

**Original Research Article**

## Prevalence of Pulmonary Tuberculosis among the Population of Visakhapatnam - The Urban, Rural, Tribal Divide

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**Abstract**

**Background and Introduction:** Tuberculosis burden continuous to be high even today despite the wide spread network of control measures started since 1962 with NTC. WHO sets the target of reducing the prevalence rate to ten per one lakh population. For the past few decades, MDR-TB has been a serious concern.

**Aims and Objectives:** In the present study, the aim is to study the prevalence rate among the population of Visakhapatnam District in Andhra Pradesh to compare it among the rural, urban, and tribal regions.

**Material and Methods:** The data for the present study is obtained with permission from the District Tuberculosis Control Officer, Pedawaltair, Visakhapatnam, Andhra Pradesh. Total of 67,017 pooled case data, both old and new, from 2007 to Aug 2018 is gathered for the study to calculate prevalence rate among the population. The data is analysed on excel sheet and IBM SPSS software statistics is applied where-ever necessary. The prevalence rate is calculated using the Bio-Statistics formula by adding old cases to new cases divided by population at risk multiplied by one lakh.

**Results and Discussion:** The calculated prevalence rate of TB among the population of 42 – 47 lakh of Visakhapatnam District is variable with fluctuations giving the SEA-SAW shape in the graph and maintains a plateau when compared to the global trend of gradual fall by 20% reduction. Yet the prevalence rate of Visakhapatnam study by the present author and its team is lesser than that of global. It is noticed that as per the analysis of data from the tables spread on the excel sheet, there is not much difference in prevalence of TB among the three regions of the district of Visakhapatnam unlike in other parts of the country particularly the state of MP.

**Conclusions:** With the fast and extensive ramification of Gene-Xpert machines to diagnose TB and resistance, more number of cases can be diagnosed and plan the control measures to check TB by involving all possible organisations like the NGOs, TBAs, local leaders, traditional healers in remote areas, extensive utilisation of social media and by providing balanced nutrition with the help of the Anganwadi staff.

**Keywords:** RURAL, URBAN, TRIBAL POPULATION, PREVALENCE, TB, WHO.

**Introduction**

Tuberculosis is an infectious notifiable disease. One fourth of world's population is infected with

TB. Quarter of TB & MDR-TB of the world is from India. As on Dec <sup>12</sup>2017, 4,35,000 people died of TB. Cure rate of MDR-TB is only 33%.

As per 2016 report, of the global 10.4 million new cases of active TB, 4,90,000 are MDR-TB and 47% of it is from India, China, Russian federation.<sup>1,7</sup> WHO statistics for 2016 report - 2.79 million cases of TB, incidence of India is 211 per one lakh. National Tuberculosis Programme (NTP) was started in 1962. In 1997, RNTCP came into force with DOTS. In 2006 WHO came with “Stop TB Strategy” and in 2016 “End TB”.<sup>2,6</sup> India

accounts for 27% of the world’s 10.4 million new TB cases, and 29% of the 1.8 million new TB deaths globally. India also accounts for 16 % of the estimated 4,80,000 new cases of multidrug-resistant TB. The<sup>8</sup> End TB strategy by WHO as per table 2 aims to end the global TB epidemic, with targets to reduce TB deaths by 95% and to cut new cases by 90% by 2035.



The above map of Visakhapatnam district shows the 20 + TU centers. The large Green (Light & Dark) shaded area indicates the tribal belt which contains 8 TU equal to rural 8 – caters to 14.42% of the total population, largest in the state of AP.

The Present Study deals with estimating the change in the trend of prevalence of tuberculosis among population in Visakhapatnam district of Andhra Pradesh. The data of TB case finding is obtained from the pooled data at the district TB control officer, Pedawaltair, Visakhapatnam with permission. The data is analysed at the Research center, GIMSR on excel sheet with the application of IBM SPSS statistics software. The **limitations** are: MDR-TB, diabetes, smoking, alcohol and other socio economic factors influencing the incidence of TB are not part of the study due to

the non availability of data and it is not a prospective study. However, the prevalence in vulnerable groups like MCH, HIV, and primitive tribal groups (PTG) are considered in the study. **2011 census**– total AP population is 4,95,75,771 and Visakhapatnam is 42,90,589 (8.65 %). The district of Visakhapatnam has the highest tribal population (14.42 %) in AP state. The draft new national strategic plan (NSP) for TB elimination 2017 – 2025<sup>9</sup> is a trend setter in the fight against TB.

