

Poor Health conditions and opportunistic infections among children of Sahariya tribe of Central India: Clinical aspects and risk factors

P Sharma, P Reddy, M Barbhuiya, G Mishra, T Singh, R Prakash, S Jain, P Tiwari

Citation

P Sharma, P Reddy, M Barbhuiya, G Mishra, T Singh, R Prakash, S Jain, P Tiwari. *Poor Health conditions and opportunistic infections among children of Sahariya tribe of Central India: Clinical aspects and risk factors*. The Internet Journal of Pediatrics and Neonatology. 2008 Volume 10 Number 2.

Abstract

The present clinical case report reveals an outbreak of severe scabies infestation along with tuberculosis among young children of Sahariya tribe of Central India. More predominately young children of the tribe were found severely infested with scabies. Some of them were also registered TB patients. Appropriate clinical tests were performed to identify the actual cause of outbreak and hematological analysis of blood sample was carried out to diagnose the clinical disease. ESR, lymphocyte counts and serum LDH content was found significantly ($p < .05$) elevated in affected children and adult subjects, indicating the pathogenic infection (tuberculosis) and infestation (scabies) induced pathology. Weak immunity resulting from malnutrition, poor hygiene and lack of proper Medicare, in these rural and remote areas are the main predisposing factors till today. There is a need of regular follow up of local hygiene and medical facilities available in these areas followed by appropriate and timely treatment to them.

INTRODUCTION

Sahariya is a primitive tribal group of central India. It is a landless community, which migrate to neighboring states in search of labor and wages during crop harvesting season. During such migration, people carry with themselves several opportunistic infections as one encountered in the present case study. The tribe lives in different villages isolated from main urban population. Population-wide surveys of Sahariya tribe for TB, carried out earlier, have reported significantly high incidence of tuberculosis in the tribe^{1,2}. During a mass camping, organized for blood sampling of tuberculosis patients of Sahariya, heavy infection of scabies was recorded.

Although, scabies infection was spread to most of the tribal villages, the present observation was made from a representative village, Goras (District Sheopur). Most of the young children of 7-15 years of age from this village were found severely infested by the mite, *Sarcoptes scabiei*. The hospital record on registered TB cases from this village indicates a ratio of 16 TB patients per 1000 individuals (the total population of village is about 2500). Skin infections causing rash and lesions are frequently used as indicators of

patient's immunological status. It is found to be the most frequent (in almost 95% of cases) problem in people living with HIV/AIDS³. Insufficient medical facilities, malnutrition and lack of vaccination against such opportunistic infections are the most likely causes of ill-health and high rates of child morbidity and mortality in tribes and other underprivileged communities of India.

Annual Risk of Tuberculosis Infection in Children: The annual rate of tuberculosis in children below 10 year in India has been found to be more than 1%, which is disappointingly very high⁴. In a study conducted to estimate the annual risk of tuberculosis infection (ARTI) based on PPD (purified protein derivatives) test results showed that ARTI is higher among slum children (2.1%) as compared to non-slum children (1.7%) indicating the correlation between poor socio-economic conditions and annual risk of child tuberculosis⁵. It has been observed that prevalence of TB infection goes up about 14% by the age of 14^{6,7}. In a recent study, carried out in Bhubaneswar, India have shown that among 100 children who were screened for tuberculosis infection, 27% and 72% were found positive for Mantoux (PPD) and 'BCG test', respectively⁸. As most of the above

studies have been conducted in general populations which have comparatively better socio-economic conditions than the rural tribal groups like that of Sahariya, the infection rate may be even higher in such underprivileged groups, which are rarely investigated for such infection due to lack of medical facilities, inaccessibility of these tribes, prevailing poor socio-economic condition, etc. Also, it has been observed that the risk of tuberculosis infection significantly increases in children having sputum positive contacts around them than in the general population⁹. Thus, such children become more likely to develop clinically active disease at higher rate as also seen in present study.

