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RESEARCH ARTICLE

STUDY OF CLINICAL PROFILE AND RISK FACTORS OF CHILDHOOD TUBERCULOSIS IN PATIENTS ATTENDING TERTIARY CARE HOSPITAL IN WESTERN RAJASTHAN

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ABSTRACT

Background: Tuberculosis is of great public health concern especially in the developing countries. It is expected that approximately one third of the World's population is infected with *Mycobacterium tuberculosis*. The majority of cases belong to developing countries of Asia. Moreover, its clinical profile is different in developing countries in comparison to developed countries.
Methods: This study was conducted in the Department of Paediatrics, Dr S. N. Medical College, Jodhpur. Patients attending the outpatient department or admitted in the wards with symptoms and signs suggestive of tuberculosis were studied.
Study Design: Cross sectional study.
Sample size: 120 patients.
Inclusion criteria: Children from 6 months to 12 years of age who fulfilled the diagnostic criteria of Crofton *et al* (1992) for clinical tuberculosis.
Results: In study group maximum (44.16%) cases were in <3 years age group, The M: F ratio was 1.4: I., 67(55.83%) children belonged to joint family, 65.83% were Hindus. Most of the cases belonged to lower socioeconomic classes (Class IV and V; 63%). Most common presenting symptoms were fever (78.4 %,) cough (64.1%) with past history of measles and whooping cough was present in 18.33% and 10% cases respectively.43.33% cases were having history of contact with tuberculous patients within household or in near relatives and neighbours. Most of the cases were moderate to severely (grade III and IV) malnourished. Pulmonary tuberculosis was more common in grade II, III and IV malnourished. Only 27% cases of tuberculosis had received BCG vaccination and 73% cases were unimmunized. MT was positive in 20.8% of cases and direct BCG test was positive in 52.5% of cases. Most common radiological finding was hilar prominences followed by bronchopneumonia. Most common type of presentation was primary complex followed by Progressive primary disease (PPD), TBM, tubercular lymphadenopathy, abdominal tuberculosis. On fundus examination, papilledema and in CT scan, hydrocephalous was most common finding in TBM cases
Conclusions: There is an urgent need for a systematic approach for determining the prevalence and incidence of *M. tuberculosis* infection among children. This has to become the corner stone of TB control and of assessing the change in trend of infection over time, in the community; until it reaches the required goal, as defined for control status by WHO.

INTRODUCTION

Tuberculosis (TB) is an infectious disease caused by the bacterium *Mycobacterium tuberculosis* (MTB).One-third of the world's population is thought to be infected with TB.[1] New infections occur in about 1% of the population each year.[2] In 2014, there were 9.6 million cases of active TB which resulted in 1.5 million deaths. More than 95% of deaths occurred in developing countries. The number of new cases each year has decreased since 2000.[1] About 80% of people in many Asian and African countries test positive while 5–10% of people in the United States population tests positive by the tuberculin test.[3] Tuberculosis has been present in humans since ancient times.[4]

In spiteof the introduction of effective chemotherapy for last 3decades tuberculosis still contributes to significant morbidity and pediatric age group in India. Though the point of control in tuberculosis, defined byWHO as Manteaux test positivity of less than.1. % among children in age group 1-12 years has not been achieved by our country[1]. The prevalence, incidence and death rates have fallen approximately in developed countries

but still the prevalence of disease in India is estimated to be between 2-7% and annual incidence about 1.9%. Furthermore, many cases are either not detected or diagnosed very late, this contributing to the increased morbidity and mortality. It may be increase of lack of adequate epidemiological data of clinical profile and risk factors[5]. One of the probable cause of the persistence of this disease in our country is unawareness of the clinical features and preventable risk factors.

According to the review of global tuberculosis by World Health Organization, India comes under a group of high prevalence countries with annual risk of tuberculosis infection ranging between 1-2.5 %. Due to high prevalence of the disease, children are at higher risk of contracting disease from the infector pool of adult cases [6].

Tuberculosis in children, represent the acquisition of recent infection and the ongoing transmission of Mycobacterium tuberculosis in a community. Children age 14 years and below constitute about 38% of total population in our country. Serious and fatal manifestation of tuberculosis occur mostly in children. The extent of tuberculosis in children is, thus, a reflection of the pool of infectious adults i.e. smear positive cases in community. The children with primary infection under the age of 5 years may develop serious complications; the situation is more prevalent in developing countries.