### Biostatistics

Prevalence is calculated by adding old cases to new cases divided by population at risk multiplied by one lakh. Incidence and case fatality rate are also calculated. The data obtained is tabulated in multiple and the relevant health status indicators are calculated based on that and conclusions are drawn. It is useful in planning future health care delivery system for controlling tuberculosis.

### Material and Methods

The case material for the present study is obtained from the Govt. of AP related District Tuberculous center with permission to avail the TB data. From 2007 to 2014 (8 years), from 2015 to Aug 2018 (4 years) the collected data is compiled and tabulated in two separate excel sheets. Prevalence rate, incidence and case fatality rate (CFR) are calculated as per the bio-statistics formula based on <sup>3</sup>PARK'S & <sup>5</sup>Mahajan's methods in consultation with the institutional statistician and the professor of Community medicine. The total

TB cases of both old and new is 67,017. Population at risk is estimated based on 2011 census by adding 5% enhancement every year till 2018. Further census report is awaited in the year 2021.<sup>4</sup> Prevalence rate is calculated per one lakh population. Relapses are included in incidence rate as a case appears after completion of treatment as per the direction of PARK'S manual. Every possible honest attempt is made not to alter the data as obtained from the DTCO center. There is a clear shift of TU network extension from 2015 when more of tribal TU centers are established over the previous years, almost doubled. Case finding is based on the traditional methods of clinical diagnosis, Smear examination and X-Ray chest primarily. Only since the year 2016, the CBNAAT (Gene-Xpert) has come into the diagnostic study, yet widely available from late 2018. The Rifampicin resistance in India for 2016 is clearly shown in table 3. The data from it also is part of the present case total. More detailed data analysis is made from 2015 to Aug 2018.

**Table : 1**

GLOBAL - INDIA TB BURDEN : 2017				
INDICES	GLOBAL		INDIA	
	CASES	RATE PER LAKH	CASES	RATE PER LAKH
INCIDENCE	1,04,00,000	140	27,90,000	211
DEATHS	16,74,000	22	4,35,000	33
HIV-TB CASES	10,30,000	14	87,000	6.6
HIV-TB DEATHS	3,74,000	5	12,000	0.9
MDR/RR CASES	6,01,000	8.1	1,47,000	11

INDIAN AVERAGE TB BURDEN - 217 PER ONE LAKH PER ANNUM.

END-TB TARGET - 10 CASES PER ONE LAKH PER ANNUM.

MDR TB - 2.84 % IN NEW CASES

- 11.60% IN PREVIOUSLY TREATED CASES.

**Table : 2**

WHO GUIDELINES				
INDICES	MILESTONES		SDG	END TB
	2020	2025	2030	2035
REDUCTION IN NO. OF TB DEATHS	35%	75%	90%	95%
REDUCTION IN TB INCIDENCE	20%	50%	80%	90%
TB FAMILI'S CATASTROPHIC COSTS	0%	0%	0%	0%

SDG - Sustainable development goals.

**Table: 3** Case Profile Data 2007 – 2014.

YEAR	AREA	NEW SPUTUM +VE	NEW SPUTUM -VE	NEW EPTB +VE	RELAPSES	FAILURE	TAD	OTHERS	TOTAL CASES
2007	URBAN	916	509	533	170	22	30	74	2254
	RURAL	1167	638	357	209	11	17	83	2488
	TRIBAL	478	137	46	42	9	7	4	723
<b>Total :</b>		<b>2561</b>	<b>1284</b>	<b>936</b>	<b>421</b>	<b>42</b>	<b>54</b>	<b>161</b>	<b>5465</b>
2008	URBAN	880	591	549	108	15	61	74	2278
	RURAL	1155	537	412	201	17	53	93	2468
	TRIBAL	486	246	98	68	13	16	4	932
<b>Total :</b>		<b>2521</b>	<b>1374</b>	<b>1059</b>	<b>377</b>	<b>45</b>	<b>130</b>	<b>171</b>	<b>5678</b>
2009	URBAN	894	535	434	170	16	26	75	2151
	RURAL	1199	633	410	254	28	60	94	2698
	TRIBAL	504	176	77	82	3	6	9	857
<b>Total :</b>		<b>2597</b>	<b>1344</b>	<b>921</b>	<b>506</b>	<b>47</b>	<b>92</b>	<b>178</b>	<b>5706</b>
2010	URBAN	852	593	426	200	25	30	90	2216
	RURAL	1191	651	431	211	35	43	121	2683
	TRIBAL	504	219	77	79	17	7	22	925
<b>Total :</b>		<b>2547</b>	<b>1463</b>	<b>934</b>	<b>490</b>	<b>77</b>	<b>80</b>	<b>233</b>	<b>5824</b>
2011	URBAN	921	521	438	199	26	34	104	2243
	RURAL	1232	556	386	222	44	44	124	2608
	TRIBAL	543	219	102	77	4	8	25	978
<b>Total :</b>		<b>2696</b>	<b>1296</b>	<b>926</b>	<b>498</b>	<b>74</b>	<b>86</b>	<b>253</b>	<b>5829</b>
2012	URBAN	877	426	489	143	11	21	117	2084
	RURAL	1294	573	391	175	20	32	116	2601
	TRIBAL	624	340	142	63	10	20	20	1219
<b>Total :</b>		<b>2795</b>	<b>1339</b>	<b>1022</b>	<b>381</b>	<b>41</b>	<b>73</b>	<b>253</b>	<b>5904</b>
2013	URBAN	947	397	494	165	20	25	89	2137
	RURAL	1284	463	370	171	12	27	115	2442
	TRIBAL	536	216	116	73	9	16	21	987
<b>Total :</b>		<b>2767</b>	<b>1076</b>	<b>980</b>	<b>409</b>	<b>41</b>	<b>68</b>	<b>225</b>	<b>5566</b>
2014	URBAN	946	404	478	247	28	29	127	2259
	RURAL	1347	527	382	248	15	32	107	2658
	TRIBAL	679	150	145	81	15	38	24	1132
<b>Total :</b>		<b>2972</b>	<b>1081</b>	<b>1005</b>	<b>576</b>	<b>58</b>	<b>99</b>	<b>258</b>	<b>6049</b>