SPUTUM POSITIVE TUBERCULOSIS IN CHILDREN:

The importance and severity of the childhood tuberculosis disease burden is recognized in many developing countries like India. There are reports on sputum positive tuberculosis in children in India. Kabra et al. (2004)¹⁰ carried out a study in different categories of child tuberculosis and found that 11% of the child patients recruited for study could demonstrate acid fast bacilli (AFB) in their sputum specimens. This has been debated that poor yield of AFB in children patients of tuberculosis is due to paucibacillary nature of disease and inability of young children to give appropriate sputum samples, moreover, obtaining a proper sputum specimen is a difficult task, often unsuccessful, procedure for children, but it does not mean that positivity rate is very low. Wiersma et al. (2000)¹¹ have suggested that the yield of AFB in children with pulmonary tuberculosis can be improved by induction of sputum. In present investigation also, two out of four children could demonstrate bacilli in their sputum, while remaining two were positive for chest-X-ray only. In addition, since convincing results were obtained by TST (tuberculin skin test) and radiographic analysis, these tests become more appropriate tests for child tuberculosis detection. But, in TB endemic areas, where these tests are neither easily available nor economically feasible, sputum smear microscopy is still practised as routine detection method for TB for all age groups. This indicate that sputum positive TB in children in India is not rare but there are difficulties in sputum specimen collection and it is the nature of disease that make reports of sputum positive TB in children rare, as we did encounter in the present study.

MATERIALS & METHODS

a. Sampling: The research team organized the blood

sampling camp at the Goras village panchayat office about 25 Km. away from the district hospital, Sheopur (M.P.) under the tuberculosis screening programme. Nineteen individuals especially young children were found to have severe skin rash. The patients already undergoing chemotherapy for TB as well as those carrying scabies infection (n=19), alone or in combination with TB, were diagnosed on the spot by the accompanying clinician from district hospital. Out of the four children having TB, two were positive for chest X-ray, while the two were only positive for acid-fast bacilli (AFB) sputum test. These are the only tests easily available as well as technically and economically affordable in the hospital in these areas for primary diagnosis of TB. The scabies infestation was re-confirmed by a specialist dermatologist. After well informed and written consent of the donors (consents were taken from parents in case of minors), blood samples (4-5ml) and skin swabs were collected in sterile vials. The blood sampling and research protocols to work on human samples were approved by Institutional Ethics Committee of Jiwaji University.

b. Hematological test: Hb, TLC and WBC counts was determined by standard Hematological method while, ESR and LDH levels were determined by the methods of Westergren (1921)¹² and Bach et al (1991)¹³, respectively.

c. Microbial culture:

The open wound swabs were cultured on the Czepak dox agar culture medium at 37 ° C for 48 hrs. to identify any fungal growth (primary or secondary infection) in samples collected from open wounds. The Fungal identification was made on the basis of macroconidia and culture morphology.

RESULTS

The skin infection was clinically diagnosed by the dermatologist as scabies, which is caused by a tiny mite *Sarcoptes scabiei*. The skin lesions and rash occur due to deep burrowing of mite into the skin, predominantly around digital webs, buttocks, etc. (see Fig. 1A) of the infected individuals.

Figure 1

Figure 1. A. Scabies infested hands and other parts of the tribal children B. Showing the fungal culture observations



The itch and rash are the result of allergic reaction, induced by the mite. Our subjects under investigation, particularly children, showed all of the above symptoms. The hematological parameters revealed, in general, low hemoglobin level (8-12 gm %) in almost all the subjects, specifically those infected with scabies and tuberculosis both, indicating severe anemic conditions. Although, infections were also observed in adults, the intensity of the symptoms was lower. The ESR (Erythrocyte Sedimentation Rate) and serum LDH level were significantly ($p < 0.05$) elevated in scabies infested children (see Table).

Figure 2

Table: Hematology and serum LDH content in the Children of Sahariya tribe infected with Scabies. NK=Not known

Sample No.	Sex	Age	Hb (gm%)	TLC (C/mm ³)	Neutrophil (%WBC)	Lymphocytes (%WBC)	Eosinophils (%WBC)	Monocytes (%WBC)	Basophils (%WBC)	ESR	LDH (IU)
Normal range			M=12-14	4000-11000	60-70	26-46	01-05	02-07	00-01	0-12	100 IU
1*	Male	11	8	9600	70	20	10	0	0	97	234
2	Female	NK	9.6	8600	67	30	3	0	0	15	345
3	Male	8	11	8000	60	47	3	0	0	4	567
4	Male	8	10	7500	58	38	2	2	0	25	345
5	Male	7	11	9500	68	21	1	0	0	40	654
6	Male	5	9	10800	78	17	5	0	0	85	234
7	Female	10	10.6	10500	66	31	3	0	0	30	435
8	Male	13	11	8500	45	51	4	0	0	40	123
9	Male	7	11	10000	60	38	2	0	0	25	789
10	Male	10	12	11200	68	25	7	0	0	30	123
11	Male	7	11.3	11500	77	20	3	0	0	45	434
12	Male	8	9	10800	70	29	5	0	0	70	338
13	Female	NK	9.6	9200	48	44	8	0	0	40	789
14	Male	NK	11.8	7000	78	20	2	0	0	35	345
15*	Male	9	10.4	8500	65	30	2	3	0	20	500
16	Male	11	11	10200	70	30	0	0	0	5	234
17	Female	NK	11.6	8600	62	38	0	0	0	15	200
18*	Female	22	11.3	8500	78	22	0	0	0	85	345
19*	Female	25	11.3	10300	75	25	0	0	0	55	287