The relationship of the incidence of tuberculosis to socioeconomic factors, overcrowding, poverty and hygiene is well established. The under privileged population in the developing countries often experience malnutrition due to food deprivation and morbidity due to frequent episodes of infections resulting from poor environment and personal hygiene. Resistance is lowered because of malnutrition. Tuberculosis is the sensitive index of a nation's poverty. There is a direct relationship in almost every society between poverty and prevalence of tuberculosis [7]

Although some Indian Workers[5, 8, 9, 10, 11], have studied childhood tuberculosis in various parts of our country, but such studies are few, especially from this part of country. Therefore we decided to undertake this study to evaluate clinical profile and risk factors of childhood tuberculosis in children aged 6 months to 12 years in our set up.

METHODS

This study was conducted in the Department of Paediatrics, Dr S. N. Medical College, Jodhpur. Patients from 6 months to 12 years of age attending the outpatient department or admitted in the wards with symptoms and signs suggestive of tuberculosis were studied.

The clinical scoring system for diagnosis of childhood tuberculosis developed by Crofton *et al* [12] was adopted for including the cases in study group.

Clinical scoring system for diagnosis of childhood Tuberculosis *(Crofton et al 1992)*

Features	0	1	3	Score
Length of illness	Less than 2 weeks	2-4 weeks	More than 4 weeks	
Nutrition (weight)	Above80%of age	Between 60% and 80%	Less than 60%	
Family history of tuberculosis past or present	None	Reported by family	Proved sputum positive	

Score for other features s present

Positive tuberculin test/BCGTest	3
Large painless lymphnodes; firm. soft sinus in neck, axilla, groin	3
Unexplained fever, night sweats. no response to malaria treatment	2
Malnutrition, not improving after 4 weeks	3
Angle deformity of spine	4
Joint swelling, bone swelling or sinuses	3
Unexplained abdominal mass or ascites	3
CNS : Change in temperament fits or coma (send to hospital if possible)	3
Total Score	
When score is 7 or more treat for TB	

All patients who scored 7 or more were considered as suffering from tuberculosis. Clinical profiles and risk factors of the disease were studied in these cases. Patients were assessed by detailed history, thorough physical examination and diagnostic investigation.

A detailed history regarding pyrexia, cough, vomiting, diarrhea, loss of weight, anorexia, abdominal pain, irritability, night sweating, abdominal distension, convulsion and coma was recorded. Age and sex of the children was noted. Past history of measles and whopping cough was asked. A family history of contact of tuberculosis was enquired. History contact was considered positive if any child who lived in a household with an adult taking anti tubercular therapy or had taken anti-tubercular therapy in the past 2 years.

Immunization history with special reference to BCG vaccination was asked and confirmed by scar mark of BCG vaccination.

Economic status i.e. total income of family per month and total number of family members was asked and per capita income per month was calculated. The children were then categorized in 5 economic groups by using Prasad index of economic status [13].

Anthropometric measurements including weight, height and head circumference were recorded in all children and nutritional status was assessed as per criteria of nutritional subcommittee of the Indian Academy of Pediatrics (IAP classification).

Thorough general physical examination and systemic examination **was** done. Investigations viz Haemogram (Hb, TDLC, ESR), MT/BCG **test,** X-ray chest were done in all patients. While X-ray and USG abdomen, X-ray skull, CSF examination, CT scan skull, pleural or ascitic fluid cyto-chemistry, liver biopsy and fundos copy were done as and when required.

MT/BCG test

BCG test was carried out by injecting 0.1 ml of reconstituted BCG vaccine, intra-dermally on the left shoulder. The BCG test was considered positive when in duration of 5mm or more after 48-72 hours.

MT was carried out by injecting 1TU of PPD-RT23 on volar aspect of right forearm and considered positive when induration of 10mm or more after 48-72 hours was noted. Radiological findings were analysed with the help of a competent radiologist in the institution. Confirmed cases of tuberculosis were treated according to IAP consensus on treatment of childhood TB.

Clinical signs and symptoms of childhood tuberculosis and association of various risk factors was assessed.

Data Evaluation: Statistical analysis was done by using chi square tests.

