

TUBERCULOSIS AMONG YOUNG PEOPLE ON RISE IN SRI-LANKA

(An analysis of trend and associated factors)

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ABSTRACT

Introduction: A descriptive cross sectional study was carried out in 5 randomly selected districts i.e Gampaha, Kandy, Badulla, Nuwara Eliya and Ratnapura during the period of March to September 2014. The general objective of the study was to describe the trend of TB among young population over past 6 years in Sri Lanka and to determine contributory factors associated with TB among young population.

Methodology: The study was carried out in two stages. The first stage was analysis of the trend of TB over the 6 year period of 2008-2014. The analysis of the trend was carried out using the existing secondary data at the Medical Records Division of the National Programme for Tuberculosis Control and Chest Diseases (NPTCCD). Trend was analyzed for new cases of TB patients of 15--34 years of age and separately for 15-24 and 25-34 age groups and for each type of new TB cases. The second stage was a descriptive cross sectional study which was carried out to determine the associated factors. All the patients (new/ retreatment) in age group of 15-34 years and registered at the selected district chest clinics with confirmed TB were selected as the study subjects. Operational Definitions were used to identify confirmed TB cases ie, Sputum smear positive TB, smear negative pulmonary TB and Extra pulmonary TB. The data were collected using a pre tested interviewer administered questionnaire by the District Tuberculosis Control Officers attached to the relevant District Chest Clinics.

Result: The main findings of the study were,

The two peaks of TB incidence were observed in the trend across age groups and first one was in the age group of 25-34 years second peak in the age group of 45-54. Overall trend of TB in the country is more towards the older age groups (over 45 years), but shift to younger age groups were observed in 15 out of 16 districts in the country. A total of 223 patients were included in the descriptive study. The highest proportion (34%) of study population was from the district of Gampaha while least proportion (10%) of it was from Nuwara Eliya. Nearly 53% of the study population was above 25 years of age with the sex ratio of 1:1. A majority (68%) of the study population was Sinhalese while nearly 70% of the study population has passed the O/L, A/L, Diploma or a degree. About one third of the study population was unemployed. Nearly half (50.4%) of the study population was having monthly income of about Rs. 20,000.00 or above. 31% of the study population were current or past alcohol consumers and 29% were smokers and 7% of the study population were current or past cannabis consumers. Majority (77%) of the study population were under-nourished while 14% of them were less than 15 kg/m². Nearly three fourth (72%) of the study population have been diagnosed by a consultant. Statistically significant associations were found between the age category and more than 3 family members ($\chi^2=5.063$, df=1, p<0.017), ethnicity ($\chi^2=4.229$, df=1, p<0.04), employment category ($\chi^2=13.859$, df=3, p<0.003). Statistically significant associations were not found between the age category and residing district ($\chi^2=5.962$, df=4, p<0.202) and type of house ($\chi^2=1.875$, df=1, p<0.110),

Conclusion: The study recommends more detailed assessment regarding the dietary habits of the patients, Emphasis on community awareness regarding nutritional aspects. Improving the nutritional status among adolescents and young adults. Modification of risky life style factors, Improvement of socio economic status through enhancement of financial stability, minimizing overcrowding and improvement of housing conditions and involving of non NTP health care providers and health professionals for TB diagnosis and management through capacity building and awareness.

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INTRODUCTION

Tuberculosis (TB) is a multi systemic disease with myriad presentations and manifestations. It ranks alongside HIV as a leading cause of death from an infectious disease related mortality worldwide¹.

Despite the encouraging progress towards control of TB, the global TB burden remains enormous. According to the WHO Global Report, in 2015, there were an estimated 9.6 million new cases of TB (range, 9.1 million–10.0 million) globally, equivalent to 133 cases per 100,000 population in 2014¹. The estimated prevalence of TB in 2014 was 13 million. There were also 1.5 million deaths due to TB (1,100,000 deaths among HIV-negative cases of TB and 400,000 deaths among people who were HIV positive¹).

The estimated prevalence and incidence rates of all forms of tuberculosis in Sri Lanka in 2015 were 99 and 65 per 100 000 population respectively. The notification rate of new and relapses of TB were 44.5 per 100,000 population, showing slight increase when compared with previous years. Treatment success rate for all forms of TB was 83.2% in 2015 (Unpublished data, NPTCCD).

