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EFFICACY OF *Ocimum basilicum* EXTRACTS AND ITS SYNERGISTIC ACTION WITH THIAACLOPRID AGAINST LARVAE OF THE FILARIAL VECTOR, *Culex quinquefasciatus* (Say)

Prejwltta Maurya^a, A.K.Kulshrestha^{b}*

Abstract: Petroleum ether, Hexane and Methanol extracts of *Ocimum basilicum* were tested for their larvicidal activity against *Culex quinquefasciatus*, a filarial vector, using WHO standard procedures. Among the three extracts, extract of PEE (Petroleum Ether Extract) was found to be highly effective with LC₅₀ and LC₉₀ being 10.06 and 129.32 ppm respectively after 24 hrs of exposure. Thiacloprid, a neonicotinoid insecticide, were also studied for their larvicidal activity which showed LC₅₀ 5.290 ppm and LC₉₀ 18.058 ppm after 24 hrs of treatment respectively. Synergistic studies of PEE with thiacloprid revealed *O. basilicum* as a more efficient synergist with synergistic factor (SF) of 1.69 for LC₅₀ value and 1.23 for LC₉₀ value. Thus, ratio 1:1 of *O. basilicum* and thiacloprid was found to be a better larvicidal and synergistic agent at all tested ratios. Evidence indicates that mixed formulations of phytoextracts with insecticides might reduce the concentration of the chemicals to be applied for vector control and reduce effective dose for vector control leading to improved resistance, management and costs.

Key words : Synergism, filariasis, *Culex*, *Ocimum*, thiacloprid

Running head : Synergism against filarial vector

INTRODUCTION

Vector-borne diseases constitute 17% of the global burden of infectious diseases. Among them, 1.3 billion people in 72 countries worldwide are under the threat of filariases, 120 million are infected and 40 million are disfigured¹. *Culex quinquefasciatus* say is the main transmitter of bancroftian filariasis in the world; it is caused by *Wuchereria bancrofti* (Cobbald), a helminth that lives in the lymph glands and vessels that provoke edemas by lymph obstruction. It is responsible for the more severe clinical

manifestations in the lower limbs (elephantiasis) and the scrotum.^{1,2} The high *C. quinquefasciatus* population density in the cosmo tropical area has triggered several interventions by the public health authorities using wide synthetic insecticide application as the main means of combat and control. However, control of such diseases is becoming increasingly difficult because the overproduction of detoxifying mechanisms of chemical insecticides have been reported for *Culex* species.³

Earlier, chemical insecticides were

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used commonly in many parts of the country for controlling mosquitoes either by killing or repelling them. However, the appearance of mosquito resistance to conventional insecticides together with public concern about the safety and availability of the insecticides have necessitated the search for alternative insecticides that are environmentally acceptable and cost effective. Therefore, researchers are engaged in identifying the use of eco-friendly and biodegradable natural insecticides of plant origin for controlling vector borne diseases. These substances have low toxicity and less persistence in flora, fauna or soil. However, their use has been restricted due to structural complexity, low availability, instability and low potency as compared to synthetic chemicals.

It is, thus, essential to explore alternative strategies and develop potent and safer insecticidal agent. Therefore, a binary approach consisting of broad spectrum screening of natural products and their derivatives in combinations with conventional or synthetic insecticide has been made.

MATERIALS AND METHODS

Synthetic insecticide

Thiacloprid (50% EC) was obtained from the district malaria office at Agra and diluted in dechlorinated tap water to obtain a concentration of 50 ppm stock and working concentrations were prepared according to P Mayurya and A.K. Kulshrestha.³

Phytoextract

Leaves of *Ocimum basilicum* were

collected, washed, dried in shade and finally powdered. The powdered leaves were subjected individually to different solvents (petroleum ether, hexane and methanol) in a Soxhlet apparatus (Borosil, Mumbai, India) for up to 72 h, each for complete extraction.⁴ After removing the respective solvent from the plant extract in a vacuum rotary evaporator, viscous paste was obtained. The crude (10 g) obtained from each solvent was dissolved in 100 ml of ethanol to obtain stock solutions of 10⁵ ppm. These stocks were further diluted to get desired working concentrations.

Binary Combination

For combinatorial studies, the stock solutions were prepared having equal concentrations of thiacloprid and PEE of *O. basilicum*, singly. Standard thiacloprid was mixed with *O. basilicum* in the ratios of 1:1, 1:2 and 1:4. Final solutions were prepared by serial dilution to obtain the final emulsion concentrations of the combinations.

Bioassay

Twenty three instar *Cx. quinquefasciatus* larvae obtained from lab culture were exposed to working test combinations independently. Experiments were conducted in triplicates along with controls conducted in parallel for each series following standard⁵ procedures at 27±1°C and 85±5% relative humidity. The larval mortality in both, the treatment and control, was recorded after 24 and 48 h of treatment. All data were then subjected to probit analysis⁶ to calculate the LC₅₀ and LC₉₀ at 95% confidence intervals along with ², regression coefficient and related

toxicity. Relative toxicities were calculated.

The co-toxicity coefficient⁷ and

$$\text{Co-toxicity coefficient} = \frac{\text{Toxicity of insecticide (alone)}}{\text{Toxicity of insecticide with plant extract}} \times 100$$

$$\text{Combined factor (CF)} = \frac{\text{Toxicity of insecticide (alone)}}{\text{Toxicity of insecticide with plant extract}}$$

Value of CF > 1 indicates synergism and CF < 1 indicates the antagonism

RESULTS

Bioefficacy of Thiacloprid

The larvicidal potentiality of thiacloprid against *Cx. quinquefasciatus* is given in Table 1 and Figure 1. LC₅₀ values are 5.290± 0.836 ppm with 6.930 and 3.649 ppm being the upper and lower fiducial limits respectively and LC₉₀ 18.058 ±

synergistic factor⁸ for mixed formulation were also calculated for each combination.

10.352 ppm with 48.349 and 7.767 ppm being the upper and lower fiducial limits respectively after 24 hours. LC₅₀ value was 3.309±0.610 ppm and LC₉₀ was 13.827 ± 2.959 ppm with 4.506 and 2.111 ppm being the upper and lower fiducial limits for the former and 19.628 and 8.026 ppm for the later after 48 hours of exposure period.³

Table 1: Toxicity of insecticides, thiacloprid and *Ocimum basilicum* extracts against culicine larvae

Insecticide Selected	Solvent extract	Exposure Period (hrs.)	2	Regression equation	LC ₅₀ ±SE (Fiducial limits) (ppm)	Relative toxicity irrespective of time period	LC ₉₀ ±SE (Fiducial limits) (ppm)	Relative toxicity irrespective of time period
Thiacloprid		24	2.16	1.768X-1.95	5.290± 0.836 (6.930-3.649)	1.598	18.058± 10.352 (48.349-7.767)	1.306
		48	3.83	2.063X-1.86	3.309± 0.610 (4.506-2.111)	1.00	13.827± 2.959 (19.628-8.026)	1.00
<i>Ocimum basilicum</i>	Hexane	24	1.26	1.18X+2.19	27.14±6.85 (39.52-8.71)	8.201	235.38±98.40 (507.84-82.92)	17.023
		48	1.24	1.19X+2.35	15.02±2.38 (29.53-4.52)	4.539	194.23±71.59 (338.66-69.80)	14.047
	Methanol	24	1.11	1.24X+1.53	63.48±20.78 (104.21-22.76)	19.184	689.71±315.96 (1308.99-76.42)	49.881
		48	0.91	1.19X+0.93	53.77±16.30 (85.72-21.82)	16.249	388.87±116.19 (616.61-161.13)	28.123
	Petroleum-ether	24	5.31	1.15X+2.69	10.06±2.69 (15.28-4.71)	3.040	129.32±53.48 (234.15-24.49)	9.352
		48	5.98	1.24X+2.79	6.06±1.80 (9.60-2.53)	1.831	65.68±21.37 (107.57-23.78)	4.750

Bioefficacy of *Ocimum basilicum*

Table 1 and Figure 1 reveal that the crude petroleum ether extract (PEE) of *Ocimum basilicum* was the most effective against the culicine larvae as compared to hexane (HEE) and methanol extracts (MEE). The PEE of leaves of *Ocimum basilicum* was observed to be more effective with LC₅₀ values of 10.06±2.69 ppm and 6.06±1.80 ppm after 24 and 48 hrs respectively. The PEE followed HEE with LC₅₀ values of 27.14±6.85 ppm and 15.02±2.38 ppm after 24 and 48 hrs of exposure respectively. The MEE

possesses lowest potency with LC₅₀ value of 384.84±30.70 ppm after 24 hrs. and 53.77±16.30 ppm after 48 hrs. of exposure. The LC₉₀ values also show the similar trend as shown by LC₅₀. In case of PEE, LC₉₀ values were 129.32 ±53.48 ppm after 24 hrs and 65.68±21.37 ppm after 48 hrs respectively. The LC₉₀ values of HEE were 235.38±98.40 after 24 hrs of exposure and 194.23±71.59 ppm after 48 hrs of exposure. LC₉₀ values for MEE were 689.71±315.96 ppm and 388.87±116.19 ppm after 24 and 48 hrs respectively.⁹

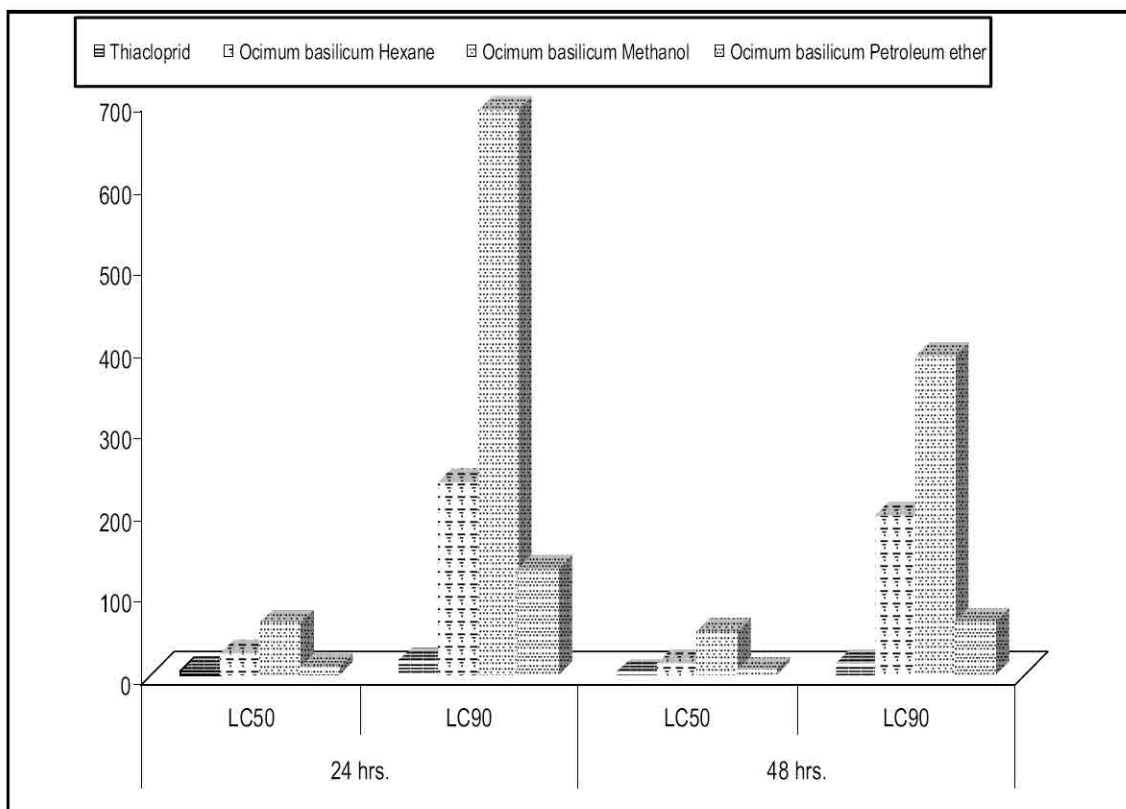


Figure 1: Toxicity of insecticides, thiacloprid and *Ocimum basilicum* extracts against culicine larvae

Binary combinatorial bioassay

Thiacloprid and PEE of *Ocimum basilicum*

The combinatorial bioassay of different ratios of thiacloprid and crude petroleum ether extract of *O. basilicum* leaves against culicine larvae are evident from Table 2. The table shows that the ratio 1:1 has LC₅₀ 3.12±0.88 ppm with 4.85 and 1.38 ppm being the upper and lower fiducial limits respectively and LC₉₀ 14.57±4.33 ppm with 23.05 and 6.09 ppm upper and lower fiducial limits respectively after 24 hours; and, after 48 hours of exposure, LC₅₀ was 1.97±0.43 ppm and LC₉₀ was 11.88±3.08 ppm with 1.99 and 0.93 ppm being the upper and

lower fiducial limits for the former and 17.92 and 5.84 ppm for the later.

It is evident from Table 3 that in case of LC₅₀ values, the co-toxicity coefficient of ratio 1:1 was 169.55 and 167.96 and combined factor was 1.69 and 1.67; and, in case of LC₉₀ values, the co-toxicity coefficient was 123.93 and 116.38 and combined factor was 1.23 and 1.16 after 24 and 48 hours of treatment respectively. In both the treatments, the nature of action was synergistic.