*Infected with Tuberculosis (sputum positive) and Scabies both.

The secondary infections observed in swab cultures of open wounds revealed mainly the presence of a human skin infecting fungus, *Microsporum canis*, with characteristic filamentous mycelium and forms a yellow pigment, which on the reverse side, turned orangish-yellow with age (Fig. 1B). The four of the nineteen children observed were sputum positive for *Mycobacterium tuberculosis* (AFB test) carried out at the district TB hospital, Sheopur, during the start of their TB chemotherapy (as per RNTCP, WHO protocols).

DISCUSSION

Earlier studies have reported significantly high incidence of *Mycobacterium tuberculosis* infection in Sahariya tribe. Scabies has been generally found associated with several pathological infections, including *Mycobacterium tuberculosis*. Typical manifestations of scabies like crusted or Norwegian scabies has also been seen in HIV patients with low CD4 counts¹⁴. The present case report indicates that severe scabies outbreak in this tribe may likely be associated directly or indirectly with their increased susceptibility to tuberculosis and or other systemic infections, which are yet to be clinically identified. The most likely reason for this could be the poor and unhygienic life style and lack of proper medical care in such patients, making them immuno-susceptible to a wide variety of pathogenic infections.

Hemoglobin (Hb) concentration in blood stream is considered as a useful indicator of health and nutritional status of any individual or population group. The relatively poor hemoglobin level in the individuals examined in this study presents a direct correlation between their socio-economic conditions and clinical health. It is reported that severely malnourished individuals are likely to have their immune functions impaired¹⁵ and show positive association with the susceptibility to infectitious diseases¹⁶. The

increased ESR, observed in most of our tribal patients, thus, indicates existence of an infective or inflammatory destructive disease like, TB. The serum lactate dehydrogenase level usually goes high in several kinds of skin infections. The elevated serum LDH level in these subjects further support the presence of physiological stress caused by scabies infestation or other co-infections, including *Mycobacterium tuberculosis* .

The secondary infection seen in swab cultures of open wounds revealed a human skin infecting fungus, *Microsporum canis*, with characteristic filamentous mycelia and forms a yellow pigment, which on the reverse side turns orangish yellow with age. Such infections are often observed as a consequence of increased inflammation resulting from tissue rupture following physical activities, like scratching etc. Rapid spread of the infection results from the innocent contact among children, while it remain contained in adults due to the preventive measure they take, as observed in this study also.

CONCLUSION

Weak immunity to such opportunistic pathogenic infections, resulting from malnutrition, poor hygiene and lack of proper Medicare, in these rural and remote areas are the main predisposing factors till today. Such health problems can be addressed by regular follow up of local hygiene and medical facilities available in these areas followed by appropriate and timely treatment.

Thus, present study stresses for a detailed clinical and detailed biochemical investigations of such outbreaks and their possible associations with other infections, particularly, in children whose immune responses are poor and thus, are more susceptible to pathogenic attacks. Such an outbreak was never reported earlier in this tribe. The knowledge and proper diagnosis of such outbreaks and their possible association with TB or other infections is most essential for tribal health as well as the health of healthcare personnel working with them.

ACKNOWLEDGEMENTS

We gratefully acknowledge the Department of Biotechnology (DBT), New Delhi, India, for the financial support provided through a research project to PKT. We are also thankful to the Chief Medical Officer (CMO), District Hospital, Sheopur in facilitating sampling process and Dr. P.