RESULTS

The present study was undertaken to evaluate the risk factors and clinical profile of childhood tuberculosis from 6 months to I2 years of age. The study population comprised 120 cases of childhood tuberculosis patients attending OPD or admittedin Department of Paediatrics, Dr S. N. Medical College, JodhpurIn this study of childhood tuberculosis, out of 120 cases, 52 (44.16%) were below 3 years of age group, 32(26.66%) were in 3-6 years of age group and 35(29.16%) were in 7-12 years of age group (Table no. l).In our study group, high incidence of disease i.e. 44.16% was seen in <3 years age group (difference was statistically significant when compared with other two groups (p <0.05), followed by 26.66% in 3-6 years of age and 29.16% 7- 12 years age group. Out of 120 cases, 58.33% were male and 41.67% were female with an M: F ratio of 1.4: 1. This preponderance of males in our study sample was statistically significant (p < 0.01).

On analysis of case according to type of family, 67(55.83%) cases were from joint family and 53(44.17%) case were from nuclear family. Statistically childhood tuberculosis was significantly more in joint type of family as compared to nuclear family *(p* < 0.05).In our study of total 65.83% were Hindus, 31.67% were Muslim and 2.5% were Sikhs. Most of the childhood tuberculosis cases belonged to lower socioeconomic classes (Class IV and V; 63%) as compared to higher socioeconomic classes (Class I & II; 18%). Statistically significant association was observed in childhood tuberculosis and socioeconomic classes (p <0.001).

Table 1 Age wise distribution of tuberculosis according to frequency of symptom

Symptoms	Age group(yrs)			Total	%
	< 3	3-6	7-12		
Fever	44	23	27	94	78.4
Cough	33	15	29	77	64.1
Anorexia	0	10	12	22	18.4
Convulsion	15	0	0	18	15.0
Wt. loss	4	5	9	18	15.0
Pain abdomen	0	5	9	15	12.5
Difficulty. in breathing	6	4	1	11	9.1
Vomiting	3	4	1	8	6.6
Diarrhoea	2	2	1	5	4.1
Headache	0	2	0	2	1.4
Coma	0	2	0	2	1.4
Abdomen. Distension	0	0	0	0	0
Constipation	0	0	0	0	0

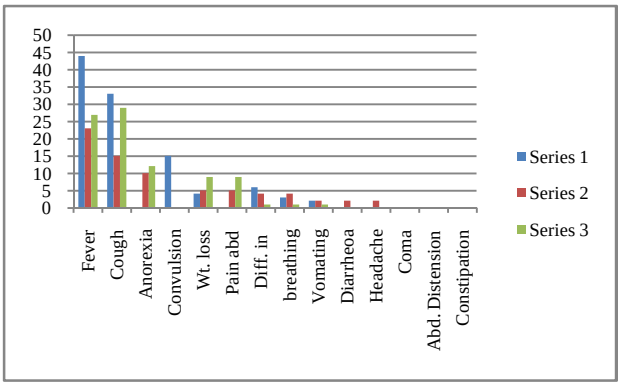

Fig 1 Age wise distribution of tuberculosis according to frequency of symptom

The common presenting symptom were fever (78.4%), cough (64.1%), anorexia (18.4%), convulsion (15%), weight loss (1.5 %) Pain abdomen (1.25%), difficulty in breathing (9.1%), Vomiting (6.6%) and diarrhoea (1.4%). Fever and cough were more prominent in younger age children (<3 years) whereas anorexia and weight loss were prominent elder children.

Duration of complaints in these cases was less than l month, 1-3 month and >3 months in 35%, 40.2% and 32.5% of cases respectively. Most of the cases presented with 1-3 month duration of illness.

Past history of measles was present in 22(18.33%) cases and whooping cougl1in 12(10%) cases, out of tot.al 120 cases. (Table no. 1)

Table 2 Relation of the various childhood tuberculosis with history of contact

History of Contact	Present	
	No	%
Total No. of cases	52	43.33
Pulmonary tuberculosis (n=75)	30	40.00
Tubercular meningitis (n=19)	11	57.89
Abdominal tuberculosis (n=ll)	3	27.27
Tubercular lymphadenopathy (n= l 3)	7	53.85
Others (n=2)	1	50

History of contact was present in 43.33% cases of childhood tuberculosis studied. History of contact was positive in 40% cases presenting with pulmonary tuberculosis, 57.89% in cases presenting as TBM. 27.27% cases with abdominal tuberculosis and 53.85% presenting with tubercular lymphadenopathy. Highest percentage of history of contact was positive in TBM cases.(Table no. 2)

Table 3 Distribution of childhood tuberculosis according to nutritional status (IAP classification)