Sri Lanka is not among the 22 high burden countries of tuberculosis. However, Tuberculosis remains a widespread problem and poses a continuing threat to the health and development of the people. The estimated annual risk of TB infection (ARTI) is 0.4% (0.17%-0.72%)². The highest rates of infection have been found in the most densely populated areas, such as Colombo and other urban areas.

World incidence of TB increased with population density and urban development. People in lower socio economic groups are more prone to get TB and it also affects young adults in their most productive years. Micro epidemics among adolescence and young adults have been reported since 1980. An outbreak of Pulmonary TB was reported among young adults in Australia and majority of the patients were of Asian origin³. Outbreaks of TB were also reported among School children in Milan, Italy⁴, and South Carolina, USA⁵ also. Clinical practice in Sri Lanka clearly showed significant change of Age distribution of TB and more and more young adults are presenting with TB without any known risk factors. But scientific evidence is lacking in this regard and the present study is designed to identify trend of TB among young population and to determine contributory factors for development of TB.

METHODOLOGY:

This is a descriptive cross sectional study. It was carried out in two stages.

First stage –Analysis of the trend of TB over the past 6 years.

The trend analysis was carried out using the existing secondary data at the Medical Records Division of the National Programme for Tuberculosis Control and Chest Disease Diseases (NPTCCD). Trend was analyzed for new cases of TB disease among patients of 15--34 years age category for past 6 years (2008 to 2014) and separately for 15-24 and 25-34 age groups and for each type of TB.

Second stage - Descriptive Cross Sectional Study to determine the associated factors

Study setting

The study was carried out in 5 selected districts in Sri Lanka namely, Gampaha, Kandy, Badulla, Nuwara Eliya and Ratnapura.

Study subjects

All (new/ retreatment) the patients in age group of 15-34 years and registered at the selected district chest clinics with confirmed TB were selected as the study subjects. Operational Diagnostic Criteria for confirmed TB is defined as

⌋ **Sputum smear positive TB-** A patient with at least two sputum smears are positive for AFB by direct smear microscopy or a patient with at least one sputum smear positive for AFB by microscopy and sputum culture is positive for *M. tuberculosis*.

⌋ **Sputum smear negative pulmonary TB** - A patient with at least three sputum smears are negative for AFB by microscopy with chest X-ray abnormalities consistent with active pulmonary tuberculosis and no response to a course of broad-spectrum antibiotics or a patient whose initial sputum smears were negative for AFB, but the sputum culture is positive for *M. tuberculosis*.

⌋ **Extra pulmonary TB** - Tuberculosis of any organ of the body other than the lung parenchyma either bacteriologically confirmed or clinically diagnosed.

Inclusion criteria

All the patients who fulfill the above criteria and are residing in the selected districts were included in the study

Exclusion criteria

Patients below 15 years of age or 35 years or above and patients who do not residing in the selected districts were excluded from the study

Study Period – Three months starting from 1-08-2013

Sample size.

A formal sample size was not calculated for the study. All the patients registered during the above period and who fulfill the inclusion criteria will be included in the study.

Data collection

Interviewer administered, structured questionnaire was used to collect information. Information was gathered on demographic, socio-economic, environmental conditions, life style factors past and present medical history, contact history, family history, history of medication, and diagnostic variables. The questionnaire was prepared in English and then translated into local languages.

Data collection was done by a pre trained data collectors (preferably pre interns)

Questionnaire was pre-tested in the Chest clinic Colombo.

Data management and analysis

Data entry was carried out and analyzed in the SPSS software. Frequencies, percentages and proportion were calculated for categorical variable while mean was calculated for continuous variables.

Chi square test was used to determine association between categorical variables and 95% confidence interval was also established.

Ethical Considerations

Data security/confidentiality was ensured and no unauthorized persons were allowed to access the data. Ethical approval was obtained from the Ethical Review Committee of the University of Sri Jayawardanapura.

RESULTS

First Stage -The Analysis of the trend of TB over the period of 2008-2014.