K. Saraswat, Dermatologist (MBBS, MD), for the diagnosis of scabies.

References

1. Chakma T, Rao PV, Pall S, et al. Survey of pulmonary tuberculosis in a primitive tribe of Madhya Pradesh. *Ind J Tub*, 1996; 43: 85.
2. Sharma PR, Jain S, and Tiwari PK. Elevated level of serum LDH2 and LDH3 in sputum three positive TB patients of Sahariya Tribe: A preliminary study. *Clin Biochem*, 2007; 40:1414-1419.
3. Phanuphak N. Skin Lesions: Mirror Images of Oral Lesion Infections. *Adv Dent Res*, 2006; 19: 69-72.
4. Gopi PG, Subramani R, Nataraj N and Narayanan PR. Impact of BCG vaccination on tuberculin surveys to estimate annual risk of tuberculosis infection in south India. *Ind J Med Res*, 2006; 124: 71-6.
5. Gopi PG, Prasad VV, Vasantha M, Subramani R, Tholkappian A S, Sargunan D and Narayanan PR. Annual risk of tuberculosis infection in Chennai city. *Ind J Tuberc*, 2008; 55: 157-161.
6. John TJ, Frimodt-Moller J, Feldman RA, Jeyabal P and Kamath KR. Infection and disease in a group of south Indian families. Part 13. Skin sensitivity to 6 mycobacterial antigens. *Indian J Med Res*, 1971; 59 : 1727-36.
7. National Tuberculosis Institute, Bangalore. Tuberculosis in a rural population of south India. A five-year epidemiological study. *Bull World Health Organ*, 1974; 51: 473-88.
8. Sareen D, Sareen N, Singh D, Ohja A and Agarwal KK. Prevalence of tuberculous infection and disease among children under five years in contact with an open case of tuberculosis. Presented at the Annual National Conference of IAP, 2008; Abstract No. ID/ 01(P). *Indian Pediatrics*, 2008, 45.
9. Singh M, Mynak ML, Kumar L, Mathew JL and Jindal SK. Prevalence and risk factors for transmission of infection among children in household contact with adults having pulmonary tuberculosis. *Arch Dis Child*, 2005; 90:624-628.
10. Kabra SK, Rakesh L and Seth V. Category based Treatment of Tuberculosis in Children. *Indian Pediatrics*, 2004, 41; 17.
11. Wiersma HE, Van Aalderen WM and Hoekstra MO. Sputum induction for the diagnosis of pulmonary tuberculosis. *Arch Dis Child*, 2000; 83: 276.
12. Westergren A. Studies of the Suspension Stability of the Blood in Pulmonary Tuberculosis. *Acta Medica Scandinavica* 1921; 247-282.
13. Bach MK, Brashler JR, Petzold EN, et al. Superoxide production by human eosinophils can be inhibited in an agonist-selective manner. *J Immunol Methods*, 1991; 142: 243.
14. Osborne GE, Taylor C, Fuller LC. The management of HIV related skin disease. Part I: Infections. *Int J STD AIDS*, 2003; 14:78-86.
15. Scrimshaw, NS, Guzman MA, Flores M, et al. Nutrition and infection field study in Guatemalan villages, 1959-1964. V. Disease incidence among preschool children under natural village conditions, with improved diet and with medical and public health services. *Arch Environ Health*, 1968; 16:223-234.
16. Koster FT, Palmer DL, Chakraborty J, et al. Cellular immune competence and diarrheal morbidity in malnourished Bangladeshi children: A prospective field study. *Am J Clin Nutr*, 1987; 46:115-120.

Author Information

Prithvi R Sharma, M.Sc.

CG-SSZ: Centre for Genomics, School of Studies in Zoology, Jiwaji University, Gwalior-474011

PV Janardhan Reddy, PhD

CG-SSZ: Centre for Genomics, School of Studies in Zoology, Jiwaji University, Gwalior-474011

Mustafa A. Barbhuiya, M.Sc.

CG-SSZ: Centre for Genomics, School of Studies in Zoology, Jiwaji University, Gwalior-474011

Gunja Mishra, M.Sc.

CG-SSZ: Centre for Genomics, School of Studies in Zoology, Jiwaji University, Gwalior-474011

Tekcham D Singh, M.Sc.

CG-SSZ: Centre for Genomics, School of Studies in Zoology, Jiwaji University, Gwalior-474011

Ravi Prakash, M.Sc.

CG-SSZ: Centre for Genomics, School of Studies in Zoology, Jiwaji University, Gwalior-474011

Sanjay Jain, MBBS, MD

District Hospital, Sheopur, M.P. India

Pramod Kumar Tiwari, Ph.D.

CG-SSZ: Centre for Genomics, School of Studies in Zoology, Jiwaji University, Gwalior-474011