Relapse= reporting TB after complete treatment.  
 Failure = Sputum +ve in the middle of treatment.  
 TAD = Treatment after default.

**Table : 4**

CHANGING TREND OF TB PREVALENCE FROM 2007 TO 2018 - VISAKHAPATNAM DISTRICT IN ANDHRA PRADESH			
YEAR	POPULATION AT RISK	CASES OLD & NEW	PREVALENCE
2007	4069450	5465	134.29
2008	4112740	5678	138.06
2009	4155178	5706	137.32
2010	4202021	5824	138.60
2011	4240606	5829	137.46
2012	4318579	5904	136.71
2013	4349045	5566	127.98
2014	4351557	6049	139.01
2015	5762444	6073	115
2016	4440443	6076	144.46
2017	4470909	5614	134.8
2018	4470909	3233	74.36

Table: 5

PREVALENCE OF TB IN VISAKHAPATNAM DIST (%)				
YEAR	URBAN	RURAL	TRIBAL	TOTAL
2015	109.93	118.03	118.37	115
2016	132.7	127.12	173.56	144.46
2017	115.56	120.71	168.11	134.8
2018 OCT	70.63	66.94	85.5	74.36

Table: 6

TB-HIV CO-INFECTION CASE PROFILE			
YEAR	TOTAL TB CASES SCREENED FOR HIV	HIV +VE	PERCENTAGE
2015	6060	464	7.66
2016	6083	430	7.07
2017	5612	397	7.07
2018	4749	280	5.90

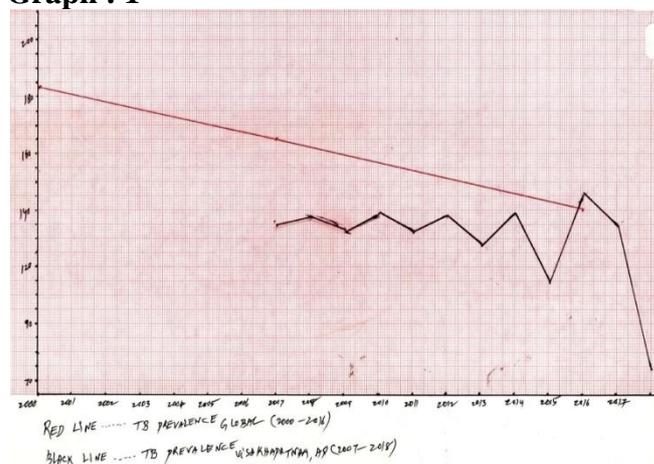
**Results**

The changing trend in the prevalence of TB is clear as per the data of 2016 when it is reported high when compared to 2017 to 2018 Oct. In 2015, the TB prevalence is same in rural and tribal areas. In 2016, 2017, 2018 Oct, there is marginal difference of about 15-20% as per table-5. But in the state of MP the difference is gross. Hence, the prevalence is fluctuating among years and regions in the same district but better than other states of India.