The trend of TB was analyzed over the period of years from 2008 -2014 for new cases, new sputum positive, new sputum negative and EPTB cases and for all 26 districts for the age categories of 15-34years, 15- 24 years and 24 -34 years. In addition trend of TB for males and females were assessed separately.

Trend of TB in All New cases –

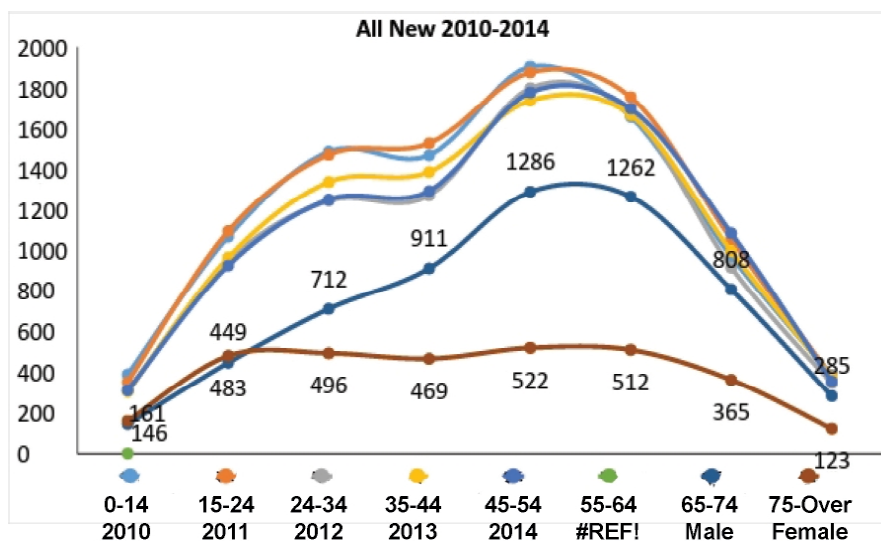
Around one fourth (25%) of the patients detected with TB during the 2010-2014 belongs to the age group of 15-34 years. The two peaks of TB incidence were observed in the trend across age groups and first one was in the age group of 25-34 years second peak in the age group of 45-54. However, overall trend for all new cases was more towards the older age groups (over 45 years).

The incidence of TB was more among males and number of cases was increased up to 45-54 age group and there was a gradual decrease of cases in older age groups. The number of cases more in young adult females of 15-24 than males in the same age group and it remained more or less static in all age groups except in extreme ages. Present medical history, contact history, family history, history of medication, and diagnostic variables. The questionnaire was prepared in English and then translated into local languages.

Data collection was done by a pre trained data collectors (preferably pre interns)

Questionnaire was pre-tested in the Chest clinic Colombo.

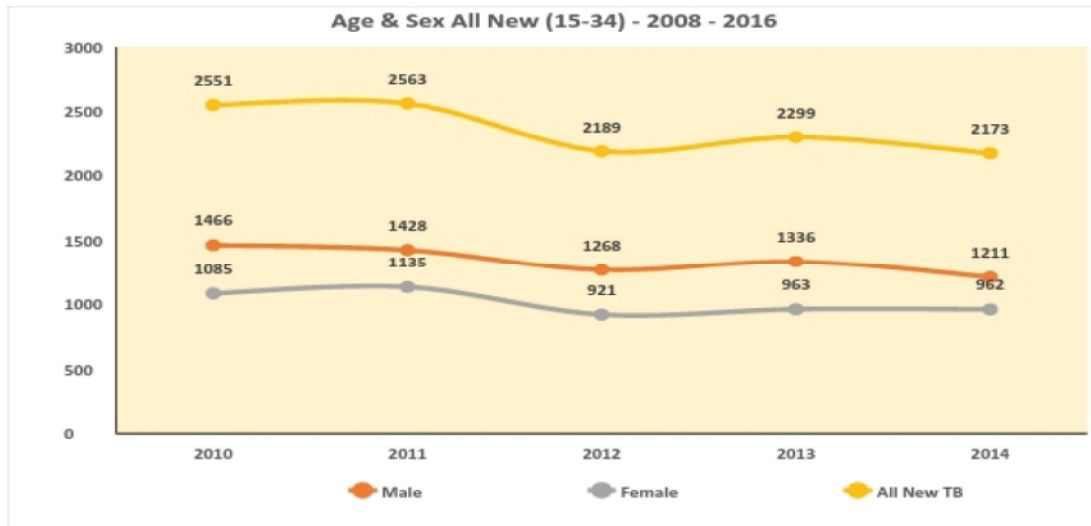
Figure 1 Trend of all new cases of TB for the 2010-2014 period