The LC₅₀ and LC₉₀ values of the ratio 1:2 was 5.11±1.30 ppm and 18.79±9.28 ppm respectively with 6.35 and 4.11 ppm upper and lower fiducial limits for the former and 36.98 and 0.60

Table 2 : Toxicity of different combinations of thiacloprid with petroleum ether crude extract of *Ocimum basilicum* against culicine larvae

Ratio	Exposure (Hrs)	Regression equation	²	LC ₅₀ ± S.E. (Fiducial limits)	Relative toxicity irrespective to time period	LC ₉₀ ± S.E. (Fiducial limits)	Relative toxicity irrespective to time period
1:1	24	1.13X+3.29	1.83	3.12±0.88 (4.85-1.38)	1.58	14.57±4.33 (23.05-6.09)	1.22
	48	1.47X+3.23	3.36	1.97±0.43 (1.99-0.93)	1.00	11.88±3.08 (17.92-5.84)	1.00
1:2	24	11.43X-83.33	4.57	5.11±1.30 (6.35-4.11)	2.59	18.79±9.28 (36.98-0.60)	1.58
	48	11.14X -104	8.81	3.29±0.44 (3.47-0.71)	1.67	16.01±5.25 (26.28-5.70)	1.34
1:4	24	3.23X-3.84	2.811	6.87±0.91 (8.20-4.63)	3.48	41.62±7.36 (75.67-27.58)	3.50
	48	3.32X-3.91	2.15	6.01±0.82 (7.61-4.38)	3.05	35.10±15.53 (65.54-4.66)	2.95

ppm for the later after 24 hours; and, after 48 hours of treatment, LC₅₀ was 3.29±0.44 ppm with 3.47 and 0.71 ppm upper and lower fiducial limits respectively and LC₉₀ value was 16.01±5.25 ppm with 26.28 and 5.70 ppm respectively being the upper and lower fiducial limits.

In case of ratio 1:2, the co-toxicity coefficient was 103.52 and 100.50 and combined factor was 1.03 and 1.00 for LC₅₀ values with synergistic action and, for LC₉₀ values, the co-toxicity coefficient was 96.10 and 86.36 and combined factor was 0.96 and 0.86 after 24 and 48 hours respectively indicating antagonistic activity. Similarly, 1:4 also showed antagonism (Table 3).

being 7.61 and 4.38 ppm respectively and LC₉₀ was 35.10±15.53 ppm with 65.54 and 4.66 ppm being the upper and lower fiducial limits respectively (Table 2).

Considering the relative toxicity irrespective of exposure period, 1:1 ratio (48 hrs.) was more toxic; followed by 1:1 (24 hrs.), 1:2 (48 hrs.), 1:2 (24 hrs.), 1:4 (48 hrs.) and 1:4 (24 hrs.) with relative toxicity of 1.00, 1.58, 1.67, 2.59, 3.05 and 3.48 respectively in case of LC₅₀. LC₉₀ follows the similar pattern as LC₅₀: ratio of 1:1 (48 hrs.) was more toxic; followed by 1:1 (24 hrs.), 1:2 (48 hrs.), 1:2 (24 hrs.), 1:4 (48 hrs.) and 1:4 (24 hrs.) with relative toxicity of 1.00, 1.22, 1.34, 1.58, 2.95 and 3.50 respectively (Table 2).

Table 3 : Categorization of different combinations of thiacloprid with petroleum ether crude extract of *Ocimum basilicum* against culicine larvae

Ratio	Analysis with LC ₅₀ values				Analysis with LC ₉₀ values		
	Exposure (Hours)	Co-toxicity coefficient	Combined factor	Nature of action	Co-toxicity coefficient	Combined factor	Nature of action
1:1	24	169.55	1.69	S	123.93	1.23	S
	48	167.96	1.67	S	116.38	1.16	S
1:2	24	103.52	1.03	S	96.10	0.96	A
	48	100.50	1.00	S	86.36	0.86	A
1:4	24	77.001	0.77	A	43.38	0.43	A
	48	55.05	0.55	A	39.39	0.39	A

The LC₅₀ and LC₉₀ values of ratio 1:4 have been 6.87±0.91 ppm and 41.62±7.36 ppm respectively with 8.20 and 4.63 ppm as the upper and lower fiducial limits for the former and 75.67 and 27.58 ppm for the later after 24 hours; and, after 48 hours of exposure period, LC₅₀ 6.01±0.82 ppm with upper and lower fiducial limits

The plant extract enhanced the larvicidal activity of thiacloprid when applied in combinations, as compared to single treatments. Larvicidal potentiality was shown to increase with the time.¹⁰ It was also seen that synergistic activity was directly proportional to the exposure period.¹⁰

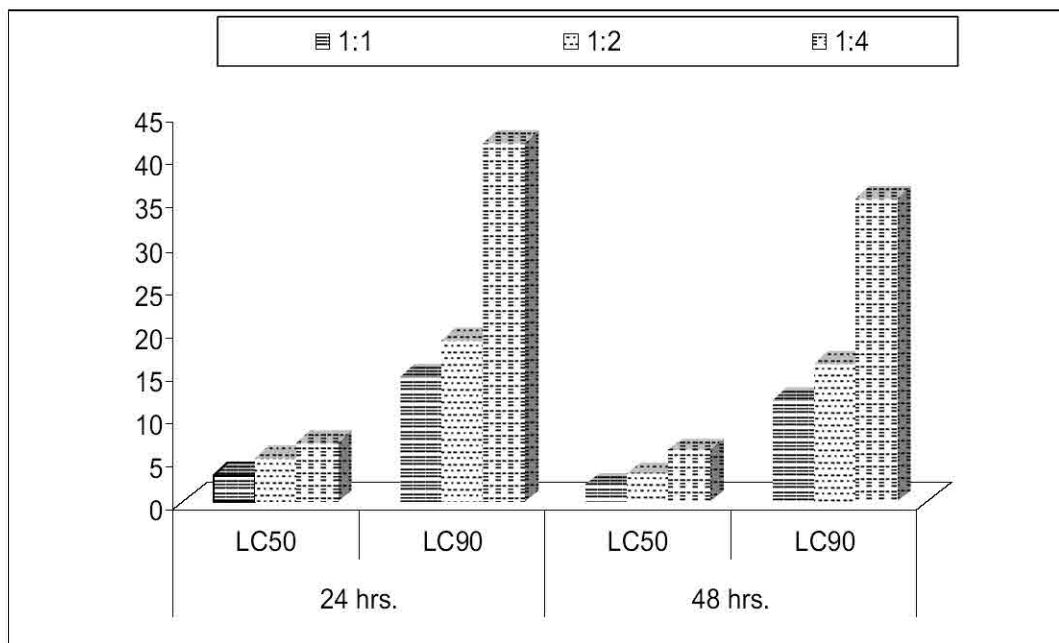


Figure 2: Toxicity of different combinations of thiacloprid with petroleum ether crude extract of *Ocimum basilicum* against culicine larvae

DISCUSSION

Thiacloprid is the member of the neonicotinoid insecticides and exhibits strong insecticidal activity against sucking and chewing insects, primarily aphids and whiteflies. The activated metabolite of thiacloprid has neurotoxic mode of action by disruption of the insect's nervous system by inhibiting nicotinic acetylcholine receptors, finally resulting in the death of the targeted pests.

According to Corbett (1974),¹¹ the general theory of synergism results from the ability of one molecule to interfere with the metabolic detoxification of the other. However, authors have also suggested that synergism may be related to a disruption of different physiological systems in insects.^{12,13,14} Corbel et. al. (2003) observed synergistic activity between permethrin and propoxur

against *Cx. quinquefasciatus* larvae.¹⁵ The synergism between DEET (N, N-diethyltoluamide) and propoxur against *Ae. aegypti* was reported by Pennetier et. al. (2005).¹⁶

The toxicity of the binary mixtures of *Annona squamosa* and *Pongamia glabra* at ratios of 3:1, 1:1 and 1:3 against *Cx. quinquefasciatus* was evaluated by George and Vincent (2005)¹⁰ : the LC₅₀ values were 0.828, 0.288 and 1.120 ppm and the synergistic factors were 5.3, 15.1 and 3.9 respectively, demonstrating synergistic action at all tested ratios. The ratio of 1:1 appeared to be more effective than the ratios of 3:1 and 1:3.¹⁰ Mohan et al. (2006)¹⁸ evaluated the joint action of cypermethrin and *S. xanthocarpum* petroleum ether root extract in the ratios of 1:1, 1:2 and 1:4 against *Cx. quinquefasciatus* larvae giving synergistic factors of 1.09, 0.98 and 0.67

respectively; the ratio of 1:1 revealed synergism and other ratios showed antagonism. With *An. stephensi*, all the ratios of 1:1, 1:2 and 1:4 act synergistically giving synergistic factors of 6.83, 6.47 and 4.99; the ratio of 1:1 acted more synergistically than the other ratios.¹⁹ The combination of pesticide in an equal ratio worked synergistically than the other ratios. The present findings are similar to the findings of George and Vincent (2005)¹⁰ and Mohan et. al. (2006)¹⁸ and Mohan et. al. (2007).¹⁹

Madhu and Vijayan (2010)²⁰, using WHO standard procedures, studied synergistic actions of all 3 plant extracts *Piper longum*, *Curcuma aromatica* and *Ocimum basilicum* with propoxur against *Culex quinquefasciatus*, a filarial vector, and demonstrated that *P. longum* was more efficient with a synergistic factor (SF) of 4.13 for LC₅₀ value and 1.68 for LC₉₀. Aivazi and Vijayan (2010)²¹ observed synergism between *Ruta graveolens* and cypermethrin with the co-toxicity coefficient and synergistic factor for the LC₅₀ value of mixture of 1:1 ratio at 24 hour being 119.4 and 9.94 respectively. Mohan et. al. (2010)²² observed the combination activities of temephos, fenthion and petroleum ether extract of *Solanum xanthocarpum* against *Culex quinquefasciatus*. The combination of temephos and *S. xanthocarpum* was tested at the ratios of 1:1, 1:2 and 1:4. Similar ratios were also used for the combination of fenthion and *S. xanthocarpum*. The temephos / plant extract combination acted antagonistically. The combination of

fenthion and plant extract acted synergistically against the target organisms at the ratio of 1:1 and LC₅₀ values showed effective 0.0144 and 0.0056 ppm and LC₉₀ 0.0958 and 0.0209 ppm at 24 and 48 hours respectively. Maurya et. al. (2012)²³ evaluated the larvicidal activities of different combinations of synthetic nicotinoid insecticide and imidacloprid with an insecticidal plant, *Ocimum basilicum*, against *Anopheles stephensi* and showed that the binary mixtures of ratio 1:1 was most effective as compared to 1:2 and 1:4 against mosquito larvae and showed synergism in all cases tested.

In our study, the fact that a sub-lethal dose of *Ocimum basilicum* strongly increased the toxicity of thiacloprid against susceptible mosquitoes suggests the manifestation of an important physiological disruption at the synaptic level.

CONCLUSION

The significance of our studies lays in the fact that synergism between natural products and synthetic compounds can improve the efficacy of natural products and minimize the use of synthetic chemicals to avoid the environmental impact. It can lead us towards a greener and effective control measure for various diseases.

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Case Report

PRERENAL AZOTEMIA, REPEATED SEIZURES WITH HYPOGLYCEMIA, HYPOTENSION AND HYPOTHERMIA ASSOCIATED WITH IRREVERSIBLE BRAIN DAMAGE IN CEREBRAL MALARIA

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Abstract: Malaria associated long term neurological impairment is uncommon in India. We observed an irreversible brain damage following cerebral malaria in a 10 year old girl admitted to the Medical College, Jabalpur, Central India. Brain damage was associated with hyperpyrexia, prerenal azotemia, multiple seizures and hypoglycaemia. Patient developed hypotension and hypothermia with the passage of time. Cerebro-spinal Fluid examination showed no sign of meningeal irritation. Patient was discharged from the hospital 3 months later with major neurological impairment characteristic of "Cerebral Diplegia". The extent of brain damage was also assessed by measuring the plasma levels of total human tau (axonal damage) at admission. The identification of signature characteristics of long term neurological impairment may help in better understanding the progress of illness and management.

Background

Cerebral malaria (CM) is a diffuse encephalopathy that is responsible for 10% of short or long term neurological complications among survivors.¹ Clinical features like hyperpyrexia, frequent seizures and hypoglycemia are associated with neurological sequelae. We describe here a case of cerebral malaria recovered with gross disability characterized as "cerebral diplegia" (inability to talk, sit or eat independently).

