=23 Boys	% No % No	0.00 00 0.00 00	5.30 0 0.00 02	94.70 23 100.00 15	0.00 00 0.00 00	0.169	0.265
Hakkipikki	2*	N=17 Girls N =22 Boys	% No No	0.00 00 0.00 02	11.80 04 18.20 02	88.20 18 81.80 03	0.00 00 0.00 00	0.880	0.582
	3+	N=7 Girls N=11 Boys	% No % No	28.60 02 18.20 00	28.60 01 9.10 02	42.90 08 72.70 12	0.00 00 0.00 00	0.302	0.405
	4*	N=14 Girls N =11 Boys	% No % No	0.00 00 0.00 12	14.30 05 45.50 10	85.70 06 54.50 09	0.00 00 0.00 00	0.326	0.085
	5+	N=31 Girls N =26	% No %	38.70 08 30.80	32.30 06 23.10	29.00 12 46.20	0.00 00 0.00	0.175	0.406

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		6			BMI (Z-Score Classif	ication)			
Population	Age (Years)	Gend	ler	<-2SD Very low BMI	< -2SD to > +2SD Low BMI	> +2SD Normal	> +3SD High BMI	CC Value	P Value
		Boys	No.	00	00	21	00		
		N=21	%	0.00	0.00	100.00	0.00		-
	Below 1	Girls	No.	00	00	08	00		
	year	N=8	%	0.00	0.00	100.00	0.00		
		Boys	No.	00	01	17	00		
		N=18	%	0.00	5.60	94.40	0.00		
		Girls	No.	00	01	14	00	0.023	0.894
	1°	N=15	%	0.00	6.70	93.30	0.00		
		Boys	No.	00	01	14	00		
		N=15	%	0.00	6.70	93.30	0.00	0.432	0.034*
	2+	Girls	No.	02	00	14	07		
Inulian		N=23	%	8.70	0.00	60.90	30.40		
rrunga		Boys	No.	05	02	09	00		
		N=16	%	31.30	12.50	56.30	0.00	0.44	0.020*
		Girls	No.	00	00	11	00	0.44	0.039*
	3*	N=11	%	0.00	0.00	100.00	0.00		
		Boys	No.	00	00	09	00		
		N=9	%	0.00	0.00	100.00	0.00	0.293	0.257
	4+	Girls	No.	01	04	15	00		
		N=20	%	5.00	20.00	75.00	0.00		
		Boys	No.	11	06	14	00		
		N=31	%	35.50	19.40	45.20	0.00		
	5+	Girls	No.	03	03	007	00	0.121	0.723
	5	N=13	%	23.10	23.10	53.80	0.00		



Fig. 4: Age and Gender wise Distribution of Body Mass Index Classification of the Tribal Children

Body Mass Index (BMI)

The body mass index refers to muscle fat mass in the body; from the table 4 it was observed that centpercent of below 1 year boys comes under normal BMI against 73.30% of girls. Majority (94.70%) of 1⁺ year boys and all the girls fall under normal category. It was noticed that, in Hakkipikkis, up to 4⁺ years most of the children fall under normal BMI. The low BMI was observed in 32.30% boys of 5⁺ year old children against 23.10% girls and none of the children fall under high BMI category. The result shows no significant association with age and gender among Hakkipikki children. In Iruligas, almost same observations as in Hakkipikkis were made in the children from 0 to 5^+ year age group. None of the children fall under high BMI category. At the age of 2^+ years, 30.40% girls fall under high BMI. The contingency co-efficient and P value revealed that a significant association was found in the children of 2^+ and 3^+ year age group.

2+

Iruliga

Boys Girls Boys Girls Boys Girls Boys Girls

14

Normal

5+

- High

3+

Age and Gender

Low BMI

Conclusion

Assessment of nutritional status using WHO recommended anthropometric indicators and Z-score interpretation reveals that tribal children of Mysore district are suffering from different grades of

malnutrition. The widespread prevalence of malnutrition is in the form of stunting, wasting and underweight.

References

- Bhasin, S. K., Singh, U., Sood, V. P and Gaur, D. R.: Height and Weight of 'Well to-do' School children in Haryana. *Indian Pediatrics*, Vol. 27 (10), pp. 1089–1093, (1990).
- De Onis, M., Onyango, A.W., Borghi, E., Siyam, A., Nishida, C., Siekmann, J.: Development of WHO growth reference for school-aged children and adolescents. *Bulletin of the World Health Organization*. Vol. 85, pp. 660–667, (2007).

- Iyer, L. K. A.: *The Mysore Tribes and Castes*, Vol.3, pp. 378–394, (1988).
- Mann, R. S.: Hakkipikkis Trapper and Seller, Anthropological Survey of India, Kolkatta. (1980).
- Measuring Change in Nutritional Status. Guidelines for Assessing the Nutritional Impact of Supplementary Feeding Programmes for Vulnerable Groups. Geneva: World Health Organization. (1983).
- 6. Suman Chakrabarty., Premananda Bharati.: Nutritional status among the Shabar tribal children living in urban, rural and forest habitats of Orissa, India, Italian Journal of Public health.Volume 7, Number 3, (2010).

Estimation of Stature from Foot Measurements

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Abstract

Estimation of stature from body parts is crucial in identification of disfigurement human remains in forensic investigation. The objectives of the present study were to understand the correlations of foot measurements with stature and to derive regression equations to estimate the stature from different foot measurements in adult Bengali females. The present cross-sectional study in the Birbhum district of West Bengal was conducted on one hundred adults Bengali females. Anthropometric measurement includes stature, five foot length measurements from each toe (i.e. $T_1, T_2, T_3, T_4, and T_5$), foot breadth at the ball and foot breadth at the heel. The mean age was 22.35 (SD, 1.55) years. The mean stature was 153.47 (SD, 4.77) cm. The result of the paired *t* test revealed that there were significant bilateral asymmetry in T_3, T_4, T_5 length and FBB. Results of the Pearson's correlation coefficient of stature with different foot measurements revealed that all foot measurements were significantly and positively correlated with stature. However, the highest correlation was observed between stature and left foot T_4 length. Equations were derived by using simple and multiple regression analysis for the estimation stature. The overall lower standard error of estimate for foot length measurements indicated that foot lengths provide comparatively higher reliability and accuracy in estimating stature. However, the standard error of estimate of multiple regression model indicated that foot lengths provide comparatively higher reliability and accuracy in estimating stature. However, the standard error of estimate of multiple regression model indicated that the multiple regression model tend to estimate stature more accurately than linear regression models.

Key words: Female; Foot Length; Foot Breadth; Stature; Forensic Anthropology.

Introduction

Stature is considered as one of the most important variable in forensic investigation for personal identification. Because along with age, sex and ancestry, estimation of stature is also assist to narrow-down the group of possible victim for identification in the forensic investigation (Krishan et al., 2011; Parekh et al., 2014). Estimation of stature become vital in mass disasters like bomb blasts, train accidents, plane crashes, earthquakes, etc (Mansur et al., 2012). Since, in those situations a forensic investigator has to depend mostly on body parts for personal identification. The disfigurement of the dead body can also be done by scavenging animals as well as by criminals to destroy the traces of identity and to facilitate the disposal of the dead body (Rani et al., 2011; Rajesh et al., 2015). Whatever may be the situations, estimation of stature from extremities or parts of the extremity become vital in identifying the dead body for personal identification.

Literature review revealed that in comparison to long bones, ossification and maturation in the foot occurs earlier and thus, stature could be more precisely predicted from foot measurements, compared to that of long bones (Mansur et al., 2012; Babu et al., 2013). There are a number of studies that attempted to derive regression equations for the estimation of stature using different foot measurements (Agnihotri et al, 2007; Sen and Ghosh, 2008; Krishan et al., 2012; Khairulmazidah et al., 2013). However, these equations are not universal and only applicable to the population they studied, due to the ethnic variations in foot measurements and stature as well as in their relationships (Tharmar et al., 2011; Babu et al., 2013). This envisages the need to conduct more studies among people of different ethnic groups, so that the stature estimation becomes more accurate and reliable. In view of the above, the objectives of the present study were to understand the correlations of foot measurements with stature and to derive regression equations to estimate the stature from different foot measurements in adult Bengali females.

Materials and methods

The present cross-sectional study in the Birbhum district of West Bengal was conducted on one hundred adult Bengali females. The individuals were identified as Bengali by their language and surnames. The study participants were homogeneous in terms of ethnic composition, language and religious affiliation. All the subjects included in the present study were free from any deformity of the foot and vertebral column. The age range of the subjects was between 18 to 26 years.

Anthropometric measurements includes stature (ST), five foot length measurements [i.e. length of foot from each toe namely, from first toe (T₁), second toe (T_2) , third toe (T_3) , fourth toe (T_4) , and fifth toe (T_s)], foot breadth at the ball (FBB) and foot breadth at the heel (FBH). All foot measurements were taken on both left and right foot. Both stature and foot measurements were taken following standard techniques (Lohman et al, 1988; Krishan et al., 2011). In brief, stature was the straight distance between floor of standing and vertex. During stature measurements, the subject was requested to stand without shoe on a flat surface and the weight was distributed evenly on both feet with the head in Frankfurt Horizontal plane (Eye-Ear plane). The arms hang freely by the sides of the trunk, with the palm facing thigh. For measurements on foot, the subject was also requested to stand without shoe on a flat surface with equal pressure on both feet. T, Length is the distance between pternion and the most distal part of the first toe. T₂ Length is the distance between pternion and the most distal part of the second toe. T_3 Length is the distance between pternion and the most distal part of the third toe. T_4 Length is the distance between pternion and the most distal part of the fourth toe. T_5 Length is the distance between pternion and the most distal part of the fifth toe. FBB is the distance between the joint of the anterior epiphyses of the first metatarsal and the joint of the anterior epiphyses of the fifth metatarsal. FBH is the distance between the lateral sides of the heel to the medial side of the heel. Stature and foot measurements were measured to the nearest 0.1 cm using a moveable anthropometer and sliding caliper, respectively.

Descriptive statistics were performed by mean, standard deviation (SD) and range. Bilateral asymmetry in foot measurements were assessed by paired *t*-test. Pearson's correlation coefficient was undertaken to understand the relationship of stature with foot length and breadth measurements. Linear and multiple regression equations were derived to estimate stature by foot measurements, using stature as the dependent and foot measurements as an independent variable. All statistical analysis was performed by using SPSS, version 9 (SPSS Inc., Chicago, IL, USA). A *p*-value of less than 0.05 was considered as significant.

Results

The mean age of the studied population was 22.35 (SD, 1.55) years. The mean stature was153.47 (SD, 4.77) cm. Mean, SD and range of different foot measurements on both left and right side are presented in table 1. Table 2 shows the bilateral asymmetry in foot measurements. The result of the paired t test revealed that there were significant (p<0.05) differences or bilateral asymmetry in T₂, T_{4} , T_{5} length and FBB in between left and right foot. However, the results were also revealed no significant (p>0.05) bilateral asymmetry in T_1 , T_2 length and FBH between left and right foot, and thus, the means of right and left foot T_1 , T_2 length and FBH were used for further analysis. Results of the Pearson's correlation coefficient of stature with different foot measurements are presented in table 3. It revealed that all foot measurements were significantly (p<0.05) and positively correlated with stature. Linear regression models derived for reconstruction of stature from each foot measurements are presented in table 4. Table 5 shows the multiple regression models for the reconstruction of stature from all foot measurements.

Variables	Mean (cm)	SD	Range (cm)	Mean (cm)	SD	Range (cm)
		Left foot			Right foot	
T_1	22.68	0.97	20.00-25.10	22.63	1.01	20.00-25.10
T ₂	22.15	0.98	19.30-25.00	22.10	0.97	19.40-24.70
T ₃	21.33	0.97	19.00-24.40	21.22	0.95	19.20-23.90
T_4	20.19	0.89	18.10-22.50	20.10	0.88	18.20-22.70
T ₅	18.81	0.93	16.60-21.50	18.75	0.89	16.70-21.50
FBB	08.86	0.49	07.60-09.80	08.77	0.47	07.60-09.70
FBH	05.43	0.43	04.40-06.50	05.40	0.40	04.40-06.50

Table 1: Mean, standard deviation and range of foot measurements on left and right side

SD-standard deviation; T_1-T_1 length; T_2-T_2 length; T_3-T_3 length; T_4-T_4 length; T_5-T_5 length; FBB-foot breadth at ball; FBH-foot breadth at heel

Variables	Mean differences (cm)	SD	t	р
LFT ₁ -RFT ₁	0.048	0.260	1.849	0.067
LFT ₂ -RFT ₂	0.055	0.281	1.959	0.053
LFT ₃ -RFT ₃	0.111	0.414	2.682	0.009
LFT ₄ -RFT ₄	0.087	0.286	3.047	0.003
LFT ₅ -RFT ₅	0.055	0.265	2.076	0.040
LFBB-RFBB	0.089	0.219	4.060	0.000
LFBH-RFBH	0.032	0.262	1.221	0.225

Table 2: E	Bilateral	asymmetry	in	foot	measurements
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SD-standard deviation; LFT₁-left foot T₁ length; LFT₂-left foot T₂ length; LFT₃-left foot T₃ length; LFT₄- left foot T₄ length; LFT₅- left foot T₅ length; LFBB-left foot breadth at ball; LFBH-left foot breadth at heel; RFT₁-right foot T₁ Length; RFT₂-right foot T₂ length; RFT₃-right foot T₃ length; RFT₄- right foot T₄ length; RFT₅- right foot T₅ length; RFBB-right foot breadth at ball; RFBH-right foot breadth at heel.

Table 3: Pearson correlations of stature with foot measurements

Variables	r	р
TI	0.681	0.001
T ₂	0.664	0.001
LFT ₃	0.689	0.001
RFT ₃	0.622	0.001
LFT ₄	0.720	0.001
RFT ₄	0.645	0.001
LFT ₅	0.711	0.001
RFT ₅	0.680	0.001
LFBB	0.239	0.017
RFBB	0.245	0.014
FBH	0.233	0.020

 T_1-T_1 length; T_2-T_2 length; LFT₃-left foot T_3 length; LFT₄- left foot T_4 length;LFT₅left foot T_5 length; LFBB-left foot breadth at ball; FBH-foot breadth at heel; RFT₃-right foot T_3 length;RFT₄- right foot T_4 length;RFT₅- right foot T_5 length; RFBB-right foot breadth at ball

Variables	Regression models	SEE (cm)	R ²	р
TI	78.377+3.311 (T ₁)	3.509	0.464	0.01
T_2	80.422+3.297 (T ₂)	3.583	0.441	0.01
LFT ₃	81.219+3.386 (LT ₃)	3.470	0.475	0.01
RFT ₃	87.485+3.109 (RT ₃)	3.750	0.387	0.01
LFT ₄	76.160+3.830 (LT ₄)	3.327	0.518	0.01
RFT ₄	83.380+3.487 (RT ₄)	3.661	0.416	0.01
LFT ₅	84.929+3.645 (LT ₅)	3.370	0.505	0.01
RFT ₅	85.162+3.643 (RT ₅)	3.515	0.462	0.01
LFBB	132.721+2.341 (LFBB)	4.652	0.057	0.02
RFBB	131.767+2.474 (RFBB)	4.646	0.060	0.01
FBH	138.195+2.807 (FBH)	4.660	0.054	0.02

Table 4: Linear regression models for reconstruction of stature from each foot measurements

 T_1-T_1 length; T_2-T_2 length; LFT₃-left foot T_3 length; LFT₄- left foot T_4 length; LFT₅- left foot T_5 length; LFBB-left foot breadth at ball; FBH-foot breadth at heel; RFT₃-right foot T_3 length; RFT₄- right foot T_4 length;RFT₅- right foot T_5 length; RFBB-right foot breadth at ball; SEE-standard error of estimate

Table 5: Multiple regression model for reconstruction of stature from foot measurements

Variables	Regression model	SEE (cm)	R	\mathbf{R}^2	Р
T ₁ , T ₂ , LT ₃ , RT ₃ , LT ₄ , RT ₄ ,LT ₅ , RT ₅ , LFBB, RFBB, FBH	81.205+1.367(T1)720(T2) +0.878(LT3)0.594(RT3)+3.715(LT4)1.876(RT4) +1.978(LT5)-0.637(RT5) -1.941(LFBB)+0.746 (RFBB)-0.150(FBH)	3.260	0.764	0.584	0.01

Discussion

Estimation of stature from body parts is crucial in identification of disfigurement human remains in forensic investigation. This can be done by mathematical methods like regression equations that utilize the measurements of available samples, which may be body parts or parts of skeleton to estimate the living stature. However, in the present study an attempt has been made to understand the correlation of foot measurements with stature and to derive regression equations to estimate the stature from different foot measurements in adult Bengali females. The result revealed that the mean of all left foot measurements (T_1 , T_2 , T_3 , T_4 , T_5 , FBB and FBH) were comparatively higher than the right foot. However, statistically significant bilateral asymmetries were observed only in $T_{3'}$, $T_{4'}$, T_5 and FBB. A previous study (Krishan et al., 2011) in sub-adult females of North India also demonstrated significant bilateral asymmetry in FBB, but in contrary to the present study they also observed significant bilateral asymmetry in FBH. When we compared this result with some other studies the results were inconclusive, because, some studies demonstrated significant bilateral asymmetry, others were not (Jasuja et al., 1999; Zeybek et al., 2008; Sen and Ghosh, 2008). However, comparatively higher mean left foot measurements were also observed in adult Rajbanshi females (Sen and Ghosh, 2008) of North Bengal, adult females of South India (Rajesh et al., 2015) and adult females of Malaysia (Khairulmazidah et al., 2013). The results of the correlation analysis revealed that all foot measurements were significantly (p<0.05) and positively correlated with stature, thus indicating that the stature could be estimated from footmeasurements. Similar significant positive association was also observed in other studies (Kanchan et al., 2008; Krishan et al., 2011; Mansur et al., 2012; Khairulmazidah et al., 2013). Furthermore, the correlations were much stronger for foot length measurements than the breadth measurements and the strongest correlation was observed between stature and left foot T₄ length (r=0.720; p<0.001). In accordance with the present study, a previous study by Zeybek et al., (2008) also observed highest correlation of foot length with stature. Contrary to that Kanchan et al., (2008) demonstrated maximum correlation of stature with foot breath.

It was observed from the simple linear regression models that the predictive value or the coefficient of determinant was best for left foot T_4 length, followed by left foot T_5 length. Moreover, the standard error of estimate was also less for left foot T_4 length. Thus, indicating that the error in estimating stature will be lower by left foot T, length, compared to other foot measurements. In a similar study in sub-adult female Krishan et al., (2011) observed different result. In that (Krishan et al., 2011) study T1 length was the most accurate predictor of stature by linear regression analysis. This difference might be due to the variation in age and ethnic group. However, the overall lower standard error of estimate for foot length measurements indicated that foot lengths provide comparatively higher reliability and accuracy in estimating stature. Several recent studies (Sen and Ghosh, 2008; Rani et al., 2011; Krishan et al., 2011; Rajesh et al., 2015) also observed that the stature can be estimated more accurately from foot length measurements than the foot breadth measurements. The standard error of estimate of multiple regression analysis indicated that the use of multiple regression model will further lower the standard error in estimating the stature when compared with linear regression models. Thus, multiple regression model could be a batter option for the prediction of stature with lower standard error. Kanchan et al., (2008) also demonstrated lower standard error of estimate for multiple regression equation in comparison with linear regression equations. This is also in agreement with other studies (Krishan et al., 2011; Singh et al., 2013), that the multiple regression models tend to estimate stature more accurately than the simple linear regression models for length and breadth measurements. However, an addition of age as a variable in multiple regression model, along with other foot measurements did not significantly affect the predictive value (R²=+0.002) in stature estimation, a finding that agrees with the studies of Kanchan et al., (2008) and Sen and Ghosh et al., (2008).

Conclusion

In conclusion, significant positive correlation of foot measurements with stature revealed that the stature could be estimated from foot measurements. However, the stronger correlation and lower standard error of estimate for foot length measurements indicated that foot lengths provide comparatively higher reliability and accuracy in estimating stature. The present study also demonstrated that though, in adult Bengali females stature can be predicted by both simple and multiple linear regression models, preference should be given to multiple regression equation for the estimation of stature more accurately with lower standard error.

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References

- Agnihotri AK, Purwar B, Googoolye K, Agnihotri S, Jeebun N. 2007. Estimation of stature by foot length. Journal of Forensic and Legal Medicine. 14: 279–283.
- Babu RS, Deepila V, Potturi BR. 2013. Estimation of stature from foot length. International Journal of Pharmacy and Biological Sciences. 3: 266–270.
- Jasuja OP, Singh J, Jain M.1999. Estimation of stature from foot and shoe measurements by multiplication factors: a revised attempt. Forensic Science International. 50: 203–215.
- Kanchan T, Menezes RG, Moudgil R, Kaur R, Kotian MS, Garg RK. 2008. Stature estimation from foot dimensions. Forensic Science International. 179: 241.e1–241.e5.
- Khairulmazidah M, Nadiah ABN, Rumiza AR. 2013. Stature estimation using foot and shoeprint length of Malaysian population. International Journal of Medical, Health, Biomedical and Pharmaceutical Engineering. 7:103–106.
- 6. Krishan K, Kanchan T, Passi N. 2011. Estimation of stature from the foot and its segments in a subadult female population of North India.Journal of Foot and Ankle Research. 4: 24.
- Krishan K, Kanchan T, Sharma A. 2012. Multiplication factor versus regression analysis in stature estimation from hand and foot dimensions. Journal of Forensic and Legal Medicine. 19: 211–214.
- 8. Lohman, TG, Roche, AF, Martorell, R. 1988. Anthropometric standardization reference manual. Chicago: Human kinetics Books.
- Mansur DI, Haque MK, Sharma K, Karki RK, Khanal K, Karna R. 2012. Estiatin of stature from foot length in adult Nepalese population and its clinical relevance. Kathmandu University Medical Journal.37:16–19.
- 10. Parekh U, Patel R, Patel P. 2014. A study of relation of stature with foot length in natives of Gujarat state. NHL Journal of Medical Sciences. 3:22–25.

Indian Journal of Research in Anthropology / Volume 1 Number 1 / July- December 2015

- Rajesh DR, Chikkara P, Chhoker VK, Singh A, Qadri SS, Kumar Y. 2015. Estimation of stature from foot dimensions and stature among South Indian medical students using regression models. Journal of Krishna Institute of Medical Sciences University. 4: 95–99.
- 12. Rani M, Tyag AK, Ranga VK, Rani Y, Murari A. 2011. Stature estimation from foot dimensions. Journal of Punjab Academy of Forensic Medicine and Toxicology. 11: 26–30.
- 13. Sen J, Ghosh S. 2008. Estimation of stature from foot length and foot breadth among the Rajbanshi: an indigenous population of North

Bengal. Forensic Science International. 181: 55.e1–55.e6.

- 14. Singh JP, Rani Y, Meena MC, Murari A, Sharma GK. 2013. Stature estimation from the dimensions of foot in males. ÝnsanbilDerg. 2: 15–20.
- Tharmar N, Mohamed K, Yaacob MHB, Thomas JP. 2011. Estimation of stature based on foot length of Malays in Malaysia. Australian Journal of Forensic Sciences. 43: 13–26.
- 16. Zeybek G, Ergur I, Demiroglu Z. 2008. Stature and gender estimation using foot measurements. Forensic Science International. 181: 54.e1–54.e5.