There was a slight but decreasing trend of new TB cases among the 15-34 years age group. The similar pattern was observed among males of the same age group. However increasing trend was observed among females in year 2010-2011 and 2012 to 2014 time periods.

The pattern of trend similar to the 15 to 34 age group was observed in trends of 15-24 and 24-35 age groups

Figure 2. Overall trend of TB among all case of age group of 15-34 years



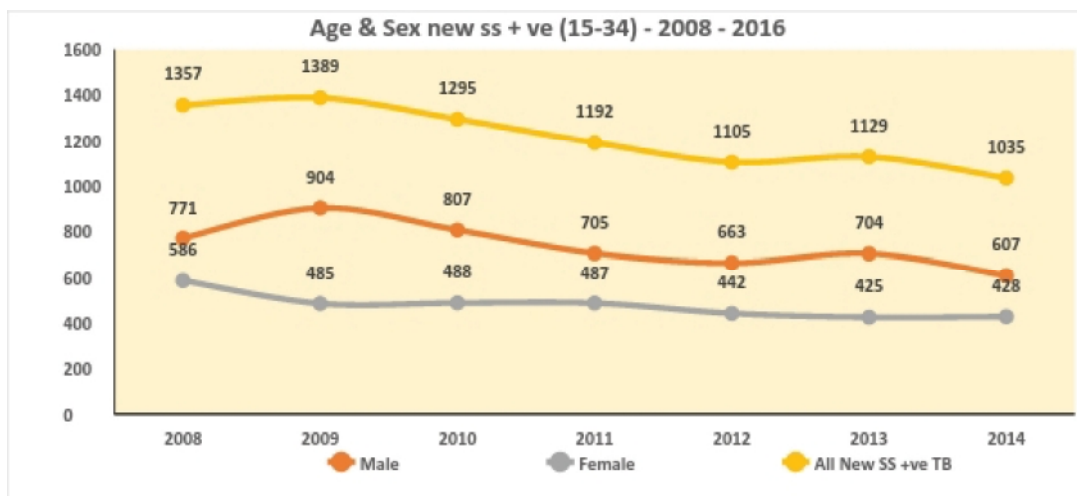
Trend of TB in New Sputum Positive Cases of 15-34 y age group

There were two peaks in the incidence of TB in 2009 and 2013 over the 6 year period of from 2008 – 2014. But the peak was more in 2009 (36 cases than in 2013 (24 cases)when compared to preceding years. A decreasing trend of TB was observed from 2009. A similar pattern was observed among male sputum sm+ve patients.

The decrease of cases was observed among females in 2009 when compared to 2008. However gradual slight increase of cases has been observed from 2009-2011 and 2013 to 2014.

The trend similar to 15-34 age group was observed among 24- 34 age group and 15-24 age groups. But the there was no marked difference in cases over the considered period.

Figure 3 . Overall trend of TB among new sputum positive cases of age group of 15-34 years