Nutritional Status	Total Number	Normal	Grade				p Value
			I	II	III	IV	
Total cases	120	38 31.67%	4 3.33%	31 25.84%	32 26.66%	15 12.5%	<0.001
Pulmonary	75	25 33.33%	1 1.33%	21 28.0%	20 26.67%	8 10.67%	>0.05
TBM	19	8 42.11%	0	5 26.32%	2 10.53%	4 21.05%	>0.05
Abdominal Tuberculosis	11	5 45.45%	0	2 18.18%	3 27.27%	1 9.09%	>0.05
Tubercular lymphadenopathy	13	0	2 15.38%	2 15.38%	7 53.86%	2 15.38%	<0.001
Others	2	0	1 50%	1 50%	0	0	

We studied the childhood tuberculosis in relation to nutritional status of the patients (table no. 10). Most of the cases were moderately (grade II)) and severely (grade III and IV) malnourished. 31.6% of case had normal nutritional status and 68.4% had malnutrition of which 25.84 % has grade II, 26.66% grade III, 12.5% grade IV and.3 33 % had grade I. Pulmonary tuberculosis was more common in grade II, III and IV malnourished children as compared to normal children. The difference was statistically significant (p < 0.001).

Table 4 Clinical spectrum of childhood tuberculosis in relation to tuberculosis with BCG vaccination

BCG vaccination	Scar Present	Scar absent	p
Total number of cases 120	32(26.66%)	88(73.33%)	<0.001
Pulmonary tuberculosis (n=75)	22 (27.00%)	53 (73%)	<0.001
Tubercular meningitis (n=l9)	0	19(100%)	<0.001
Abdominal tuberculosis (n= l l)	6(54.54%)	5(45.46%)	>0.05
Tubercular lymphadenopathy (n-=13)	3(23.07%)	10(76.93%)	<0.01
Others (n- 2)	1(50%)	1(50%)	>0.05

TBM and abdominal tuberculosis were also more common in malnourished children but statistically not significant (p > 0.05).(Table no. 3)

In this study only 27% cases of tuberculosis had received BCG vaccination. BCG scar was present in 27% of cases of pulmonary tuberculosis and absent in 73% cases. The difference was statically highly significant (p < 0.001). None of the TBM cases had received BCG vaccination in our study (p < 0.001). BCG scar in abdominal tuberculosis was present in 54.54% cases and absent in 45.46% cases but difference was statistically insignificant (p > 0.05). BCG scar in tubercular lymphadenopathy was present in 23.07% cases and absent in 76.93% cases. The difference was found statistically significant (p<0.01).(Table no. 4)

Most common finding on general examination was pallor followed by lymphadenopathy and oedema.

Table 5 Manteaux test/BCG test in childhood tuberculosis patients

Test	No. of Cases	Percentage
Total number of positive cases (MT or BCG positive)	98	81.7
MT positive	25	20.8
MT negative/BCG positive	10	8.33
Direct BCG positive	63	52.5
MI negative/BCG negative	22	18 .3

In this study, MT was positive in 21% of cases whereas BCG test was positive in 60% of cases. BCG test was positive in 8.33% of cases who were MT test negative and direct BCG test was positive 52.5% of cases. Both tests (MT and BCG) were negative in 18.3% of cases of childhood tuberculosis (Table no. 5).

Table 6 Radiological features in tuberculosis cases

Past History	No. of cases	Percentage
X-ray chest (n=120)		
Normal	9	7.50
Hilar prominence	86	71.67
Military shadow	1	0.83
Bronchopneumonia	23	19.17
Consolidation	14	11.67
Effusion	5	4.17
X-ray skull (n=19)		
Normal	15	80.0
Sutural separation	4	20.0
Silver beaten appearance	0	-
Calcification	0	-
X-ray Abdomen		
Normal	3	75.0
Dilated bowel loop	1	25.0
USG		
Normal	4	40.0
Dilated loop	2	20.0
Ascites	4	40.0

Most common radiological finding in X-ray chest was hilar prominence (71.67%) followed by, bronchopneumonia (19.17%), consolidation (11.67%), effusion (4.17%) and miliary shadow (0.83%).X-ray skulls of 15 cases (80%) of TBM were normal and sutural separation was the only radiological abnormality observed in 4 cases (20%).(Table no. 6)

Fundus examination was done in TBM cases, out of 19 cases, papilledema was observed in 10.05%, optic atrophy in 10.05%, disk blurring in 10.05% and normal fundus in 69.8% of cases.