Health Profile and Reproductive Performance of Korku Tribal Women of Betul District, Madhya Pradesh

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Abstract

Healthy health is a dynamics of human life. Health status of any population has tremendous effect in nation's development. Women are the core of population. Their health status plays a major role for the birth of healthy child. Indian population has major segment of the tribals in which Madhya Pradesh is one of the tribal dominated states. Most of the tribals reside in remote areas and unhygienic conditions with lack of proper health care facilities. Available studies indicate that availability, feasibility and utility of health care facilities are not in satisfactory form especially in tribals. For the strengthening of tribal women, it is necessary to have basic information regarding their health status. The present study has been carried out on 207 Korku tribal women of Betul district, Madhya Pradesh. Their health status including malnutrition and blood pressure has been assessed whereas reproductive performance has been enumerated through pregnancy by pregnancy details. The present study revealed that the nutritional profile of Korku women was in satisfactory form. The fertility rate is low as compared to the rural Madhya Pradesh. Majority of women have been sterilized and have awareness towards pre and post natal care and the performance of health worker in the concerned village was satisfactory.

Keywords: Sterilized; Feasibility; Pregnancy; Post natal care.

Introduction

The concept of human health is as old as human's social history. Health is a natural state of human's and it is the result of living in accordance with the natural law pertaining to the body, mind and environment. Health is a function, not only of medical care but also of the overall integrated development of society, cultural, economic, educational, social and political. Healthy health and a healthy society go together. Hence, it is not possible to raise the health status and quality of life of people unless such efforts are integrated with the wider efforts to bring about the overall transformations of a society. Reproductive health of women consists of health of the women after puberty and before pregnancy, and health care,

utilization of health services during pregnancy, delivery care and postnatal care. Balance nutrition is required throughout life and is vital to women in terms of health and work. Nutritional anemia is a problem for women in India and more so in the rural areas. Maternal malnutrition which is guite common among the rural women is also serious health problem. Mother and children constitute a priority group of community. They are approximately 70% of the population of developing countries in India. Maternal health influences the fetus and neonatal health in a number of ways. The impact on maternal and child health of mild and moderate forms of malnutrition has been demonstrated in many studies. There is general agreement that health status of Korku is very poor and there is widespread poverty, illiteracy, malnutrition, absence of safe drinking

water, poor sanitary and living conditions and maternal and child health.

Tribal population in India, known to be autochthonous people of the land constitute around 8.6% of the nation's total population; comprising more than 400 communities, considered to be socioeconomically the most disadvantaged exploited group.Different ethno-lingual groups at varied/ different levels of development - economically, educationally and culturally, and are not homogenous group. 547 recognized scheduled tribal groups of which 76 are particularly vulnerable tribal groups (PVTGs). For providing better health care services, especially among the tribal population, it is essential to have information regarding fertility and mortality profile as well as nutritional status (Chaudhari, 1996; Bajaj, 1999; Balgir, 2000; Adak, 2001; Biswas, 2003; Dasgupta, 2003; Nagda, 2004; Jain & Agrawal, 2005; Maiti et al., 2005; Maurya et al., 2005; Nanda & Tripathi, 2005; Sharma, 2005; Bhasin, 2007; Banik, 2008; Day & Basu, 2008; Chandraker et al., 2009; Dey & Goswami, 2009; Guriya et al., 2009; Sangawan & Manocha, 2009; Das, 2010; Gupta & Bhatiya, 2010; Nema & Sharma, 2013; Patanwar & Sharma, 2013 and Sharma & Shrivastava, 2013).

The Korku is a Scheduled Tribe (ST) community predominantly found in the East Nimar, Betul and Chhindwara districts of Madhya Pradesh. The total population of Korkus in M.P. was 5, 59,344 including 1, 38,798 in Betul district (TRI, 2010). Korkus have derived their name from the combination of the word 'koru' meaning man and 'ku' which makes it plural meaning tribal men. The Korkus are a branch of the great Munda tribes and are placed here in the vicinity of the great tribethe Gonds. Korkus are initially believed to be a hunting gathering community dwelling in the forests of Satpura ranges on either sides of the river Tapti. The Korku tribe lives in small groups of huts made of grass and wood. They socially consume liquor made from the flowers of the Mahua tree which is prepared in almost all the houses. Predominantly, a rural-based community with 98.74 per cent living in rural areas, Korkus is primarily cultivators. They share the love of the forests with the Gonds. Women have dominant roles in the economic life of the society through agriculturists and agricultural wage labourers. 'Korku Panchayat' is found in many villages governed by a chief known as Patel and other members in the Panchayat include Padihar, Kotwar and ten to twelve older male members of the community known as Panch.

Materials and Methods

The present study has been conducted among the Korku's of Betul district, (M.P.). The concerned data has been collected from its predominated villages i.e. Behda, Batlakhurd, Neemkheda, Dhabda, Bichhutekri and Veerpur of Bhimpur block of Betul district, Madhya Pradesh among 207 women for fertility and mortality profile by pregnancy enumeration and 200 were measured for height and weight to assess Body Mass Index (BMI) for the nutritional profile.

Results and Discussions

Table 1 shows the village wise status of body mass index among women. Among 200 women, 70.5 percent women are normal, 26.5 percent are underweight and 3 percent women are overweight whereas no woman was found to be obese.

Table 2 exhibits the scenario of fertility profile. It shows that total numbers of pregnancies are 698, out of which total numbers of abortions are 2.29 per cent, total numbers of still births are 0.28 per cent, total number of live births among male & female are 40.83 per cent and 42.12 per cent respectively, total reproductive wastage is 2.58 per cent and total number of living children are 579.

Table 3 shows the live birth rate. It is found that the total number of pregnancies 698, out of which total live births are 579 and live birth rate, is 829.51.

The age group-wise general fertility rate (live birth per mother) is explained by table 4. Total live births are 579 and average live birth per woman is 2.79. Average live birth per woman is more in 45-49 age groups as compared to other age groups.

Table 5 shows the number of living children per women by age group. Among 207 women, total number of living children's are 551 and average living children per women is 2.66.

Table 6 exhibits the number of living children per thousand live births. Total number of live births is 579, total living children's are 551 and living children rate is 952.

Table number 7 shows the mother's age wise prereproductive mortality. Total number of neonatal death are 0.48, total number of post natal death 8.21, total number of infant death 15.45, total number of child death10.14, total number of adult death 6.29, and total number of juvenile death 3.87, and the total pre-reproductive mortality is 44.44 per cent.

S. No.	Villages	Total women	Under- weight (<18.5)	Normal (18.5-24.9)	Over- weight (25.0-29.9)	Obesity/ grade-i (30.0-34.9)	Obesity/ grade-ii (35.0-39.9)	Obesity/ grade- lii (>40)
1	Dhabda	30	7 (23.33%)	23 (76.67%)	-	-	-	-
2	Veerpur	17	5 (29.41%)	12 (70.59%)	-	-	-	-
3	Borkund	31	5 (16.13%)	24 (77.41%)	2 (6.45%)	-	-	÷
4	Bichhutekri	16	3 (18.75%)	13 (81.25%)	-	-	-	-
5	Neemkheda	17	8 (47.06%)	8 (47.06%)	1 (5.88%)	-	-	-
6	Batlakurd	63	17 (26.98%)	46 (73.02%	-	-	-	-
7	Bhehda	26	17 (26.98%)	15 (57.69%)	3 (11.54%)	-	-	-
	Total	200	53 (26.5%)	141 (70.5%)	6 (3%)	-	-	-

Tahle	1.	Village	wise	women	status	of	hody	mass	index	(RMI)	
lable	11	villaye	wise	women	Status	01	bouy	111922	muex	(DIVII)	

Table 2: Scenario of fertility profile

Age- group (In year)	No. of mothers	Total pregnancies	No. of abortions	No. of still- births	Live births		Total Wastage	Total
Below 20	15	15	-	-	3 (75%)	1 (25%)	-	4 (0.69%)
20–24	40	67	1 (1.45%)	1 (1.45%)	42 (60.87%)	27 (39.13%)	2 (2.89%)	69 (11.91%)
25–29	35	110	4 (4.39%)	-	39 (42.86%)	52 (57.14%)	4 (4.39%)	91 (15.71%)
30–34	37	121	1 (0.98%)	-	51 (50%)	51 (50%)	1 (0.98%)	102 (17.61%
35–39	31	120	3 (2.80%)	1 (0.93%)	59 (55.14%	51 (50%)	4 (3.74%)	107 (18.49%)
40–44	20	98	3 (3.95%)		38 (50%)	38 (50%)	3 (3.95%)	76 (13.12%)
45–49	29	167	4 (3.07%)	-	53 (40.77%)	77 (59.23%)	4 (3.07%)	130 (2.24%)
Total	207	698	16 (2.29%)	2 (0.28%)	285 (40.83%)	77 (59.23%)	18 (2.58%)	579 (82.95%)

Table 3: Number of live births

Total no. of mothers	Total Pregnancies	Total live birth	Rate
207	698	579	829.51

Table 4: Age group-wise general	fertility rate (Live birth per mother)
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Age group (in year)	No. of Mother	Live birth	Average live birth per women	
Below 20	15	4	0.27	
20-24	40	69	1.72	
25–29	35	91	2.6	
30–34	37	102	2.76	
35-39	31	107	3.45	
40-44	20	76	3.8	
45–49	29	130	4.48	
Total	207	579	2.79	

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Age group (in year)	No. of Mother	Living children	Average living children per women	
Below 20	15	66	4.4	
20–24	40	196	4.22	
25-29	35	36	1.03	
30-34	37	83	2.24	
35–39	31	64	2.06	
40-44	20	49	2.45	
45-49	29	57	1.97	
Total	207	551	2.66	

Table 5: Number of living children per women by age group

Table 6: Number of living children per thousand live births

No. of mothers	Total live birth	Living children	Rate	
207	579	551	952	

Table 7: Mother's age wise pre-reproductive mortality

Age group (in year)	No. of Mothers	Neo-natal death	Post-natal death	Infant death	Child death	Adult death	Juvenile death-	Total pre-reproductive mortality
Below 20	15	-	-	-	-	-	-	-
20–24	40	-	1 (0.48%)	2 (0.97%)	-	-	-	3 (1.45%)
25-29	35	-	4 (1.93%)	2 (0.97%)	1 (0.48%)	-	-	7 (3.38%)
30–34	37	-	4 (1.93%)	6 (2.89%)	3 (1.45%)	-	-	13 (6.23%)
35–39	31	1 (0.48%)	-	7 (3.38%)	4 (1.93%)	-	1 (0.48%)	13 (6.29%)
40–44	20	50	4 (1.93%)	6 (2.89%)	2 (0.97%)	3 (1.45%)	3 (1.45%)	19 (9.18%)
45–49	29	-	3 (1.45%)	9 (4.35%)	11 (5.31%)	10 (4.83%)	4 (1.93%)	37 (17.87%)
Total	207	1 (0.48%)	17 (8.21%)	32 (15.45%)	21 (10.14%)	10 (4.83%)	8 (3.87%)	92 (44.44%)

Summary and Conclusion

It can be concluded that most are found normal (76.5%) whereas only 26.5 per cent women are found underweight. total numbers of pregnancies are 698, out of which total numbers of abortions are 2.29 per cent, total numbers of still births are 0.28 per cent, total number of live births among male and female are 40.83 per cent & 42.12 per cent respectively, total reproductive wastage is 2.58 per cent and total number of living children are 579. the total number of pregnancies 698, out of which total live births are 579 and live birth rate, is 829.51. Total live births are 579 and average live birth per woman is 2.79. Average live birth per woman is more in 45-49 age groups as compared to other age groups. Among 207 women, total number of living children's are 551 and average Living Children per women is 2.66. Total number of live births is 579, total living children's are 551 and

living children rate is 952. Total number of neonatal death are 0.48, total number of post natal death 8.21, total number of infant death 15.45, total number of child death10.14, total number of adult death 6.29, and total number of juvenile death 3.87, and the total pre-reproductive mortality is 44.44 per cent.

The present study revealed that the nutritional profile of Korku women was in satisfactory form. It can be explained that Korku are residing in the boundary of Tapti River with irrigated land. The socioeconomic status is high and involved in government services. The fertility rate is low as compared to the rural Madhya Pradesh. It has been also observed that majority of women have been sterilized and have awareness towards pre and post natal care. It has been noted that the performance of health worker in the concerned village was satisfactory. The findings of the study will be helpful to improve better health care strategies in tribal population.

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References

- 1. Adak, D. K. (2001): Mortality in three tribal populations of Shillong. J. Hum. Eco. 12(2): 147–152.
- Bajaj, A. (1999): Knowledge and utilization of maternal and health services in Delhi slums. J. Fam. Wel. 45 (1): 44–52.
- Balgir, R.S. (2000): Human genetics, health and tribal development. In: Environment, health and development, (Ed.) Sharma, P.D. and Roy, S.C. Institute of Anthropological Studies., Ranchi, pp. 29–33.
- 4. Banik, S.D. (2008): Demography of the Santals in West Bengal and Jharkhand: A comparative study. Stud. Tribes Tribals. 6(1): 53–58.
- Bhasin, M.K. and Nag, S. (2007): Demography of the tribal groups of Rajasthan: 2. Levels, differentials and trends in fertility. Anthrop. 9(1): 39–46.
- 6. Biswas, R. K. (2003): Fertility profile of a primitive tribe, Madhya Pradesh. Anthrop. 5(3): 161–167.
- 7. Census of India. (2011): Ministry of health and family welfare, Govt. of India, New Delhi.
- 8. Chaudhari, B. (1986): Tribal health: socio-cultural dimensions (Ed.) Inter India Publications.
- Chandraker, R., Chakrabarty, S., Mitra, S., & Bharti, P. (2009): A study of reproductive and child health among the Mahasamund district, Chhattisgarh, India. Stud. Trib. Tribals. 7(2): 97– 103.
- 10. Day, A. S. & Basu, R. (2008): Women's empowerment and its effect on key RCH indicators in M.P. The Orient. Anthrop. 1 & 2 81–90.
- Dasgupta, A. (2003): Cultural and fertility: Son preference and reproductive behavior. Socio. Bullet. 52(2): 86–197.
- 12. Das, M. (2010): Study of nutritional status of Korku tribes in Betul district of Madhya Pradesh. Stud. Tribes Tribals. 8(1): 31–36.
- 13. Dey, S. and Goswami, S. (2009): Fertility pattern and its correlates in North East India. J. Hum. Ecol. 26(2): 145–152.

- 14. Government of Madhya Pradesh: Rural Health Statistics in Madhya Pradesh. 2010.
- 15. Gupta, P. S. & Bhatiya, A. (2010): Fertility and size of family: An empirical study in the western part of Rajasthan, Man and Life. 36(1-2): 11–20.
- Guria, M.; De, D.; Bera, T.K. and Ghosh, D. (2009). Awareness level of family planning practices in school going adolescent girls of different socioeconomic groups in rural sectors, West Bengal. J. Hum. Ecol., 27(2): 101–104.
- Jain, S. and Agrawal, S. (2005): Perception of health care and illness among Bhils: A study of Udaipur district in Southern Rajasthan. Stud. Tribes Tribals. 3(1): 15–19.
- Maiti, S.; Unisa, S. and Agrawal, P.K. (2005): Health care and health among tribal women of Jharkand: A situational analysis. Stud. Tribes Tribals. 3(1): 37–46.
- 19. Maurya, N., Sachdeva, M.P. and Kalla, A.K. (2005): Contraceptive Prevalence in an Isolated Population of Bay of Bengal, Anthrop. 7(1): 53– 56.
- 20. Nagda, B.L. (2004): Tribal population and health in Rajasthan. Stud. Tribes Tribals, 2(1): 1–8.
- 21. Nanda, S. and Tripathy, M. (2005): Reproductive morbidity, treatment seeking behavior and fertility: A study of scheduled caste & tribe women. J. Hum. Ecol., 18(1): 77–83.
- 22. Nema, Anjna & Sharma, K.K.N. (2013): Maternal health care awareness among college girls of other backward class of central India. Inter. J. Chi. Heal. Nutri. 2: 143–152.
- Patanwar, Pratibha & Sharma, K.K.N. (2013): Awareness of reproductive health among the kurmi adolescent girls of Raipur city, Chhattisgarh, India. Inter. J. Res. Heal. Sci. 1(3): 126–133.
- 24. Sangwan, S. & Manocha, A. (2009): Maternal knowledge and child health. J. Hum. Ecol. 25(1): 51–54.
- 25. Sharma, K.K.N. (2005): Reproductive and Child Health Problems in India. Academic Excellence, New-Delhi.
- Sharma, K.K.N. & Shrivastava, Anil. (2013): Studyof Fertility and Mortality Trends among the Kodaku tribe of Chhattisgarh. Man in India. 92(3-4): 537–541.

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Health and Nutritional Status of Munda Women in Mayurbhanj District, Odisha

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Abstract

The present paper is based on nutritional status of Munda women, those are living in forested zone as indigenous people specifically defined as "a politically underprivileged group, who share a similar ethnic identity different from the majority people, and who have been an ethnic entity in the locality before the present culture or society came into existence".

The physical condition of the body in those respects influenced by the diet and the levels of nutrients in the body and the ability of those levels to maintain normal metabolic integrity is considered as nutritional status. In this connection the present study is carried out in Shyamakhunta block of Mayurbhanj district, to assess the nutritional status of 428 married women from four sample villages, particularly between age group 15–49 and special emphasis has given to bring clear nutritional status of pregnant and non-pregnant women, general adequacy is assessed by measuring weight and height; the result is commonly expressed as the body mass index, the ratio of weight (kg) to height² (m). Status with respect to individual food pattern has measured to determine the nutritional status of women for specific metabolic responses.

The objectives of the study are framed as (i) to determine the nutritional status of pregnant and nonpregnant Munda women with the BMI status (ii) to examine whether there exists any difference in the nutritional status of pregnant and non-pregnant tribal women due to the level of income of their family; (iii) To examine whether there exists any difference in the health and nutritional status of Pregnant and Non-pregnant tribal women due to the level of education, i.e., illiterate and literate; (iv) It aims to examine the interrelationship between the food habit and calorie intake of the pregnant and non-pregnant women in the study area.

Keywords: Tribe; Munda Women; Income; Nutritional Status; BMI.

Introduction

Nutrition is the main factor to energize the human body to perform various functions and to lead a healthy life. The nutrients include proteins, fat, carbohydrate, vitamins and minerals. These nutrients are chemical substances which are present in the food we eat daily. The foods containing these nutrients which we consume daily are classified as cereals, pulses, nuts and oil seeds, vegetables, fruits and milk products and flesh food (It keeps the body healthy and to create immune power and sustain in work activities to generate income. Health is a prerequisite for human development and is an essential component for the well being of the mankind as a whole. It is a fact that the health problems of any community are influenced by interplay of various factors including social, economic and political ones. Also, the common beliefs, customs, practices adopted by any community related to health and disease in turn influence the health seeking behavior of that community to a greater extent. There is a consensus agreement among all those experts who are engaged in the health and nutritional studies and experiments that the health status of the tribal population is very poor and, more particularly, worst among the primitive tribes because of their isolation, remoteness and for the fact that they are being largely unaffected by the developmental processes going on in the country.

It is highlighted in the book" Nutritive value of Indian food" that there are serious deficiencies in the diets of our population particularly among the poor. As a consequences of this dietary deficiency, several nutritional deficiencies with clinical manifestations and disabilities are encountered in our country namely, (i) protein energy malnutrition among preschool children, (ii) Vitamin-A deficiency among children, (iii) Iron deficiency anemia in all groups, particularly among women, children and pregnant women, (iv) Iodine deficiency-endemic goiter, (v) B-complex deficiency. These diseases, if untreated or not prevented, may lead to many disabilities. Protein Energy Malnutrition (PEM) results in poor growth and development among Children. Vitamin-A deficiency when it becomes severe leads to nutritional blindness. Anemia leads to impaired work capacity, impaired resistance to infection and poor pregnancy outcome. Goiter due to iodine deficiency results in thyroid insufficiency, impaired metabolism and mental retardation. It is happening due to inadequate and faulty diets.

The ICMR study has indicated a high incidence of malnutrition in the tribal dominated districts of Orissa, in spite of the fact that Orissa is one of the ten states in the country covered under the National Nutrition Monitoring Bureau (NNMB). According to the report of NNMB (2000–2001), Orissa continues to have second highest level of under-nutrition among the ten states. When compared with the aggregate figures for chronic energy deficiency (BMI <18.5) in adult men and women in these states the level is higher in our state.

After analyzing the entire health scenario and the types of health problems faced by the tribes of the state, the ICMR Report concludes that the primitive tribes of Orissa and their health scenario presents a kaleidoscopic mosaic of various communicable and non-communicable disease profile keeping in pace with their socio-economic development. Among these studied tribes, there are communities who still depend primarily on hunting and food gathering as primary source of livelihood. The wide spread poverty, illiteracy, malnutrition, absence of safe drinking water and sanitary conditions, poor maternal and child health services, ineffective coverage of national health and nutritional services, etc. have been found, as possible contributing factors of dismal health condition prevailing amongst the primitive tribal communities of the country. Some of the intervention programs can be included in the national programs also. Besides this, the Bulletin also indicates that the non-communicable diseases like diabetes and hypertension are conspicuously absent among those tribes which indicates the fact that the primitive tribal communities of the State are still far away from the modern civilization and developments. In spite of the tremendous advancement in the field of preventive and curative medicine, the health care delivery services in these primitive tribal people are still at a very poor state and as per the ICMR Report- an all out effort is needed to strengthen these services so that the 'Health for All' goal in the country can be achieved.

A cross-sectional study has undertaken to determine anthropometric profile and nutritional status based on body mass index (BMI) of Munda women, a tribal population of Mayurbhanj district, Orissa. A total of 428 adult (aged > 15 years) Mundas of four villages of Shyamakhunta block, Mayurbhanja District, Orissa, were studied. Anthropometric measurements including height, weight, as well as BMI were measured. In conclusion, this study demonstrated that the prevalence of adult under nutrition was found to be very high among the Munda women, a tribal of Mayurbhanj District, Orissa. These rates were much higher than those found in several tribal populations from other parts of India. Therefore, immediate nutritional intervention programs are needed for implementation among Munda women moreover, further research is needed not only among this ethnic group but also other tribal populations of India to fully understand the causes and consequences of adult under nutrition.

Review of earlier studies

Different reviews and analyses of the literatures had helped to overcome various obstacles and pitfalls which might arise during the course of the work. Moreover, the review of previous literature helps in generating new ideas, theories and hypotheses those are very much required for a better analysis, which can result in a useful innovative model which can be utilized by the society, nation or the common man. Thus, review of related literature assumes a greater significance in designing and planning the study and it also helps in minimizing the errors arising out of various risks associated with a research design. Hence, the time spent and the amount of effort put on this exacting task is always considered as a wise and gainful investment for any good researcher. All those materials reviewed were collected from various libraries of various universities and institutions, maintained by various organizations. A skeletal representation of some useful research works and studies are presented below for the reference of the study.

Varma G.R et.al (2011) in their article "Antenatal care service utilization in tribal and rural areas in a South Indian context : an evaluation through mixed methods approach" have highlighted the utilization of ante natal care services by women living in tribal areas in the district of Visakhapatnam, Andhra Pradesh. Quantitative data on ANC were collected from women having a child aged less than a year. The study reports higher utilization of ANC compared with the national average of India. A greater proportion of women living in tribal areas utilize the services from governmental sources, 92 per cent women as approximately 54 per cent of rural women seek services (paid services) from private practitioners. The study showed relatively higher utilization of ANC services than the national average but at the same time, child deliveries at home which were mostly conducted by untrained elderly women were also high. In addition the literacy levels of women, socioeconomic conditions and distance to the health facilities also played a role.

Goswami et.al (2011) in their article "Traditional method of Reproductive Health Care Practices and Fertility among the Bhumija Tribe of Baleswar, Orissa" makes an attempt to focus on the traditional medicine used by the Bhumijas of Baleswar district for reproductive health problems and fertility control. The study reveals eight plant species are being used as traditional medicines to cure. The village medicine man, who has a good knowledge about the herbal medicines usually treat the patients. Many elderly persons and experienced women of the village who attend the deliveries are also aware of the importance and use of such herbal medicines. It is found that though the traditional reproductive health service is generally affordable and easy to access yet the younger generation is getting influenced by the modern medicine. Further due to the process of urbanization and culture contact there is always a threat to the indigenous knowledge.