Trend of TB in New Sputum Negative Cases

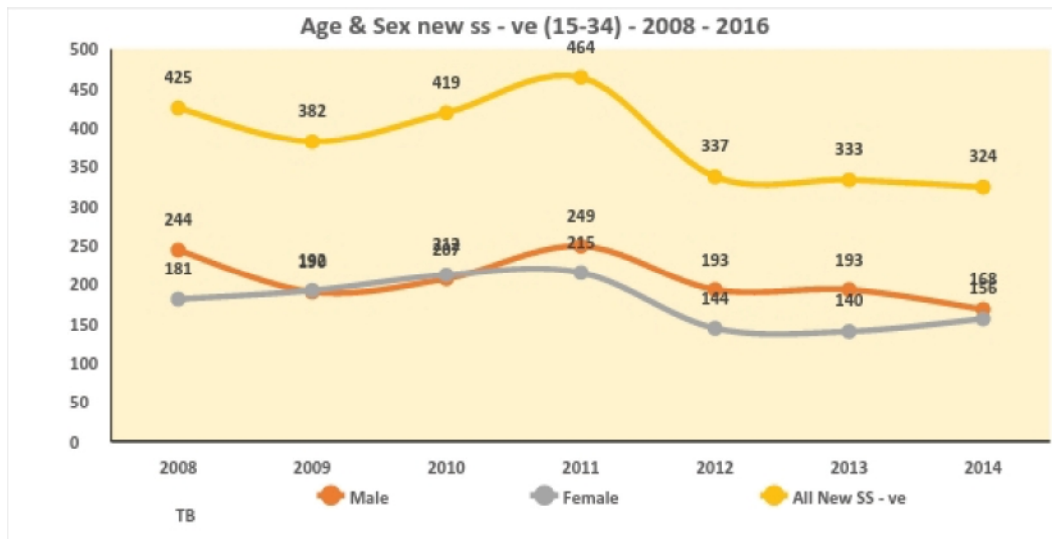
There was a decrease of new sputum negative cases in 2009 when compared to 2008 but there was a significant increase cases from 2009 to 2011. There was a decline in 2012 by 121 cases and the almost static trend was observed in subsequent years.

The similar trend was observed among males for the 2008-2013 and there was a decrease of cases by 25 in year 2014.

When considered the females, there was a gradual increase of cases in 2008 to 2011 and 2012 to 2014 period. Number of females with new sputum negative TB was more in 2010.

The pattern similar to 15-34 was observed in both 15-24 and 25-34 age groups

Figure 4 . Overall trend of TB among new sputum negative cases of age group of 15-34 years

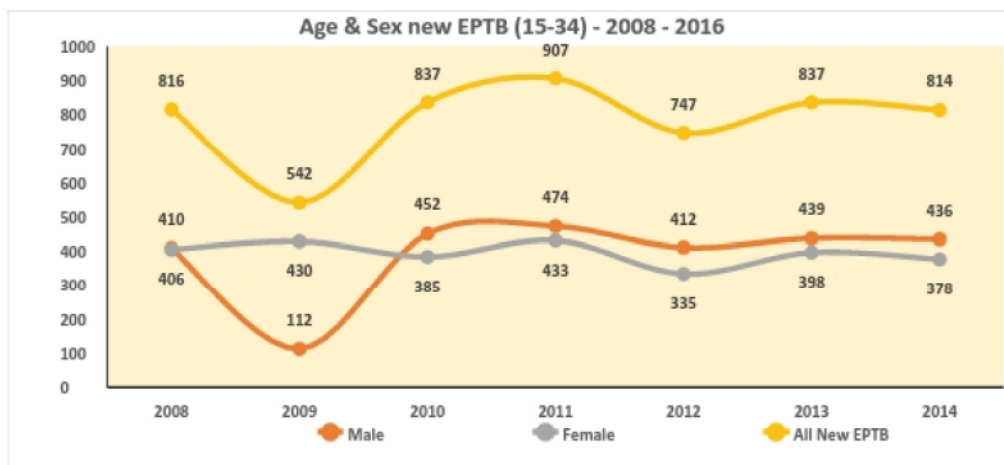


Trend of TB in EPTB Cases

There was a significant decrease of new EPTB cases among the age group of 15-24 in 2009 when compared to 2008. But increasing trend of EPTB cases was observed in 2009 to 2011 period and 2012-2014 period. The similar pattern was observed among males in this age group. EPTB cases among females of the same age group were almost static during the 2008-2014 periods with minor fluctuations. In 2009 New EPTB cases were more among the females than males in the same age group

The pattern similar to the 15-24 age group was observed among 15-24 and 25-34 age groups.