Table 7 CSF examination in TBM cases (n=l9)

S.No.	Finding	No. of cases	%
1.	Appearance Clear Xanthrochromic	19	100
2.	Pressure increased	4	21.05
3.	Cob-wed formation	0	-
4.	Cell counts		
	<5 cells/mm^3	4	21.05
	5-100 cells/mm^3	2	10.53
	>100 cells/mm^3	13	68.42
5.	Protein level		
	<40 Mg%	3	15.79
	40-100mg%	9	47.37
	>100mg%	7	36.84
6.	Sugar level		
	<40mg %	18	94.74
	>40mg %	1	5.26
7.	AFB staining	0	-

Table 7 shows CSF finding in TBM cases. The gross appearance FCSF was clear in all cases. CSF pressure was raised in 21.5% cases. Cobweb was absent in all cases. Cell count < 5 cells/nun3 all 1ymphocytcs were present in 21.05%. Cell count 5-100 cells/mm3 in 10.53% and cells more than l00/ mm3 were present in 68.42% cases. Protein level was raised in 84.21% of cases whereas normal level in 15.79% of cases. Sugar level was <40mg% in 94.74% of cases whereas > 40mg% in 5.26 of cases. AFB staining was negative in all cases.(Table no. 7)

Most common finding in CT scan of TBM cases was hydrocephalus (74.9%) followed by cerebral edema (10.05%) and infarction (5%). CT scan was normal in 10.05% of cases.

Table 8 Clinical spectrum and age wise distribution of various childhood tuberculosis

Type of TB	Total No. of cases (n=120)	Age group (yrs)			p
		<3	3-6	7-12	
P. complex	67 (55.83%)	30 (44.78%)	10 (14.93%)	27 (40.30%)	>0.05
PPD	25 (20.83%)	11 (44%)	7 (28%)	7 (28%)	>0.05
Military	1 (0.83%)	1 (100%)	0	0	-
Pleural effusion	6 (5%)	2 (33.33%)	2 (33.33%)	2 (33.33%)	>0.05
Abdominal TB	11 (9.16%)	0	4 (30.77%)	7 (69.23%)	<0.001
Lymphadenopathy	13 (10.83%)	0	4 (30.77%)	9 (69.23%)	<0.001
Pott's spine	1 (0.83%)	0	1 (100%)	0	-

In this study most common type of presentation was primary complex,(53.83%) followed by PPD (20.83%), TBM (15.83%), tubercular lymphadenopathy (10.83%), abdominal tuberculosis (9.16%), pleural effusion (5%), miliary (0.83%) and Pott's spine (0.83%). Pulmonary tuberculosis was found in all age group and it has statistically insignificant age relation (p>0.05). Out of total TBM cases, 78.95% cases were in <3 years of age group which was statistically highly significant with other age group (p<0.001). TB abdomen and tubercular lymphadenopathy were observed in > 3 years age group of children. Difference was statistically highly significant (p < 0.001). (Table no. 8)

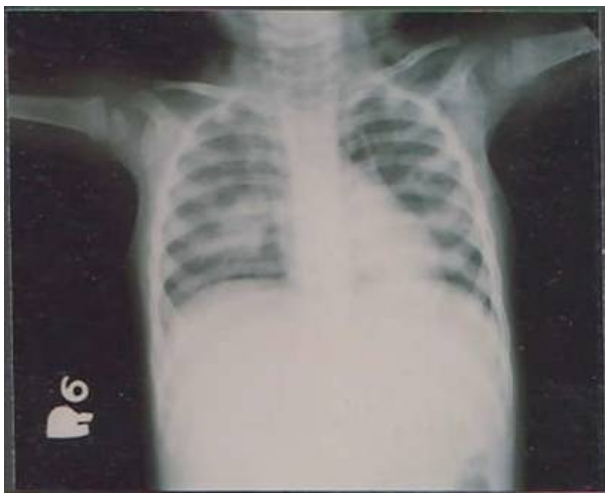

Fig 2 -X-ray chest AP Supine, Arjun, 8 month male child showing consolidation right middle zone.