Chauhan, P et.al (2011) have highlighted the maternal mortality in the tribal region of Bastar district of Chattisgarh state and their relation to age, education, occupation and socio-economic status of the diseased mothers. A majority of maternal mortality 93(78.14 %) was noticed in age group between 19 and 35 years. A majority of patients had a low education status. Out of 119, only 1 per cent was educated up to 11th class, 8 per cent were up to class 10. The chief cause was found to be unhygienic and primitive practices for parturition, low education and socio-economic status. From the inception of pregnancy to its termination, no specific nutritious diet is consumed. The habit of taking alcohol during pregnancy has been found and continues their regular activities including hard labor during advanced pregnancies. A majority of deliveries are conducted at home attended by elderly ladies of the household which resulted in an increased susceptibility to various infections.

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Goswami et.al (2009) in their article "Reproductive performance of the Bhumija women: An empirical study of a Tribal village, Balasore, Orissa" have described about the reproductive performance of the Bhumija women of a tribal village of Balasore district, Orissa. She has also described the factors affecting fertility, such as age at marriage, family planning practices, etc. Average number of conception, average life birth, uterine wastage and surviving offspring's are considered as reproductive measures. The study reveals that the mean age at first child birth is 18.14 year. There is less number of uterine wastage and post natal death. The average number of conception per women is 3.87 and live births per woman are 3.28, pre partum reproductive loss is 0.13 and post natal loss is 0.10.

Acharya, A (2008) in his article "Access and Utilization of Health Care Services in urban lowincome settlements in Surat, India", has described about the various programs like ICDS, NRHM and its implication in reality. He has also described that the socio-economic status like sex ratio, education, income of people acts as the influential indicators of health services. In his study the accessibility to electricity, toilet, drinking water and other minimum facilities are well evaluated. The health care seeking behavior and health expenditure of the sample population are also analyzed. Besides this, various aspects of preventive health care services like reproductive health care facilities, anti-natal checkups, delivery expenditures, awareness and use of contraceptives, enculturation, and immunization of the children and use of ORS etc. are also carefully studied by the author.

Acharya, S (2007) in her article "Health, Disease and Indigenous Health Care system among the Munda–A Primitive Tribe of Orissa" has made an attempt to investigate different systems of indigenous medical practices including the concept of illness and diseases, ethno medicine used for treatment and cure of different diseases. She also studied different indigenous methods of preservation, identification of herbs and plants used in medicine and the attitude of people towards the use of modern medicine with the background of traditional tribal health care system.

Panda, P and et.al (2007) in an article "Health status of Tribal in India: Evidence from Andhra Pradesh" has made a modest attempt to critically evaluate the health status of tribal women and children in Andhra Pradesh on the basis of different determinants and health indicators. The indicators chosen are provision of sanitary and drinking water facilities, mortality and morbidity, fertility and family planning, diet and nutritional status of tribal women and children and their access to different forms of health care services. The study shows that the health status of tribal population in Andhra Pradesh is better when compared with average health scenario of Indian tribal, but it is not satisfactory when it is compared with the non tribal population of Andhra Pradesh. There exists a wide gap in the health indicators between tribal and non tribal areas which is mainly due to uneven provision and utilization of health care services at the both areas. Infant mortality and maternal mortality are very high among the tribal's. Tribal prefer more to traditional form of medicines and practices than the health care facilities available in private run clinics and PHCs for healing their diseases.

Patra, R (2007) in an article "Health Care Delivery System in Orissa" has made an attempt to analyze the health care delivery system prevalent in our state. Besides these, he also examines the issues of accessibility to the health services along with its financing aspects. He has also done an extensive as well as intensive study of two health related programs of government of Orissa, i.e. "Bare Foot Doctors", "Panchabyadhi Chikitsa Vyabastha" which is being implemented by the Government of Orissa for the improvement

Kaushik Bose and Falguni Chakraborty (2011) found that the high rate of under nutrition among adult Bathudis could have severe health implications. Further-more, there is an urgent need for further studies to ascertain the relationship of this high rate of under nutrition with morbidity and mortality among this ethnic group. Similar studies should also be undertaken among other tribal populations in India since they constitute a sizeable portion of India's population. Moreover, since under-nutrition has several underlying causes, future investigations should aim at identifying the likely cause(s) of high rates of under nutrition among Indian tribal populations.

Nayak, Ajanta (2007), observed that the Body Mass index (BMI) made above indicates the factor which really influences the health and nutritional status of the Munda women children within the age group of 6 to 14 years. In addition to this to assess the exact level or standard of nutrition status of those children, the researcher has also used the dietary assessment method. Through this method the average dietary intake -in terms of cereals, pulses etc. of those sample children were computed and the deficit/surplus in the dietary supplement of a child was calculated with the help of the standardized or recommended dietary allowances for a normal adolescent children which is developed by the Indian Council of Medical Research (ICMR).

Methodology

The study adopted various anthropological methods like in depth interviews, observation and focused group discussion. The study adopts a purposive random sampling method by which the sample block and the sample villages are being selected. The component of the study is the Munda married women with pregnant and non-pregnant (15–49 years of age) in the family whose response are being critically examined. From one household one woman is selected. Four hundred twenty eight women sample chosen for the study on a random method and have listed the household first and used Tippets table and have selected every fifth household. Again the selection is made till we get 428 samples. Beyond these factors income, education, food pattern, calorie intake and BMI status of the women have been taken into consideration which are critically important for implementing any new policy or program for the improvement of health aspect of the tribe and in turn all the people.

Body mass index (BMI), computed using the following standard equations: *BMI (kg/m2) = Weight (kg) / height (m2)*. Nutritional status was evaluated using internationally accepted World Health Organization (WHO) BMI guidelines. The following cut-off points are used: Under Nutrition: BMI <18.5, Normal: 18.5d" BMI < 25.0, over weight: BMIe" 25.0.Means and standard deviations of all anthropometric variables and indices were computed. Standard Deviation, mean have been utilized to compute differences in nutritional status.

Objectives

The aims and objectives of the study are framed as:

- To determine the nutritional status of pregnant and non-pregnant Munda women with the BMI status.
- To examine whether there exists any difference in the nutritional status of pregnant and nonpregnant tribal women: due to the level of income of their family.
- To examine whether there exists any difference in the health and nutritional status of pregnant and non-pregnant tribal women: *due to the level of education, i.e., illiterate and literate.*
- Further, it aims at examining the interrelationship among the food habits and calorie intake of the pregnant and non-pregnant Munda women in the study area.

Area and People under study

Mayurbhanj is one of the thirty districts of Orissa, which spreads over an area of 10,418 sq km. The district accounts for 6.69 per cent of the total land mass of Orissa and hence the district is regarded as the largest among the 30 districts of the state. The district lies between 85 40'E and 87 11'E longitude and 21 and 23 N latitude. It is a land locked district which is bounded by Jharkhand and West Bengal state on the north, Keonjhar and Balasore districts of Orissa on the south, West Bengal and Balasore on the east and Keonjhar district of Orissa and Jharkhand state located on the west of the district. The history of

Table1: Health car	e indicators of	mayurbhan	j district
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the formation of the district can be traced back to a thousand years back when it was ruled by the Mayurs and the Bhanjas. In accordance with the signing of the instrument of Merger, this princely state became a part of the Indian Union on November 9, 1948. It was the last feudatory state to be annexed with Orissa in January, 1949 which is a border district located in the northern part of the state and is dominated by tribal.

As per the estimation there are around two millions of Munda People living in our country. Since the preindependent India, this tribe is one among the highly respected tribes in our country. Among these tribal people, Birsa Munda, who turned to be a Prophet, is the most respected and revered one who has fought for the freedom of India. Even today his contribution to the Independence of India is recognized with high regard. The Munda tribe speaks a language which is called as Mundari. This language belongs to the Munda sub group of the Austro-Asiatic language family and formed into one of the Indigenous Peoples of the Indian subcontinent. Normally, the Munda identify them as "Hodoko" which means "Human Beings". The Munda People have been living in the same region for quite a long time, considering it their home from birth to death.

Health and Nutrition

The nutritional status in the district is grossly inadequate in terms of the minimum requirements of the people. As per the data collected in the district, there are 589 sub centers to provide nutritional food through Substantial Nutrition Program (SNP) to the indoor pregnant women. Besides the pregnant

Primary Indicators	Orissa	Mayurbhanj
Infant Mortality Rate	71	59
Maternal Mortality Rate	303	207
Neo-natal Mortality Rate	44	40.9
Under 5 Mortality Rate	87	14.5
Total Fertility Rate	2.4	2.26
Contraceptive Prevalence Rate	49.0	37.1
Marriage and Fertility		
Percentage of girl's marrying before completing 18 years	37.5	34.0
Percentage of Births of Order 3 and above	20.4	40.5
Sex Ratio at birth	110	119
Percentage of women age 20-24 reporting birth of order 2 & above	51.0	39.6
Percentage of births to women during age 15-19 out of total births	11.0	4.6
Maternal Health		
Mothers registered in the first trimester when they were pregnant with last live birth/still birth (%)	57.7	47.5
Mothers who had at least 3 ANC visits during the last pregnancy (%)	66.0	48.1
Mothers who got at least one TT injection when they were pregnant with their last live birth / still birth (%)	99.0	89.1
Institutional births (%)	43.0	32.4
Delivery at home & other places assisted by a doctor/nurse /LHV/ANM (%)	54.6	7.3
Mothers who received PNC within 48 hours of delivery of their last child (%)	93.5	NA

Source: DLHS -3, 2012

women, adult women are being deprived off to get nutritional food due to prevalence of acute poverty.

Thus, this gross inadequacy of nutritional food results in different disease like anemia, weak body, problem in pregnancy etc. Furthermore the mismatch between need for and availability less across regions became wider as the mobility patterns and distribution of population varies according to the regional pattern of the district. Thus, it is of no doubt that the thinly populated and rural and tribal areas are at the most disadvantageous position in comparison to other people.

To examine and analyze the current health and nutritional status of the district based on the data related to various indictors which provides the status of nutrition of the population of the district is provided in the Table -1.

An examination of the health indicators reveals that 34 % girl marry before completing 18 age, 40.5 % have 3 and above birth order and 10 % women are not taking TT injection when they were pregnant with their last live birth / still birth which indicates the low health awareness and leads to ill health and low nutritional status. the central part of the district. The block is bounded by Bangiriposhi and Kuliana block in the north, Khunta and Barsahi block on the south. Similipal hills adorned the western side and Sadar block of the Mayurbhanj district is located on the east of the block. About thirty kilometers of the reserve forest area of Similipal Sanctuary is also located inside Shyamakhunta block. The block is situated 13 km far away from district head guarter, i.e., Baripada.

As per 2011 census, male population constitutes around 50.53 per cent of the total population and the rest 49.47 per cent are female. The Scheduled tribe constitutes around 64.39 per cent of the total block population and around 3.93 percent belongs to the scheduled caste category. This implies that only 31.69 per cent of the people belong to the general category. The APL/BPL data reveals that only 1.32 per cent of the people of the block belong to the APL (Above Poverty Line). This indicates that the block is predominately characterized with poverty (98.68 per cent BPL).

Health Status

Block Profile

Shyamakhunta is one of the 26 blocks of Mayurbhanj district predominately dominated by the scheduled tribe population. The block has a total geographical coverage of 121sq.km and is located in

The health profile of the block depicts a poor picture
when compared with the scenario of the district, state
and the country. The data in relation to the IMR, MMR
and NNMR which are regarded as most vital and
standardized health profile indicators across the globe
were collected and cross-examined with the figures
available with various other agencies (Table-2).

Table 2: Comparative	Health	Care	Indicators
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SL No	Particulars	India	Orissa	Mayurbhanj	Shyamakhunta
01	IMR	53	69	59	43.45
02	MMR	254	303	207	220.90
03	NNMR	34	47	40.9	42

Source: CDMO Office, Mayurbhanj, 2012

As per the data provided in the Table-2, the IMR of the block is estimated as 43.45 per 1000 population, MMR is 220.90 per 1000 populations and the Neo Natal Mortality Rate (NNMR) is estimated to 42. An examination of the data and the information collected through discussions with a number of health officials indicates that this low health profile is also characterized by the additional fact of a high birth rate of low birth weight babies and lack of basic post-natal care for the newborns. In addition to these, lack of access to adequate nutrition and safe drinking water mostly in the rural and backward areas are other underlying factors which contribute to the lower health status of the people of the block. Apart from causes related to health factors, maternal deaths due to socio-cultural, economic and educational factors which have a bearing on timely and appropriate health seeking behavior also contributes to this degraded health profiles of the block. Furthermore, the availability of types of services and of special care at health care facilities are also of critical importance in regard to this lower profile related to health and health facilities.

In spite of the backwardness of the block, Shyamakhunta contributes few numbers of deaths in TB and Malaria. Public health care facilities in Shyamakhunta comprise of 21 functioning Sub-Centre, 1 PHC & 1 PHC (N) which cater to the health needs of the people who reside in a scattered area of the block. Especially a large number of traditional healers and practitioners are present in different areas of the block and most of the people more particularly the tribal communities depend upon them for their treatment of illness. There is a under utilization of existing public health infrastructure facilities due to a combination of reasons. It has been observed that some regions suffer disproportionately in terms of lower access to health services due to the lack of availability of staff, especially the services of health specialists.

Findings and analysis

Sample Selection

A critical examination of various aspects on nutritional status of Munda women perception about a perfect health, causes of the health ailments, expenditure on treatment, income, education, expenditure, food habit, calorie intake and BMI is highly essential to understand the impact of nutritional status among married Munda women and the changes that occur in the faith, belief and practices of the Munda women over the years. In the following, the distribution of sample women presented below.

Table 3: Distribution of the Sample Munda Women/HHs selected for the Study

Village	No. of HHs	Total Munda Population	No. of Munda Women	% of sample to Total Munda women	Sample Women
Jagannathpur-1	172	1207	444	36.79	129
Jagannathpur-2	177	1219	447	36.67	133
Hinjolgodia	119	714	225	31.51	89
Kitadihi	103	590	176	29.83	77
Grand Total	571	3730	1292	34.64	428

Source: Field survey, 2012

The data presented above indicates that out of total 1292 Munda women, 428 married women (15–49 years) have selected for the study, on the other hand, about 37 % each from Jaganathpur-1 acd Jaganathpur-2 village, 32% selected from Hinjolgadia village and 30% selected from Kitadihi village. All the sample women were canvassed with the well designed questionnaire and analyzed for the research purpose.

Occupation

To do any activities, healthy body and mind is essential to perform work activities for which proper nutritional needed. In this regard Occupational pattern of their and their counterpart has shown in the following table-5.

Village	No. of HHs	Agriculture	Agricultural Labour	Non- Agricultural Labour	Business	Service	NTFP	Others
Jagannathpur-1	133	73 (54,89)	22 (16.54)	18 (13.53)	2 (1.50)	2 (1.50)	14 (10.53)	2 (1.50)
Jagannathpur-2	129	70 (54.26)	25 (19.38)	16 (12.40)	3 (2.33)	1 (0.78)	11 (8.53)	3 (2.33)
Hinjolgodia	89	18 (20.22)	21 (23.60)	22 (24.72)	2 (2.25)	2 (2.25)	21 (23.60)	3 (3.37)
Kitadihi	77	14 (18.18)	20 (25.97)	18 (23.38)	(1.30)	1 (1.30)	19 (24.68)	4 (5.19)
Total	428	175 (40.89)	88 (20.56)	74 (17.29)	8 (1.87)	6 (1.40)	65 (15.19)	12 (2.80)

Table 4: Occupational pattern

Source: Field survey, 2012

N.B.-Figures in Parentheses represent percentage to the respective totals

It is revealed that out of total households (428), 41% engaged in Agricultural activities, 21 % engaged in Agricultural labor, 17% engaged in Non-Agricultural labor, 2 % engaged in Business, 1.4 % engaged in service and 15 % engaged in collection of NTFPs from nearby forest. Village-wise figure shows that highest 55% household in Jagannathpur-1 village involved in agricultural activities, highest 24% household in

Hinjolgadia village involved in agricultural labor, highest 25% household in Hinjolgadia village involved in Non-agricultural labor, highest 2.3% household in Jagannathpur-2 village involved in business, highest 2.2% household in Hinjolgadia village involved in service and highest 25% household in Kitadihi village involved in NTFP collection.

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Income

Income is the main indicator for all means and ends. Though the above activity undertaken by households, but their income is very low, this is unable to cross the BPL line, so the income has depicted in different range in the following table.

Sl.No	Income Groups	Jagannath pur-1	Jagannath pur-2	Hinjolgadia	Kitadihi	Total
1	Up to 6000	39	44	32	33	148
		(30.23)	(33.08)	(35.96)	(42.86)	(34.58)
2	6001-11000	20	17	15	13	65
		(15.50)	(12.78)	(16.85)	(16.88)	(15.19)
3	11001-15000	23	22	15	8	68
		(17.83)	(16.54)	(16.85)	(10.39)	(15.89)
4	15001-18000	21	18	14	8	61
		(16.28)	(13.53)	(15.73)	(10.39)	(14.25)
5	18001-22000	14	15	7	9	45
		(10.85)	(11.28)	(7.87)	(11.69)	(10.51)
6	22001 & Above	12	17	6	6	41
		(9.30)	(12.78)	(6.74)	(7.79)	(9.58)
7	All	129	133	89	77	428
		(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Source: Field survey, 2012

N.B.-Figures in Parentheses represent percentage to the respective totals

It is evident from above table that above 90 % households under below poverty line (BPL). 35% households under ultra poor (Up to Rs 6000/-), 15 % under the income group Rs 6001–11000, 16% under Rs.11001-15000, 14% under the income group Rs15001-18000, 11% under the income group Rs18001-22000, 10% under the income group Rs22001 &Rs18000. It reveals that the women counterparts have no such income to afford for proper diet, so the mal nutrition has become major problems in the study area. Further analysis has given in table-12 below.

Ailments and Expenditure on Treatment

Furthermore to gather knowledge of nutritional status of Munda women and their consequences due to nutritional deficiencies and expenditure incurred has collected and estimated in table-6. The study documented the occurrence of diseases during the previous year of the collection of data. The data in this respect were collected in different seasons.

Village										
	Total Women	Not attended any PHI	Gyaenic	Itching	Fever	Anemia	Family Planning Complicacy	Pregnancy Related complicacy	Malaria	Total Women Affected
1	2	3	4	5	6	7	8	9	10	11
Jagannathpur-1	129	39 (30.23)	8	10 (7.75)	46	23 (17.83)	1 (0.78)	2 (1.55)	0 (000)	90 (69 77)
Jagannathpur-2	133	46	7	16	40	21	2	0	1	87
Hinjolgodia	89	25	(12.36)	15	16	16	2	3	1	(05.41) 64 (71.91)
Kitadihi	77	23	9	11	10	19	3	(1.2)	1	(71.91)
Grand Total	(100.00) 428 (100.00)	(29.87) 133 (31.07)	(11.69) 35 (8.18)	(14.29) 52 (12.15)	(12.99) 112 (26.17)	(24.68) 79 (18.46)	(3.9) 8 (1.87)	(1.3) 6 (1.4)	(1.3) 3 (0.7)	(70.13) 295 (68.93)

Table 6: Profile of ailments of women

Source: Field survey, 2012

N.B.-Figures in Parentheses represent percentage to the respective totals

A cross examination of the data provided in the table-6 indicates that out of the total 428 sample women about 31 per cent has responded that they had not attended any public health institutions for treatment. In other words one can say that they have not suffered from any serious diseases during the year 2014. Out of the rest 295 sample respondents (69%), most of the women have suffered from various types of fevers which tunes to 26%. It also reveals that about 18 per cent Munda women had suffered from various health ailments due to severe anemic (bloodlessness) conditions which is followed by skin diseases (12%)

basically the unhygienic condition in which they live. About 8 per cent of the sample subject had suffered from various types of gynecological problems which is followed by family planning complicacies (2%) and pregnancy related problems (1%).

To add to this analysis, their average expenditures incurred to cure their illness during the last year were also estimated. To make a simplified explanation the categories of expenditures are being restricted to two only, viz., modern and traditional methods. All those compiled figures are provided in Table-7 and are presented below for further analysis.

Table 7: Average Annual Expenditures incurred for Treatments (Figures in Rs)

Village	No. of Women	No. of Women under Treatment	Modern	Traditional	Total
Jagannathpur-1	129	65	762.00	178.90	940.90
Jagannathpur-2	133	66	689.00	184.50	873.50
Hinjolgodia	89	50	799.90	195.40	995.30
Kitadihi	77	43	767.10	214.50	981.60
Total	428	224	744.74	188.92	933.65

Source: Field survey, 2012

N.B.-Figures in Parentheses represent percentage to the respective totals

From the point of per women (Both pregnant and non-pregnant) expenditure, Rs 933.65 has expenditure in the sample area. Women in Hinjolgadia village have expenditure more (Rs. 995.30) among the sample villages. It implicate that where more than 90% household under below poverty line, so expenditure in health disorder may be burden to them. As the households residing near forest, which is full of source of natural resource, but they have no knowledge about the intake of proper diet. So, proper knowledge dissemination regarding awareness on proper diet and food pattern is needed.

Nutritional status of the sample women

Furthermore, as per the methodology described earlier among various available methods two methods have been used; a) Anthropometric Measurements and b) Dietary Assessment for the purpose of estimation of the related data collected through the questionnaire. It is also mentioned above in detail that the' Anthropometric Measurement is based on the height-for age and the weight-for age and the Dietary Assessment is based on the comparison of the standardized Recommended Dietary Allowance (RDA) and the observed food intake of the Munda women. All those data, estimation and corresponding analysis are being presented in the sections below.

(a) Anthropometric Measurement

This measurement of nutritional status mainly uses the Body Mass Index (BMI) to estimate the nutritional status of any population. Hence, in accordance with the standard practices adopted by various researchers the BMI data was collected and estimated for our purpose. With the help of standard weighing units the weight of each woman has collected. Similarly, the height of each woman has been measured. Both these data were computed (with the help of the mathematical formula) to estimate the BMI of married sample women (both pregnant and non-pregnant). Moreover, the utmost care and caution was maintained to assess the correct age of the woman. For this purpose, the voter card records have been referred. Moreover, to achieve the nearest truth (in case of any further doubts), the fact was cross-checked with some of the neighbors and nearest and dearest family member. The age of the women arrived at this process is taken into granted for our purpose of investigation. Further, each woman has regrouped as per the strata selected. Then the average BMI of the total number of women in each age group was estimated and provided in tables for further analysis. To obtain a clear comparative picture of the Body mass Index (BMI) of those women has prepared and given below for further analysis.

Village	15-20	21-26	27-32	33-38	39-44	45-49
		PREGNAN	VT.			
Jagannathpur-1	24.2	24.8	23.7	18.5	16.2	17.8
jagannathpur-2	23.6	23.5	22.4	17.4	16.1	18.4
Hinjolgadia	23.4	23.6	19.5	17.4	16.8	18.6
Kitadihi	21.5	21.7	18.8	17.5	15.6	18.2
Average	23.18	23.4	21.1	17.7	16.16	18.25
		NON-PREGN	ANT			
lagannathpur-1	22.4	22.5	20.7	17.2	15.6	18.8
agannathpur-2	19.7	18.9	17.7	17.3	15.5	18.3
Hinjolgadia	18.2	18.4	17.6	16.5	15.6	18.2
Kitadihi	18.1	17.9	17.4	16.8	15.3	18.1
Average	19.6	19.42	18.35	16.95	15.5	18.35

Table 8: Age-wise average BMI Status of women 15-49

Source: Field survey, 2012

It is revealed from above table that the normal BMI status of pregnant women is 23.18, 23.4 and 21.1 in the age group 15-20, 21-26 and 27-32 respectively. The BMI status of under nutrition women is 17.7, 16.6 and 18.25 in the age group 33-38, 39-44 and 45-49 respectively as per WHO guideline. Compare to the BMI status Non-pregnant women, the normal BMI status of the Non-Pregnant women is 19.6 and 19.42 in the age group 15-20 and 21-26 respectively. It

indicates that higher age groups women are in under nutrition than lower age groups. In other words, the pregnant women have more BMI than Non-Pregnant women. Due to the responsibility to foster and nurture their child, they ignore to their own health status, which leads mal nutrition.