Case Presentation

A ten year old girl (body weight: 22 Kg) was admitted to a private trust hospital in

Jabalpur (Central India) on the evening of 6th day of March, 2006 due to sudden unconsciousness with the history of high grade fever (40.5^o C) with chills and rigor for 24 hrs associated with headache, body ache and vomiting. Her hospitalization continued. However, due to no improvement in her condition, she was transferred to another private hospital on 8th of March, 2006. She subsequently experienced many episodes of generalized tonic clonic seizures. Later, she was diagnosed with cerebral malaria (CM) with repeated seizures and anemia. Intravenous quinine, mannitol and anticonvulsant

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along with 1 unit of blood transfusion were carried out. At this time, on 10th of March 2006, she was referred to Netaji Subash Chandra Bose (NSCB) Medical College Hospital, Jabalpur. At the time of admission to NSCB, she was comatose (Glasgow Coma Score = 3) with no sign of meningeal irritation. Deep tendon response and superficial reflexes were not elicited and pupils were sluggishly reacting to the light. Patient was hypotensive and hypoglycaemic (RBS = 28 mg %). The patient was tested for *P. falciparum* parasitemia both by blood smear examination and HRP-2 based RDT (rapid diagnostic kit; ParaHIT Pf®; although parasitemia was exceedingly low yet RDT band was very intense).

Blood cell count and biochemical investigations revealed Hb (haemoglobin) = 11.4 g/dL, total leukocyte count = 11200/mm³, Na⁺ = 152 m. eq, K = 5 m. eq, blood urea = 146.1 mg%, serum creatinine = 2.72 mg%, Random blood sugar = 65 mg%, serum bilirubin = 1.29 mg%, SGOT (AST) = 284 IU, (ALT) SGPT = 240 IU. Patient's renal function was impaired and CSF examinations were within normal limits. Blood pressure varied between 80 to 110 systolic during the first 12 hrs of hospitalization. The patient remained deeply comatose and went into decompensated shock afterwards on 11th of March 2006 (after 36 hours of admission). Hypoglycemia again developed on 11th of March 2006 (RBS = 24 mg%).

Treatment with $\alpha\beta$ arteether, anticonvulsants and other supportive therapies (antibiotics and fluid)

commenced at the medical college hospital. After 52 hours of admission, the patient developed hypothermia which continued for a week. She was administered another unit of blood transfusion after 15 days of hospitalization. In the absence of CT scan and MRI facilities in the hospital, no further investigation could be carried out. She remained unconscious for about 45 days and recovered with an adverse outcome, characterized as "Cerebral diplegia" (i.e. inability to talk, sit or eat without support). She was discharged from the hospital after 3 months on 17th of June 2006 with major neurological impairments. Anticonvulsant therapy was continued as she developed occasional epileptic seizure episodes (frequency of seizure increased by 8 – 10 episodes per month in the absence of anti-convulsants). She was followed up for about 5 years regularly till her death in May 2011. She was reported to experience epileptic seizures (1-2 times in a month) for first two follow-up years. Use of the anticonvulsant was terminated as the patient experienced no seizures in subsequent years of follow-up.

Patient's history revealed that she had visited the district of Katni (Primary Health Center – Dheemerkheda, a highly malarious area, approximately 150 km from the city of Jabalpur) with her mother for 2 weeks prior to contracting malaria. She developed fever 3-4 days after her return. The patient's mother also developed a high grade fever with chills and rigor and was simultaneously found positive for *P. falciparum* infection on 10th March 2006, but no complication developed. According to the patient's

family, the patient carried normal health prior to hospitalization (Figure 1).

Plasma total tau levels were determined for identifying the extent of axonal injury, using the blood sample collected at the time of patient's admission by ELISA (Biosource International, Camarillo, California, USA). Tau is a phosphorylated microtubule associated protein, considered to be important for maintaining the stability of axons. About 864.4 pg/ml of total tau was detected; this is considered relatively very high as compared with the earlier studies on CSF samples obtained from 52 Vietnamese adults with severe malaria. A median level of tau identified was 240 pg/ml.²

Long term neurological sequelae have been described to be associated with the cerebellar dysfunction.^{3,4} However, reports on prolonged cerebral dysfunction are lacking.^{5,6} As the peripheral blood smear revealed malarial

parasites both in the mother and the child after the history of their recent travel to a malaria endemic area, the patient was considered to be a case for cerebral malaria, prerenal azotemia, repeated seizures with hypoglycemia, hypotension and hypothermia causing irreversible brain damage. In the present study, the patient appeared to exhibit post encephalitis sequelae. However, no information was available on any pre-existing infection or clinical condition. A report on Malawi children suggests that 23% of malaria attributable deaths are caused by other pre-existing medical conditions.⁷ The precise description of the characteristics of long term neurological impairment may help in better understanding the progression of CM and treatment options. It is essential that patients showing any evidence of neurological sequelae must be followed up for a longer period of time to identify these signature events for the better management.



Figure 1: (A) Normal patient three days before hospitalization, (B) One year after recovery from CM.

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FOOD HABITS OF MANKIRDIA CHILDREN - A PRIMITIVE TRIBE IN ODISHA

Gargi Dhar^a

Abstract: A study was conducted on Mankirdia children, a primitive tribal school going children, aged 6-11yrs (either boys/girls), living in different villages at Kaptipoda and Khunta block of Mayurbhanj district in Odisha to identify, (i) meal pattern and dietary sources, (ii) daily consumption of different food groups and (iii) daily nutrient intake. Study included (a) 3 days Dietary recall method, (b) Food frequency questionnaire, (c) Information related to foods provided by Mid-Day Meal Scheme (checklist) and (d) Parental enquiry on dietary habit of the child (checklist) among 60 samples. It was found that Mankirdia children were consuming 3 meals on average per day and food intake was dependent mainly on availability. Other than protein, carbohydrate and vitamin C; calcium, iron and carotene were consumed in very less quantity by the Mankirdia children. As they live in forest ecosystem, their diet comprises variety of unconventional foods, i.e., edible forms of stem, leaves, flowers, fruits, tubers, reptiles, rodents and other flesh foods available from the forest.

INTRODUCTION

The Mankirdia constitutes a semi nomadic section of the Birhor tribe. Based on low level of literacy (5.49%), pre-agricultural technology and declining or stagnant population (Decadal growth rate -29.58 as per 2001 census), they have been declared as "Primitive Tribal Group" (PTG) of Odisha. They are primarily hunting and food gathering community. They are called Mankidi/Mankirdia due to their traditional skills of rope making and trapping, and eating monkey flesh. In the districts of Kalahandi and Sundargarh, they are named 'Mankidi'; whereas in Mayurbhanj and Sambalpur districts, they are called 'Mankirdia'.¹

Several focused interventions for their development and improvement in their health and nutritional status have been initiated in the last three decades. Although, there has been marginal

reduction in the prevalence of severe forms of under-nutrition and nutritional deficiency disorders, there has been no marked improvement in their food and nutrient intake. Earlier studies have showed that genetic potential, the intra-uterine environment, mother's nutritional status (pre and post-pregnancy), neonatal nutrition and associated traditional behavior influence the growth and development of individuals.² Reports regarding dietary habits and nutritional health statuses on Mankirdia tribes are few; therefore, present studies were carried out to determine food habits of PTG, Mankirdia. The objectives of the present studies were: (i) To identify the meal pattern and dietary sources of Mankirdia children, (ii) To study the daily consumption of different food groups of Mankirdia children and (iii) To find out daily nutrient intake.

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METHODOLOGY

Sampling : The sampling for the study was done in 3 different systematic steps: 1 Selection of the district, 2 Selection of tribe, village and households and 3 Selection of sample through indepth interviews. Mayurbhanj district in Odisha was selected first for the study as it constitutes 16 percent of the tribal population of the state. Most vulnerable PTG Mankirdia was selected for this study. 168 Mankirdia households from different Villages (Uthanisahi, Baliposi and Dengum) of Kaptipoda and Khunta blocks of Mayurbhanj district were selected for the study with simple random sampling. Purposive sampling method was used to collect the respondents for the study. One child from each selected household was interviewed.

The Sample : A total 60 school going children in the age group of 6-11 years (boys and girls, in equal ratio) were selected for the study from Mayurbhanj district of Odisha. School going tribal children were selected as they consume different nutrients rich foods in terms of Mid Day Meal, along with their traditional home food.

Selection Criteria : School going children (boys and girls) of 6-11 years in age, belonging to Mankirdia tribe, free from genetic diseases, were included after obtaining oral/written consent.

Data Collection : Primary data was collected by interview schedule and observation. The field-work was carried out during the month of June, 2012. But, before going to the field, all the tools were

validated and a pilot study was carried out. Primary data was compared with ICMR's RDA.^{3,4}

Tools and Techniques used for Data Collection : Both, quantitative and qualitative tools were used for data collection in the present study. In quantitative tool, structured interview schedule was used. A checklist was used as a qualitative tool. In this study, Triangulation of the measurement has been implemented. Tools used for the study were: 3 days Dietary recall method (2 working days and 1 holiday); Food frequency questionnaire; Information related to foods provided by Mid-Day Meal Scheme (checklist) and Parental enquiry on dietary habit of that child (checklist).

RESULTS AND DISCUSSION

Assessment of Dietary Intake

Meal Pattern : Mankirdias are non-vegetarian by their food habit. The children have no special liking/disliking of foods and eat whatever is offered.

They consume food 3-4 times a day [breakfast, Lunch/ Mid-day Meal and dinner; few children sometimes take "Pakhal" (cooked rice, soaked in water) as evening snack after returning home from school]. Mostly they consume "Pakhal" with iodine free salt and, if available, dry chilli; alternatively, Pakhal and boiled "sago" or "sajina sago" with small amount of garlic and dry chilli. Details of the home food consumed by Mankirdia children are shown in Table 1.

Table 1: Meal pattern at home

Meals	Items
Breakfast	“Pakhal” with salt-chilli / Sago
Lunch / Mid day Meal	“Pakhal” with salt-chilli / Sago / Potato at home / Mid day Meal at School
Afternoon	Pakhal” with salt-chilli / Sago
Dinner	“Pakhal” with Sago / Dal-Potato /Potato-other Vegetables /Chicken / Fish

Mankirdia children visit school regularly to eat food, which is provided under Mid-day Meal Scheme. Daily menu provided under Mid-day Meal Scheme is depicted in Table 2.

consume some Dal/ vegetables/meat-fish. Most of them consume lentil from pulses group; potato and onion as roots and tubers; drumstick leaves and spinach for green leafy vegetables and tomato,

Table 2 : Meal pattern in school

Days	Menus
Monday	Rice - Dal with vegetables
Tuesday	Rice - Soya Chunks with vegetables
Wednesday	Rice - Egg with vegetables
Thursday	Rice - Dal with vegetables
Friday	Rice - Soya Chunks with vegetables
Saturday	Rice - Egg with vegetables

Children relish school food offered on Wednesday and Saturday, as eggs are served. Children prefer school food menu in the following order: (i) Rice-Egg (ii) Rice-Dal and (iii) Rice-Meal Maker (Soy Chunks). Their food intake depends on the availability of the food. On the day of weekly “Hato”, in the evening, they

brinjal, ladies-finger as vegetables. They do not consume milk. Uses of spices, salt, chillies, garlic, turmeric, oils are made to a limited extent. They consume fruits, collected from wild. When the parents of these children are unable to provide good food, these children consume boiled “jungle aloo” and “jungle sago” for both

lunch and dinner. The types of “jungle aloo” and “jungle sago” consumed by Mankirdias are mentioned in Table 3. Few children when they go to the jungle along with their parents prefer to eat dry fish along with “Pakhal” (Table 3).

Frequency of food intake : Table 4 reveals frequency of food intake. Rice is their staple food and consumed daily.

As pulses are expensive, they consume it once in a week at home and twice a week

in school. They consume green leafy vegetables nearly regularly (purchased / collected from jungle/ Homestead). Roots and tubers like potato, onion and “jungle aloo” are eaten daily considering home food and school food. Other vegetables like Tomato, Brinjal, Ladies-Finger, Bitter gourd are consumed 4-7 times in a week. Fruits, Milk and Milk products are eaten rarely. Meat/ Fishes are consumed once in a week at home and eggs are consumed 1-3 times in a

Table 3: Sources of diet

Foods Collected From Jungle/ Homestead	Foods Purchased From Market	Govt. Assistance
Legumes(Jhurang) : <i>Vigna unguiculata</i>	Pulses	35kg rice from Govt @ of Rs 2 per family
Roots and Tubers : (i) Pita Aloo- <i>Dioscorea pentaphyla</i> (ii) Tunga Aloo- <i>Dioscorea wallichia</i> (iii) Mitha Aloo- <i>Dioscorea puber</i>	Green Leafy Veg : Drum stick leaves, spinach	sugar
Green Leafy Vegetables : Sajina Sago : <i>Bauhinia semla</i> Pita Sago : <i>Clinus oppositifolius</i> Dali sago: <i>Bauhinia purpuria</i> Marshi Sago: <i>Amaranthas viridis</i> Modranga Sago: <i>Alternanthera sessilis</i> Chakunda : <i>Cassia tora</i> Saru : <i>Colocasia esculenta</i> Purni : <i>Trianthema portulacastrum</i> Tokai Kunda: <i>Tellosoma pallid</i> Konta sago: <i>Amaranthas spinosus</i> Nahanga: <i>Celosia argentea</i> Kansaree : <i>Commelina benghanensis</i>	Roots and Tubers: Potato, onion	
	Other Veg: Tomato. Brinjal, Ladies Finger, Bitter gourd	
Monkey, Jungle fowl, wild boar	Broiler Chicken, Fish, Dry Fish	
Flower : Mahua : <i>Madhuka indica</i>	Spices : Turmeric, garlic, ginger, red chilli	
Seed: Mahua : <i>Madhuka indica</i> Neem : <i>Azardachta indica</i>	Oil	

week at school. Sugar is rarely consumed. Oil is often included in the school food (Table 4).

vegetables intake of each category is below 50% of the recommendation.