Fig 3 -X-ray Chest AP supine, Babu, 1 year Male child showing pleural effusion right side

DISCUSSION

Despite the modest advances in diagnostic techniques and effectiveness of treatment, Mycobacterium tuberculosis remains one of the pathogens causing the greatest amount of chronic disease and death throughout the world. More than 20% of the world's population is infected with the tubercle bacillus. Every year, there are 8-10 million new cases and 3-5 million death attributed to tuberculosis. In developing countries, tuberculosis accounts for 1.3 million cases and 45000 deaths annually in children less than 15 years of age. Only recently has the enormous economic impact of this disease been appreciated by the world health organization and national government [14.]

In this study, highest incidence (44. 16%) of disease was observed in age group < 3 years and maximum numbers of cases were below 6 years of age. Higher incidence of disease was observed in age group less than 3 years and difference was statistically significant whe11 compared with other two groups ($p<0.05$).Our observations were similar to Ramachandran and Pumayyan[15]who observed maximum incidence of tuberculosis in children in age group 0-2 years (46.8%), 43% in age group 2-6 years and 10.2% in age group 6-12 years. Sushma Bai and Lakshmi Devi observed maximum number of cases in 1-5 years of age group (49.5%), 27.4% was in 5-10 years age group, 17.9% were under l years and 5.3% were in the age group 10-12 years[16].

In our study, 70(58.33%) were male and 50(41.67%) were female. Male to female ratio was 1.4:1. Males were significantly more than females ($p < 0.01$). Similar male preponderance was also observed by others [15,16]. It is possible that more male children are brought to doctor, because people, at least in this country, consider that boys confer more social security to the family than girls and hence this difference [9].

In this study childhood tuberculosis was significantly more in joint type of family as compared to nuclear family ($p < 0.05$). Thus overcrowding is important risk factor for occurrence of tuberculosis (Table no. 3). Mangtani *et al* also observed that tuberculosis notification rates were related to overcrowding[17]. In our study 79(65.83%) were Hindu, 58(31.67%) were Muslims and 3(2.50%) were Sikhs. Most of the cases belonged to lower socioeconomic classes.35.83% cases were in class IV followed by Class V 27.50%, class III 14.17%, and class II 9.17%. Statistically signification association was observed in childhood tuberculosis and socioeconomic classes ($p<0.001$). According Lo Sushma Bai and Lakshmi Devi [16] slightly more than half (53.8%) belonged to low, 38.9% to middle and 5.3% to high socioeconomic group. Many others also observed association of TB with poverty.[18,19,20,21] Thus, it is in conformity with the fact that tuberculosis is a disease of poverty, poor hygiene, poor housing and overcrowding.

In this study the prominent symptoms were fever (78.4%), cough (64.1%), anorexia (18.4%), convulsion (15%), weight loss (15%), pain abdomen (12.5%), difficulty in breathing (9.1%), vomiting (6.6%) and diarrhoea (4.1%). Fever and cough below 6 years of age, anorexia above 3 years of age while convulsion < 3 years of age were prominent symptoms. Udani *et al*[7] reported fever (76.2%), convulsion (47.4%), vomiting (42 %), altered sensorium (22%) and constipation or diarrhoea (7.8%). Ramachandran and Purnayyan[15] observed clinical feature as not thriving well (60%), irregular fever (44.6%), chronic diarrhoea (37.6%) and repeated respiratory infections (27.6%). Seth *et al* [5]observed fever 65.8%, cough 63.8%, weight loss 37.4% and anorexia 35.70%. On distribution of childhood tuberculosis according to duration of illness we observed that. 1-3 month of duration of illness was seen in 40.2% followed by< 1 month in 35% and >3 months in 32.5%. Most of cases presented with 1-3 month of duration of illness.

In our study, history of measles was found in 18.33% and whooping cough in 10% whereas Bhakoo *et al* (1969) reported history of measles in 22% of cases and whooping cough in l8% of patients as precipitating factor for tuberculosis. A quiescent tuberculosis infection may flare up after an attack of measles and whooping cough[22].

History of contact was present in 43.33% cases of childhood tuberculosis studied. History of contact was positive in 40% cases presenting with pulmonary tuberculosis, 57.89% in cases presenting as TBM, 27.27% cases with abdominal tuberculosis and 53.85% presenting with tubercular lymphadenopathy. Highest percentage of history of contact was positive in TBM cases. Seth *et al* noted a positive history of contact in nearly 33.7% of cases[5]. Sushma Bai and Lakshmi Devi revealed positive history of contact with adult in half of the cases[16]. These studies showed almost similar results to our study.