To understand BMI status, mean and Standard Deviation of age, height and weight of each woman has measured and depicted in table-9.

Table 9: Mean & Standard deviation of age, Height & Weight of Sample women

Variable	Mean	SD
Age(Years)	32.00	9.96
Height(cm)	145.33	4.56
Weight(kg)	45.56	2.93
BMI(kg/m2)	18.40	3.84

Source: Field survey, 2012

It is reveals that the average age is 32 years (9.96), average height is 145.33(4.56) cm, average weight is 45.56(2.93) and average BMI is 18.40 (3.84). It indicates that low age with low height and weight result under nutrition (< 18.5) as per WHO guide line. From the point of standard deviation, the data shows very low performance. Thus, it can be inferred that the effect of socio-economic developmental factors takes some time to put some positive impact on the health and nutritional status of the women. It indicates the fact that higher nutritional status is positively correlated with the level of education. It indicates the fact that higher nutritional status is positively correlated with the level of development, which can mainly ascribed to higher education and awareness of the women.

Furthermore, to examine how the literacy level of women influences the nutritional status, the BMI data of the women have been computed taking into consideration of the literacy level (literate/illiterate). Those computed data are presented in Table-10

Table 10: Literacy Level & the BMI Status of the women

Literacy Level	No. of Women	No. of Women Pregnant		Non-Pregnant		
		No.	BMI	No.	BMI	
Literate	118 (100.00)	50 (42.37)	20.6	68 (57.63)	20.7	
Illiterate Total/ Average	310 (100.00) 428 (100.00)	105 (33.87) 155 (36.21)	17.6 18.57	205 (66.13) 273 (63.79)	17.5 18.4	

Source: Field survey, 2012

N.B.-Figures in Parentheses represent percentage to the respective totals

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A close look at the above table reveals the literate pregnant and non-pregnant have more BMI status than the illiterate Pregnant and non-pregnant women. The distinction between pregnant and non-pregnant women is that pregnant women have more BMI status than the non pregnant women irrespective of literate and illiterate.

The BMI of the Munda women in all the sample villages, chosen is higher than the Non-pregnant women in the studied villages, irrespective of the literate or illiterate women proves that literate, by which we mean the socio-economic development of the villages puts a positive impact on the health and nutritional status on the Munda women. Further, a higher BMI after a certain age indicates that the general awareness plays a more significant role in the health and nutritional aspect of the Munda women rather than the level of education, i.e., literate or illiterate. Of course, this does not mean that literacy level does not play any role as it is one of the important inputs of the development which have been taken care. But from the above analyses, it can be interpreted that the effect of level of general awareness plays a more important role than the level of education or literacy of the women as observed in all the cases the mean BMI status of the women after the age of pregnancy has shown a leap forward.

Further, the comparative analyses of the Body Mass Index(BMI) of the literate and illiterate Munda women reveal the fact that literacy has put some impact on the nutritional status of sample women but the analysis indicates that the health and nutritional status of the women are more influenced by the increase in age, which indicates that increase in general level of awareness (along with the increase in age) combined with literacy contributes to a greater degree towards the health aspect of the Munda women. Hence, there is significant difference in the health and nutritional status of the tribal women due to the level of education of the women, i.e., illiterate and literate is accepted which means it has got some impact on the women but it should be associated with a specific awareness programmes to be initiated by the Government and other concerned agencies.

Besides this, an attempt has been made to examine the relationship between the income level of the counterpart of the sample women and their health status. For this purpose, we have regrouped the parents in terms of a) counterpart who live below poverty line (BPL) and the b) counterpart who live above the poverty line (APL). For this purpose the standard definition of BPL and APL is used. The number of parents in each category was finalized after a thorough scrutiny of the official data and the actual income figure obtained during the study. The BMI has been calculated and the average BMI are computed for a comparative scrutiny. All those figures are provided in table-12 below.

Table 11: Income Level of the Counterparts and BMI Status of women

Poverty Line	Pres	gnant	Non-Pres	gnant
	No.	BMI	No.	BMI
BPL	150 (36.06)	18.40	266 (63.94)	18.20
APL	5 (41.67)	23.50	7.00 (58.33)	22.40
Total/ Average	155 (36.21)	18.57	273 (63.79)	18.40

Source: Field survey, 2012

N.B.-Figures in Parentheses represent percentage

An examination of the above table indicates that most of the Munda families are living below the poverty line in sample villages. The BMI figures presented in the table indicates the average BMI computed for the number of women.

The analysis along with the figures provided in the table (the average BMI figures of the various category of women who lives in sample villages reflects that the income level of the family influences the BMI and hence the health and nutritional status of. This is also applicable for Munda women. Hence, the objective is significant that that; *"To examine whether there exists any difference in the nutritional status of the tribal women: due to the level of income of their family. i.e., Below Poverty Line (BPL) and Above Poverty Line APL)', is accepted.*

All the above analyses (with the help of the mean Body Mass Index (BMI) of Munda women proves some important points which has been proved by data analysis is that it influenced by the socioeconomic developmental factors as the BMI status of the women. In this study, as we consider those villages which are within a radius of 4–5 km from the Block headquarter or a big town, so the developmental factors include, a) better and modern treatment/health facilities for the women b) better arrangement of various awareness programs on health and nutritional status of the people and more particularly of the women c) Association of the tribal people and the women with people of other caste and creed who are more advanced etc. Though, it has been found out that in certain cases the BMI status of the literate and

illiterate women does not reflect a particularly higher status in our sample women (as it is commonly expected) but the fact that recurrence of a higher BMI in tune with the increase in age of a woman in case of literate women reflects that along with the increase in awareness level education also plays some interactive role. All these factors taken together prove that there exists a joint/interactive impact of the variables like *nature of locality'; 'literacy level' or level of education of the women' 'income level of their family' etc* on the health and the nutritional status of the Munda women.

Thus, all the analyses with the help of the Body Mass index (BMI) made above indicates the factor which really influences the health and nutritional status of the Munda women within the age group of 15 to 49 years. In addition to this to assess the exact level or standard of nutrition status of those women, the dietary assessment method has been used. Through this method the average dietary intake in terms of cereals, pulses etc. of those sample women were computed and the deficit/surplus in the dietary supplement of a woman was calculated with the help of the standardized or recommended dietary allowances for a normal adult women which is developed by the Indian Council of Medical Research (ICMR). All those data and analyses related are discussed below.

b) Dietary Assessment of the Women

The data regarding the daily food intake of each woman was collected. All care was taken to scrutinize and cross check that information. The various types of food were weighed, using simpler and standard techniques. As it was also discussed earlier that the Recall Method has been used as they are less reactive. Twenty-four hour recalls, in which the previous day's intake is queried in detail (for instance, foods, amounts of food, preparation techniques, and condiments) are easiest for individuals to complete. The data reported are converted from foods such as cereals and pulses etc. Also, to accommodate the seasonal and other variations the food composition and the dietary intake of the women for thirty days, which was dived into various sub-groups in accordance with different types of food calendar were studied followed by the women. These multiple recalls can be thought of as sampling from an individual's ongoing food behavior. All those data collected were computed and tabulated for the analyses and compared with the Recommended Dietary Allowances (RDA) developed by the ICMR for a healthy woman within the age group of 15 to 49 years.

The most common food items used by the family and more particularly the Munda women intake rice (madi), curry (utu), leafy vegetables and meat. They consume pulses like Kolatha (hale) and Muga (mugi), Harada (rahali), Biri (rambda) which are local pulses available. In addition to this they eat vegetables like pumpkin (kokhru), brinjal (bengala), ladies finger (vondo), potato (golalu), tomato (belati) gourds (jingha) and boutle gourd (karla). The prominent leafy vegetable (ala) constitutes Kosala ala, mula ala, leper ala, mani ala, munga ala, poi ala which was also supplemented with other leafy products primarily collected from their own back yard. Roots and tubers like sweet potato (which are mainly collected from the forest surrounding their villages also features in their food routine along with the tole Seed (oil Seed). Besides these the food basket of the Munda women also constitutes flesh foods like chicken (sim), goat (merang), sheep (vedi), pigeon (parai), duck (koda) etc. Also, they use fruits (mostly collected from the nearby forests) like Amla (ambdu), Mango (uli), kendu (tirul), charkoli (tarob) and Tamarind (jojo) which are normally available seasonally. Besides these food stuff they also use tubers in their diet like saru (saruni), ulakobi (pindi), khambalu (hatikata sanga) and different types of mushrooms (utt) which constitutes more or less a specialty to the Munda women. The data in relation to these diets were assessed and the mean food intake of various categories of the women are weighed and presented as the 'Observed Intake' in the following tables and compared with the RDA. The corresponding figures are presented below.

As observed from the above table that the observed mean food intake shows a negative trait in comparison to the RDA, which indicates a lower amount of food intake by the Munda women. An examination of the comparative figures reveals that the boys are consuming about 385 less flesh foods than the RDA, followed by Oils & fats (37%), Roots and Tubers (33.33%), Vegetables (22.50%), Fruits (20%). On the other hand, though less than RDA in comparison to other food stuff the Munda women consume more cereals and pulses than other food stuffs. Similarly, the Munda women girls also consume food stuffs lesser than the RDA. As reported and computed by us the girls consume about 51% less flesh foods followed by oils and fats (37.375), Vegetables (30%) and Fruits (28.89%). Though, the girls consume more cereals and pulses but it also falls short of the RDA (4% for cereals and 10% for pulses).

It is observed from above table that calorie intake by women in sample area is 1177.72 which is less than 2400 calorie (For BPL standard). The result shows that under nutrition among the women due to low calorie intake.

SI. No	Food Stuffs	RDA	Pregna	nt Women	Non-Pre	Non-Pregnant women	
			Observed Intake	% Deficit (-) %Surplus(+)	Observed Intake	% Deficit (-) %Surplus(+)	
1	2	3	4	5	4	5	
2	Cereals	150-200	170	(-)2.85	168	(-)4.00	
3	Pulses	40-50	42	(-)6.67	40.5	(-)10.00	
4	Vegetables	30-50	31	(-)22.50	28	(-)30.00	
5	Leafy Veg.	50	40	(-)20.00	41	(-)18.00	
6	Root & Tubers	30	20	(-)33.33	26	(-)13.33	
7	Oil &Fats	200	74	(-)37.00	74	(-)37.00	
8	Flesh Foods	30-40	28	(-)37.78	22	(-)51.11	
9	Fruits	20-25	18	(-)20.00	16	(-)28.89	

Source: Field survey, 2012

SI.No	FOOD STUFS	Food Intake	Calorie	Protein	Carbo-hydrate	Fat	Carotin	Vit-C	Calcium	Irone
1	Rice	172	595.12	11.01	135.88	0.69	0.00	0.00	15.48	1.72
2	Kolath	5	16.05	1.10	2.86	0.03	3.55	0.05	14.35	0.00
	Mung	5	17.40	1.23	0.08	0.06	2.45	0	14.35	0.34
	Harada	23	78.89	5.77	13.57	0.16	62.1	0	15.87	1.74
	Biri	5	17.35	1.20	2.98	0.07	1.9	0	7.70	7.00
3	Pumpkin	7	1.75	0.10	0.32	0.01	3.5	0.14	0.70	0.03
	Potato	10	9.70	0.16	2.26	0.01	2.4	1.7	1.00	0.05
	Brinjal	5	1.20	0.07	0.20	0.02	3.7	0.6	18.00	0.02
	Tomato	3	0.69	0.06	0.11	0.00	5.76	0.93	0.60	0.05
5	Kosala	14	6.30	0.56	0.854	0.07	35.7	1.4	55.58	0.49
	Other*	26	7.80	0.96	0.754	0.104	452.4	9.1	39	1.1
4	Khamba Alu	8	9.60	0.10	2.256	0.024	0.48	1.92	3.68	0.02
	Mushroom	10	4.30	0.31	0.43	0.08	0	0	0.6	0.15
6	Tola seed	50	360.50	16.73	11.97	27.3	0	0	210	39.69
7	Chicken	5	8.65	0.67	0	0.665	30	0	3	0.10
	Mutton	10	11.80	2.14	0	0.36	0	0	1.2	0
	Pigeon	10	15.00	1.93	0.13	0.75	0	0	1	0.63
8	Mango	4	2.96	0.02	0.676	0.016	109.72	0.64	0.56	0.05
	Tamarind	10	11.50	0.58	1.82	0.21	25	0.3	10.1	0.03
	Amla	2	1.16	0.01	0.274	0.002	0.18	12	1	0.02
	Total		1177.72	44.70	177.43	30.62	738.84	28.78	413.77	53,23

Table 13: Calorie Intake of Sample women

Source: Computed from Nutritive value of Indian Foods, NIN, ICMR, Hyderabad.

Food Habits

The most common staple food in general is boiled rice. The more well-to-do families use boiled pulse or 'dal' as a side dish, But for most of the poorer category of the people food except on special occasions, consists of only some boiled green herb or 'ala' along with the boiled rice, pigeon meat, hen etc. Fowls, goats, hens, pigs are reared for food, but are mainly used for festival purposes and sacrifices. Besides the green herbs or 'ala,' the more well-to-do families occasionally use vegetables grown on their own backyard or farm lands. They usually grew onions, brinjals, radishes, tomatoes, pumpkins and gourds, lady's fingers (hebiscus Esculentus), beans, varieties of tubers and vegetable roots such as the sweet potato (Ipomea batktus) etc as described above.

An examination of the food habits indicates that

the women (mostly the house lady) take her meal after all the family members finishes theirs which is normally followed by the Hindu societies. Also, they drop a few grains of rice on the ground in the names of his deceased ancestors before taking their meals which is followed by some orthodox Hindu communities. The most used and the most favorite drink of the Munda is rice-beer (Handia), which is made of boiled rice which is fermented and mixed with certain kinds of other drink also. This liquor is stored in earthen jars and silver jars become ready for use in about four/five days. It is taken always by them whether it is sad or in happy moments. Now-adays mostly the young ones prefer the distilled liquor shops opened up in the nearby areas. It has documented that the Munda people ordinarily smoke tobacco. Moreover, the use of betel (gutka) or betelnut is practically very common.

Conclusion

The empirical analysis thus concludes that the ageold cultural values show their profound impact on perception of nutritional value. Impact of education and income have identified as a major factor, which brings some changes in their nutritional status and has helped in the introduction of modern health care systems among the Munda tribes to a certain extent. But it is not so that all educated respondents hold the scientific view that physical factors, unhygienic food, unclean drinking water, and poor sanitation etc. are the factors responsible for occurrence of the under nutrition and supernatural powers has a little role to play. In the above discussion whoever had the idea of the factors for causation of malnutrition other than supernatural powers they are literate and some of them belong to higher group of education which indicates the fact that a higher level of education has got a direct and proportional link to the health, hygiene and the nutritional status of the tribal people and more particularly to women.

Efforts to reduce under nutrition depend on reducing poverty and raising people's living standards by improving the quality of homes and by increasing access to clean drinking water and adequate sanitation. Such interventions have positive impacts on health, and implementing these also goes some way towards fulfilling people's basic human rights Unfortunately, these variables were not studied in the present investigation. However, the results clearly indicate that the Munda women, Mayurbhanja, Odisha are under severe nutritional stress. Therefore, it is imperative that immediate nutritional intervention programs are initiated among this population. Such programs would be beneficial in not only reducing the rates of malnutrition, but also they are associated maladies of morbidity and mortality.

References

 Acharya Sabita. 2007. III health, Disease and Indigenous Health Care systems among the Munda- A Primitive Tribe of Odisha. Intangible Cultural Heritage of India -5, Traditional Knowledge in Contemporary societies: Challenges and Opportunities, New Delhi.Pratibha Prakashan.

- 2. Acharya, Akash .2008. Access and Utilization of Health Care Services in Urban low income settlements in Surat, India", Working Paper, Centre for Social Studies, Surat.
- Goswami Monali, Bijaylaxmi Dash, N.C Dash. 2009. Reproductive performance of the Bhumija women: An empirical study of a Tribal village, Baleswar, Odisha Study Tribes Tribals. New Delhi. Kamala Raj Publications.
- Journals: Goswami Monali, Bijaylaxmi Dash, N.C. Dash. 2011. Traditional method of Reproductive Health Care Practices and Fertility among the Bhumija Tribe of Baleswar, Odisha. Ethnomedicine, 5(1)51-55.
- Kaushik Bose and Falguni Chakraborty.2011. Anthropometric characteristics and nutritional status based on body mass index of adult Bathudis: a tribal population of Keonjhar District, Orissa, India.
- Nayak, Ajanta.2007. Nutritional status of tribal children in Koraput District" submitted Ph.d thesis.
- 7. Panda, Prasant, Atulya Bhoi, Yoginder Singh, K.Sankaraiyah. 2007. The Health Status of Tribals in India: Evidence from Andhra Pradesh. Health Economics in India ed. by Himansu S. Rout, New Delhi. New Century Publications.
- 8. Patra, N.Rabi. 2007. The Health Care Delivery System in Orissa. Health Economics in India. ed. by New Delhi. New Century Publications.
- Journals: Prabha Chauhan, VKS Chauhan, Praveen Srivastava. 2011. Rural Epidemiology of Maternal Mortality in Tribal Women from Bastar, Chhattisgarh, India. International Journal of Biological and Medical Research, 2 (4): 1106-1109.
- 10. Journals: Varma G.R. 2011. Antenatal care service utilization in tribal and rural areas in a South Indian context: an evaluation through mixed methods approach. Egypt Public Health Association.

A Study Based on Somatometric Measurements of Hand and Foot for the Estimation of Stature of Ramgarhia Sikh Population in Delhi Region

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Abstract

In forensic investigation difficulties are being experienced in the stature and gender estimation of bodies dismembered in mass destruction and criminal mutilation.

The study is based on a sample of 175 subjects (85 males and 90 females) of "Ramgarhia Sikh Population" from Delhi, aged between 20 and 50 years. Four Somatometric measurements: Hand Length, Hand Breadth, Foot Length and Foot Breadth taken on the right side in each subject were included in this study.

Stature was measured using standard anthropometric techniques. Sex differences were found to be highly significant for all the measurements (P<0.01). Linear and multiple regression equations for stature estimation were calculated using the above mentioned variables. The correlation coefficients between stature and all the measurements of hands and feet were found to be positive and statistically significant [1]. The highest correlation in males was found to be in between stature and foot length, whereas in the females the highest correlation was between stature and hand length, providing reliability and accuracy of these body parts for the estimation of stature.

Keywords: Forensic Anthropology; Stature; Anthropometry; Somatometry; Ramgarhia Sikh.

Introduction

Forensic Anthropometry helps in reconstruction of the biological profile of the person (alive or dead) such as age, sex, ethnicity and stature. Among these 'big four' of forensic anthropology, estimation of stature is considered as one of the main parameter of personal identification in forensic examinations. Stature provides insight into various features of a population including nutrition, health and genetics. It is an inherent characteristic; its estimate is considered to be an important assessment in the identification of unknown human remains [2].

With the increasing frequency of mass disasters, homicides, air plane crashes, train and road accidents etc., there is always need for measuring body parts which help in identifying the deceased from fragmentary and dismembered human remains. It is very common to find the peripheral parts of the body such as hand and foot in such disasters. Hand and foot remain intact and thus in such a situation, their anthropometric measurements provide good approximation about the height of a person [3].

Stature is determined by measuring overall length of long bones and applying formulae that are based on the relatively constant R/S of each bone length to stature. Stature of intact body is obtained by direct measurement in supine position. Stature estimation is performed only after identifying age, sex and race. As a rule of thumb, the larger the skeletal element, the taller theindividual[4][5].

Materials Used

Verificator (Gauze; 10-250mm) was used for calibration of instruments. Anthropometric Rod (200cm) was used to measure the stature of an individual. Rod Compass was used to measure the Foot length of an individual, whereas the Sliding Caliper (25cm) was used to measure the Hand Length, Hand Breadth and Foot Breadth of an individual ; SPSS V22 Software.

Methodology

The present study is based on estimating stature from the measurements of hand and foot in the Ramgarhia Sikh Population of Delhi.Ramgarhia's are one of the major endogamous caste groups of North India, a large number of them living in Punjab and Delhi. Ramgarhia is associated mainly with the Tarkhan Tribe. They are primarily expert carpenters and blacksmiths[6].

This study includes Ramgarhia's residing in Delhi region of North India. The range of age for the study is 20 to 50 years. Parameters taken are: Hand-Length, Hand-Breadth, Foot-Length, Foot-Breadth, and Stature on the right side of each individual.All the measurements were taken scientifically. Before taking the Somatometric measurements, each subject was asked to remove the shoes. The subjects were healthy and free from any apparent symptomatic deformity. The data were subjected to statistical analysis using Statistical Package for Social Sciences (SPSS) and regression formulae were calculated for various combinations to reach the best estimate possible [7].

Landmarks And Techniques Involved In Taking Somatometric Measurements[4]

Height (Stature)

It is the vertical distance between the point vertex and the floor.

Vertex: It is the highest point on the head when head is held in F.H. (Frankfurt Horizontal) plane.

- The subject was instructed to stand on the plane floor and to stand erect so that his/her heels and buttocks, back touch to the wall. The hands turned inwards and fingers pointing downwards.
- Then the subjects head was brought to Frankfurt plane and asked to take deep breath.
- And then total height was measured from the right side of the subject with anthropometer in

the median sagittal plane of the subject by moving cross bar to touch the vertex up to the floor level.

Hand Length (HL): It measures the straight distance between the mid-point of a line joining the two stylion (sty) and dactylion (da) of the middle finger.

The subject was instructed to place his/her hand straight and stretched with palmer side up on a flat surface. Then measures the straight distance between the first crease and the tip of middle finger.

Hand Breadth (HB): It measures the straight distance between metacarpal radiale (mr) and metacarpal ulnare (mu).

The subject was instructed to place his/her hand stretched to its maximum on the table. The fingers should be together and on line with forearm.

Foot Length (FL): It measures the straight distance directly from pternion(pte) to acropodion (ap) when the foot is stretched.

While subject was standing the fixed arm of the rod compass was adjusted back to the foot slightly and movable arm was touched to the foremost point of the toe I or II.

Foot Breadth (FB): It measures the straight distance between metatarsal tibiale (mtt) and metatarsal fibulare (mtf) when the foot is stretched.

Subject was instructed to stand straight and then with the sliding caliper breadth of the foot was measured horizontally by adjusting the moving sliding sleeve.

Statistical Analyses [8]

The data obtained were computed and analyzed with SPSS (Statistical Package for Social Sciences, version 22.0) computer software. Multiplication factor for stature estimation was derived by dividing stature by hand and foot dimension in each individual.Mean of multiplication factor derived in each individual was taken as the multiplication factor for the study group. Male-female differences in the stature, hand and feet measurements and for the derived multiplication factors for estimation of stature were compared using Student's t-test. Level of significancewas set at p-value less than 0.05. Regression formulae were derived for stature estimation from hand (HL, HB) and foot dimensions (FL, FB) in males and females, keeping stature as the dependent and each hand or foot dimension as an independent variable. Multiplication factors and regression equation thus derived for each variable were applied in the study group itself and the stature

was estimated [9]. Actual stature and the estimated stature frommultiplication factor method as well as from regression analysis method were compared and the error of estimate was calculated by finding the difference between estimated and the actual stature (Error of Estimate = Estimated stature -Actual stature)[10].