Figure 5 . Overall trend of TB among EPTB cases of age group of 15-34 years



Trend of TB among new TB cases in the 15-34 age group in Districts

There was a huge variation in trend of new TB cases across districts in 15-34 years age group. A significant increase of all new cases of TB was observed in 2013 when compared to 2012 in 15 districts namely, Colombo, Ratnapura, Kalutara, Kandy, Polonnaruwa, Kegalle, Batticaloa, Puttalam, Kilinochchi, Vavunia, Hambantota, Jaffna, Mathale, Nuwaraeliya and Matara. This increasing trend was further continued in districts of Kandy, Mathale, Jaffna, Vavunia, Puttalam and Polonnaruwa Districts. Decreasing trend in subsequent years when compared to 2013 was observed in Colombo, Nuwaraeliya, Matara and Batticaloa districts.

In Kegalle District there was a significant reduction of cases in 2012 when compared to previous two years. It was increased by 87 cases in 2013 and subsequent decrease of cases was observed in 2014 and it was mainly due to reduction of cases among males. There was a significant gradual increase of incidence of TB among females in the same age since 2012.

A peak in the trend in 2012 observed in Badulla, Monaragala, Anuradhapura, Kalmunai and Ampara districts followed by a sharp decrease in 2013. In subsequent years, slow but steady increase of TB cases in 15-34 age group was observed in all the above districts except in Ampara, where further decrease was observed. The more or less similar pattern of trend was observed for males and females in the same age group.

Second Stage

Descriptive Study

A descriptive study was carried out in March to September 2014 among 233 patients in 5 randomly selected districts.

For the comparison of the information the study population was divided into two groups which included age 15 to 24 in the younger group and the age 25 to 34 in the older group.

Table 01: Distribution of study population by their resident district

District	Number	Percentage (%)
Nuwara Eliya	15	9.8
Badulla	22	14.4
Rathnapura	31	20.3
Kandy	33	21.6
Gampaha	52	34.0
Total	153	100.0

Missing value = 80

A highest proportion (34%) of study population was from the district of Gampaha while least proportion (9.8%) of it was from Nuwara Eliya.

Table 02: Distribution of study population by Age

	N	Minimum	Maximum	Mean	Std. Deviation
Age in years	231	14	35	25.9	5.58

Missing value = 2

Mean age of the study population was 26 years with standard deviation of 5.58 and range of 15 – 34 years.

Table 03: Frequency distribution of study population by socio-demographic factors

Characteristic	Number	Percentage (%)
Age (Years)		
15 – 24	109	47.2
25 – 34	122	52.8
Total	231 ^a	100.0
Sex		
Male	60	50.4
Female	59	49.6
Total	119 ^b	100.0
Ethnicity		
Sinhalese	159	68.2
Tamils	57	24.5
Moor	17	7.3
Total	233	100.0
Level of education		
No schooling	5	2.3
Gr. 1 – 5	10	4.5
Gr. 6 – 10	50	22.5
O/L Passed	87	39.2
A/L Passed	61	27.5
Degree/Diploma Holder	9	4.1
Total	222 ^c	100.0

Missing value; a = 2, b = 114, c = 11

Nearly 53% of the study population was above 25 years of age and sex ratio was 1:1 for males and females in the study population. A majority (68%) of the study population was Sinhalese while nearly 70% of the study population has passed the O/L, A/L, Diploma or a degree.

Table 04: Frequency distribution of study population by socio-economic factors

Characteristic	Number	Percentage (%)
Employment		
Unemployed	62	30.2
Unskilled Manual	36	17.6
Skilled Manual	52	25.4
Farmer/Fisherman	1	0.5
Housewife	22	10.7
Sales & Service	12	5.9
Technical	7	3.4
Managerial	1	0.5
Other	12	5.9
Total	205 ^d	100.0
Family income (Rs.)		
< 3,000.00	9	4.2

3,000.00 –4,999.00	8	3.7
5,000.00 – 9,999.00	24	11.2
10,000.00 – 19,999.00	65	30.4
20,000.00 – 30,000.00	45	21.0
> 30,000.00	63	29.4
Total	214 ^e	100.0

Missing value; d = 28, e = 19

About one third of the study population was unemployed while only less than 4% of the study population was from technical or managerial occupational categories. Nearly half (50.4%) of the study population was having monthly income of about Rs. 20,000.00 or above.