Tuberculosis being believed as a social stigma in the community, there is marked under reporting of history of contact cases as compared to the actual incidence of the

disease. Parents either do not voluntarily admit or actually deny the existence of tuberculosis in family. If we routinely screen or X-ray the near relatives and possible contacts of a child suffering from tuberculosis, we can arrive at a higher contact rate.

We studied the childhood tuberculosis in relation to nutritional status of the patients. Most of the cases were moderately (grade II) and severely (grade III and IV) malnourished. 31.6% of cases had nom1al nutritional status and 68.4% had malnutrition of which 25.84% had grade II. 26.66% grade III, 12.5% grade IV and 3.33% had grade I. Pulmonary tuberculosis was more common in grade II, III and IV malnourished children as compared to normal children. The difference was statistically significant ($p < 0.001$). TBM and abdomen tuberculosis was also more common in malnourished children, but differences were statistically insignificant ($p > 0.05$). Seth *et al* observed that grade III malnutrition was maximum in TBM followed by progressive primary complex and was least in the primary complex[5].

Similarly other workers observed 58% of cases had normal nutritional status and 42% had malnutrition of which 37% had grade I or II and 5% had grade III and no child in grade IV[16].Thus, undernourished children are more susceptible to develop tuberculosis, probably due to depressed immunological defenses. Tuberculosis disease may precipitate kwashiorkor or marasmus in infant with borderline malnutrition. A malnourished patient who does not respond to dietary therapy should be promptly investigated for tuberculosis[23].

In our study, BCG vaccination was found only in 32(27%) of cases. Tubercular meningitis was found only in unimmunized children, whereas other forms of tuberculosis was found in both immunized and unimmunized children. BCG scar was present in 27% of cases of pulmonary tuberculosis and absent in 73% cases. The difference was statistically highly significant ($p<0.00l$). None of the TBM cases had received BCG vaccination in our study ($p<0.001$). BCG scar in abdominal tuberculosis was present in 54.54% cases and absent in 45.46% cases but difference was statistically insignificant ($p>0.05$). BCG scar in tubercular lymphadenopathy was present in 23.07% cases and absent in 76.93% cases. The difference was found statistically sigi1ificant ($p <0.01$).Thus, BCG vaccination cannot prevent natural tuberculosis infection of the lungs and its local complication but it reduces the serious forms of tuberculosis. Udani [8] and Kosecik *et al* [24] also gave similar opinion regarding the BCG vaccination. Therefore, it is suggested that BCG vaccination should be administrated in infants and children to reduce the risk of primary tubercular infection disseminating to severe forms.

In our study, the most common finding in general physical examination was pallor (65.5%) followed by lymphadenopathy (10 .83%), edema (6.67%) and clubbing (3.33%)

In this study, MT was positive in 21% of cases whereas BCG test was positive in 60% of cases. Indirect BCG test was positive in 8.33% of cases and direct BCG test was positive 52.5% of cases. Both tests (MT and BCG) were negative in 18.3% of cases of childhood tuberculosis.

Jaiswal and Bhandari [25]observed, that BCG test was positive in 90.9% while MT was positive in 14 .7% only.Dikshit and Singh [26] noted in TBM, BCG test was positive in 82% whereas MT was so only in 49.6%. In pulmonary TB, BCG test was positive in 93 and MT only in 65%.Gocmen *et al* [27]and Udani [28] also observed that BCG test were more reliable and sensitive than MT in diagnosis of tuberculosis. BCG test showed high positivity in all grades of malnutrition.

Velhal *et al* [29] observed that MT was positive in 65% cases of tuberculosis with malnutrition whereas BCG test was positive in all cases (100%). Thus, our finding corroborate well with many others[25, 26, 28, 29]

Udani [28] found that under the age of one year the tuberculin lest was positive only in 25% of proved cases of tuberculosis and negative in 75%. In children between the ages of 1-5 years tuberculin test was positive in 60% and negative in 40%. This is partly because in infants and young children the condition such as miliary tuberculosis, meningitis, disseminated tuberculosis and all severe type of tuberculous manifestations are more common with a greater impact on the nutrition of the child. Hence, with serious type of disease and greater degree of malnutrition in infancy and early childhood, MT has very limited value and negative MT does not exclude tuberculosis. Most common radiological finding in X-ray chest was hilar prominence (71.67%) followed by bronchopneumonia (19.17%), consolidation (11.67%) effusion (4.17%) and miliary shadow (0.83%). Radiological findings in X-ray skull were nom1al in most of TBM cases and sutural separation was present in 4(20%) cases. Adercle (1980) found lymphadenopathy in 74%, parenchymal lesion in 68%, and majority of cases were presented as multiple lesion[30]. Seth *et al*[5] observed most important lesion on radiology was parenchymal lesion (51.4%). Sushma Bai and Lakshmi Devi [16] also noted parenchymal lesion (66.2%), hilar (13.2%) and parenchymal and nodal lesions in (8.41%).