Result and Discussion

200 - CONTROL			Males (N=85)			Females (N=90)		
S.No.	Variables	Mean(Cms)	Sd*(Cms)	S.E.**(Cms)	Mean(Cms)	Sd*(Cms)	S.E.**(Cms)	
1	Stature (S)	167.54	7.6	0.82	154.17	5.5	0.58	
2	HI	18.68	1.03	0.11	17.23	0.78	0.08	
3	Hb	8.46	0.44	0.04	7.65	0.38	0.04	
4	Fl	25.61	1.3	0.14	23.21	1.0	0.11	
5	Fb	9.78	0.7	0.07	8.88	0.5	0.05	

Table 1: Descriptive Statistics of Various Body Demensions for Males and Females

*SD -.Standard deviation (σ) is the positive square root of the average of squared deviation taken from arithmetic mean.

**S.E - Standard error of mean, S.E.M = σ/\sqrt{n} , where S.E.M = Standard Error of Mean

 σ = standard deviation; n = number of samples

Table 1 shows descriptive statistics for stature and measurements of hands and feet in both the genders. Mean value, standard deviation, and standard error of mean in stature, hand length, hand breadth, foot length and foot breadth on right side are presented. The values of all the measurements in case of males are higher than in females. Here it is clear that males are having larger dimensions on all the above mentioned variables in comparison to females.

Table 2: Correlations of Stature with Different Body Dimensions among Male and Female

S.No	Variables	Value of Correlation In Female	Value of Correlation in Male
1	HI	0.591**	0.593**
2	Hb	0.384**	0.366**
3	Fl	0.444**	0.699**
4	Fb	0.168	0.360*

*significant (p-value: 0.01<p<0.5). Correlation is significant at 0.05 levels.

**strongly significant (p-value: p=<0.01). Correlation is significant at 0.01 levels.

Table 2 shows correlation between stature and different body dimensions in males and females. The highest correlation is of foot length and stature in case of males whereas the maximum correlation of stature is with the hand length in case of females. The lowest correlation with stature is seen with foot breadth in both the males and females.

Table 3: Linear Regressions for Estimation of Stature for Males and Females from

 Different Body Dimension

Males (N=85)	Females (N=90)
S = 85.73+4.38(HI)	S = 81.7+4.21(HI)
$S = \frac{123.06+5.27(HB)}{S} = \frac{63.31+4.07(FI)}{S}$	S = 111.19+5.61(Hb) S = 100.67+2.31(Fl)
S = 130 + 3.85(Fb)	S = 138 + 1.84(Fb)

Here, 'S' stands for'Stature'

Table 3 lists the regression equations for estimation of stature from measurements of hands and feet in both the sexes. Worldwide, the regression formulae are accepted as of utmost importance in determination of stature from various Somatometric dimensions. Regression equations have been computed separately, for each sex, and for each measurement of the hand and foot.

 Table 4: Differences in Actual and Estimated Stature Using Regression Equation for Hand and Foot Dimensions among Maleand Female

		Males (N=85)			Females (N=90)		
DIMENSIONS	Estimated Stature (Cm)	Actual Stature (Cm)	Error [SEE]*(Cm)	Estimated Stature (Cm)	Actual Stature (Cm)	Error [SEE]*(Cm)	
HL	167.54	167.54	0.00	154.18	154.17	0.01	
HB	167.59	167.54	0.05	154.10	154.17	0.07	
FL	167.54	167.54	0.00	154.28	154.17	0.11	
FB	167.65	167.54	0.11	154.33	154.17	0.16	

*Standard Error of Estimate (SEE)

Table 4presents multiple regression equations for the estimation of stature from different combinations of the dimensions of hands and feet in both the sexes. It is observed that the linear regression equations reveal lower values of SEE (i.e. 0 to 0.11 in males and 0.01 to 0.16 in females) than the values given by linear regression equations.

Table 5: Differences in Actual and Estimated Stature Using Multiplication Factor (M.F.) and Regression Equation For Hand and Foot Dimensions Among Maleand Female.

	Males (n=85)			Females (n=90)			
DIMENSIONS	Estimated Stature (cm)	Actual Stature (cm)	Error [SEE]** (cm)	Estimated Stature (cm)	Actual Stature (cm)	Error [SEE]**(cm)	
HL	167.54	167.54	0.20	154.20	154.17	0.03	
HB	167.76	167.54	0.22	154.45	154.17	0.28	
FL	167.48	167.54	-0.06	154.34	154.17	0.17	
FB	168.0	167.54	0.46	152.2	154.17	-1.97	

**Standard Error of Estimate (SEE)

Table 5 presents multiplication factor for the estimation of stature from dimensions of hands and feet in both the sexes. It is observed that the multiple regression equations reveal higher values of SEE (i.e. -0.06 to 0.46 in males and -1.97 to 0.28 in females) than the values given by linear regression equations.

Table 6: Summarises the Work Done by Various Authors on Hand Length Compared to Present Study [11][12]

Author	Parameters	Males	Females
Sunil, Dikshit, Aggarwal And Rani, 150 (75 Males And 75 Females) Of Delhi	Regression Equation	S = 85.84+ 4.32 (HI)	S = 80.94+4.40 (HI)
Nath, Rajni And Chhibber, 302 Punjabi Females Of Delhi	Multiplication Factor Regression Equation	-	9.12 S = $85.22 + 4.05$ (HI)
Sethi And Nath, 204 Punjabi Females Of Delhi	Regression Equation	-	S = 88.04+2.95 (Hl)
Manpreetkaur Et Al 400 (200 Males And 200 Females) Of North India	Regression Equation	S = 130.90 + 2.398 (HI)	S = 160.41 + 0.027 (HI)
Present Study (85 Males And 90 Females) Of Ramgarhia Sikh Population Of Delhi.	Multiplication Factor Regression Equation	8.98 S =85.73+4.38(Hl)	8.95 S = 81.7+4.21 (HI)

Table 6,7&8, Multiplication factor for stature estimation was derived by dividing stature by hand and foot dimension in each individual. M.F. = Stature/Body Dimension

S.No	Population/ Region	Author / Year	M.F.	
1	Rajput (F) / Garhwal, U.K	Anand & Nath (1990)	7.13	
2	Rajput (M) / Garwahl, U.K	Anand & Nath (1990)	6.42	
3	Rajput (F) / Garhwal, Sirmour	Kaur (1996)	6.71	

Table 7: Multiplication Factor (Mf) for Foot Length Measurement Among Different Indian Population [13][14]

5	Jat (F) / Churu, Rajasthan	Nath & Rautray (1996)	6.68	
6	Jat (M) / Churu, Rajasthan	Nath & Rautray (1996)	6.60	
7	Sikh (F) / Delhi	Kaur (1998)	6.79	
8	Sikh (M) / Delhi	Kaur (1998)	6.60	
9	Sikh (F) / Delhi	Present Study (2015)	6.65	
10	Sikh (M) / Delhi	Present Study (2015)	6.54	

Table 8: Multiplication Factor for Foot Breadth Measurements among Different Indian Population [13][14]

Rajput (M) / Garhwal, Sirmour

4

Sno	Population/ Region	Author/Year	M.F.
1	Shia Muslims (M)/Delhi	Bhavana & Nath (2008)	16.62
2	Sikh(M)/Delhi	Present Study (2015)	17.18
3	Sikh(F)/Delhi	Present Study (2015)	17.41

Kaur (1996)

6.57

Conclusion

Population variations in Somatometric dimensions do exist and are attributed to genetic, dietary habits and environmental factors. This indicates that specific formulae or regression equations used in prediction of stature are only applicable to the population from which the data were collected [15].

By analyzing the data collected for various body dimensions for Sikh population of Delhi following conclusion can be furnished:

- The average stature of females (154.17 cm) is less than that of males (167.54 cm).
- Dimensions like HL, HB, FL, and FB as expected were showing lesser values for females as compared to males.
- Multiplication factor for all the four body dimensions for both males and females were uniform, showing very less variation when compared to their counter parts for opposite sex. Maximum variation in multiplication factor between males and females is seen in the case of HB and minimum variationin multiplication fact or between males and females is shown in case of HL.
- Regression equations for all the four body dimensions to calculate the stature were formulated. Zero error value was found while computing the stature from regression equation for both the sexes. So, it can be concluded that the HL is the best suited body dimension for estimation of stature females and FL is the best suited body dimension for stature estimation in Sikh population of Delhi.
- Sex differences were found to be highly significant for all the measurements (P < 0.01). [11] Linear regression equations for stature estimation were calculated using the above mentioned variables. The correlation coefficients between stature and all the measurements of hands and feet were found to be positive and statistically significant.
- The highest correlation coefficient between stature and foot length in males indicate that the foot length provides highest reliability and accuracy in estimating stature of an unknown male, whereas, in females, the highest correlation was found between hand length and stature indicating that the hand length provides highest reliability and accuracy in estimating stature of an unknown female.

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References

- 1. Kanchan T, Menezes RG, Moudgil R, Kaur R, Kotian MS, & Garg RK, (2010), Stature estimation from foot length using universal regression formula in a North Indian population. *J Forensic Sci;* 55:163e6.
- 2. Singh, I.P. &Bhasin M.K. (2004). A Manual of Biologoical Anthropology, Delhi: Kamal-Raj enterprises.
- 3. Bhasin, M.K., Indian Anthropology: Racial, Ethnic, Religious and Linguistic Elements in Indian Population.
- 4. Nath, S. (1989), An Introduction to Forensic Anthropology, Gyan Publishing House, New Delhi.
- 5. Kanchan T, & Krishan K., (2011), Anthropometry of hand in sex determination of dismembered remains; a review of literature. *J Forensic Leg Med;* 18:14e7.
- 6. Ronki Ram (2007), Social Exclusion, Resistance and Deras: Exploring the Myth of Casteless Sikh Society in Punjab. Economic and Political Weekly, Vol.42, No.40 (Oct.6-12,2007), p.4066-4074.
- KrishanK, &Kanchan T, Sharma A., (2011), Sex determination from hand and foot dimensions in a North Indian population. *J Forensic Sci*; 56:453e9.
- 8. Krishan K, &Kanchan T, Sharma A., (2012), Multiplication Factor versus Regression Analysis in Stature Estimation from Hand and Foot Dimensions. *J Forensic Leg Med*; 19 211-214.
- 9. Auerbach BM, Ruff CB. Stature estimation formulae for indigenous North American populations. *American Journal of Physical Anthropology 2010; 141(2): 190–207.*
- 10. Srivastava A., Yadav V.K., (2014), Reconstruction of Stature using Hand and Foot Dimensions among Indian Population, *J. of Engineering Sciences and Emerging Technologies;6(4), 400-404.*
- 11. Kaur M., Singh B., Mahajan A., Khurana B.S., Kaur A., Batra APS, (2013), Anthropometric Measurements of Hand Length For Estimation of

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Stature In North Indians, International J. of Applied Biology and Pharmaceutical Technology.

- Kaur, S., & Nath, S. (1997), Reconstruction of stature from various dimensions of upper extremity among Sikh females of Delhi. Proceedings of X All India Forensic Science Conference, Bhubaneswar (11-13 Nov, 1997), 6-16.
- 13. Ramachandran M., Komandur S., (2012) Survey of Anthropometric data collection methods of

Indian Population, Symposium on Human Factors and Ergonomics in Health Care.

- 14. Bhavna, Nath S., Use of Lower limb measurements in reconstructing stature among Shia Muslims, *The Internet J.of Biological Anthropology.*
- 15. JitenderJakhar, Vijay Pal, Paliwal PK. (2010) Estimation of height from measurement of foot length in Haryana region, *J. Indian Acad. Forensic. Med.*, 32(3); 231-233.

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Tribal Rights on Land: Policy, Practices and Perspective

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Abstract

Chhattisgarh has 30.6 per cent the highest percentage of Schedule Tribe (ST) in its population. However, large scale alienations of tribes from land and forest are ongoing dreadfully. Instead of safeguarding their rights the state has mastered a violence fuelling technique of Salwa Judum to counter naxalism.

The Fifth and Sixth Schedule of the Indian constitution enable devolution of power to create autonomous structures safeguarding tribal traditions and practices. Importantly, guarantees protection of tribal land rights.

Over the years due to gross negligence and non-committal attitude of the state government towards solving issues in tribal areas, the contradiction between the tribal community and the state is translating itself into an open conflict in many areas.

The paper reviews the actual situation on ground and promises made by the Chhattisgarh government on *issues* of tribal land rights; and fifth schedule. To do so the paper juxtaposes various issues identified by the Chhattisgarh Tribal Advisory Council, *reported during 2005-2011; and the state response*.

Keywords: Fifth Schedule; Land; Tribal Right.

Introduction

According to the 2011 Census, in central India Chhattisgarh has 30.6 per cent the highest percentage of Schedule Tribe people in its population followed by Jharkhand (26.2 per cent) and Orissa (22.8 per cent). In Chhattisgarh out of total 27 districts, 7 districts have tribal population more than 50 per cent in comparison to its total population and another 6 districts have 25 per cent to 50 per cent tribal population.

However, the tribal communities in state have faced rampant exploitation, displacement and

dispossession from their resources at the hands of the state. Large scale alienation of tribals from their land and forest is going on rampantly in Chhattisgarh. Whether for coal blocks in Raigarh, or a power plant in Premnagar, cement plants in Tilda, or a large industrial area in Rajnandgaon, bauxite mining in Sarguja and Jashpur, sponge iron in Raigarh and Raipur or diamond mining in Devbhog, tribals are facing and resisting displacement. Same is the story for the Tiger Reserve, Elephant Reserve, Wild life Sanctuaries etc. in Bilaspur, Jashpur and Dhamtari districts. The list is endless [1].

In general, over the years due to gross negligence and non-committal attitude of the state government towards solving issues in tribal areas, the contradiction between the tribal community and the State itself has become sharper, translating itself into open conflict in many areas. Almost all over the tribal areas, including North- east, Chhattisgarh, Jharkhand, Orissa and Maharashtra, Andhra Pradesh and Kerala, tribal people seem to feel a deep sense of exclusion and alienation, which has been manifesting itself in different forms. The Report of the Expert Group on Prevention of Alienation of Tribal Land and its Restoration (October 2004) pointed out that the socioeconomic infrastructure among the tribal people is inadequate, thereby contributing to their disempowerment, deprivation and resultant poverty, increasing malnutrition and forced migration [2].

The objective of the paper is to review the actual situation on ground and promises made by the Chhattisgarh state government on *issues* of tribal land rights; and fifth schedule of the constitution that deals with the administration and control of the scheduled areas. To do so the paper juxtaposes various issues identified by the Chhattisgarh Tribal Advisory Council (CGTAC), reported during 2005-2011; and the state response. To build the case, the paper is based on information available in public domain.

Chhattisgarh and the Fifth Schedule [3]

On 29th February, 2003 in exercise of the powers conferred by sub-paragraph (2) of paragraph 6 the Fifth Schedule to the Constitution of India, an Order was issued by the Governor of the state to notify the Scheduled Areas in the states of Chhattisgarh. In Chhattisgarh, PESA districts are Sarguja, Bastar, Raigad, Raipur, Rajnandgaon, Durg, Bilaspur, and Kanker District.

The Fifth Schedule and Sixth Schedule of the Indian constitution contain provisions for governance of tribal areas. These were designed to apply in areas with a large tribal population. These provisions enable devolution of power to the tribals and create autonomous structures that safeguard their traditions and practices. Perhaps most importantly, the constitution guarantees protection of their land rights. The Fifth Schedule applies in nine states, while the Sixth Schedule covers north-east part of India. However, these schedules only cover certain parts of the states despite the fact that tribes are also found in other areas.

While laws and policies exist to ensure peace and good governance in tribal areas, institutions and forest departments breach many laws. Pristine territories with rich mineral resources overlapping indigenous settlements have seen marginalization of tribal voices, loss of autonomy and land. Having experienced displacement and broken promises over the years, a historical mistrust has characterized the relationship between the state and its indigenous communities. When land is required for developmental projects, the government has to follow due process, which amongst other things entails that people displaced should be adequately rehabilitated. But in most cases this has not been the case.

The tribals today have to also face all the time the ever-increasing threats from private interests. Improper mining, deforestation and land encroachment by voracious businesses and corrupt government officials not only jeopardize the environment, but also take away from tribals their way of life, the land. They have a symbiotic relationship with their land and forests. The forests provide means of livelihood to them, and their traditional practices in turn conserve these forests. With the government failing to protect their rights, tribals have resorted to fighting back and that is gaining ground for extremists in tribal areas. Faggan Singh Khulaste, Rajya Sabha MP from the Bhartiya Jannata party, works with indigenous communities in Chhattisgarh and Madhya Pradesh states where a number of districts are governed by the Fifth Schedule. He says, "Even though there is a degree of effort and initiative towards tribal governance, yet somehow what contradicts new paradigms and state policies is the lack of implementation" [4].

The Planning Commission of India, like many other committees and governing bodies, emphasizes on institutions of self-governance. A self-governing body such as the gram sabha is the only effective mechanism for efficient rural governance in tribal areas. According to a Planning Commission report, negligence and marginalization of tribal communities have been responsible for the emergence of left-wing extremism in 76 districts (32 PESA districts) of the country of which 13 districts are of Chhattisgarh. A year ago the Chhattisgarh state Government has also applied to the Central Government to include 4 (four) more newly created districts of the State, namely, Sukma, Kondagaon, Surajpur and Balrampur as extremist affected districts.

This provides lot of ground to seriously ponder why tribal welfare laws such as the PESA 1996, the Forest Rights Act 2006 or even the Fifth Schedule of the Constitution have utterly failed to provide protection to the indigenous tribal communities of India. Why tribal laws such as The PESA, 1996 and The Forest Rights Act of 2006 remain subservient to other laws and find out concrete amendments to make them un-breakable in the Schedule V and VI areas.

PESA Implementation [5]

The adaptation of the Panchayat Acts has been pursued by the States in a routine way. The current review shows that hardly any relevant Acts of the Centre, or even the concerned States, have been amended to make them consonant with the relevant 'features' of governance in Scheduled Areas. Madhya Pradesh and Chhattisgarh are the only exception, which made a commendable beginning in this regard but left the same halfway through.

Vishnu Deo, a Lok Sabha MP from Raigarh District of Chhattisgarh and a part of the ruling Bharatiya Janata Party in an interview stated that "The Panchayati Raj does not function or make adequate decisions on governing roles, neither are powers devolved within state rural economies. The dilution of state policies by politicians lessen the chances for devolution rather than the involvement of local leaders. Neither does panchayati governance consist of tribal population or appropriate representation of the tribal perspective."

Many tribal voices are therefore demanding introduction of the Sixth Schedule in Chhattisgarh's Bastar district, which would give them a special status to participate directly in governance as in the North East States currently under the Sixth Schedule. Furthermore, the Sixth Schedule has certain features that can be implanted in any governance model for tribal areas, particularly concepts of constitutional and legislative subjects that are exclusive to local governments. An autonomous district council will give greater role in directing administrative requirements without depending on the Central State structure.

Issues with PESA [6,7]

 Ideally under the panchayati raj system, decision on industries, minor forest produce or infrastructural development projects should be based on gram sabha decisions. Unfortunately, the gram sabha has neither the authority nor the capacity to make decisions. Not all the states have given authority to Gram Sabha in this regard but Chhattisgarh is exception to that regard.

- However, the Zilla Parishad, the third tier of the panchayati raj system, is an independent body that proceeds on the basis of decisions taken at the gram sabha level. It comprises Members of Legislative Assembly (MLAs) and MPs who actually take decisions on behalf of gram sabhas. In most of reported cases of opposition to land acquisition in the gram sabha, fake approvals have been given. Evidently, these decisions are taken for political reasons and do not serve the interests of tribal communities. This has resulted in some of the biggest land scams which have taken place within tribal communities in Scheduled Areas.
- The Ministry of Tribal welfare and Ministry of Social Welfare regulate and decide on tribal grants. These grants go directly to the state, and it is the state government that makes sure that these grants are spent on tribal communities. The system needs to change, and funds for tribal welfare should not be clubbed with grants for other schemes. The tribal grants should only be used for the purpose they were allocated for.
- The Planning Commission needs to look into matters concerning state funds, as these get directed to a general fund pool. It is the lack of political will that has marginalized the tribal people further.
- Devolution will only come about if the system works well, but if the system does not have a meaningful application for its people, then the need is to look at on what grounds are decisions made in Scheduled Areas.
- There is a need for accountability regarding implementation of laws in tribal areas, and a strong political will is required in a scenario where there is reluctance to devolve authority to local bodies by the lawmakers. And in cases where there is some level of devolution of authority is given, it should be protected and promoted wholeheartedly.
- The Ramchandran Committee (Planning at the Grass root Level: March, 2006, New Delhi) about the duties of the Central Government to ensure that PESA should be effectively and correctively implemented in the Fifth Scheduled areas. PESA casts direct responsibility on the state legislature but being a central legislation and logical extension of the Fifth Schedule, a duty is cast on the Central Government to see that the provisions are strictly implemented.

- A critical issue in the implementation of PESA is to harmonize its provisions with those of the Central legislations concerned and also recast relevant policies and schemes of Central Ministries/Departments.
- According to available information, no integrative exercise has yet taken place to examine the relevance of different Central Laws to Schedule V Areas and to harmonize them with the aims and objectives of the PESA. The Land Acquisition Act, 1894, Mines and Minerals (Development and Regulation) Act, 1957, The Forest Act, 1927, The Forest Conservation Act, 1980, and The Indian Registration Act are among the laws which warrant particular attention in this context. Besides, The National Policy on Resettlement and rehabilitation of Project Affected Persons, 2007, National Water Policy, 2002, National Minerals Policy, 2008, and National Forest Policy, 2004 would require detailed examination from the viewpoint of ensuring compliance to the provisions of PESA.

Supreme court notice to chhattisgarh on 5th schedule

Tribal Areas Administration

In the seventies, a serious attempt to focus on the tribal population in the planning process was made in the form of a Tribal Sub Plan strategy. The process of bringing all tribal majority areas under the Fifth Schedule of the Constitution was also taken up. The 73rd and the 74th amendments to the Constitution of India, followed by the Provisions of Panchayats (Extension to Scheduled Areas) Act 1996 (popularly known as PESA), brought in a new model for self-government in the Fifth Schedule areas of the country.

Source: Development Challenges in Extremist Affected Areas — Report of an Expert Group, 2008

In July 2013, Supreme Court issued notice to Chhattisgarh government on a petition related to the Tribal Advisory Council (TAC) and Fifth Schedule of the Constitution that deals with administration and control of scheduled areas and scheduled tribes.

"This case is keenly watched by tribal rights activists across the country because it claims to provide the answer to the off repeated question as to why hasn't Fifth Schedule been applied in Scheduled areas so far," says B K Manish (a tribal rights activist who had earlier filed a PIL on the Matter in CG High Court). The petitioner claimed that provincial governments had usurped governor's Tribes Advisory Council by installing chief minister as its chairperson and thus stifling all chances of a governor acting to remedy any state action to safeguard tribal interests as envisaged in Fifth Schedule. Chhattisgarh Tribes Advisory Council Rules, 2006 (similar to its counterpart in Orissa Bihar/Jharkhand) has been challenged on this ground in the said PIL [8].

Chhattisgarh Tribe Advisory Council (CGTAC) [9,10]

In Chhattisgarh the TAC was formed after constitution of the State in November, 2000. The last TAC was renamed in 2011 as Chhattisgarh Tribe Advisory Council (CGTAC). The Chief Minister is the Chairperson, the Minister of Scheduled Tribes and Schedule Caste Development Department (Vice Chairperson); 15 Scheduled Tribes MLAs (Members); three Members of Parliament (nominated as Members); and Secretary, Scheduled Tribes and Schedule Caste Development Department, Chhattisgarh government (Secretary). However, all these members belong to the leading political parties and rest serving the state government. As against many other states in CGTAC meetings most of the cases of tribal development are followed up rigorously. But progress in implementation is found lacking.