Table 4: Frequency of food intake of Mankirdia children

Food Stuff	Never / Rare Consumed (Gm)	Consumed once / week (gm)	Consumed 1-3times/ week (gm)	Consumed 4-7 times/week (gm)	Consumed Daily (gm)
Cereals	-	-	-	-	250
Pulses	-	-	25	-	-
Green Leafy Vegetables	-	-	-	-	20
Roots and Tubers	-	-	-	-	30
Other Vegetables	-	-	-	100	-
Citrus Fruits	Rarely	-	-	-	-
Milk and Milk Products	Never	-	-	-	-
Fish/ Egg/ Meat		70gm (Chicken/ Fish)	50gm(Egg)		
Sugar-Jagerry	Rarely	-	-	-	-
Oil-Ghee-Butter	-	-	-	-	3

Dietary Intake of Mankirdia : Table 5 shows that Mankirdia children in all 4 age-sex categories (6years-all, 7-9years-all, 10-11years Boys and 10-11years Girls) consume cereals in higher quantity than the ICMR recommendation (120gm, 180 gm, 300 gm, 240 gm respectively). Intake of pulses is < 50% of the recommendation in all four categories (15 gm, 30 gm, 30 gm, and 30gm respectively).

Green leafy vegetables intake are < 50% of the recommendation for Boys/ Girls-6yrs and < 25% of the recommendation for the rest of the categories (100gm for each group). Roots and tubers and other

With respect to meat/fish/egg, 6yrs old children often consume more than the recommended value and uptake of remaining 3 groups are nearly the same as ICMR recommendation (30 gm for each group). Fat intake of Mankirdia of four different categories is less than 25% of the recommended value. Only very few 10-11yrs old Mankirdia boys consume sugar, but in low quantity. Notably; fruits, milk and milk products are often not included in their daily diet.

It is clear from Table 5 that excluding cereal and meat/fish/egg; pulses, green leafy vegetables, roots and

tubers, other vegetables, fat, sugar, jaggery are consumed in very low quantity by Mankirdia children in comparison to the ICMR recommendations. However, ICMR dietary recommendation may not be suitable for this nomadic PTG and their jungle based life.³ Plausible causes for not consuming balanced diet may be, (i) cost of food, (ii) tradition-wise developed dietary pattern, (iii) ignorance due to lack of nutrition knowledge, (iv) unavailability of food (v) food faddism etc.

Assessment of Nutrient Intake: Table 6 shows mean of daily nutrient intake of Mankirdia children in all 4 age-sex categories (6 yrs, 7-9 yrs, 10-11yrs Boys and 10-11yrs Girls) and its comparison with ICMR (RDA). As can be seen from table 6, daily protein (recommended) intake for 4 different age groups of children is: 20.1gm, 29.5 gm, 39.9 gm and 40.4 gm respectively. Daily protein consumption of Mankirdia children is 21.2 gm for 6 yrs; 26.6 gm for 7-9yrs; 36.7 gm for 10-11yrs Boys and 34.06 gm for

Table 5: Daily average dietary intake of Mankirdia children

Parameters (Gm)	Particulars	Mankirdia			
		Boys/Girls(6yrs)	Boys/Girls (7-9yrs)	Boys (10-11yrs)	Girls (10-11yrs)
Cereal intake	Recommended	120	180	300	240
	Actual	280	318	345	321.67
Pulses intake	Recommended	15	30	30	30
	Actual	11	11.47	11.8	11.16
Green Leafy Veg. intake	Recommended	50	100	100	100
	Actual	19.28	21.67	24	18.33
Roots & Tubers intake	Recommended	100	100	100	100
	Actual	43	43.8	43	48
Other Veg. intake	Recommended	100	100	200	200
	Actual	26.14	22.67	23	24.67
Fruits intake	Recommended	100	100	100	100
	Actual	0	0	0	0
Milk & Milk Products intake	Recommended	500	500	500	500
	Actual	0	0	0	0
Meat/Fish/Egg intake	Recommended	15	30	30	30
	Actual	18.75	27.8	29.2	25.67
Fat/Oil intake	Recommended	25	30	35	35
	Actual	4	3.7	4	3.5
Sugar/Jaggery intake	Recommended	20	20	30	30
	Actual	0	0.07	2	0

10-11yrs Girls. Thus, protein consumption is nearly similar. However, daily fat intakes for all 4 age groups are much below the required dosage. Daily energy intake for all 4 groups, given in the table, indicates that only 6 year old children receive near recommended value. Most differences were observed in RDA for calcium and iron in all groups. Similarly, daily carotene intake was lower than the essential values. Notably, only Vitamin C requirement for all 4 age groups matched the ICMR recommendation.

Table 6 clearly shows that excluding protein, carbohydrate and vitamin C intake, other essential nutrient intake of these children did not match the

recommended values. This is mainly due to their uptake of rice as staple food, combined with the consumption of meat products. Their Vitamin C requirement is fulfilled by the consumption of Sajina sago, a rich source of vitamin C. Lack of milk and oil in their food leads to poor fat and energy intake. Similar observations were noted in a study conducted on 3 other primitive tribal groups (Kharia, Mankirdia and Paudi Bhuyan) which indicated vulnerability to nutritional insufficiency due to seasonal variation in food availability and intake.⁵

It is worthwhile to note that Recommended Dietary Intake and Nutrient intake were used as a primary data of this study which were developed

Table 6: Daily average nutrient intake of Mankirdia children

Parameters	Particulars	Mankirdia			
		Boys/Girls (6yrs)	Boys/Girls (7-9yrs)	Boys (10-11yrs)	Girls (10-11yrs)
Protein Intake	RDA (gm)	20.1	29.5	39.9	40.4
	Actual(gm)	21.2	26.6	36.7	34.06
Fat Intake	RDA (gm)	25	30	35	35
	Actual(gm)	8.77	8.57	9.2	8.29
Carb. Intake	RDA (gm)	0	0	0	0
	Actual(gm)	278.88	278.83	301	281.13
Energy Intake	RDA (Kcal)	1350	1690	2190	2010
	Actual(Kcal)	1304.45	1334.61	1437.4	1336.76
Calcium Intake	RDA (mg)	600	600	800	800
	Actual(mg)	216.92	220.89	226.14	221.96
Iron Intake	RDA (mg)	13	16	21	27
	Actual(mg)	6.73	6.78	7.11	6.77
Carotene Intake	RDA(µg)	3200	4800	4800	4800
	Actual(µg)	1547.49	1648.23	1819.94	1479.76
Vit C Intake	RDA (mg)	40	40	40	40
	Actual(mg)	39	38.05	37.78	39.82

by ICMR on the basis of the life styles of general (urban and rural) Indian population, not specific to primitive tribal groups. These tribal groups are mostly dependent on forest for fruits, roots and tubers, seeds, leaves, mushrooms for their daily needs. In comparison, the urban and rural populations do not consume similar unconventional food sources whose nutritive values are not identified.

It can be concluded from this study that, being a primitive tribal community, Mankirdia's food consumption is totally different from the general population and they were found to consume 3 meals (2 meals at home and 1 meal at school). Their food intake was dependent mainly on the availability of food. As they are forest dwellers, their food source often comprises variety of unconventional foods, viz, edible forms of stem, leaves, flowers, fruits, tubers, reptiles, rodents and other flesh food available in the forest.

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HERBALS FOR THE TREATMENT OF ETHNO-GYNAECOLOGICAL PROBLEMS AMONG THE NILGIRI PRIMITIVE TRIBAL GROUPS

S. Rajan^a

Abstract : *The present article describes the plants used for various ethnogynaecological ailments by the Nilgiri primitive tribes namely, Todas, Kurumbas, Irulas, Paniyas and Kattunayakkas for their gynecological and related health care protection. Total 23 species under 23 genera belonging to 18 families used were collected during the study. Among the 23 plants with gynaecological curative properties, 15 species are utilized for antifertility and abortifacient activities by 5 different primitive communities. The plants are arranged in alphabetical order followed by tribal name, family and description of the plant species.*

INTRODUCTION

The term 'Gynaecology' deals with the administration of health care to women, especially the diagnosis and treatment of disorders affecting the female reproductive organs. A woman's body continuously goes through many changes and development from adolescence to post menopause. Every stage of development and maturation is associated with gynaecological, reproductive as well as sexual health issues. Thus, it is essential for a woman to maintain a good and strong physical health. In general, females over the age of 18 years or sexually active as well as those who are experiencing gynaecological symptoms should have a periodical gynaecological consideration such as breast examination, colposcopy, pelvic ultrasound for diagnosis of abnormalities etc. Some of the common gynecological problems observed in

teenage girls and adolescents include menstrual disorders, urinary tract infections (UTI), eating disorders and vaginitis.

The other more severe gynecological problems may include Adnexal Tumors, Corpus Luteum Rupture, Ovarian Cysts and Vulvovaginitis. Adnexal tumors are masses which grow in the ovaries, fallopian tubes and/or other areas in the female pelvis. Approximately 80 percent of the Adnexal tumors that occur in the prepubescent girls are said to be malignant. Malignant Adnexal tumors usually necessitate the surgery, followed by chemotherapy and/or radiation.

Fertility continues to decline among the primitive tribes for various reasons, but primarily due to inbreeding. Approximately more than 40 % of the tribal populations have adopted family planning measures in Tamil Nadu and Pudhucherry in recent times. The

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awareness should be created among Nilgiri primitive tribe that they should not undergo any family planning due to decline in their population. At present, more than 50 percent of the married women among prohibitive tribes have some gynecological related health problems which include vaginal discharge, urinary infection, pre-term birth, adolescent girls suffering from nutritional anemia etc. Hence, there is a need to expand reproductive health service based programme to the Nilgiri primitive tribal communities.¹

The Nilgiri hill, popularly known as “The Blue Mountains”, is a good repository for medico-ethnobiological and anthropological studies. It is rich in both native and exotic flora of good therapeutic value. The annual rainfall of the district ranges from 1600 – 4800 mm which favours the growth of evergreen forests in this region. There are 6 primitive tribes of anthropological interest living here. They are *Toda*, *Kotas*, *Kurumbas*, *Irulas*, *Paniyas* and *Kattunayakas*. The total tribal population of the district is 25, 0482.² It is conjectured that these groups have lived in the Western Ghats from 700 BC³ and in the Nilgiris from 1200 BC.⁴ Currently, there is a resurgence of interest in medico-ethnobotanical data concerning non-literate primitive groups. A great deal of research thrust dwells on ethnobotany of simple folk societies world-wide.⁵

An Ethnography of Nilgiri tribes

Todas

They are professional dairymen and pastoralists living in the higher altitudes of the district in the traditional houses, called

“Mund”. The community has two exogamous divisions called 'Tarthar' and 'Teivali'. There are 5 socially distinguishable sects (clans) such as *Peiki*, *Pekkan*, *Kuttan*, *Kenna* and *Jodi*. Todas tenaciously maintain their rich cultural heritage and religious identity. Todas believe that they exist only to serve buffaloes which form an integral part of their life. The dairies are temple for this tribe.⁶

Kotas

They are musicians and excellent craftsmen having mastery over iron crafts. Traditionally, their distribution in the district is confined only to 7 villages living in moderate altitudes of the district, namely: Gudalur, Kil-Kotagiri, Kollimalai, Kundah, New Kotagiri (Aggal), Sholur Kokal and Trichigadi. Each village has 3 Keri; known as 'Kizhkheri', 'Nadukeri' and 'Melkeri'. Members living in the same Keri are considered as brotherly clan and hence no marriages are permissible. Keri exogamy is noteworthy among Kotas. They have elaborate ritual practices and their own methods of worship of their family god, Kambattarayan.⁷

Irulas

They are distributed in the lower regions of the district. They are dark complexioned whose chief occupation is wage-earning as plantation laborers in the estates. The community is divided into seven clans (sects): *Devanan*, *Kipper*, *Kalkatti*, *Kurunagar*, *Peradar Pungar* and *Sambar*. Marriage practices are regulated by clan exogamy. Irulas are proficient in magico-religious cure for scorpion, dog and snakebite. They are good herbalists.⁸

Kurumbas

Kurumbas practice hunting and food-gathering economy and are well versed in honey collection techniques. They are plain dwellers in the interior forests of the district. Their staple foods are tubers (*Dioscorea* sp.), wild fruits and other forest produces. Kurumbas are considered to be experts in magico-religious and witchcraft practices. Their social organization is heterogenous in nature having divisions such as *Betta Kurumbas*, *Halu Kurumbas*, *Jenu Kurumbas*, *Mullu Kurumbas* and *Urali Kurumbas*.⁷

Paniyas

The Paniyas are dark skinned people living in bamboo huts at the junction of bordering places of Kerala and Tamil Nadu. They work as labourers with Wynaad Chettis. Their economic status and the educational attainments are very low. They possess excellent skills in the art of fishing by employing certain plant parts like fruits of *Croton tiglium* and leaves of *Centella asiatica* as stupefying agents for catching fishes.⁸

Kattunayakkas

They are another group of forest-dwellers who are nomadic in nature. Their staple foods are honey, wild fruits and tubers. Eating bison flesh is a cultural taboo with them. The social customs and religious practices of Kattunayakas are akin to Kurumbas in many respects. They have curly hair and speak Kannada language. They are good at taming elephants.⁹

METHODOLOGY

The systematic field explorations have

been carried out in various tribal settlements at regular intervals. Medico-ethnogynaecological information concerning 5 tribes was collected with the help of elderly tribal persons or local healers with significant knowledge of plant remedies. Bilateral discussions and open-ended interviews with tribes were held in various settlements to collect the ethno-gynaecological data. All details pertaining to the plant drugs have been recorded in an approved proforma. Standard procedures were followed for the collection of ethno-botanical data, as recommended.¹⁰ The plants are deposited in the herbarium of Survey of Medicinal Plants and Collection Unit, Emerald for the future reference. All plants identification have been verified and further confirmed by their match with authentic plant specimens housed at the Botanical Survey of India (southern circle), Coimbatore.