From the tabulated data it is obvious that the prevalence rate among the people of Visakhapatnam ranges from 115 to 144 per lakh and in most of the years there is only a marginal difference of less than 5 (ranging from 134 to 139 per one lakh). Overall, the rate maintained a plateau over a decade yet reported low prevalence. Males outnumber females by 2.4 : 1.0 ratio and most of the cases occurred in the age group of 35 to 54 with the least reported in extremes of age for PTB cases – this is for the period 2015 to 2018 the same the case with EPTB cases also but with short difference of ratio of 2:1. There is not much rural - urban difference in prevalence rate but higher rate is reported in tribal areas. Most unfortunate is the retreatment category which is from 14 – 20% of new cases including relapses and in children below 14 years it is less than 5%. The TB HIV case load for the period 2015 to Aug

2018. Shows no increase in trend when compared to the national average are other sources of data. The overall HIV positivity is less than 7% (5.84 – 8.82) in most of the cases barring few. As per table 1, the global HIV TB report of 2017 and the rate is 14 per lakh and for India it is 6.6.

Graph : 1



The above spot/line graph of frequency polygon shows the trend in the distribution of prevalence over a period of 2000 – 2016 globally and 2007 – Aug 2018. The above redline of the graph shows gradual descent of prevalence from 183/lakh in the yr 2000 to 140/lakh in the year 2016 as per the WHO global report i.e. a reduction by 20% with the midpoint at 2007 with 165/lakh prevalence. Whereas the black line below the redline of the graph shows SEA-SAW appearance indicating

fluctuating prevalence rate in the population of Visakhapatnam in Nov'18 by the DTCO & GITAM combined study. The dip in 2015 is not due to sudden change in the prevalence but due to the alteration in tuberculous units' allotted population where in more tribal units have come into effect with change of share in population and the average of prevalence of rural, urban and tribal.

Yet the overall prevalence rate of Visakhapatnam is less than that of global when India aims at "End TB" by 2025 and the WHO aims to fulfil the same target by 2030. Hence it is an indication of favourable signs to achieve the goal set by India a head of Global. The data and the graph are well calculated without alteration and in consultation with the bio-statistician and the professors of community medicine of different medical colleges.

### Discussion

Low level of present prevalence need not necessarily indicate the low TB case load in the population. With improved motivation and people well aware of health due to media propaganda, the TB and also HIV prevalence have received a downward trend. With the participation of private doctors in the notification process, more number of TB cases can be identified and diagnosed, the prevalence rate may go up. Intensive effort with wide application of molecular diagnostic tests to diagnose cases can result in hike in prevalence rate. In tribal areas, the incidence and the prevalence rate for the years 2015, 2016, 2017 and Aug 2018 are 108 – 118, 54 – 173, 56 – 168, 30 – 85 respectively. Hence, even the largest tribal prevalence rate of Visakhapatnam is not higher than that of Indian average. The increasing trend in 2016 & 2017 over the previous year's indicates case identification of more number of TB due to more TU and CBNAAT. However surveillance has to be maintained continuously.

### Conclusion

As per the conclusions drawn from the tables 4 to 15 the low prevalence rate reported in Visakhapatnam can surely result in reaching the goal of END-TB by 2025 with the prevalence rate of 10 per one lakh population in the forth coming 7 years with about 15 to 17% annual reduction. TB-HIV co-infection is a matter of concern which will also come down as HIV-AIDS has already experienced considerable reduction. Co-morbid conditions like smoking bronchitis, alcoholism, auto immune disorders, anaemia & malnutrition provoking TB reactivation has to be kept in mind by all the practicing doctors. One glaring mistake in the control of TB is that the private, public, corporate, NGOs feel is as the responsibility of government machinery only. Air pollution control is one missed area that influences TB reactivation to a great extent. As long as the nutrition, anaemia, Ill-temperate habits, poor housing, illiteracy are not kept under check, TB cannot be controlled fully.

### Future Perspective

In <sup>10</sup>future, more number of TB cases can be notified and diagnosed due to the intensification of RNTCP field work and the extended ramification of latest molecular diagnostic Gene-Xpert/RT-PCR in most of the TU centers. Even private corporate hospitals can purchase Gene-Xpert machines to diagnose more number of EPTB cases. It is a distant dream to expect all nongovernmental hospitals and private clinics to send samples of all presumptive TB cases to Government aided diagnostic centers. However government agencies can supervise them. Infact, the real burden of TB arises not from faulty notification but from slow socio economic, <sup>11</sup>educational and climate changes. Modern methods of health education can bring radical change. The methods of propagation already adopted with regards to the control of population by family planning, HIV-AIDS and epidemics like Cholera & Diarrhoea which received downward

trend can also be adopted for the control of TB for lasting results.

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