Governor of Chhattisgarh Report to the president of India on TAC

The Governor of every state having scheduled areas has to send a report of the TAC functioning, issues identified by TAC specific to the state's scheduled areas and action taken. For Chhattisgarh over the period from 2005 to 2011 the following issues besides others have found mention in report of the Governor: (a) Adverse effects of the Naxalite movement on the lives of the STs residing forest areas of the state; (b) Beginning of resistance to the Naxalite by the villagers in Bastar, Dantewada and Kanker district; (c) Adivasi families living in interior forest areas of these district have started moving in hundreds to places near to the main road to avoid atrocities of the Naxalites; (d) Thousand of Adivasi families have been displaced and there is urgent need for providing gainful employment to them.

Excerpts of various CGTAC reports Specific to Tribal land Rights

A. Granting of land titles to STs

The meeting of the CGTAC held on 5 July 2005 discussed the issue of granting of land titles to STs who were in possession of forest land till 1980. The Forest Department informed that there were 65,000 families who were residing and were in possession of forest land till 1980. The CGTAC decided to request the Central Government for issuing formal approval to grant land titles to STs and to extend the cut-off year 1980 to 1993 In the CGTAC meeting held on 18 October 2006, the CGTAC was informed that no formal order had yet been received from the Central Government to issue land titles. Another recourse of filing a petition in the High Court for grant of land title was also thought for those who had been living in and possession of forest land since 1993. However, in the CGTAC meeting held on 19 November 2007, it was informed that granting of land titles to STs could be possible only after the Forest Rights Act came into force. In the CGTAC meeting dated 5 September 2008, it was informed by the Department of Tribal and Scheduled Castes Welfare that as on 31 August 2008 land titles were given to 41,000 persons. In the CGTAC meeting held on 28 July 2009, the Secretary, Department of Tribal and SC Welfare informed that as many as 1,28,467 land titles were granted and distributed under FRA.

Contradiction [11]

In Rajnandgaon District only 5,791 forest land claims filed by STs have been settled so far. Another 10,994 forest land claims have been rejected. In Kanker district according to government records out of 27,646 filed claims on 17,831 cases 21,898 hectare land has been allotted. Whereas 9,815 cases were written off, the reason given by the forest department is that they were found inappropriate. In kosmi village, Bastar district 300 claims under FRA were filed out of which only 65 cases were heard rest are still languishing. However in all these cases the forest department did not inform the claimants about rejection. Moreover in all the cases it found that land allotted is much less than for which the claims are filed or the prescribed limit. In all the districts the forest department is reluctant to entertain any claims under the purview of Forest Rights Act (FRA).

In Bastar district, village Paragaon 57 people have received letter of recognition of rights under FRA but the land recognized and allotted in these claims are very minimal ranging only 25-30 percent of the actual claims. Moreover of 80 families claims have not been heard yet. The Forest Rights Committee formed under FRA is almost non operational. In village Chhura of 700 claims filed only 47 claims are only heard, for rest there no status update from the department. Even after state government's orders for not filing criminal cases against tribals regarding forest claims the department still does it.

In Mahsamand District for 2000 acres 640 families had filed claims for regularization under FRA out of that in 4 villages claims of 63 families over 77 acres of land has been accepted. In other 8 villages of 3 panchayats claims have not be heard even though Panchayat Secretary has forwarded them.

In District Bilaspur, Kotmi area only 56 tribal families have been settled on homestead land but 446 claims filed by tribals under FRA have yet to be resolved by the forest department. In district korea claims under FRA of non-tribal forest dependent families residing and also cultivating the land from last three generations are not getting accepted. In the same district total 26,824 claims of forest land regularization have been filed out of which 20,181 claims have been rejected and rest 6,643 claims were settled by allotting 6,045 acres of land which is less than an acre per family.

In District Sarguja, total 90,882 claims of forest land regularisation were filed out of which only 26, 584 claims were settled with 14,298.50 hectares of land. Rest of the claims was rejected but no intimation has been given to the settlers. Moreover, there are still thousand of claims could not filed due to lack of proper knowledge about FRA among tribals.

In Jashpur District, total 13,319 FRA claims were filed of which 3,554 claims were settled with 1769.67 hectares of land. Rest of the claims was rejected but no intimation to the settlers. In village Bhelava, Pataibahar, Kotli, Jamtoli hundreds of claims were filed by tribals families under FRA but 90 per cent are still unsettled with due to no response or rejection from the government.

In District Raigarh, village Durgapur, on 60 acres of land 20 tribal families were settled by Ekta Parishad in 2003 are yet waiting for their claims under FRA to be settled.

In Chhattisgarh state, till 2012, out of total 4, 86,101 FRA claims only 2, 14,633 are settled with 2, 17, 126 hectares of land. However, this isn't promising considering the share of tribal population in Chhattisgarh. Moreover, lack of implementation of PESA is disempowering when it comes to save land rights of the tribals. In majority of the settled claims cases it is seen that the land allotment is scanty, difference between claims filed and settled are gross, to dissuade forest dependent families both tribals and non-tribals to file for legal entitlements under FRA no or improper information sharing by the departments, non-availability of claim forms in thousands of reported cases, non-issuing of caste certificates and overall total ignorance of the state towards recognition and settlement of community rights. The whole process of FRA on ground level implementation is disempowering to the tribals in reality against its spirit and purpose of recognizing historical injustice towards them and recognizing their rightful rights.

B. Land Titles for Disputed land between Schedule Tribes and the Forest Department

In 2007 TAC meeting, with regard to the tribal land owners who were allotted land in 1980 by the Revenue Department but whose land was claimed by the Forest Department, it was decided that a 3-member Committee consisting of the Secretaries of Forest Department, Revenue and Tribal and Scheduled Tribes Welfare department be constituted to survey the land in dispute and prepare an action plan for rectification of the land records. In next TAC meeting the Revenue Department informed that the land records were rectified following a joint instruction by the Secretaries of Revenue Department and Forest Department. The tribals who had been allotted the disputed plots were being granted titles under the Forest Rights Act.

Contradiction [12]

In Chanabharri, Kusumi Panchayat, Bastar District 100 tribal families have been cultivating on the acquired land from last twenty years. But none of the claims have been heard and settled under FRA. According to the villagers the local forest department and police are still antagonized against Tribals. In village Hardi 22 tribal families cultivating 80 acres of land since 1998 but under FRA only 10 families have their rights recognized. There isn't any intimation from the forest department about rejection of claims. In Bhuruku village of 22 families claims have not been accepted due to pressure from the forest department. Moreover, to stop them from cultivating their occupied land their sickles, axes and other traditional farm objects have been confiscated by the department.

In Daiharipara village, Block Belgahna of Bilaspur District 20 families had filed claims over forest land acquired by them and under cultivation for the last 15 years now forest department is forcibly displacing them and started cultivating Jatropa. On villagers protest to this act of the forest department, the department went ahead and filed criminal cases against them. In District Korba, villages raniatari, kendai, amjhar, binjhra and lainga the similar incidences of forest department highhandedness has been reported. In most of the cases government is not keen on distributing forest land to the already settled tribals and applies force to push them, in other cases even if land is regularized it is meager and not enough for the families to cultivate and survive.

In District Jashpur, villages Patthalgaon, Jhimki, Khuntapani, claims of Pahadi Korwa tribes have not been accepted though filed under the procedure of FRA. Even in the village forest rights committee the tribe representation is marginalised.

Landless adivasis mainly of the Muria or Gothi Koya tribe of Chhattisgarh have long been crossing over into the forests of Khammam district of Andhra Pradesh in search of land, with the support of the naxalites. Again, both the forest and police departments came down heavily on them and set their hamlets on fire in incident after incident from 1989 till about 2002. But due to the interventions of civil society bodies the immigrants have stood their ground and today their presence is informally accepted by the administration.

C. Alienation of tribal land to non-tribals

In the CGTAC meeting, held on 28 July 2009 regarding alienation of Tribal lands through illegal sale and transfer to Non-Tribals, it was decided that cases of cheating and other forms of malpractices occurred in the illegal transfer/sale of lands of tribals to non-tribals and fraudulently obtaining approval of office of the District Collector in Scheduled Areas should inquired into and actions should be taken as per law.

This was followed up at the next meeting held on 9 November 2010 where MLA and CGTAC Member Sohan Potai informed about large scale illegal diversion of tribal lands in Dhamtari and Mahasamund districts and demanded an inquiry. At the CGTAC meeting held on 26 September 2011 with respect of taking actions in cases of large scale illegal diversion of tribal lands in Dhamtari and Mahasamund districts, it was informed by the Divisional Commissioner, Raipur that all districts in the Raipur Division had been surveyed. In Mahasamund district, 178 cases of illegal diversion of tribal lands have been found and the same were being investigated.

Further, Chief Minister also confirmed having received complaints of large scale land purchases by outsiders in Raigarh, Janjgir and Korba districts and direction to the concerned District Collectors to take action against such persons. Further, in the CGTAC meeting held on 26 September 2011 the Revenue department informed that approval was found to have been given for sale of tribal lands to non-tribals in 1108 cases in Raipur Division and 254 cases in Bilaspur Division, 63 cases in Bastar Division while no approval was given in Sarguja Division. It was stated that approval given to sale of tribal land to non-tribals in Raipur and Bilaspur Division were non-Scheduled Areas whereas the Bastar Division was completely a Scheduled Area where tribal lands cannot be legally sold to non-tribals. Therefore, action for returning the land to the original tribal landowners was under process. It was decided that detailed report should be obtained in respect of approvals given in Raipur and Bilaspur Division while all cases of illegal transfer of tribal land to non-tribal should be repealed or abrogated.

In 2010 CGTAC meeting the member and MLA Subau Kashyap had informed about cases of nontribals marrying tribal women and indulging in illegal purchase and sale of tribal lands in Bastar division. An enquiry was directed to be conducted into all cases of non-tribals marrying local tribal women and indulging in purchase and sale of lands in Scheduled Areas. With respect to questions as to the status of transfer of property that was acquired on inheritance by a non-tribal born out of a marriage between a non-tribal man and a tribal woman in the light of Section 165 (6) of the Land Revenue Regulations of 1959, state could not find an answer and decided to obtain legal opinion on the subject.

D. Land Titles yet to be distributed in Abujhmad

In the meeting of the CGTAC held on 5 July 2005, the previous decisions asking the State Revenue Department to survey the Abujmadh area, to expedite the process of issuing land titles (patta) to the families who had previously settled and to complete the survey in 6 months, were reviewed. However, the CGTAC meetings held over the consecutive years in 2007, 2008, 2009, 2010 and 2011 did not see any progress related to the survey work which yet to be initiated. Though the central government grant of Rs.2.60 crore was received by the Chhattisgarh revenue department, the reason given by the revenue department for not completing the task is inaccessibility of the region and lack of personnel having expertise in land records and cadastral surveying.

Contradiction [13]

Expert Group on Development Challenges in Extremist Affected Areas (2008) was appalled to be told that the Abujmarh in Narainpur district of Chhattisgarh area has not been surveyed to date and that it has hardly any revenue or police presence on a regular basis. Abujhmad is one of such remote areas in the country where there is hardly any governance. Abujhmarh literally means 'Unknown Highlands'. The area has a tribal population of 27,000 inhabiting some 260 far-flung villages over a sprawling area of 4000 sq. kms. The tribals here are primarily the Maria; they are the most backward tribals between the rivers Ganga and Godavari. Abujhmarh has a difficult terrain which remains cut off from the rest of the civilized world for about six months a year. The Expert Group has no wonder that the Naxals have made it one of their strongholds. Even in areas which are not so much in the interior, the absence of adequate public intervention, especially in education, health and employment has allowed the non-state actors to push their agenda among the people.

E. PTGs and Land Titles [14]

As per 2002 base line survey, the 5 PTGs tribes -Kamar, Bega, Bihror, Hill Korba and Abujmadia tribes were recorded residing in 11 districts of Chhattisgarh and the number of families were 24,770 while according to the base line survey of 2005-06 (excluding Abujhmadia tribe) the number of PTG families is 34,203. At CGTAC meeting held on 26 September 2011, Minister for Panchayat and Rural Development proposed to make special provisions for development of PTGs in Sarguja district from the State budget.

Contradiction [15]

In District Kabeerdham, Block Bodla, also known as "Baiga Chak", almost 6,500 people belonging to Baiga PTG tribe living in the area. Even after FRA implemented in the state Forest department continue to encroach for plantation in Baiga occupied lands. Moreover, the area is also gripped under threat of non-adivasi outsiders occupying large tracts of lands under Baiga Chak. In Sajatola village out of 32 forest land claims filed by Baiga families only 18 claims were settled. In village Navatola, from the last 22 years around 40 Baiga families have occupied and cultivating 100 acres of land but even though claims for regularization and rights settlement have been filed under FRA no action has been taken by the forest department. In village Bijapani, 10 Baiga families cultivating 35 acres of land since last one decade, but instead of their rights recognition the forest department has filed criminal cases against them. In total 1,445 Baiga families had filed claims under FRA only 502 claims were settled and rest 943 claims still pending. The land allotted in settled cases are scanty than the claims filed. Moreover homestead titles are not allotted which will certainly in future create trouble for these PTGs.

In Block Pandariya, FRA claim forms have not made available in sufficient number due to which around 3,000 Baiga families failed file their claims. The state government had promised to take back the cases filed against Baiga families related to forest land encroachment but no such action has been initiated on ground. In village Pathratola, 22 Baiga families had filed claims over 50 acres of land under cultivation but claims were not settled. They planned to file second appeal. In village Singhari Dhauratola, 21 families cultivating swamp area under acquisition since 2003 but their FRA claims have not been heard yet. In Bheera village Panchayat, 14 Baiga families had filed claims which were not settled but encroachment cases were filed against them by the forest department. In 2003, with the help of Ekta Parishad 6,100 Baiga families were promised to be settled by the state Government but even after so many years no such action has been initiated by the state.

Since 2003, nine villages, comprising 220 Baiga households, displaced from Bhoramdeo Sanctuary in Kabirdham district. No official records exist. Similarly, since 2009, six villages, comprising 245 Baiga families, displaced from the Achanakmar Tiger Reserve. Nineteen more villages are to be displaced. Earlier since 1970 to 2010 almost 28 villages have been displaced for Kanha National Park now in Madhya Pradesh. (Baiga in Exile: Sayantan Bera, Down To Earth, 15-31 July 2012).

Similar is the case with regard to Dhanuhar, Bilaspur District, whose claims of land settlement are yet to be decided by the forest department. The Pando tribe couldn't file nominations under FRA due to their illiteracy.

In District Raigarh, Block Dharamjaigarh, Nomadic Tribe Pardhi community's 220 families from village Tejpur, Baggudenga, Pathrapara, Heerapur, Beldegi and Lipti have been cultivating land under possession since last three generations but their claims under FRA have not been settled. This is ironical to find that even PTGs, NTs and DNTs claims under FRA are not heard and settled rather rejected and they are subjected to legal action.

F. Rehabilitation of Naxal conflict affected displaced persons

In the CGTAC meeting held on 18 October 2006, the plight of the Internally Displaced People's (IDPs) displaced due to the Naxal conflict was discussed. The Home Department and Revenue Department confirmed that about 40,000 persons were living in the relief camps and 6,000 persons were given permanent land titles and an Action Plan had been developed for resettlement of the IDPs who had been living near the highway. The Chief Minister instructed that the government land near the highway should be reserved for distribution to the displaced people.

As the instruction remained unimplemented, the Chief Minister once again instructed in the CGTAC meeting held in November 2007 that information in this regard should be collected from the concerned district collectors and immediate action should be taken in this regard. In the CGTAC meeting held on 5 September 2008, the Revenue Department informed that 2.50 acre land at Bamhi village; 3.00 acres at Bade Dongor village and some government land at Dhanora village under Koragaon Sub-Division in Bastar district had been reserved for distribution. 89 displaced families had been allotted 900 square feet each at Devgaon village and Halamimujmeta in Narayanpur district and land titles were issued to them. In Dantewada district in 18 villages, area of 3822.804 hectare was declared as residential area where 7177 Naxalite affected families had been resettled. In Kanker district the department selected an area of 64 acres private land near the main road for resettlement of the displaced families. Rs 53.20 lakh was required to acquire the said land. In the CGTAC meeting held on 9 November 2010, the Secretary, Revenue Department informed that 8,000 Sg km was eligible for de-notification. In the CGTAC meeting held on 26 September 2011, the Forest department informed that it would complete the process of de-notification within 3 months.

Contradiction [16]

In many places the local inhabitants formed resistance groups when the Naxalites severely interfered with their traditional life style. However, these resistance groups were converted into vigilante groups sponsored by the state authorities over a period of time. In Chhattisgarh, the group is called Salwa Judum. Some members of this group are appointed as Special Police Officers (SPOs). Some of them are given arms training and are provided with fire arms. Often these vigilante groups fight with armed naxalite groups making the tribals fight the tribal. As a principle of good governance such a situation is not desirable. These vigilante groups, once inhabitants of tribal villages, but have moved out are put in camps along with some arterial roads. Such migrants have left behind their agricultural land, their livestock and other means of production and livelihood. Most of them do not like their camp life which has discipline and constraints. Moreover, through this process of forced migration, many tribals have left their villages and even the State and migrated into neighboring States. This involuntary displacement and migration has caused further distress among the tribals and created administrative problems for the host State.

Considering the widespread phenomenon of internal displacement and in the absence of any policy in this regard, the migrant tribals are prey to all manner of exploitation. The Muria (Gothi Koya) immigrants from Chhattisgarh have, in their desperation, been a source of extremely cheap labor in building construction and civil works of all kinds in the parts of A.P that they have migrated to.

It is a well acknowledged fact that Naxalites have secured increases in the rate of payment for the picking of 'Tendu' leaf which is used for rolling beedies, in the forest areas of Andhra Pradesh, Chhattisgarh, Orissa, Maharashtra, and Jharkhand. This was once a major source of exploitation of adivasi labor, and while the Government knowingly ignored it, the Naxalites put an effective end to it. The exploitation was so severe that the rates have over the years increased up to fifty times what the 'Tendu patta' contractors used to pay before the Naxalites stepped in. It is therefore necessary for the State to provide for Minimum Support Price (MSP) for all types of minor minerals and forest produce and institutionally efficient procurement systems.

As a widespread vicious practice, wherever there is a basis for discretion on the part of government officials, forest personnel have had to be appeased by the tribals in different ways to avoid harassment. It was only after the Naxalites entered the picture that the adivasis got protection from this harassment, which was well known to the administration but was normally ignored. However, after the initial impact on extortionate practices of the forest department officials, the Naxalite movement's impact on official corruption has been slight. On some occasions the Naxalites have been able to put pressure upon lower level administrators to perform their job effectively. The pressure exerted by the Naxalite movement has had some effect in ensuring proper attendance of teachers, doctors etc., in Andhra Pradesh, Maharashtra and Chhattisgarh, but it is also true that such employees have made the presence of the Naxalites an excuse for not attending to their duties properly in the interior areas. To counter State, over the years, Naxalites have also used opportunities as in Chhattisgarh by demolishing pucca buildings such as schools so that the police and paramilitary may have no shelter in the forests.

G. Salwa Judum and 5th Schedule [17, 18, 19]

The Salwa Judum campaign was started in June 2005 by the ruling Bharatiya Janata Party (BJP) government in Chhattisgarh to eliminate the ultraleft guerrillas, variously referred to as Naxalites or Maoists. In forest- and mineral-rich Dantewada district of Chhattisgarh, at least 300,000 tribals have been displaced in the face-off between the Maoists and the state-sponsored Salwa Judum. The villages have been "evacuated" and some 50,000 refugees moved to government camps. The rest have migrated to neighboring states. Around 40 per cent of the children evacuated by the Salwa Judum to camps in Chhattisgarh are not in school. Government camps where the herded tribals are literally starving, with no healthcare, no sanitation and almost no way to earn a livelihood. As many as 3,800 civilians in Dantewada and Bijapur districts both tribals and non-tribals have joined the Salwa Judum as special police officers. Most of them are young men, but there are plenty of (not-on record) children too.

The Chhattisgarh government has to date inducted thousands of villagers as auxiliaries into this campaign by invoking the fear of the Maoists, the chief minister going to the extent of announcing: "Those who are not with the Salwa Judum are with the Maoists." And so began the business of evacuating entire villages in the deep jungles of this central Indian state located right in the middle of the country's mineral-rich tribal belt. The government believed these villages were sustaining the Maoists. If they were vacated, how would the Maoists get food, water and shelter? And for whom would they run parallel governments?

The Maoists hold sway over considerable areas in the country, from Andhra Pradesh in the south to the Nepalese border in the north. India's intelligence agency, the Research and Analysis Wing (RAW), estimates that some 20,000 insurgents are currently in operation across the country. Their growing influence prompted former Prime Minister Manmohan Singh in 2006 to declare them the "single biggest internal security challenge ever faced" by India.

Dantewada is virtually in the heart of Maoist territory, bounded on the east by Malkangiri district of Orissa state, on the south and southwest by Khammam district of Andhra Pradesh state, and on the west by the Indravati River, which forms the boundary with Karimnagar district of Andhra Pradesh and Gadchiroli district of Maharashtra. The district is blessed with the Bailadila range of hills that are full of saal and teak forests and also hold some of the country's richest reserves of iron ore, coal, limestone and bauxite. Here live some of India's most impoverished people: some 7.19 lakh predominantly semi-literate tribes who exist in near-destitution across 1,354 villages spread over a total area of 9,046.29 sq km.

If government figures are to be believed then some 644 villages have been burnt and evacuated by the Salwa Judum. The Dantewada district collector's memorandum of 2007 states that since June 2005 around 139 Salwa Judum rallies and 47 Salwa Judum meetings were held and 644 villages from Dantewada district "joined" Salwa Judum.

A report by the Campaign for Peace and Justice in Chhattisgarh, a group of individuals and organizations concerned over the state-sponsored violence, says that exact figures are not known, but estimates that at least 100,000 people have been displaced and the lives of at least 300,000 people from the 644 "liberated villages" have been completely disrupted because of the Salwa Judum.

The Chhattisgarh government created salwa judum to do the kind of barbaric crimes that the official forces do not want to be seen doing. This included the burning and emptying villages, the driving people to leave their homes in a "scorched earth" policy; killing and gangraping on a mass scale, physical, social and political exploitation to the height of anybody's imagination.

In 2011, the Supreme Court, in a historic judgment on a PIL, declared anti-constitutional State government supported and formed a militia called Salwa Judum. It disallowed the use of Special Police Officers in the "counterinsurgency" campaign against the CPI (Maoist).

This case represents a yawning gap between the promise of principled exercise of power in a constitutional democracy, and the reality of the situation in Chhattisgarh, where the State of Chhattisgarh, claims that it has a constitutional sanction to perpetrate, indefinitely, a regime of gross violation of human rights. The State of Chhattisgarh also claims that it has the powers to arm, with guns, thousands of mostly illiterate or barely literate young men of the tribal tracts, who appointed as temporary police officers, with little or no training, and even lesser clarity about the chain of command to fight the battles against alleged Maoist extremists. State led initiatives like Salwa Judum have only resulted in excessive landlessness, extreme poverty and severe malnourishment, demeaning of women, torture and large scale internal (forced) displacement. The worst is that a tribal is pitted against another tribal in Salwa Judum. This has far reaching consequence in breaking down a community based societies of tribals.

The above discussion indicates that the reason behind extremism in tribal areas is indeed due to nonrecognition of tribal rights over land and land based natural resources. And forceful exploitation of these resources and arbitrary state response towards demands of tribal rights and autonomy. It is suggested that there is urgency to find solutions of bottlenecks in practice of the Scheduled Areas autonomy specified under the constitutional framework. Dilution of state policies (governing tribal areas) by politicians rather than the involvement of local representatives only lessen the chances for devolution of powers. It also alienates tribal perspective by not giving appropriate representation in panchayat governance and hence curtailing their opportunities of freeing from landlessness, extremes of poverty, social oppression and institutional suppression. Devolution of powers to Panchayats in Scheduled Areas and freeing bodies like TAC from the clutches of political influences and bureaucracy will help in rationale of PESA and upholding the long pending rights of tribal over their land, livelihood and life. This is to bring real development to the tribals and tribal areas, to see tribal developing at par with the development of other communities.