Abbreviations: Ir.- Irulas; Ka.- Kattunayakas; Ku.-Kurumbas; P.- Paniyas; T.- Todas;

Alocasia indica (Roxb.) Schott **Ku.:** *Kadusembbu Geddai* [Araceae]

A perennial herb up to 5 m high. Leaves alternate; leaf blades 60 cm long, erect, spreading, ovate, sagittate with 1 m long, sheathing petiole. Flowers yellow, spathe fragrance, 2 feet long. Fruit a berry, globose. Cultivated.

Ku.: The rhizome juice or the extract (100 ml) is given orally to men to induce fertility for 3 days in the morning. Same juice is also given as a restorative.

Areca catechu Linn. **Ir.:** *Dakkae Mara* [Arecaceae]

A monoecious tall tree. Leaves terminal, linear-lanceolate. Flowers yellow. Fruits orange yellow. Commonly cultivated.

Ir.: A part of the inflorescence is burned in fire and the ash is mixed in water. A glassful (ca. 100 ml.) of it is given orally to postnatal women to enable easy expulsion of the placenta. Repeated 2 or 3 times with a gap of 2 hours (Uteroaactive agent).

Arisaema leschenaultii Blume **T.:** Putvasack [Araceae]

An erect tuberous herb up to 4 feet high. Leaves compound, radiately divided; leaflets 5–12, elliptic–oblong to obovate–lanceolate, narrowly acuminate, base cuneate, pinnately veined. Flowers greenish with white stripes. Fruit a berry, red when ripening.

T.: Seeds are used as abortifacient. The seed paste is placed in the cotton cloth and is applied on the vagina (at the time of fetus formation's confirmation). It is administered once daily for 3 days in the early morning if monthly menstrual cycle is interrupted.

Borassus flabellifer Linn. **P.:** Pana [Arecaceae]

A large, unbranched tree. Leaves simple, palmate, multifid, leaflets 40-60. Fruits yellow when ripe. Common.

P.: The fresh root of this plant and fresh root of papali (*Carica papaya*) are made into a paste with water and given orally (ca. 50 ml) after menstruation for preventing conception. Same paste, when given in the first trimester, can (Root of *Borassus flabellifer* plants

should be at flowering stage) be used as a fertility regulating agent.

Calotropis gigantea (Linn.) R. Br. **P.:** Erikku [Asclepiadaceae]

Large shrub. Leaves opposite, elliptic-oblong or obovate. Flowers purplish.

P.: The tender stick is inserted into the vagina as a physical abortifacient. This treatment is to be done within 2 months of the conception.

Carica papaya Linn. **Ir.:** Poppulipummu [Caricaceae]

A soft wooded dioecious tree. Leaves digitally and deeply 7 lobed. Flowers greenish-yellow. Fruits ovoid-oblong, yellow when ripe. Commonly cultivated.

Ir.: The ripe fruit is cut, made into pieces, kept on the roof overnight and given to pregnant women early in the morning (2 months of conception) as an abortifacient. Dosage: 3 days in an empty stomach (uterogaactive agent).

Cocos nucifera Linn. **Ir.:** Thenka kaai [Arecaceae]

An erect, unarmed, unbranched, monoecious palm. Leaves long, leaflets also long, linear-lanceolate. Flowers female pale yellow. Fruit obovoid, sub-globose, green or yellowish. Commonly cultivated.

Ir.: The oil from the kernel (3 teaspoonfuls) is given to women with the chanting of mantras on the 3rd day after menstruation to prevent conception. The ash of burnt shell mixed in coconut oil and applied on the cuts and wounds to ensure quick healing. Useful in the treatment of skin diseases also.

Dendrocalamus strictus (Roxb.) Nees
Ku.: *Kadumoongil* [Poaceae]

A deciduous densely tufted bamboo. Leaves long broad, rounded suddenly at the base, gradually narrow, rough; leaf sheath striate, hairy, callus prominent, ligule narrow, serrate. Flowers (Spike) greenish-yellow. Fruit (grains) an ovoid to subglobose, brown, shining, hair above, beaked with the persistent style-base.

Ku.: The bamboo ash (q.s.) with honey (2 teaspoonful) is given orally to women 3 days after the menstruation cycle is completed as an antifertility agent. Dosage: daily once in the morning in an empty stomach for 3 days. The tender stem is made into paste and applied all over the body to relieve body pain and in joints for rheumatism. Dosage: daily once in the evening for 3 days for body pain and 7 days for rheumatism.

Eleusine coracana (Linn.) Gaertn. **Ir.:**
Ragi [Poaceae]

An erect, tufted annual grass. Leaves linear. Inflorescence whorled, spikelets greenish, solitary. Cultivated.

Ir.: The newly harvested grains are prepared as food and given to pregnant women as abortifacient. According to their folk belief, the newly harvested grains are considered to be heat inducing. Due to heat, the fetus is aborted. Dosage: Once daily in the morning in empty stomach for 3 days.

Ficus exasperata Vahl **Ku.:** *Koduathi*
[Moraceae]

A shrub or small tree without aerial roots; bark white and smooth. Leaves alternate,

oblong – lanceolate to ovate or obovate or elliptic, entire (very rarely irregularly crenate in the upper part). Flowers (receptacle), solitary, globose, when ripe yellow or purple with yellowish dots. Fruit achenes, obovoid.

Ku.: The fresh stem bark (q.s.) extract is administered orally to arrest diarrhoea and dysentery. Daily twice in the morning and evening for 3 days. The seeds (q.s.) are consumed by women after the 3rd day of menstruation consecutively for 3 days in the morning in an empty stomach to regulate.

Gyrocarpus asiaticus Willd. **Ku.:**
Kadubendi mara [Hernandiaceae]

A medium-size tree. Leaves alternate, broadly ovate, entire or 3-lobed, glabrous above, thinly appressed – pubescent below, base truncate to cordate, margin entire, apex acute to acuminate. Flowers greenish – yellowish. Fruit an obovoid – globose drupe, ribbed.

Ku.: The stem bark juice is mixed with honey and taken orally (Ca 5-10 ml) by women after the 3rd day of menstruation consecutively for 3 days in the early morning in an empty stomach as an antifertility agent according to their folk belief.

Hibiscus lobatus (Murray) Kuntze **Ka.:**
Chuvanna appa [Malvaceae]

An erect, annual herb or sub shrub. Leaves basal orbicular – ovate; upper ones 3-lobed, and lanceolate. Flowers white. Fruit an ovoid capsule, shortly beaked; seeds many, ovoid, glabrous.

Ka.: Leaves and root are made into a paste, mixed with gingely (sesame) oil

and taken orally as a remedy for all type of menstruation associated disorders.

Lantana salvifolia Jacq. **Ku.:** *Bulleparale* [Verbenaceae]

An erect, unarmed, hirsute shrub. Leaves opposite, elliptic-oblong, rugose, sericeous above, densely so below, base rounded to acute, margin crenate, apex acute. Flowers pink to pale purple. Fruit a globose berry, red when ripe.

Ku.: The leaves (q.s.) are made into paste with jaggey (*Borassus flabellifer*) and given (Ca 25 ml) orally in an empty stomach for abortion. Doasage: Once daily in the morning in an empty stomach for 3 days.

Moringa concanensis Nimmo ex Dalz. and Gibson **Ir.:** *Kattu murukka* [Moringaceae]

Tree up to 8 m. tall. Leaves alternate; 2-pinnate; pinnae 4-8 pairs opposite; leaflets, broad-ovate. Flowers white. Fruit cylindrical, long, green, bitter. Rare.

Ir.: The stem bark and (q.s.) of salt and pepper (*Piper nigrum*) made into a paste and mixed with water. The extract is given orally as abortifacient before the completion of first 3 months of pregnancy. Dosage: Single.

Ocimum basilicum L., var. **purpurascens** Benth. **Ku.:** *Karuppu thulasi* [Lamiaceae]

An erect, branched herb or sub shrub, branchlets dark purple, hirsute. Leaves opposite, elliptic ovate, thin coriaceous, puberulous on side, base rounded, margin serrate, apex acute. Flowers

cream. Fruit verticles lax, calyx not markedly enlarged.

Ku.: The fresh leaf juice is given orally (5 - 10 ml) to women after the 3rd day of menstruation consecutively for 3 days in the evening. It ensures antifertility activity according to their folk belief.

Pterocarpus marsupium Roxb. **Ir.:** *Pennae pattae* [Fabaceae]

A large, semi-evergreen tree up to 15 m tall. Leaves alternate; leaflets opposite, 3 pairs, elliptic-oblong. Flowers yellow. Fruits winged, curved. Common.

Ir.: The stem barks (ca. 50 gms.) juice (ca. 100 ml.) is given orally as an abortifacient. Once daily morning for 5 days in empty stomach.

Ricinus communis Linn. **Ir.:** *Kottamuthu* [Euphorbiaceae]

An evergreen shrub. Leaves alternate, palmatifid, 6-10 lobed, lanceolate. Flowers greenish. Fruits 3-lobed, prickly. Common.

Ir.: The stem barks (ca. 25gm.) paste is given orally (ca. 25 ml.) to pregnant women to hasten the delivery (uterioactive). Dosage: Single.

Schleichera oleosa (Lour.) Oken **Ir.:** *Jagada mara* [Sapindaceae]

A tree up to 10 m. tall. Leaves opposite, paripinnate, 6-8 pairs (lower leaves very small), oblong-elliptic. Fruits immature green, globose, beaked, mature yellow. Rare.

Ir.: The aqueous extract of the stem bark is mixed with jaggery (ca.25 gms.) from *panai* (*Borassus flabellifer*) and given (ca. 50 ml.) orally during the first trimester

pregnancy. Dosage: once daily morning for 3 days as an abortifacient (uteroactive).

Solanum sisymbriifolium Lam. **Ku.:** *Mullusundae* [Solanaceae]

An armed, evergreen under shrub with yellowish prickly. Leaves alternate, oblong-lanceolate in outline, deeply pinnatifid, sometimes bipinnatifid, covered with soft stellate-pubesence. Flowers lilac to white. Fruit a globose berry, orange yellow when ripe; seeds many, large.

Ku.: Fruits are boiled, made into decoction and the filtrate is given orally from 3rd day post menstruation cycle. Dosage: daily once in the morning in an empty stomach for one week as an antifertility agent.

Tamarindus indica Linn. **Ir.:** *Puli* [Caesalpiaceae]

A large, branched tree. Leaves pinnate; leaflets oblong. Flowers yellowish with pink stripes. Planted.

Ir.: The fruit is made into a form of *rasam* (soup) and given to nursing mothers to promote breast milk (galactagogue). Dosage: once daily in the evening for 2 days.

Tephrosia purpurea (L.) Pers. **Ir.:** *Thagara geeda, Thattanj chittu* [Fabaceae]

An erect, woody herb or sub-shrub. Leaves odd pinnate; leaflets opposite, 3-7 pairs, obovate. Flower pink-purple. Fruit flat pod, glabrous, rare.

Ir.: The washed root is chewed by women to correct dysmenorrhoea (uteroactive).

The root (ca.25 gms.) paste is mixed with water (ca.100ml.) and given orally as an abortifacient prior to the completion of the first month of pregnancy.

Terminalia chebula Retz. **P.:** *kadukka* [Combretaceae]

A branched tree. Leaves alternate or sub-opposite, elliptic-oblong. Flowers greenish-yellow. Common.

P.: The seed powder (q.s) is mixed with boiled rice water / starch (ca. 250 ml.) with a pinch of salt and administered orally to nursing mothers to promote breast milk (galactagogue). Dosage: once daily for 5 days.

Thunbergia fragrans Roxb., var. *fragrans*. **Ku.:** *Ammuggedai balli* [Thunbergiaceae]

A slender twiner. Leaves opposite, broadly elliptic - ovate, 5-nerved from base, base truncate to subcordate, apex acute. Flowers white. Fruit a scabrid capsule; seeds reticulate.