In our study, most of the patients of TBM showed normal fundus examination. Some cases showed papilledema (10%), optic atrophy (10%) and disk blurring (10%). Benakappa *et al* reported fundal changes (papilledema and optic atrophy) in 18.4% cases[31].Joshi *et al* reported papilledema in 24% and optic atrophy in 16% cases.[32]

In CSF examination of TBM cases, we observed grossly clear CSF in all cases. Benakappa *et al* [31] observed xanthochromic CSF in 5.6% cases. In our study CSF pressure was raised in 21.5% cases and cobweb was absent in all cases. CSP protein was raised in 84% of cases. Sugar decreased in 94.74% of cases. Cell count increased in 79% of cases. The most common cell type was lymphocytes.

In our study, most common finding in CT scan was hydrocephalus (7 4.9%) followed by cerebral oedema (10.05%) and infarction (5%). Bhargava *et al*[33] reported hydrocephalous (83.05%). exudates in subarachnoid cisterns (81.6%), infarcts (28.3%), tuberculoma/abscess (10%) and white matter edema (3.33%). Kingsley *et al*[34] reported hydrocephalous in 84%, basal exudates in 64%, tuberculoma in 88% and infarction 36%.

Clinical spectrum and age wise distribution of childhood tuberculosis was shown in this study. The most common type of tuberculosis was primary complex (55.83%) occurring alone or in combination with other lesions followed by progressive pulmonary disease (20.83%), tubercular meningitis (15.83%), tubercular lymphadenopathy (10.83%), abdominal tuberculosis

(9.16%), pleural effusion (5%), miliary (0.83%) and Pott's spine (0.83%).

Bhargawa *et al* [10] reported primary complex including complication in 59.2% of cases in 3-6 years of age. Pleural effusion without demonstrable lung les ion was seen in 10.2% in 7-12 years of age. Adult type 16.8% and quiescent type were seen in 13.8%.

Maltezou *et al* observed superficial lymphadenitis (48), pleural effusion (27), meningitis (16), skeleton TB (5), military tuberculosis (3), abdomen TB (2) and pericarditis (1), out of total number of 102 cases[35].

In our study, most common lesion was primary complex (55.83%), the proportion being higher in older age group (3-12 years). It has statistically insignificant age relation (p>0.05). Seth *et al* [5] also reported higher incidence of primary complex (82.1%) in older age group and the incidence of severe form of tuberculosis i.e. PPD, TBM, miliary was significantly more in younger age group. In our study, all cases of tubercular meningitis (19) were within 6 years of age group. Out of these, 78.95% cases of TBM were <3y ears of age group, the difference was statistically significant (p<0.00I).

In this study, all cases of TB abdomen and tubercular lymphadenopathy were found after age of 3 years. The difference was statistically significant (p<0.001). Miliary tuberculosis (1) was observed within 3 years of age.

Our findings were similar to findings of Seth *et al*[5] and Bhargava *et al*[10]. Children below 3 years of age suffered from severe illness probably because of non-communicability of the symptom in younger age group which may cause undue delay in the diagnosis thus helping in developing of a severe disease.

CONCLUSION

The tuberculosis in children is seen more frequently below 6 years of age. Lower socioeconomic status, overcrowding, malnutrition, and lack of immunization were important risk factors for childhood tuberculosis. It is recommended that every child should be immunized with all vaccines included in national immunization program, so as to give protection from measles and whooping cough which were significant preceding illnesses in our study. Contacts for childhood tuberculosis should be actively screened and promptly treated. Prophylaxis should be provided to every child who is living in close contact with adult cases. Health education should be provided to public regarding improvement of nutritional status, environmental sanitation and personal hygiene to reduce the incidence of this social stigma.

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Declarations

Ethical approval: This study was an observational study. The investigations required were a part of routine management of illness. No change was made in usual management of subjects under study, informed consent was taken from the patients who were enrolled for study. In case of refusal of consent, subjects continue to receive the standard treatment as per protocol.

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