Table 05: Frequency distribution of study population by substance abuse

Type of substance consumed	Number	Percentage (%)
Alcohol		
Yes	33	17.4
Never	130	68.8
Consumed but stopped	26	13.8
Total	189 ^a	100.0
Smoking		
Yes	26	13.5
Never	137	71.4
Smoked but stopped	29	15.1
Total	192 ^b	100.0
Drugs		
Yes	8	4.3
Never	173	93.0
Consumed but stopped	5	2.7
Total	186 ^c	100.0
Cannabis		
Yes	6	3.2
Never	176	93.1
Consumed but stopped	7	3.7
Total	189 ^a	100.0
Other		
Yes	5	2.7
Never	179	96.2
Consumed but stopped	2	1.1
Total	186 ^c	100.0

Missing value; a = 44, b = 41, c = 47

Substantial percentage of the study population were current or past alcohol consumers (31%) and smokers (29%). However, proportion of the study population who were current or past illicit drug consumers and current or past cannabis consumers were 7% each.

Table 06: Frequency distribution of study population by their BMI

BMI	Number	Percentage (%)
< 15	26	13.8
15 - 18.5	120	63.4
18.6 – 25	40	21.2
25.1 – 30	3	1.6
Total	189	100.0

Missing value; a = 44

Great majority (77%) of the study population were under-nourished while BMI of 14% of the study population were even less than 15 kg/m².

Table 07: Frequency distribution of study population by type of their residing house and number of members living in the house

Characteristic	Number	Percentage (%)
Type of the house		
Slums	22	10.2
Semi-detached house	55	25.5
Detached house	124	57.4
Other	15	6.9
Total	216	100.0
No. of family members		
One	71	33.3
Two	75	35.2
Three or more	67	31.5
Total	213	100.0

Missing value; a = 17, b = 20

Nearly 36% of the study population were living in slums or semi-detached house while a third (31%) of the study population were having three or members living together in the family.

Table 08: Frequency distribution of study population by factors related to past medical and surgical history

Characteristic	Number	Percentage (%)
Previous hospitalization		
Yes	72	36.5
No	125	63.5
Total	197 ^a	100.0
Past surgery		
Yes	31	16.5
No	157	83.5
Total	188 ^b	100.0
Treatment regimen		
CAT I	217	95.2
CAT II	11	4.8
CAT IV	0	0

Other	0	0
Total	228 ^c	100.0
Diagnosis made by		
DTCO	35	15.8
GP	8	3.6
Consultant	160	72.1
Other MO	19	8.6
Total	222 ^d	100.0

Missing value; a = 36, b = 45, c = 5, d = 11

One third (36%) of the study had hospitalized previously while 16% has undergone a surgery previously. Almost all (95%) study population were on the treatment category of CAT I. Nearly three fourth (72%) of the study population have been diagnosed by a consultant. The percentage treated outside NTP was 12%

Table 09: Association between the age category and their resident district

Characteristic	15 – 24 yrs	25 – 34 yrs	Total	Significance
Nuwaraeliya	7 (46.7%)	8 (53.3%)	15 (100%)	$\chi^2 = 5.962$ df= 4 p = 0.202 Not significant
Badulla	10 (45.5%)	12 (54.5%)	22 (100%)	
Rathnapura	11 (36.7%)	19 (63.3%)	30 (100%)	
Kandy	15 (45.5%)	18 (54.5%)	33 (100%)	
Gampaha	32 (62.7%)	19 (37.3%)	51 (100%)	
Total	75 (49.7%)	76 (50.3%)	151 (100%)	

Out of the total, a majority (62.7) of the younger age group resided in Gampaha, while in all other districts majority are from the older age group . But a significant association was not found between the age category and the district they are residing.