Ku.: The fresh leaves (one handful) are ground with one tea-spoonful of cumin (*Cuminum cyminum*) seeds, mixed with water and administered (Ca 100 ml) orally to pregnant women as an abortifacient. Dosage: daily once in the morning in an empty stomach for 3 days.

CONCLUSION

Out of 23 plant species collected from Nilgiri primitive tribal communities, maximum 15 plant species are used for abortifacient (as an antifertility agent) purposes by the different ethnic communities, namely : Todas employ 1 plant species; Kurumbas make use of 6

plant species; Irulas utilize 8 plant species and Paniyas apply 1 plant species. In addition, Irulas exercise Areca nut (*Areca catechu*) plant for the easy expulsion of placenta post delivery while the Kattunayakkas exploit the plant lobed leaf Mallow (*Hibiscus lobatus*) for menstrual disorder. Furthermore; to enhance the milk secretion, the Irulas use Tamarind (*Tamarindus indica*) and Paniyas administer Chebulic Myrobalan (*Terminalia chebula*) to nursing mothers. The Kurumbas use 2 plant species for fertility regulation.

Due to environmental changes and urbanization in and around the tribal areas of the Nilgiri district, their mode of life, customs, beliefs, life style modifications and their ethno-medical practices have undergone substantial changes in recent times. The rapid degradation of forest and natural resources has reflected in their culture and social condition. In addition, the younger generations have been influenced by modern life styles leading to abandoning of their traditional living and food habits.

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COMMON HAEMOGLOBINOPATHIES AND G6PD DEFICIENCY AMONG KOL TRIBE OF SATNA DISTRICT, MADHYA PRADESH

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Abstract: Screening for haemoglobinopathies was carried out in Kol tribe of Satna district, Madhya Pradesh. Two hundred ninety blood samples of Kol tribe were collected and tested for the presence of various common haemoglobin disorders. Sick cell trait was found in 4.1% of the population with a gene frequency of 0.0207 and Beta thalassaemia trait was found in about 5.9% population with a gene frequency of 0.0293. Interestingly, no case of sickle cell disease (homozygous) and thalassaemia major was found in sampled population. G6PD enzyme deficiency was found in 3.8% of the Kols. In general, a total of 37.9% of individuals were found to be anaemic. The population under investigation was found to be in an equilibrium state for both sickle and beta thalassaemia gene as per Hardy-Weinberg's Law ($p > 0.05$).

INTRODUCTION

Haemoglobinopathies, in general, refer to disorders of haemoglobin including sickle haemoglobin and thalassaemias that result in anaemia. These disorders are inherited as autosomal recessive manner, resulting lethal disease in homozygous state. Deficiency of Glucose-6-phosphate dehydrogenase (G6PD) enzyme in red blood cells causes haemolysis during the administration of certain anti-malarial or other oxidant drugs. G6PD deficiency is also an inherited disease. Haemoglobinopathies and G6PD deficiency are frequently observed in different proportions in various tribes of the Madhya Pradesh.¹⁻⁷ Present study was initiated to see the prevalence of these disorders among the Kol tribe as pre-existing data is lacking. The present study was carried out by Regional Medical

Research Centre for Tribals, Jabalpur during 1995-96. The Kol tribe lent their name to the language group "Kolarian", as formerly known, and now known as "Mundari" or "Austro-asiatic Language Family". The Kol tribe that today bears the name "Kol" is restricted to a small portion of Madhya Pradesh and Uttar Pradesh. Kols are scattered over Rewa, Shahdol, Sidhi, Panna, Jabalpur, Mandla, Narsingpur and Sarguja districts. In Satna district, they are found in the highest concentration. They are mainly engaged in agriculture and also in various types of labour work. According to the census 2001, the total population of Satna district is 18,70,104 and 20.63% of these individuals live in the urban areas. The total tribal population of Satna district was 2,68,104 and proportion of tribal population to the total district population of district is 14.3%.

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MATERIAL AND METHODS

A total of 290 blood samples from individuals of Kol tribe of Satna district were collected randomly in EDTA (Ethylenediaminetetraacetic acid) vials. These samples included 196 males and 94 females. They were all in the age group of 5-60 years. Complete blood cell count (CBC) was done by automatic blood cell counter (Sysmex KX-21). Sickie haemoglobin was identified by sickling test with 2% sodium metabisulphite and confirmed by electrophoresis which was done on cellulose acetate membrane with TEB (Tris-EDTA-Borate) buffer at pH 8.6.⁸ HbA₂ was quantified by column chromatography to diagnose the β -thalassaemia trait.⁹ G6PD deficiency was detected by using DCIP decolorization method.¹⁰

sickle cell gene among this tribe was 0.0207. The status of beta thalassaemia trait (heterozygous for β -thalassaemia gene) was 5.9% and gene frequency of β -thalassaemia gene was 0.0293. G6PD enzyme deficiency was found in about 3.8% of the individuals tested. This studied population was in equilibrium state for both sickle cell gene ($\chi^2 = 0.129$; d.f.=2) and beta thalassaemia ($\chi^2 = 0.264$; d.f.=2) gene as per Hardy-Weinberg's Law.

Age and gender-wise segregation was done to identify the status of anaemia among Kols. Status of anaemia (as per WHO standards)^{11,12} among the studied population is given in Table-2. Overall, 37.9% of Kol population had haemoglobin levels lower than the normal. Majority of the population (34.4%) was mildly anaemic (Hb10-12gm/dl) and 2.1% were

Table 1: Percent prevalence of common haemoglobinopathies and G6PD deficiency among Kol population of Satna district (N = 290)

Sickle cell trait (HbAS)	4.1%	Gene freq. of ' β^s gene'
Sickle cell disease (HbSS)	0	
-Thalassaemia trait	5.9%	Gene freq. of ' β -thal. gene'
β-Thalassaemia major	0	
G6PD deficiency	3.8%	

RESULTS

Table 1 shows the status of sickle haemoglobin and G6PD deficiency among Kol tribe of Satna district. Among studied population, 4.1% were found to be sickle cell trait, i.e., heterozygous for sickle haemoglobin. Notably, no individual with sickle cell disease (homozygous) was found. Frequency of

moderately anaemic (Hb7-10gm/dl). Only 1.4% of Kols were severely anaemic (Hb <7gm/dl). In general, sub-normal haemoglobin levels were seen in 41.5% of adult females. Adult male (36.6%) and Children (36.5%) were equally anaemic.

The mean red cell indices of Kol population are given in Table 3. As can be seen from Table 3, the mean

haemoglobin levels of sickle cell trait and β -thalassaemia trait is $13.2\pm 1.0\text{g/dl}$ and $13.0\pm 1.8\text{g/dl}$ respectively. Mean haemoglobin levels of G6PD deficiency was $12.1\pm 2.4\text{g/dl}$. The β -thalassaemia group showed comparatively lower mean values for MCV (75.3 ± 3.1) and MCH (25.4 ± 1.0). The mean fetal haemoglobin levels varied from 0.7% (in G6PD deficient) to 1.1% (among sickle cell trait).

especially in Madhya Pradesh, the frequency of sickle cell trait among Gond group of tribes varies from 0.10 to 0.14 and no data exists on Kols of eastern India.¹³ In the present study, sickle haemoglobin does not appear to be a serious health affliction as its prevalence was found to be 4.1% among studied population. It is estimated that only 0.4 per 1000 births among the studied population

Table 2: Percent prevalence of anaemia among Kol population of Satna district

Group	N	Type of Anaemia			Total Anaemia
		Mild	Moderate	Severe	
Male	145	35.2	0.7	0.7	36.6
Female	82	35.4	2.4	3.7	41.5
Children	63	31.7	4.8	0	36.5
Total	290	34.4	2.1	1.4	37.9

Table 3: Haematological parameters of genetically abnormal Kol population of Satna district

	N	Hb (gm/dl)	PCV (gm/dl)	TRBC ($\times 10^{12}/L$)	MCV (fl)	MCH (pg)	MCHC (gm/dl)	HbF (%)	HbA2 (%)
Sickle cell trait (AS)	12	13.2 1.0	39.6 3.1	4.8 0.5	83.2 11.3	27.5 3.4	33.3 2.2	1.1 0.7	-
G6PD Deficiency	13	12.1 2.4	35.8 6.3	4.0 0.7	88.7 7.2	30.0 2.3	33.7 2.0	0.7 0.3	2.1 0.5
-Thalassaemia trait	17	13.0 1.8	38.5 5.0	5.1 0.7	75.3 3.1	25.4 1.0	33.6 1.5	0.8 0.2	4.0 0.4

DISCUSSION

The sickling allele is spread over the Central belt from Gujarat through Madhya Pradesh to Orissa in the east and over western tract from Gujarat through Maharashtra to South of Kerala.¹³ In India, sickle haemoglobin was first detected in Nilgiri hills.¹⁴ Among Indian population, the frequency of sickle cell trait varies from 0% to 41%.¹³ In central India,

is expected to suffer from sickle cell disease (homozygous) condition. β -thalassaemia trait was found in 5.9% of Kol population and indicating an expected frequency of 0.9 per 1000 births with β -thalassaemia major. The present report is preliminary and its sample size being low needs to validate with a larger population in the state. Impediments to such studies lie in the lack of diagnostic

facilities at PHC as well as district level. The tribal communities being endogamous breeding group in nature will be benefited through screening to avoid marriage between two heterozygous individuals that will eventually give rise to genetically abnormal child. Interestingly, frequency of anaemia was found to be low in the studied population.

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PREVALENCE AND DETERMINANTS OF OBESITY AMONG SCHOOL CHILDREN OF 13-17 YEARS AGE IN BHILAI CITY

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Abstract : The WHO refers obesity as a global epidemic because of rapid increase in the number of overweight and obese individuals in past 20 years. The onset of obesity may occur at any age and it may be triggered by factors such as early weaning, inadequate food intake, eating disorders and problems related to disturbed family relationships. A study was undertaken with the following objectives: 1) To assess the nutritional status of school children and 2) To analyze the relationship between obesity with physical activity.

We measured the weight, height and body mass index of children. The children were classified as normal, underweight, overweight and obese according to body mass index per age. 500 children were assessed at a school in Bhilai Nagar, Chhattisgarh. Two hundred seventy three (54.6%) subjects were boys and two hundred twenty seven (45.4%) were girls among the samples studied. The overall prevalence of overweight among children was 23.8% and obesity was 8.4%, gender wise prevalence of overweight was 23.44% boys and 24.22% girls and 8.02 and 8.81% were obese, respectively. The prevalence of overweight and obesity in school-aged children in our study counter the results obtained from earlier studies. Present data was analyzed statistically and efforts were made to correlate with the time spent in watching TV and computer in addition to physical activity. Positive association between excess weight and obesity to physical inactivity exists in children. The time spent in watching TV programs was a positive indicator for weight and height gain.

INTRODUCTION

Obesity is an epidemic of the 21st century and a major causative factor for many metabolic disorders. According to a global estimate by the World Health Organization (WHO) in 2005, there were about 1.6 billion overweight persons aged 15 years and above and at least 400 million adults were obese.¹ Prevalence in obesity varies within the country because of differences in the lifestyles, mainly in the dietary patterns and physical activity. In addition to this, urbanization and

industrialization are the main reasons for the increase in the prevalence of obesity. Obesity increases the risk of chronic diseases such as diabetes mellitus, cardiovascular disease, stroke and some cancers. It is a serious public health ailment growing in countries with low or middle income.² While this global epidemic is well described in the adult population, not much data is available regarding the prevalence of overweight/obesity in children or adolescents amongst developing countries. In India,

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the problem of obesity has been poorly studied even among the economically affluent population groups.³ Despite the growing numbers of adolescent school children and the overall increasing obesity, only few studies have been carried out in India to determine the prevalence of obesity. These studies will help in planning and developing appropriate intervention methods. In this context, the present study was conducted to estimate the prevalence and determinants of overweight and obesity in Bhilai city. Epidemiological literature shows that about one-third of obese pre-school children and about one-half of obese school-age-children become obese adults.⁴ Hence, we included children in the age group of 13-17 years in the study.

MATERIAL AND METHODS

This study was conducted from April 2009 to December 2010. From a list of all public and Bhilai steel plant schools in Bhilai Nagar, children were selected randomly. Consent from head of the school was obtained before conducting the study. A total of about 500 children, i.e., 100 children from each age group of 13-17 years and about 125 from each of the four selected schools studying in class 7th to 12th, were included in the study. Classes were selected randomly from each of the four schools and all the children present in the selected classes were requested to take part in the study. Childrens' as well as their parents' informed and written consent to the study was obtained. Their exact ages were as ascertained from the school register. Data was collected in the form of general information. All

participants completed a questionnaire on their usual physical activity, habit of watching TV and time spent using computer; and the pattern of dietary intake was also recorded. Socio-demographic data were collected in the form of family income, parents' educational status, number of family members and working status of the parents. All the anthropometric measurements were obtained using standard procedures. Body weight was recorded to the nearest 0.1 kg using a standard balance scale with the subjects being barefoot and wearing light inner clothing. Body Height was measured by the scale that was used up to an accuracy of 1mm. Body Mass Index (BMI) was defined as the ratio of body weight to body height squared, expressed as kg/m². Overweight and obesity were assessed by BMI for age.⁵ Student who had BMI for age >85th and < 95th percentile of reference population were classified as "overweight". Students who had BMI for age > 95th percentile of reference population were classified as "obese". Means (N) and frequency (%) were calculated for the statistical analysis. Student's t- test was used to compare the outcomes, and analyzed for the comparison of frequencies. A p value below or equal to 0.01 was considered to be statistically significant.