References

- http://socialissuesindia.wordpress.com/ Development Projects and Tribal Displacement (accessed 13 May 2014).
- 2. Government of India (2004), Report of the Expert Group on Prevention of Alienation of Tribal Land (accessed 14 June 2014).
- http://www.epw.in/web-exclusives/tribalautonomy-undermined (accessed 14 June 2014) & http://socialissuesindia.files.wordpress.com /2012/09/tribal-displacement-in-india (accessed 16 June 2014).

- 4. www.epw.in/web-exclusives/tribal-autonomyundermined (accessed 14 June 2014).
- http://www.thehindu.com/opinion/op-ed/ right-place-wrong-arrangement (accessed 14 June 2014).
- 6. http://www.epw.in/tribal-autonomy-under mined.html(accessed 14 June 2014).
- Development Challenges in Extremist Affected Areas — Report of an Expert Group to Planning Commission, GOI, 2008 (accessed 14 June 2014).
- http://timesofindia.indiatimes.com/city/ raipur/Notice-to-Chhattisgarh-on-5th-Schedule (accessed 14 June 2014).
- 9. The Tribes Advisory Councils: Time to be replaced by the Autonomous District Councils Report by Asian Indigenous and Tribal people's network (AITPN), 2012 (accessed 14 May 2014).
- 10. http://ncst.nic.in/ Proceedings of meeting taken by Secretary on 11-01-2012 on role of Governors.doc (accessed 14 June 2014).
- 11. Janadesh, 2012, Jan satyagraha samvad yatra, Ekta Parishad.
- 12. Janadesh, 2012, Jan satyagraha samvad yatra, Ekta Parishad.

- 13. Janadesh, 2012, Jan satyagraha samvad yatra, Ekta Parishad.
- 14. The Tribes Advisory Councils: Time to be replaced by the Autonomous District Councils, a report by AITPN Network, December 2012 (accessed 14 May 2014).
- 15. Janadesh, 2012, Jan satyagraha samvad yatra, Ekta Parishad.
- 16. Development Challenges in Extremist Affected Areas — Report of an Expert Group to Planning Commission, GOI, 2008 (accessed 14 June 2014)
- 17. Geetashree, Infochenge: Human Right (2009, April) http://www.infochangeindia.org/humanrights/no-mans-land/what-wrong-have-wedone.html (accessed 14 May 2014).
- 18. http://www.hrln.org/hrln/chhattisgarh-legalwatch/pils-a-cases/1511-a-landmarkjudgment-in-salwa-judum-case (accessed 14 May 2014).
- 19. Development Challenges in Extremist Affected Areas — Report of an Expert Group to planning Commission, GOI, 2008 (accessed 14 June 2014).

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Ecogenetic Revelations on Paraoxonase 1 Enzyme in Population Genetic Studies

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Abstract

Ecogenetics aims at studying the genetics of underlying differential reactions to chemicals in the environment. Genetic modifications due to exposure to foreign substances like toxins due to occupational exposure, dietary constituents, drugs etc. majorly constitute areas studied in the scope of ecogenetics. One of the enzymes that have been at the center-stage of ecogenetic studies is the Paraoxonase 1 (PON1) enzyme. It is one of the oldest enzymes present since the life originated. The presence of an active PON1 enzyme in lower organisms proves that the enzyme's presence predates human origins. It also had a different native activity and not paraoxonase or arylesterase activities that presumably occurred only later in evolution. The enzyme is also characterized by promiscuity in its specificity towards substrates. These features account for the existence of enzyme isoforms of PON1 and their relevance in xenobiotic metabolism has made PON1 an interesting area of research. Previous studies have assessed PON1 variation in different human populations by evaluating them for activity, genetic variation or PON1 status (constituted by gene variations and activity). The variations have been studied in lieu of their toxicological and pharmacological properties and effects on human health. Sensitivity to chronic exposure of chemicals with the organophosphate moiety like pesticides (chlorpyrifos, malathion, parathion) and nerve gases (soman, sarin) is determined by the PON1 catalytic efficiency and abundance. The ethnic variations in PON1 status and gene frequencies are, hence, keys to understand the differential sensitivity among different groups of populations to chronic exposure of OP compounds. We examined selected populations of India for genetic variations of PON1. Findings show an interesting conglomeration of populations having different PON1 gene frequencies that will be important in assessing OP exposure risk among them. Also, the underlying cause of the systemic variation has not been determined. So, a review of previous research was done to find patterns of genetic variation at key loci of PON1 gene to comprehend the extent of differentiation at these loci. The paper aims at outlining the various aspects of PON1 research with special emphasis on the outcomes of toxicogenetic and pharmacogenetic approaches and the leads they provide for conducting population genetic studies. Deciphering the cause of PON1 variation will improve environment risk assessment exercises that help frame public health initiatives.

Keywords: Genetic; Paraoxonase 1; Conglomeration; Enzyme; Metabolism.

Introduction

One of the ways biochemical diversity manifests itself is as varied responses of individuals to environmental agents like pesticides, heavy metals and UV radiation. For instance, drug in one individual differs from the other who has been given the same dose. Three historically significant drugs, consumption of which led to first reports of difference in response of individuals were primaquine, succinylcholine and isoniazid (Meyers, 2004).

Differences in response towards a group of substances were first reported for drugs but subsequently for a wide range of physical and chemical agents. Human related factors that influence substance-specific differential response are age, sex, physiological and biochemical conditions of the individual and genetic factors. Ecogenetic studies carry out targeted examination of human detoxification systems that with the objective of finding differences in them contributing to variable response. Detoxification systems comprise an enzyme or combination of enzymes functioning in an organized manner to orchestrate the systematic deactivation of a substance foreign and at times toxic to the organism. These substances are called xenobiotics and also represent those substances that are endogenous to but do not exist in an organism under normal conditions. Detoxification systems located in liver were the first to be studied but with discovery of methods with enhanced sensitivity to detect enzyme expression in other tissues, their presence was detected in organs like kidneys, serum, intestine etc. With a more widespread presence, a wider functionality was conjectured for these enzyme systems. As a result the detoxification systems were known to metabolize as well and hence termed drug metabolizing enzymes (the name was suggested as the only known substrate for detoxification enzymes were drugs). Detoxification systems were now considered as xenobiotic metabolizing enzymes or "effector metabolizing enzymes" (the later term was suggested by Nebert, 1997). Considering its wider usage we will be using the term xenobiotic metabolizing enzymes in this paper.

The variation in response towards xenobiotics among individuals and populations has been attributed to genetic polymorphisms in xenobiotic metabolizing enzymes (XMEs). XME polymorphisms are also termed ecogenetic polymorphisms due to the availability of xenobiotics in varied ecological systems ranging from a soil microbiota to air ecosystem. Ecogenetic polymorphisms affect that affect drug response are studied in the domain of *pharmacogenetics*. Some others that modulate sensitivity towards toxic environmental agents are studied in the expanse of *toxicogenetics*. Genetic studies have also focused on finding the origins of slow metabolizing phenotypes of these enzymes in some populations by studying them in an evolutionary framework. The broad aims of ecogenetic studies are as follows:

(i) Assessing the variation at XME genes and studying the pattern of inheritance

- (ii) Examining the pattern of genetic differentiation within and among populations (both at risk and comparatively safe from exposure) at XME genes
- (iii) Evaluating the ecological factors responsible for the extent of differentiation observed at these genes
- (iv) Examining the contribution of evolutionary forces to explain slow and fast metabolizer phenotypes

PON1: A XME connecting Pseudomonas, Organophosphates and Lipid metabolism

The Paraoxonase1 (PON1) gene has garnered interest of researchers from many different areas of biology. The reason is that it links research areas as diverse as microbial studies, toxicology, pharmacology and HDL-physiology. The promiscuity in substrate specificity or moonlighting property of PON1 is the key for its strategic positioning in animal metabolism. PON1 metabolizes the L-acyl homoserine lactones (AHLs) secreted by the pathogenic bacterium Pseudomonas aeruginosa that blocks cell-to-cell communication among the bacterial cells thus inhibits infection. This property of PON1 makes it valuable for maintaining innate immunity and of interest to microbiological research on human pathogens. PON1 was first discovered due to its detoxifying action against the chemical diisopropyl fluorophosphate (DIFP) which is an irreversible cholinesterase inhibitor used in organophosphate insecticides (Mazur, 1946). Thereafter a series of experiments to find out cholinesterase-inhibiting substances hydrolyzed by PON1 followed. The enzyme was found to act against a number of toxic chemicals like nerve gases and organophosphate (OP) compounds used in pesticides. The metabolism of some drugs also requires participation of PON1. These observations lead to inclusion of the enzyme in toxicological and pharmacological studies. The PON1 enzyme was found to prevent accumulation of lipoperoxides (Mackness et al., 1991) in association with high density lipoprotein (HDL) molecules (Blatter et al., 1994) thus preventing increase in oxidative stress. The enzyme is thus capable of metabolizing a vast array of substrates, albeit with varied catalytic efficiencies.

Inter-population level differences in enzyme variants have been subject to clinical and epidemiological investigations. With the advent of molecular biological techniques, the molecular basis of the enzyme variants and their contribution to variation in response to xenobiotics were unraveled. Molecular genetic investigations of PON1 revealed the complete gene sequences in different species including humans, genetic variants in the coding and regulatory regions of the gene, the presence of two other enzyme paralogs, several orthologs in other species and the molecular genetic basis of differential enzyme concentration, expression and activity. The frequencies of the genetic variants were compared in populations of different ethnicities and the low activity allele was seen to decrease in frequency from Europeans to Africans and East Asians which have the least frequencies for this allele (Geldmacher von-Mallinckrodt et al., 1983). Specificity towards multiple substrates and presence in prokaryotic and eukaryotic genera suggests the antiquity of this enzyme in evolution.

Fig.1: Evolutionary relationship of PON1, PON2 and PON3 genes



The reason why paraoxonase is important to ecogenetic studies is the differential activity of the enzyme that leads to distinct metabolizing capacities. Biochemical and molecular genetic investigations that have thrown light on this are hereby discussed.

Biochemistry of Paraoxonase 1 enzyme

The biochemistry of PON1 enzyme is explained by its catalytic properties: substrate specificity and hydrolytic activity. PON was first known as an esterase possessing both paraoxonase and arylesterase activities (Smolen, 1991). Numerous studies have been conducted ever since to find out the substrates acted upon by the enzyme and catalytic efficiencies towards them. Organophosphate compounds were the first identified substrates of PON1. Studies revealed that chemicals with aromatic carboxylic ester and lactone based moieties are also PON1 substrates (Billecke et al., 2000; Rochu et al., 2003).

The first structure-activity study on PON1 indicated that a lactone like structure is necessary for hydrolysis by PON1 (Augustinsson and Ekedahl, 1962). PON1 activity is characterized by wide substrate-specificity and high inter-individual variability. But no difference was observed between sexes (Simpson, 1971). Also the activity increased with age. The PON1 activity was found to vary among distinct ethnic groups. A polymorphic distribution was observed with populations exhibiting bi-modal and tri-modal distribution depending on the substrates used for assaying the activity (Eckerson et al., 1983; Mueller et al., 1983; Geldmacher von-Mallinckrodt and Dipegen, 1988). When hydrolytic activity was evaluated with paraoxon and aryl-ester compounds, three levels of activity were found: low,

intermediate and high and the difference in levels of activity were 30-40 folds (Furlong et al., 1988). Molecular basis of the polymorphic activity was found by Humbert et al. (1993) through an *in-situ* hybridization technique.

Paraoxonase 1 was earlier described to possess a paraoxonase and an arylesterase activity. Activity studies using different substrates pointed that lactonase might have been the native activity of the PON family as it was found in different genera (Billecke et al., 2000). Structure-activity relationship (SAR) studies confirmed the native activity of the enzyme to be that of a lactonase (Khersonsky and Tawfik, 2005) where the native activity was defined to be the basic function for which the enzyme and its structure had evolved. The native lactonase activity is characterized by robustness (specificity) that is lesser in the other promiscuous activities (arylesterase and paraoxonase) and so the latter active sites are more responsive to mutations (Aharoni et al., 2005). PON1 has been studied both for its native and promiscuous activities.

PON1 structure

The cDNA of PON1 mRNA codes for a protein which has one methionine amino acid less at the Nterminal end (Hassett et al., 1991; Adkins et al., 1993). This residue is removed when the enzyme is secreted from liver into blood and subsequently matures. The leader sequence is retained post-translation and facilitates PON1's attachment with an HDL particle through a signal peptide which modulates HDL function (La Du et al., 1993). The matured, functional enzyme is 354 amino acids long with a molecular weight of 43kda (Mackness et al., 1996). The human PON1 enzyme is coded by nine exons (Clendenning et al., 1996). It was found that in humans, total serum PON1 is associated with HDL-C (Vekic et al., 2007). The structure of the PON1 gene has also been studied for its variations that have important role in the protein's function. In all about 200 Single Nucleotide Polymorphisms (SNPs) have been found (Seattle SNPs, http://pga.gs.washington.edu/). The ones mostly studied (Figure2) are found in the exons (exonic) and the promoter region (5' UTR). They have been discussed here.





The glutamine (GIn, Q) to arginine (Arg, R)mutation occurring at 192 amino acid position (Figure2) was found to produce the A and B alloforms of the enzyme (Adkins et al., 1993) with low and high paraoxonase activity respectively. The substitution is due to an A to G transition in exon 6 of the PON1 gene. Designated as Q192R, the polymorphism is the more investigated among two coding region polymorphisms and the most studied among all the PON1 polymorphisms considering its non-synonymous nature that results in the two alloforms having different activity. The polymorphism has a substrate-dependent effect on the enzyme activity which is determined by measuring hydrolytic activity and catalytic efficiency (Vmax/Km ratio, where Vmax is the initial velocity of the enzyme catalyzed reaction and Km is a constant specific for the enzyme-substrate complex). The wild type allele Q192* shows greater hydrolytic activity towards diazoxon, soman and sarin while *192R rapidly hydrolyzes paraoxon and chlorpyrifos-oxon (Furlong et al., 1988). Both the alleles exhibit equal activity towards phenylacetate (Humbert et al., 1993; Davies et al., 1996; Li et al., 2000). Resultantly, serum paraoxonase activity of PON1 was greater in individuals homozygous for *192R allele in comparison with those homozygous for Q192*. The Q192* homozygotes showed increased activity towards nerve gases, tabun, sarin and soman. Similar patterns were observed with different organophosphate chemicals among varying ethnic groups (Brophy et al., 2000; Furlong et al., 2006). In vitro studies show inconsistency in the hydrolytic activities of the same allele with varying concentrations of the same substrate (Furlong et al., 1991; Davies et al., 1996; Brophy et al., 2000; Li et al., 2000; O'Leary et al., 2005; Sirivasarai et al., 2007). The population studies of PON1 activity are in accordance with the results from the in vitro kinetic

studies (Davies et al., 1996). Studies on transgenic mice showed higher resistance to acetyl cholinesterase (AChE) inhibition in *192R expressing mice (Furlong et al., 2005).

The second coding region polymorphism included in this study designates a nucleotide substitution (T to A) in exon 3 at codon 55 that produces a nonsynonymous mutation of leucine (Leu, L) to methionine (Met, M). This mutation causes decreased serum enzyme concentrations. Individuals homozygous for *55M allele were found to have decreased serum enzyme concentration but normal activity (Blatter-Garin et al., 1997). The crystal structure of PON1 suggested that L55M mutation lead to distortion in packing and a destabilized structure (Harel et al., 2004). Population studies also suggest that L55M polymorphism alters gene expression (Blatter-Garin et al., 1997; Brophy et al., 2000). A lower expression in presence of *55M allele was initially conjectured to be due to an unstable transcript but later studies described the differential expression to be a result of linkage disequilibrium with the promoter region polymorphisms (Brophy et al., 2000; Leviev et al., 2001).

The low gene expression due to *55M allele and low catalytic efficiency due to Q192* together (QQ192*/*55MM) show the lowest activity towards paraoxon while individuals with *192RR/LL55* genotype have the highest activity (Blatter-Garin et al., 1997). Substrate-specific variations are observed among genotype combinations (Ginsberg et al., 2009). It was also noted that the *192R allele is in linkage disequilibrium with the *55L.

Five polymorphisms have been identified in the promoter region of the *PON1* gene (Figure2) positioned at -108, -126, -162, -832, -909 nucleotide positions from the transcription start site (Leviev & James, 2000; Suehiro et al., 2000). These
polymorphisms affect the expression pattern of PON1. Elevated PON1 activity was observed in -108C, -162A and -909G polymorphisms in comparison to individuals with -108T, -162G and -909C (Brophy et al., 2000). -108 polymorphism contributed to 23% of the observed variance in PON1 expression in a Caucasian sample (Suehiro et al., 2000) and the variation was consistent with change in phenotype in different samples (Brophy et al., 2001; Chen et al., 2003). Leviev and James (2000), however, did not find any effect of -108 on PON1 activity but that of -832 instead. -108 polymorphism was found to be the principal cause of the association of *55 polymorphism with PON1 gene expression due to the linkage disequilibrium between the two positions (Brophy et al., 2001; Chen et al., 2003). -126 and -162 polymorphisms did not modify the serum PON1 activity. Carlson et al. (2006) found 26 different polymorphisms affecting PON1 function but none of these have been characterized through animal models or kinetic studies on humans.

Ecogenetic studies on PON1

Early population genetics studies made worldwide comparisons of the pattern of the distribution of PON activity (Geldmacher von-Mallinckrodt, 1983; Mueller et al., 1983; Goedde et al., 1984). The percentage of low activity group was observed to be less in African and Asian populations and even absent in some tribes. European populations however had a higher percentage of the low activity group. Basing on the populations screened, the low, intermediate and high activity type populations were found in 'Indio-German', 'Oriental' and 'Negroid' ethnic groups (Geldmacher von-Mallinckrodt, 1983). These observations encouraged further investigations that were required to find out the molecular and genetic basis of the differential distribution of PON1 activity. The gene frequency patterns found later enunciate the observations of the PON1 activity pattern reported in earlier studies for some populations. But for some populations like East Asians the allele frequencies do not support the observations in activity measurements. This emphasizes the importance of restriction fragment length polymorphism (RFLP) analysis for studying PON1 polymorphism. The distribution of both *192 and *55 polymorphisms in populations from different ethnicities have been reported by several groups (Serrato and Marian, 1995; Antikainen et al., 1996; Davies et al., 1996; Hermann et al., 1996; Blatter-Garin et al., 1997; Mackness et al., 1997; Zama et al., 1997; Sanghera et al., 1998; Aynacioglu et al., 1999; Richter and Furlong, 1999; Fanella et al., 2000; Imai et al., 2000; Hong et al., 2001; Jakubowski et al., 2001; Malin et al., 2001; Allebrandt et al., 2002; Scachhi et al., 2003; Rojas-Garcia et al.,

Table 1: Substrates of PON1 enzyme (Adapted from Billecke et al., 2000; Hioki et al., 2011; Ishizuka et al., 2012)

Substrate classification	PON1 substrate		
Drugs	Ampicillin		
	Aspirin		
	Ciprofloxacin		
	Cisplatin		
	Cyclophosphamide		
	Cyclosporin A		
	Fluvastatin		
	Glucocorticoid δ - lactones		
	Levonorgestrel		
	Lovastatin		
	Mevastatin		
	Mithramycin		
	Olmesartan medoxomil (OM)		
	Paracetamol		
	Pilocarpine		
	Pitavastatin		
	Prulifloxacin		
	Simvastatin		
	Spironolactone		
Nerve agent (NA)	DFP		
	Tabun		
	Soman		
	Sarin		
Pesticide	Parathion		
	Diazinon		
	Chlorpyrifos		
	Diisopropyl fluorophosphates		
	Phenytoin		
	Dihydrocoumarin		

2005; Sirivasarai et al., 2007). The gene frequencies reported for various groups of populations for the Q192R polymorphisms are given in Table 2 and Figure 3.

Genetic studies have also helped understand the role of PON1 polymorphisms in human health due to the enzyme's antioxidant and antiorgano-

Region	Population	Allele Frequency		N	Reference
		Q	R		
Asia (7)	Thai	0.710	0.290	202	Phuntuwate et al., 2005
	Punjabis	0.740	0.260	300	Gupta et al., 2011
	Gujarati	0.750	0.250	223	Patel et al., 2007
	Jats	0.530	0.470	100	Unpublished results
	Meos	0.550	0.450	83	Unpublished results
	Santhal	0.460	0.540	95	Unpublished results
	Rongmei	0.490	0.510	70	Unpublished results
Africa	Beninese	0.388	0.612	98	Scacchi et al., 2003
(2)	Ethiopians	0.592	0.408	169	Scacchi et al., 2003
America	Cayapa Indians	0.211	0.789	83	Scacchi et al., 2003
(23)	Caucasians (New York)	0.730	0.270	82	Chen et al., 2003
	Africans (New York)	0.370	0.630	117	Chen et al., 2003
	Hispanic (New York)	0.540	0.460	203	Chen et al., 2003
	Poturujara	0	1	47	Santos et al., 2005
	Mapuera	0.330	0.670	29	Santos et al., 2005
	Parakena	0.470	0.530	17	Santos et al., 2005
	Wayampi	0.160	0.840	16	Santos et al., 2005
	Arara	0.210	0.790	35	Santos et al., 2005
	Awa-Guaja	0.320	0.680	28	Santos et al., 2005
	A. Koatinema	0.370	0.630	15	Santos et al., 2005
	Urubu-Kaapor	0.380	0.620	26	Santos et al., 2005
	Yanomami	0.6	0.4	19	Santos et al., 2005
	Kayapo	0.22 0.780	0.780	27	Santos et al., 2005
	Inuit	0.490	0.510	793	Lahiry et al., 2007
	Mexican	0.510	0.490	214	Rojas-Garcia et al., 2005
	Caucasian-Panamanians	0.610	0.390	50	Tejada et al., 2010
	Black-Panamanians	0.390	0.610	40	Tejada et al., 2010
	Ngobe-Bugle Amerindians	0.730	0.270	48	Tejada et al., 2010
	Mestizos	0.520	0.480	208	Gamboa et al., 2006
	Teenek	0.480	0.520	57	Gamboa et al., 2006
	Mayos	0.560	0.440	55	Gamboa et al., 2006
	Nahuas	0.680	0.320	56	Gamboa et al., 2006
Europe	French	0.717	0.283	796	Ruiz et al., 1995; Hermann et
(9)					al., 1996
0	Irish	0.710	0.290	170	Hermann et al., 1996
	Turks	0.690	0.310	381	Avnacioglu et al., 1999
	Germans	0.718	0.282	2784	Gardemann et al., 2000
	Finns	0.740	0.260	169	Antikainen et al., 2000
	Dutch	0.691	0.309	815	Heijmans et al., 2000; Leus et
	Italians (mainland Italy)	0.687	0.313	179	Scacchi et al., 2003
	Sardinians	0.752	0.248	161	Scacchi et al., 2003
	Serbians	0.770	0.230	122	Pejin-Grubisa et al., 2010

Table 2: Global low activity allele Q192* frequencies among different populations of the world

phosphate action. The role of gene polymor- phisms in regulation of PON1 activity and their subsequent effect on disease, toxicological and pharmacological aspects of health are discussed next.