RESULTS

A total of 500 adolescents in the age group of 13 to 17 years were studied. Among them, 273 (54.6%) subjects were boys and 227 (45.4%) were girls.

The overall prevalence of overweight among children was 23.8%

and obesity was 8.4%. The prevalence of overweight was 23.44% among boys and 24.22% among girls; 8.02% boys and 8.81% girls were obese (Table 2). However, according to the Body Mass Index cut off values, shown in Table 1,

12.08% were underweight ($\leq 5^{\text{th}}$ percentile), 55.67% were normal ($>5^{\text{th}}$ to $<85^{\text{th}}$), 23.44% were overweight (85^{th} to 95^{th} percentile) and 8.05% were obese ($>95^{\text{th}}$ percentile).

Table 1 : Various BMI categories

Age Group	BMI Categories							
	Under Weight		Normal		Over Weight		Obese	
	N	%	N	%	N	%	N	%
13+ (N=48)	6	12.5	26	54.16	15	31.25	1	2.08
14+ (N=44)	9	20.45	25	56.81	7	15.09	3	6.8
15+ (N=66)	6	22.72	40	60.6	18	27.27	2	3.03
16+ (N=79)	7	8.86	42	53.16	17	21.51	13	16.45
17+ (N=36)	7	19.44	19	52.77	7	19.44	3	8.33
Total	35	12.08	152	55.67	64	23.44	22	8.05

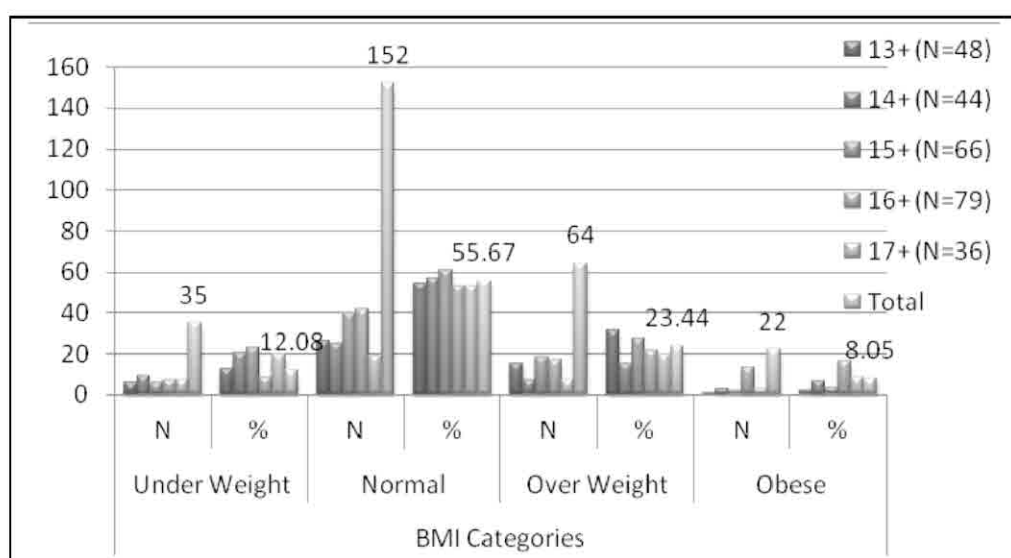


Figure 1 shows graph of various BMI categories

On the basis of BMI, the risk of overweight (25.56%) and obesity (13.53%) was observed among subjects not performing any routine physical activity. The prevalence of overweight was 38.59% and 12.86% was obesity respectively

among those who reported watching television and playing games on the computer for more than 3 hours per day. Similarly, 32.73% individuals were overweight and 15.10% were obese and belonged to high SES group (Table 2).

Table 2 : Gender, economy and effect of physical activities and watching television on obesity

Categories	Number of students	Over weight N (%)	Obesity N (%)
Sex			
Boys	273	64(23.44)	22(8.02)
Girls	227	55(24.22)	20(8.81)
Socio-economic status			
High Income group (>=25000Rs/month)	278	91(32.73)	42(15.10)
Low Income group (<5999Rs/month)	222	28(12.61)	-
Participation in physical exercise >60min.			
No activity	133	34(25.56)	18(13.53)
2-3day/week	147	40(27.21)	17(11.56)
4-5days/week	86	20(23.25)	3(3.48)
daily	134	25(18.65)	4(2.98)
T.V Watching			
<1hr./ day	186	24(12.90)	9(4.83)
1-2hr./day	143	29(20.27)	11(7.69)
>3hr./day	171	66(38.59)	22(12.86)

Table 3 : Socio-economic status of children

SES	Mean	S.D.
High Socio Economic Status (N=278)	24.71	3.54
Low Socio Economic Status (N=222)	20.86	3.14
(N=500)	23	3.87

DISCUSSION

The present study between the age group of 13-17yrs showed that the overall prevalence of overweight among children was 23.44% in boys and 24.22% in girls. The relatively high prevalence of overweight (23.8%) is alarming. Children with excess weight are at a health risk. The obesity was seen in 8.05% of boys and 8.81% of girls. An important finding of this study is an ever burgeoning prevalence of obesity among the school going children when compared to previous surveys in India.^{3,6,7} This study has shown higher figures which is suggestive of the obesity epidemic in 21st century. The prevalence of overweight and obesity was significantly higher among girls in the present study, which is comparable with figures reported for other developing countries.^{6,8} A clear socioeconomic gradient in the prevalence of overweight and obesity was observed in the present study, which is consistent with the earlier studies that report that BMI is influenced by different SES backgrounds.⁸ The prevalence of overweight and obesity among children was higher in High Socio Economic Status as compared to Low Socio

Economic Status group in both the genders (present study). In United Kingdom, an association between social deprivation and child obesity was found to be strongly correlated, especially in the girls. In contrast, in India, social deprivation has resulted in low BMI among the children. This difference may be due to the fact that criteria of social deprivation vary in developed and developing countries. In general, social deprivation results in non-availability of sufficient food and causes nutritional deficiencies. In low economic groups, nutritional imbalance is probably a result of poverty.

Recently, the school children have been found to concentrate more on academics and are less involved in sports and other activities. In addition, the prevalence of overweight and obesity was higher among the children who were involved in sedentary activities such as spending more than 3 hrs per day watching television; this is consistent with the earlier studies.^{4,9} The findings in the present studies are also comparable with WHO/HBSC survey that showed that the prevalence of obesity increased by 2% in 12-17 years old for each additional hour of

television viewed. Further, obesity incidence increased in children who viewed TV for more than 4 hours/day. Kruger et al. (2005) found that overweight children were the least active, and constantly watching TV programs.⁹ In addition, Khader et al. (2008) found that the prevalence of overweight and obesity was higher in children viewing TV for more than 2 hours/day.^{7,9} Sibia et al. (2003) demonstrated that obesity was more significant in those children who did not carry out any physical activity or exercise. The less active child increases the probability of being an overweight since activity is the major modifiable component of energy equation that consumes energy.¹⁰

The health impact of increasing prevalence of overweight and obesity among children and adolescents is a matter of serious concern. Heart disease and diabetes were rare among children and young adults in the previous century. However, diseases associated with the older population have been observed to occur in younger population generation. This study has thus highlighted the need to improve awareness for the prevention of obesity among children and to motivate them practice healthy lifestyles.

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AWARENESS OF HIV / AIDS AMONG THE KODAKU TRIBE OF SURGUJA DISTRICT, CHHATTISGARH

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Abstract: Tribals are the major component of India. Majority of the tribes dwell in remote and inaccessible regions of India with poor communication facilities. Creating awareness about HIV/AIDS among them is a challenging task for the government. Despite unswerving efforts by government departments and NGO's (Non-government organisation), perceptible results are lacking. Thus, it becomes imperative to find effective media for communication. Present study aims to explore the level of awareness of Kodaku tribe of Surguja district regarding HIV/AIDS and to find effective media for communication.

INTRODUCTION

According to UNAIDS / WHO, India has the largest number of HIV infected individuals in the world. It was estimated that there were about 3.31 million HIV infected adults population (15-49 year age group) in India in the year 2001.¹ Although India is still at the early stages of the epidemic in terms of prevalence, yet the absolute numbers of infected persons are very large and dwelling in both urban and rural areas.² In a span of about two decades, since its first identification, HIV infection has become pandemic and poses a formidable challenge to mankind in all aspects of life. The alarming rate of its spread, magnitude of its infection, long incubation period and lack of curative therapies and vaccines mandate the acquisition of complete knowledge of HIV disease.³ Studies show that HIV and AIDS have become the most sensitive health issues of the country. HIV/AIDS are not limited to urban areas alone but are also found prevalent in rural and inaccessible areas.⁴⁻⁷ Chhattisgarh is mainly tribal dominated state of India with

about 31.02% of its population constituting tribals. These tribals reside in the most remote and inaccessible areas with poor communication link. In general, negligible or limited awareness about AIDS exists there. The present study has been carried out on Kodaku tribe of Chhattisgarh to identify the level of awareness regarding HIV/AIDS amongst them.

THE KODAKU

Kodaku is one of the most backward tribes of the country residing in Surguja district of Chhattisgarh state. They belong to Austro-Asiatic linguistics family. They are patrilineal, exogamous in nature, follow nuclear family and believe in monogamy.⁸ Most of the Kodaku dominated villages are in the interior forest areas where communication facilities are low. Magic and witchcraft are deeply rooted in their culture. They have a strong superstitious belief that the diseases are the consequences of curse of god or witchcraft or bad souls. Their main occupation is weaving of baskets and mats with bamboo-wood. They are

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mainly dependent on agriculture, seasonal labor and collection of forest produces. They are illiterate, socio-economically poor and highly marginalized.

METHOD

A survey relating awareness about HIV/AIDS was made in 320 households from Kodaku predominant villages (13) of two blocks of Surguja district of Chhatisgarh. One man and woman of the

from Table 1, only 179 (27.97%) individuals were aware of HIV/AIDS. Among them, only 117 (36.56%) male and 62 (19.38%) females had knowledge about HIV/AIDS.

Table 2 shows individuals possessing knowledge regarding prevention of HIV/AIDS. It was observed that 147(82.12%) subjects believe that prevention of HIV/AIDS is possible while 28(15.64%) opined that it is not

Table 1: Sex-wise HIV / AIDS awareness

Response	Total		Male		Female	
	Number	%	Number	%	Number	%
Yes	179	27.97	117	36.56	62	19.38
No	461	72.03	203	63.44	258	80.63
Total	640	100.00	320	100.00	320	100.00

selected family were included in the present study. A semi-constructed schedule was used for the data collection.

RESULTS AND DISCUSSION

Table 1 shows the individuals possessing awareness of HIV/AIDS. As can be seen

preventable. Four individuals (2.23%) were totally unaware. Gender-wise analysis revealed that 93(79.49%) males and 54(87.10%) females believe that it is preventable. In contrast, 24(20.51%) males and 4(6.45%) females perceived it as unpreventable.

Table 2: Awareness regarding prevention from HIV / AIDS

Prevention	Total		Male		Female	
	Number	%	Number	%	Number	%
Yes	147	82.12	93	79.49	54	87.10
No	28	15.64	24	20.51	4	6.45
Don't Know	4	2.23	0	0.00	4	6.45
Total	179	100.00	117	100.00	62	100.00

Table 3 shows the source of information regarding HIV/AIDS prevention among Kodaku tribe. It was observed that 48(26.82%) subjects indicated the source of information as radio and followed by radio/T.V. 38(21.23%), radio/health worker 15(8.38%), teacher/relative 7(3.91%), radio/hospital 11(6.15%), spouse/relative 25(13.97%), spouse/other 9(5.03%),

spouse/doctor/relative 4(2.23%) and other sources 10 (5.59%). In case of male subjects, 48 (41.03%) considered radio as their source of information, followed by radio/T.V. 26 (22.22%), radio/health worker 15(12.82%), teacher/relative 7(5.98%) etc. in that order. Out of 62(100.0%) females, 12(19.35%) agreed that their source of awareness was radio/TV.

Table 3 : Sources of information for HIV/AIDS prevention

Source	Total		Male		Female	
	Number	%	Number	%	Number	%
Radio	48	26.82	48	41.03	0	0.00
Radio/T.V.	38	21.23	26	22.22	12	19.35
Radio / Health worker	15	8.38	15	12.82	0	0.00
Teacher/ Relative	7	3.91	7	5.98	0	0.00
Radio/ Hospital	11	6.15	11	9.40	0	0.00
Spouse/ Relative	25	13.97	0	0.00	25	40.32
Spouse/Other	9	5.03	0	0.00	9	14.52
Spouse/Doctor/ Relative	4	2.23	0	0.00	4	6.45
Spouse/ Relative/ Other	8	4.47	0	0.00	8	12.90
Doctor/ Relative / Other	4	2.23	0	0.00	4	6.45
Other	10	5.59	10	8.55		0.00
Total	179	100.00	117	100.00	62	100.00

Table 4 shows causal reasons for HIV/AIDS as perceived by Kodaku members. Forty two (23.46%) believe that the cause of HIV/AIDS is unsafe sex,

followed by blood (infected) transfusion 13(7.26%), mother to child 9(5.03%), homosexuality/unsafe sex 26(14.53%) etc.

Table 4: Awareness regarding causes of HIV/AIDS

Reason	Male		Female		Total	
	Number	%	Number	%	Number	%
Unsafe sex	28	23.93	14	22.58	42	23.46
Infected Blood Transfusion	13	11.11	0	0.00	13	7.26
Infected mother to Child	9	7.69	0	0.00	9	5.03
Homo Sex/ Unsafe sex	26	22.22	0	0.00	26	14.53
Homo Sex/ Infected mother to Child / Infected Blood Transfusion	18	15.38	0	0.00	18	10.06
Infected Needle or Syringe / Infected Blood Transfusion	10	8.55	0	0.00	10	5.59
All Above Reason	13	11.11	0	0.00	13	7.26
Unsafe sex / By Mosquito	0	0.00	7	11.29	7	3.91
Unsafe sex/ Kissing	0	0.00	17	27.42	17	9.50
Hand Shaking / Kissing	0	0.00	3	4.84	3	1.68
Unsafe sex/ Hand Shaking	0	0.00	1	1.61	1	0.56
Unsafe sex/ By cloths	0	0.00	7	11.29	7	3.91
By cloths / Eating Together	0	0.00	5	8.06	5	2.79
Don't Know	0	0.00	8	12.90	8	4.47
Total	117	100.00	62	100.00	179	100.00

Twenty eight men (23.93%) opine that the cause of HIV/AIDS is unsafe sex, followed by blood transfusion 13(11.11%), mother to child 9(7.69%), homosexuality/unsafe sex 26(22.22). Out of 62 women, 14(22.58%) said that the cause of HIV/AIDS was unsafe sex.

Kodaku's views regarding best prevention method against HIV/AIDS were, as : 17(9.50%) believed safe-sex and 6(3.35%) use of condom, 12(6.70%)

use of sterilized syringe/testing of blood before transfusion, 2(1.12%) avoiding pregnancy in infected condition etc. Kodaku women considered use of condom/safe sex as the best prevention method, followed by 7(11.29%) use of condom/use of sterilized syringe, 24(38.71%) use of condom/safe sex/use of sterilized syringe and 8(12.90%) were not aware about any prevention method (Table 5).

Table 5: Awareness regarding prevention method for HIV/AIDS

Source	Male		Female		Total	
	Number	%	Number	%	Number	%
Safe Sex	17	14.53	0	0	17	9.50
Use of Condom	6	5.13	0	0	6	3.35
Use of Sterilize syringe / Testing of Blood before Transfusion	12	10.26	0	0	12	6.70
Avoiding Pregnancy in Infected Condition	2	1.71	0	0	2	1.12
Use of Condom / Safe Sex	41	35.04	23	37.0968	64	35.75
Use of Condom / Use of Sterilize syringe			7	11.2903	7	3.91
Use of Condom / Safe Sex / Testing of Blood before Transfusion	7	5.98	0	0	7	3.91
Use of Condom / Safe Sex / Use of Sterilize syringe	14	11.97	24	38.7097	38	21.23
No Answer/ Don't Know	18	15.38	8	12.9032	26	14.53
Total	117	100.00	62	100.00	179	100.00

CONCLUSION AND SUGGESTION

On the basis of our observations, it can be concluded that only 27.97% members of the sampled population were aware of HIV/AIDS, indicating low awareness. The data revealed that the men were comparatively more aware than women.

Fifteen per cent subjects believe that HIV/AIDS is not preventable. Regarding prevention methods, women were comparatively better informed than men.

The best source of information for HIV/AIDS prevention is radio, followed by radio/T.V. and spouse/relative. Radio is major source of information for men than women whose primary source of information was spouse or relative. Both men and women believe that the main cause of HIV/AIDS is unsafe sex, followed by homosexuality/unsafe sex and blood transfusion.

A small percentage of Kodakus believe that mosquito bite, hand shaking, sharing of clothes and eating together can cause HIV/AIDS. These misconceptions were mainly prevalent among women.

Notably; belief that use of condom, safe sex and use of sterilized syringe lead to prevention of HIV is an encouraging sign. However, only 25% subjects are aware about HIV/AIDS; thus, necessitating the implementation of awareness programmes.

Most importantly; in planning these programmes, involvement of local people and tribes is of utmost importance for the easy acceptance by these communities. Consultancy centers at block level will

also reduce the risk of infection of HIV/AIDS in rural areas.

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MAJOR SOCIO-ECONOMIC AND DEMOGRAPHIC ATTRIBUTES AMONG THE TRIBES OF GUJARAT AND RAJASTHAN: A COMPARATIVE ANALYSIS

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Abstract: Tribals maintain their own cultural, social and economical identities which distinguish them from the non-tribals. However; presently, they are facing various problems associated with their identity, and these problems are reflected in their socioeconomic and demographic characteristics. Socioeconomic differences between different tribal communities also reveal existing disparities among them which make some of the tribal population lack in; or deprived of, the advancements made available to other tribal populations. Present paper highlights such disparities between the tribals of Rajasthan and Gujarat and the responsible factors for such disparities. This paper concludes with some suggestions regarding measures to reduce such disparities between the tribals of Rajasthan and Gujarat in particular and among other tribes of India in general.

INTRODUCTION

Tribals are a group of families that have their own customs, occupy a specific geographical territory and remain independent or have very little contact with the dominant society of the country. They maintain their unique cultural, social and economical identities which distinguish them from the non-tribals. At present, they are grappling with various problems related to their identity. Despite constitutional safeguards for their development in terms of equal status, good education, health, reservation policy and other developmental issues, they are exploited by the moneylenders and politicians.¹ Presently, many tribals are working in inhuman conditions, i.e., low wage jobs with unhygienic conditions, for their livelihood due to poverty, illiteracy and forced withdrawal from their natural habitation and other related factors. ¹ To

some extent, these factors account for tribals' unrest and discontentment. The intensity of their problems can be understood from their socioeconomic and demographic characteristics. Socioeconomic differences among different tribal communities also highlight the existing disparities that make part of the tribal population lack, or deprived of, the advancements made available to the other part/s. In this paper, an attempt has been made to formulate a comparative study of tribals of Rajasthan and Gujarat states of India.

The focus of the paper is on the comparison of socio-economic and demographic characteristics of the tribals of these 2 states revealing the differences and disparities between them and highlighting the responsible factors for such disparities.

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TRIBES OF GUJARAT AND RAJASTHAN

A number of tribes inhabit Gujarat and Rajasthan states. According to census 2001, there are about twenty nine (29) notified scheduled tribes in Gujarat. Major among them are Bhil, Dubla, Dhodia, Rathawa, Naikda, Gamit, Kokna, Chaudhri, Varli, Dhanka, Patelia and Koli. The Bhils with 3.4 lakh population represent majority (46%) of the total ST population of Gujarat. Dubla (8%), Dhodia (7.9%), Rathawa (7.2%) and Naikda (5.3%) are the other major STs; each having a sizable population. Including Bhils, tribes constitute about 74.3 % of Gujarat's total ST population. Gamit, Kokna, Chaudhri, Varli and Dhanka each account for 3-4 % to state's total ST population (2001 census). The ST population in Gujarat is predominantly rural with 91.8% residing in rural and 8.2% in urban areas. Of twelve major STs, having more than one lakh population, Dubla has recorded the highest and Varli, the lowest percentage of urban population. Significant urban population has been recorded also among Dhodia, Pateli and Koli.²

For Rajasthan, the census 2001 reveals that out of 12 notified scheduled tribes, Mina is most populous with 53.5 % of the total ST population, followed by Bhil. Mina and Bhil together constitute 93 % whereas Garasia, Damor, Dhanka and Saharia make 6.6 % of state's total ST

population. Six tribes, viz., Bhil Mina, Naikda, Kathodi, Patelia, Kokna and Koli Dhor with generic tribes constitute the residual 0.3% of the total tribal population. Among the twelve STs, Koli Dhor is the smallest tribe with the population below 100 preceded by Kokna (405), Patelia (1,045), Kathodi (2,922) etc. (2001 census). The scheduled tribes in general are predominantly rural with 94.6 % of them living in rural areas in contrast to 76.6 % of the total population of the state (2001 census).³

ANALYSIS

Population-wise

Population of Gujarat, according to census 2001, is 50,671,017. Of it, 7,481,160 persons belong to scheduled tribes (STs) constituting 14.8 % of the total population of Gujarat. Rajasthan has the population of about 56, 507,188 with the population of the scheduled tribe (ST) being 7,097,706, constituting 8.4 % of the total ST population of India and 12.6% of the state (2001 census). This shows the difference of about 58,36,171 in the overall population of Rajasthan and Gujarat. However, the tribal population of Gujarat and its percentage reveal a reversal trend of a difference of about 3,83,454 between the ST population of Gujarat and Rajasthan implying that Gujarat state has shown increasing trend in the ST population in comparison to Rajasthan (Table 1).

Table 1: Population of tribals

Population Size	Rajasthan	Gujarat	Differences in %
Total size	12.6%	14.8%	2.2%

Sources: (Census 2001)

Sex Ratio

Census 2001 reveals the sex ratio (females per 1000 males) of the ST population in Gujarat state as 974, close to the national average of 978 in contrast to the overall sex ratio of the ST population in Rajasthan, being 944, lower than the national average. The difference

other features that reflect the disparity between the tribals of Gujarat and Rajasthan, as described in Table 3. The scheduled tribes of Rajasthan state have the literacy rate of 44.7% in contrast to the national average of 47.1%; whereas, for Gujarat tribal population, literacy rate is around 47.7% - the literacy level of the

Table 2: Sex-Ratio among tribals

Sex Ratio	Rajasthan	Gujarat	Differences
Total Sex Ratio	944	974	30
Child Sex Ratio	950	966	16

Source: (Census 2001)

between these two states regarding the sex ratio is of 30 points which reveals that the tribes in Gujarat state have higher sex ratio and child sex ratio than the tribes in Rajasthan. The child sex ratio (CSR) of tribals in both the states has the difference of 16 points which means that Gujarat tribal's CSR is higher than that of the tribals of Rajasthan (Table 2).

Literacy Rate

Literacy and educational level are the

tribes of Gujarat being 3% higher than that of the tribes of Rajasthan. However, findings about the male and female literacy rate reveal some reversal trends. The male literacy rate of Rajasthan tribes (62.1%) has been found 2.9 % higher than the Gujarat male tribes' literacy rate (59.2%). Similarly, the female literacy rate of Gujarat tribes (36 %) has been noticed to be 9.8% higher than that of the Rajasthan female tribes (26.2%).

Table 3: Literacy rate among tribals

Literacy Rate	Rajasthan	Gujarat	Differences in %
Total literacy Rate	44.7%	47.7%	3%
Male literacy Rate	62.1%	59.2%	2.9%
Women literacy Rate	26.2%	36%	9.8%

Work Participation Rate (WPR)

WPR is another characteristic that reveals the inequality lying between the tribals of Gujarat and Rajasthan (Table 4). The work participation rate of the ST population in Rajasthan is 47.6 %, lower than the national average of 49.1 %. The WPR of Gujarat tribals (51.7%), however, is 4.6% higher than the WPR of Rajasthan tribals. The male work participation rate of Rajasthan tribes (50.1%) shows the

Gujrat shows that 49 % of them are 'never married', 46.5% 'currently married', 4% 'widowed' and 0.5 % 'divorced/ separated'. As for the marital status of tribes of Rajasthan, the 'never married' persons (51.7 %) constitute more than half of the total population. 'Married' persons account for 44.5 % while 3.5 % are 'widowed' and 0.2 % of STs are 'divorced/separated'. This shows that in terms of marital status too Gujarat tribes are ahead of Rajasthan tribes.

Table 4: Work participation rate among tribals

Work Participation Rate (Wpr)	Rajasthan State	Gujarat State	Differences in %
Total WPR	47.6%	51.7%	4.1%
Male WPR	50.1%	55.5%	5.4%
Women WPR	44.9%	47.8%	2.9%

Sources: (Census 2001)

declination of 5.4% compared with the WPR of Gujarat male tribes (55.5%). The WPR of females of Gujarat tribes (47.8%) shows 2.9% increase in relation to the WPR of Rajasthan female tribes (44.9%). Among the total workers, 66.8 % are the main workers (cultivators) in tribals of Rajasthan and 70.4% among the tribals of Gujarat. This shows 3.6% increase in the main workers rate of the Gujarat tribes in comparison to the tribals of Rajasthan.

Marital Status

Marital Status is another feature that distinguishes the tribes of Rajasthan and Gujarat from each-other in terms of their socioeconomic and demographic aspects. The marital status of tribes of

CONCLUSION

Present study compares the status of various tribes in Gujarat and Rajasthan and enumerates the various factors responsible for the marginalization of tribes. It highlights the need for goal oriented multifaceted socioeconomic reform programs.

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Backcover : Baiga women