Paraoxonase 1 enzyme metabolizes chemicals at different rates in individuals (La Du, 1996). Some of these chemicals are known carcinogens while for others therapeutic or toxic properties are well established. This formed the basis of the toxicogenetic and pharmacogenetic studies of PONs. The lactones have been observed in all phyla from the unicellular bacteria to the complex multicellular animal and plant kingdoms. Lactones constitute many phytochemicals and are used to enhance flavor of food products. Besides, some drugs comprise lactone and cyclic carbonate structures that are targeted by the PON1 enzyme. A list of different chemicals metabolized by PON1 enzyme is given in Table1.

Molecular genetic studies gave interesting revelations that went on to have huge repercussions in toxicological and pharmacological studies involving PON1. The important ones were i. The signal peptide sequence by the PON1 during secretion is retained and ii. The Q192R

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Fig. 3: Graphical representation of PON1*Q192 allele frequencies in populations around the world. Allele frequency at rs662 position of PON1 is given for 40 populations. The populations are grouped into four geographical regions Asia, Africa, America and Europe.



polymorphism is the main contribution of differential PON1 activity. The coding region polymorphism L55M and promoter region polymorphisms have also been studied for their roles in modulating PON1 levels and expression that affect PON1-mediated xenobiotic sensitivity.

Serum paraoxonase protects an organism from the cholinesterase inhibiting organophosphate pesticides. The organophosphate (OP) compounds that are metabolized by PON1 are the main derivatives of a group of OP pesticides. The OP compounds undergo oxidative desulfuration by cytochrome P450 enzymes to produce oxon derivatives of the compound. The PON1 enzyme then hydrolyzes the highly toxic oxon derivative into nontoxic by-products that are secreted out of the system. The level of activity of the enzyme determines the rates of hydrolysis of OP pesticides. Lower oxon hydrolysis causes higher sensitivity towards OP exposure as bioavailability of OP will be high for cholinesterase inhibition. The OP pesticides that are widely used are chlorpyrifos, diazinon, malathion and parathion (Table1). The respective oxon derivatives of the pesticides mentioned are chlorpyrifos oxon, diazoxon, malaoxon and paraoxon. PON1 also hydrolyzes nerve gases like soman and sarin. The toxicogenetic studies involving

PON1 have examined the inter-individual, interpopulation and inter-species differences in catalytic efficiency of the enzyme towards these compounds and the role of genetic polymorphisms. It was found that *R192 allele better hydrolyzed paraoxon while Q192* showed higher activity for diazoxon, soman and sarin. Effects of OP exposure on PON1 activity has been studied in different cases. Allelic variationinduced differential sensitivity to OP exposure was noted in some. Some of these studies recruited the Gulf war veterans, sheep dip workers, farm workers and victims of the Tokyo subway attack. An important observation in these studies was that the hydrolytic activity of PON1 was more effective during chronic exposure to low doses of poisoning and not acute exposure which again emphasizes the fact that organophosphatase activities are promiscuous to the enzyme and hence less effective at high exposure of toxins. PON1 polymorphisms modulate risk in environments of chronic exposure like among agriculturists who are exposed to pesticides on a regular basis.

Pharmacogenetic investigations examine the effect of allelic variations on the within and between population dissimilarities in drug metabolism. Drug metabolizing enzymes (DMEs) transform a drug into an active metabolite which then passes on into the circulation before acting on the target tissues. A similar course of action is followed in metabolism of phytochemicals that are consumed by animals as nutrients. Enzyme isoforms produced due to allelic variants in PON1 gene differ in their efficiencies of biotransformation thus influencing drug (or other chemical) kinetics and consequently response. A subset of PON1 variants have been investigated in pharmacogenetic studies due to their interaction with drugs and drug derivatives. The Q192R polymorphism has been studied for its role in the bio-activation of the combination therapy with clopidogrel and aspirin in patients with coronary artery disease. Xenobiotic response elements (XREs) with a consensus sequence GCGTG in the promoter region of PON1 have been found to regulate the gene expression in presence of different chemical substances. Also, the promoter polymorphisms are putative binding sites for transcriptional factors which are often targeted by xenobiotics. Pharmacogenetic interactions have been studied between the promoter polymorphisms of PON1 gene and statins which are used to inhibit the HMG-CoA reductase enzyme to treat atherosclerotic plaques (Goudedard et al., 2003; Deakin and James, 2004; Deakin et al., 2007). The effect of dietary polyphenol, quercetin on PON1 gene expression was studied and a reduction in promoter up-regulation was observed when a mutation occurred in a 20bp sequence of the promoter region. This implies a mutation in this region will affect the metabolism of the drugs and polyphenols that act through the promoter region to impress upon the enzyme activity.

The distribution of gene frequencies at these loci will help determine the potential risks the populations are associated with. Studying individual populations will help customize group specific interventions to ward off episodes of toxicity caused by OP chemicals metabolized by PON1. One of the outcomes of the population genetic analysis was the finding that *192R is the ancestral allele at the Q192R polymorphism (Scacchi et al., 2003). This indicates that most of the populations carry this allele in a higher frequency. *192R codes for the high activity phenotype of PON1 and hence decreases susceptibility of an individual towards poisoning by oxon derivatives of parathion and chlorpyrifos. In contrast, it would make an individual more susceptible to poisoning by diazoxon. Thorough population screening programs can thus help in introducing suitable pesticides that would pose less danger to the human population due to chronic exposure while performing the function of pest-killing. Population screening is more pertinent in countries where the use of OP based pesticides is more prevalent.

Population genetic studies have, hitherto, targeted description of PON1 to give a rich resource of data on gene frequencies among different populations. A complete picture describing the worldwide genetic diversity at PON1 loci will be useful in answering questions ecogenetic relevance. The questions that need to be answered by population geneticists are the roles played by drift and selection forces in maintaining the allele frequencies of PON1 for the low activity alleles. Recent genome wide scans for detecting selection pressures also found signs of positive selection at the coding region polymorphisms of PON1 gene. Examining the apportionment of PON1 variation among worldwide populations will be helpful to find out which of the factors, geography, ethnicity or subsistence acts as the proxy for PON1 status.

Conclusion

An evolutionary understanding of the health problems posed by increased exposure (both intended and non-intended) to xenobiotics will help reduce its burden. Population genetic studies targeting xenobiotic-metabolizing enzymes have helped to gain insights on their evolutionary history. These findings can be useful for genetic medicine to leverage the ills of toxic xenobiotics or adverse events caused due to drugs and lowered drug efficacy. Albeit they are few in number, clear evidences of toxicogenetic and pharmacogenetic relevance have been reported. Population genetic studies have revealed the genetic variants in the PON1 gene that affect the enzyme's activity and concentration in populations of different ethnic groups. Further understanding of the geographical, climatic, and dietary variations in these groups will help provide clues to explain the patterns observed in the genetic variation in this gene. An improved understanding of the factors influencing PON1 activity and expression including genetic factors will help unravel the relationship between PON1 genotypes and variability in response to environmental toxins and drugs. Populations having the low activity alleles for specific substrate should be finely screened for comprehending the population risk towards the substrate in case it is a toxin. If the substrate is a drug, the low activity alleles might be accountable for lower efficacy towards the drug. This might be important for formulating group-specific drug regimes.

References

- Adkins, S., Gan, K. N., Modyt, M., & Dut, B. N. La. (1993). Molecular Basis for the Polymorphic Forms of Human Serum Paraoxonase / Arylesterase/: Glutamine or Arginine at Position 191 for the Respective A or B Allozymes. American Journal of Human Genetics, 52, 598– 608.
- Aharoni, A., Gaidukov, L., Yagur, S., Toker, L., Silman, I., & Tawfik, D. S. (2004). Directed evolution of mammalian paraoxonases PON1 and PON3 for bacterial expression and catalytic specialization. PNAS 101(2): 482-487.
- Allebrandt, K. V, Souza, R. L. R., & Chautard-Freire-Maia, E. A. (2002). Variability of the paraoxonase gene (PON1) in Euro- and Afro-Brazilians. Toxicology and Applied Pharmacology, 180(3), 151–6. doi:10.1006/ taap.2002.9368
- Antikainen, M., Murtomäki, S., Syvänne, M., Pahlman, R., Tahvanainen, E., & Jauhiainen, M. (1996). The Gln-Arg191 polymorphism of the Human Paraoxonase Gene (HUMPONA) is not associated with the risk of coronary artery disease in Finns. Journal of Clinical Investigation 98(4): 883–885.
- 5. Augustinsson, K. B., & Ekedahl, G. (1962). On the specificity of arylesterase. Acta Chemica Scandanavica 16: 240–248
- Aynacioglu, A. S., Cascorbi, I., Mrozikiewicz, P. M., Nacak, M., Tapanyigit, E. E., & Roots, I. (1999). Paraoxonase 1 mutations in a Turkish population. Toxicology and Applied Pharmacology, 157(3), 174–7. doi:10.1006/ taap.1999: 86-90
- Billecke S., Draganov D., Counsell R., Stetson P., Watson C., Hsu C. & La Du B. N. (2000). Human serum paraoxonase (PON1) isozymes Q and R hydrolyze lactones and cyclic carbonate esters. Drug Metabolism and Disposition 28(11), 1335– 1342.
- Blatter Garin M-C, Abbott C, Messmer S, Mackness M. Durrington P, Pometta D, James RW (1994) Quantitation of human serum paraoxonase by enzyme-linked immunoassay: population differences in protein concentrations. Biochemical Journal 304: 549–554
- Blatter Garin, M.-C., James, R. W., Dussoix, P., Blanche, H., Passa, P., Froguel, P., Ruiz, J. Paraoxonase polymorphism met-leu54 is

associated with modified serum concentrations of the enzyme: a possible link between the paraoxonase gene and increased risk of cardiovascular disease in diabetes. Journal of Clinical Investigation 99: 62–66, 1997.

- Brophy, V. H., Jampsa, R. L., Clendenning, J. B., McKinstry, L. a, Jarvik, G. P., & Furlong, C. E. (2001). Effects of 5' regulatory-region polymorphisms on paraoxonase-gene (PON1) expression. American Journal of Human Genetics, 68(6), 1428–36. doi:10.1086/320600.
- Carlson, C. S., Heagerty, P. J., Hatsukami, T. S., and et al. (2006). TagSNP analyses of the PON gene cluster/ : effects on PON1 activity, LDL oxidative susceptibility, and vascular disease. Journal of Lipid Research 47: 1014-1024. doi:10.1194/jlr.M500517-JLR200.
- Chen, J., Kumar, M., Chan, W., Berkowitz, G., & Wetmur, J. G. (2003). Increased Influence of Genetic Variation on PON1 Activity in Neonates. Environment Health Perspectives 111: 1403– 1409. doi:10.1289/ehp.6105.
- 13. Clendenning, J. B., Humbert, R. I. and et al., (1996). Structural organization of the human PON1 gene. Genomics 35, 586–589.
- 14. Davies, H. G., Richter, R. J. and et al. (1996). The effect of the human serum paraoxonase polymorphism is reversed with diazoxon, soman and sarin. Nature Genetics 14: 334–336.
- Deakin, S. P., & James, R. W. (2004). Genetic and environmental factors modulating serum concentrations and activities of the antioxidant enzyme paraoxonase-1. Clinical Science 107(5): 435–447. doi:10.1042/CS20040187.
- Eckerson, H. W., Wyte, C. M., La Du, B. N. The human serum paraoxonase/arylesterase polymorphism. American Journal of Human Genetics 35: 1126–1136, 1983.
- Fanella, S., Harris, S. B, Young, T. K., Hanley, A. J., Zinman, B., Connelly, P. W., Hegele, R. A. (2000). Association between PON1 L/M55 polymorphism and plasma lipoproteins in two Canadian aboriginal populations. Clinical Chemistry and Laboratory Medicine 38:413–20.
- Furlong, C. E., Cole, T. B. and et al., (2005). Role of paraoxonase 1 status in pesticide sensitivity: Genetic and temporal determinants. Neurotoxicology 26: 651–659.
- Furlong, C. E., Holland, N., Richter, R. J., Bradman, A., Ho, A., & Eskenazi, B. (2006). PON1 status of farmworker mothers and children as a predictor

of organophosphate sensitivity. Pharmaco genetics and Genomics 16: 183–190.

- Furlong, C. E., Richter, R. J., Chapline, C., Crabb, J. W. (1991). Purification of rabbit and human serum paraoxonase. Biochemistry 30: 10133– 10140.
- Furlong, C. E., Richter, R. J., Seidel, S. L., & Motulsky, A. G. (1988). Role of Genetic Poly morphism of Human Plasma Paraoxonase / Arylesterase in Hydrolysis of the Insecticide metabolites chlorpyrifos oxon and paraoxon. American Journal of Human Genetics 43: 230– 238.
- 22. Geldmacher-V.Mallinckrodt M., Diepgen T.L., Duhme C. and Hommel G. (1983). A Study of the Polymorphism and Ethnic Distribution Differences of Human Serum Paraoxonase, 241, 235–241.
- Geldmacher-von Mallinckrodt, M., and Diepgen, T. L. 1988. The human serum paraoxonase polymorphism and specificity. Toxicological and Environmental Chemistry 18, 79–196.
- 24. Ginsberg, G., Neafsey, P. and et al., (2009). Genetic polymorphism in paraoxonase 1 (PON1): Population distribution of PON1 activity. Journal of Toxicology and Environment Health 12(5-6), 473–507. doi: 10.1080/10937400903158409.
- Goedde H. W., Rothhammer F., Benkmann H. G., & Bogdanski P. (1984). Ecogenetic studies in Atacamefio Indians^{*}. Human Genetics 67: 343– 346.
- Gouedard C., Barouki, R., & Morel, Y. (2004). Dietary Polyphenols Increase Paraoxonase 1 Gene Expression by an Aryl Hydrocarbon Receptor-Dependent Mechanism. Molecular and Cellular Biology 24(12), 5209–5222. doi:10.1128/ MCB.24.12.5209.
- Harel, M., Aharoni, A., Gaidukov, L., Brumshtein, B., Khersonsky, O., Meged, R., ... Tawfik, D. S. (2004). Structure and evolution of the serum paraoxonase family of detoxifying and anti-atherosclerotic enzymes. Nature Structural & Molecular Biology, 11(5), 412–9. doi: 10.1038/nsmb767.
- Hassett, C., Richter, R. J., Humbert, R., Chapline, C., Crabb, O. J. W., Omiecinski, C. J., & Furlong, C. E. (1991). Characterization of cDNA Clones Encoding Rabbit and Human Serum Paraoxonase/ : The Mature Protein Retains Its Signal Sequence. Biochemistry 30: 10141–10149.
- 29. Herrmann S, Blanc H, Poirier O, et al. 1996. The Gln/Arg polymorphism of human paraoxonase

(PON 192) is not related to myocardial infarction in the ECTIM Study. Atherosclerosis 126: 299– 303.

- Hong, S. H., Song, J., Min, W. K., & Kim, J. Q. (2001). Genetic variations of the paraoxonase gene in patients with coronary artery disease. Clinical Biochemistry 34: 475–481.
- Humbert, R, Adler, D. A., Disteche, C. M., Hassett, C., Omiecinski, C. J. & Furlong, C. E. (1993). Nature Genetics 3: 73–96.
- 32. Imai Y, Morita H, Kurihara H, et al. 2000. Evidence for association between paraoxonase gene polymorphisms and atherosclerotic diseases. Atherosclerosis 149:435–42.
- Jakubowski, H., Ambrosius, W. T., & Pratt, J. H. (2001). Genetic determinants of homocysteine thiolactonase activity in humans/: implications for atherosclerosis. FEBS Letters 491: 35–39.
- Khersonsky, O., & Tawfik, D. S. (2005). Structure-Reactivity Studies of Serum Paraoxonase PON1 Suggest that Its Native Activity Is Lactonase. Biochemistry 44: 6371–6382.
- La Du, B. N. (1996). Structural and functional diversity of paraoxonases. Nature Medicine 2: 1186–1187.
- La Du, B.N., Adkins, S., Kuo, C.-L., and Lipsig, D. 1993. Studies on human serum paraoxonase/arylesterase, Chemico-Biological Interactions 87, 25–34.
- Leviev, I., & James, R. W. (2000). Promoter Polymorphisms of Human Paraoxonase PON1 Gene and Serum Paraoxonase Activities and Concentrations. Arteriosclerosis, Thrombosis, and Vascular Biology 20(2): 516–521. doi:10.1161/01.ATV.20.2.516.
- Li W. F., Costa L. G., Richter R. J., Hagen T., Shih D. M., Tward A., Lusis A. J., & Furlong C. E. (2000). Catalytic efficiency determines the *in-vivo* efficacy of PON1 for detoxifying organo- phosphorus compounds. Pharmaco- genetics 10: 767–779.
- Mackness M. I., Mackness B., Durrington P. N., Connelly P. W. and Hegele R. A. (1996). Paraoxonase: biochemistry, genetics and relationship to plasma lipoproteins. Current Opinion in Lipidology 7: 69-76.
- 40. Mackness, B., Mackness, M. I., Arrol, S., Turkie, W., & Durrington, P. N. (1998). Effect of the human serum paraoxonase 55 and 192 genetic polymorphisms on the protection by high density lipoprotein against low density lipoprotein oxidative modification. FEBS Letters 423: 57–60.

- 41. Mackness, M., Arrol, S., Durrington, P.N. 1991. Paraoxonase prevents accumulation of lipoperoxides in low-density lipoprotein. FEBS Letters 286, 152–154.
- Malin, R., Loimaala, A., Nenonen, A., and et al. (2001). Relationship Between High-Density Lipoprotein Paraoxonase Gene M/L55 Polymorphism and Carotid Atherosclerosis Differs in Smoking and Nonsmoking Men. Metabolism 50(9): 1095–1101. doi:10.1053/ meta.2001.25641.
- 43. Mazur A. (1946). An enzyme in animal tissues capable of hydrolyzing the phosphorus-fluorine bond of alkyl fluorophosphates. Journal of Biological Chemistry 164: 271–289.
- 44. Meyer, U. A. (2004). Pharmacogenetics five decades of therapeutic lessons from genetic diversity. Nature Genetics 5: 669–676.
- Mueller, R. F., Hornung, S., Furlong, C. E., Anderson, J., Giblett, E. R., & Motulsky, A. G. (1983). Plasma Paraoxonase Polymorphism/ : A New Enzyme Assay, Population, Family, Biochemical, and Linkage Studies. American Journal of Human Genetics 35: 393–408.
- 46. Nebert, D. W. (1997). Polymorphisms in Drug-Metabolizing Enzymes/: What Is Their Clinical Relevance and Why Do They Exist/? American Journal of Human Genetics 60: 265–271.
- O'Leary, K. A., Edwards, R. J., Town, M. M., Boobis, A. R. (2005). Genetic and other sources of variation in the activity of serum paraoxonase/ diazoxonase in humans: consequences for risk from exposure to diazinon. Pharmacogenetics and Genomics 15: 51–60.
- 48. Richter RJ, Furlong CE. 1999. Determination of paraoxonase (PON1) status requires more than genotyping. Pharmacogenetics 9: 745–53.
- 49. Rochu, D., Chabriere, E. & Masson, P. (2007). Human paraoxonase/: A promising approach for pre-treatment and therapy of organophosphorus poisoning. Toxicology 233: 47–59. doi:10.1016/j.tox.2006.08.037.
- Rojas-García, A. E., Solís-Heredia, M. J., Piña-Guzmán, B., Vega, L., López-Carrillo, L., & Quintanilla-Vega, B. (2005). Genetic polymorphisms and activity of PON1 in a Mexican population. Toxicology and Applied Pharmacology 205(3): 282–9. doi:10.1016/ j.taap.2004.10.015.
- Sanghera, D. K., Aston, C. E., Saha, N., & Kamboh, M. I. (1998). DNA polymorphisms in two

paraoxonase genes (PON1 and PON2) are associated with the risk of coronary heart disease. American Journal of Human Genetics, 62(1), 36– 44. doi:10.1086/301669.

- 52. Santos N. P. C., Ribeiro-dos-Santos Â. K. C., & Santos, S. E. B. (2005). Frequency of the Q192R and L55M polymorphisms of the human serum paraoxonase gene (PON1) in ten Amazonian Amerindian tribes. Genetics and Molecular Biology 28(1): 36–39.
- Scacchi, R., Corbo, R. M. Rickards O. & De Stefano G F. (2003). New Data on the World Distribution of Paraoxonase (PON1 GIn 192'!Arg) gene frequencies. Human Biology 75(3), 365–373.
- 54. Serrato M. and Marian A.J. (1995). A variant of human paraoxonase/arylesterase (HUMPONA) gene is a risk factor for coronary artery disease. Journal of Clinical Investigation 96, 3005–3008.
- 55. Simpson, N. E. Serum arylesterase levels of activity in twins and their parents. American Journal of Human Genetics 23: 375-382, 1971.
- 56. Sirivarasai, J., Kaojarern, S., Yoovathaworn K., & Sura T. (2007). Paraoxonase (PON1) poly morphism and activity as the determinants of sensitivity to organophosphates in human subjects. Chemico-Biological Interactions 168: 184–192. doi:10.1016/j.cbi.2007.04.006.
- Smolen A., Eckerson H. W., Gan K. N., Hailat N., & La Du B. N. (1991). Characteristics of the genetically determined allozymic forms of human serum paraoxonase/arylesterase. Drug Metabolism and Disposition 19(1), 107–112.
- Suehiro, T., Nakamura, T., Inoue, M., Shiinoki, T., Ikeda, Y., Kumon, Y., Shindo, M., et al., 2000, A polymorphism upstream from the human paraoxonase (PON1) gene and its association with PON1 expression. Atherosclerosis 150:295–298.
- Vekic, J., Kotur-Stevuljevic, J., Jelic-Ivanovic, Z., Spasic, S., Spasojevic-Kalimanovska, V., Topic, A., Zeljkovic, A., Stefanovic, A. & Zunic, G. (2007). Association of oxidative stress and PON1 with LDL and HDL particle size in middle-aged subjects. European Journal of Clinical Investigation 37(9): 715–23.
- 60. Zama T., Murata M., Matsubara Y., Kawano K., Aoki N., Yoshino H., Watanabe G., Ishikawa K. and Ikeda Y. (1997). A ¹⁹²Arg variant of the human paraoxonase (*HUMPONA*) gene polymorphism is associated with an increased risk for coronary artery disease in the Japanese. Arteriosclerosis, Thrombosis and Vascular Biology 17: 3565–3569.

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[2] Twetman S, Axelsson S, Dahlgren H, Holm AK, Källestål C, Lagerlöf F, et al. Caries-preventive effect of fluoride toothpaste: A systematic review. Acta Odontol Scand 2003;61:347-55.

Article in supplement or special issue

[3] Fleischer W, Reimer K. Povidone iodine antisepsis. State of the art. Dermatology 1997;195 Suppl 2:3-9.

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[4] American Academy of Periodontology. Sonic and ultrasonic scalers in periodontics. J Periodontol 2000;71:1792-801.

Unpublished article

[5] Garoushi S, Lassila LV, Tezvergil A, Vallittu PK. Static and fatigue compression test for particulate filler composite resin with fiber-reinforced composite substructure. Dent Mater 2006.

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[6] Hosmer D, Lemeshow S. Applied logistic regression, 2nd edn. New York: Wiley-Interscience; 2000.

Chapter in book

[7] Nauntofte B, Tenovuo J, Lagerlöf F. Secretion and composition of saliva. In: Fejerskov O, Kidd EAM,

editors. Dental caries: The disease and its clinical management. Oxford: Blackwell Munksgaard; 2003. p. 7-27.

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[8] World Health Organization. Oral health surveys - basic methods, 4th edn. Geneva: World Health Organization; 1997.

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[9] National Statistics Online—Trends in suicide by method in England and Wales, 1979-2001. www.statistics.gov.uk/downloads/theme_health/ HSQ 20.pdf (accessed Jan 24, 2005): 7-18. Only verified references against the original documents should be cited. Authors are responsible for the accuracy and completeness of their references and for correct text citation. The number of reference should be kept limited to 20 in case of major communications and 10 for short communications.

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