Table10: Association between the age category and sex

Characteristic	15 – 24 yrs	25 – 34 yrs	Total	Significance
Male	29 (49.2%)	30 (50.8%)	59 (100%)	$\chi^2 = 0.136$ df=1 p = 0.712 Not significant
Female	27 (45.8%)	32 (54.2%)	59 (100%)	
Total	56 (47.5%)	62 (52.5%)	118 (100%)	

Among males and females, the majority were in the older age group . A significant association was not found between the age category and sex

Table11: Association between the age category and ethnicity

Characteristic	15 – 24 yrs	25 – 34 yrs	Total	Significance
Sinhalese	66 (42.0%)	91 (58.0%)	144 (100%)	$\chi^2 = 4.229$ df= 1 p = 0.040 Significant
Tamils	33 (57.9%)	24 (42.1%)	57 (100%)	
Total	99 (46.3%)	115 (53.7%)	214 (100%)	

A higher percentage (58.0%) of Sinhalese study units was reported from the older age group while that of Tamil study units (57.9%) was reported from younger group. This difference was statistically significant ($\chi^2=4.229$, df=1, p<0.04)

Table12: Association between the age category and number of family members

Characteristic	15 – 24 yrs	25 – 34 yrs	Total	Significance
Less than 3	77 (52.4%)	69(47.6%)	146 (100%)	$\chi^2=5.063$, df=1, p<0.017 Significant
3 or more	24(35.8%)	43 (64.2%)	67 (100%)	
Total	101 (46.3%)	112 (53.7%)	213 (100%)	

The majority (52.4%) of study units among families having less than three family members was from younger age group while 64.2% of families having more than three family members were from older age group. This observed difference was statistically significant ($\chi^2=5.063$, df=1, p<0.017)

Table 13: Association between the age category and level of education

Characteristic	15 – 24 yrs	25 – 34 yrs	Total	Significance
Below grade 6	5 (33.3%)	10 (66.7%)	15 (100%)	$\chi^2 = 1.736$ df= 2 p = 0.420 Not significant
Grade 6 – O/L passed	62 (45.9%)	73 (54.1%)	135 (100%)	
A/L Passed and above	36 (51.4%)	34 (48.6%)	70 (100%)	
Total	103 (46.8%)	117 (53.2%)	220 (100%)	

Out of the older age group majority had education below 6th grade while younger group had education above A/L. But observed association was not significant.

Table 14: Association between the age category and the category of occupation

Characteristic	15 – 24 yrs	25 – 34 yrs	Total	Significance
Unemployed	38 (62.3%)	23 (37.7%)	61 (100%)	$\chi^2 = 13.859$ df= 3 p = 0.003 Significant
Unskilled manual	9 (25.0%)	27 (75.0%)	36 (100%)	
Skilled manual	20 (39.2%)	31 (54.5%)	51 (100%)	
Other	25 (45.5%)	30 (54.5%)	55 (100%)	
Total	92 (45.3%)	111 (54.7%)	203 (100%)	

A majority (62.3%) of unemployed category was from younger study group while 75% of unskilled category was from the older group. This observed difference was statistically significant ($\chi^2=13.859$, df=3, p<0.003).

Discussion

The study conducted in two stages and the trend of TB among 15-34 age group was analysed over the period of years from 2008 -2014 using secondary data obtained from the medical statistics division of the NPTCCD. The study was limited to new patients as desegregated data for retreatment cases were not collected through routine system during the period of study. However this was not impacted on the interpretation of the overall trend of the study as retreatment cases are very less. The Trend analysis was limited for a 6 year period as disaggregated data for age was not available. The trend of TB among adolescents (15-19 years) could not be assessed

as it was not collected in the routine data collection system.

Around one fourth of the patients detected with TB during the 2010-2015 belongs to the age group of 15-34 year age group. Overall trend for all new cases was more towards the older age groups (over 45years), indicating the good control of TB. However, there is a huge variation in trend of TB among 15-34 age in districts and increasing trend among young age group was observed in 15 out of 26 districts which indicated the further spread of disease. An increasing trend of EPTB was observed in all the years except in 2009 and may be due to improvement in diagnostic facilities over the

years. Increasing trend of sputum negative cases were observed up to 2011 but it was more or less static over the following years with the expansion of specialist services in subsequent years with improved diagnosis.

The second stage of the study was a descriptive cross-sectional study to identify associated factors. We have randomly selected five districts including Gampaha, Kandy, Badulla, Nuwara Eliya and Ratnapura, for the study with the highest proportion (34%) of study population was from the district of Gampaha while least proportion (10%) of it was from Nuwara Eliya and this is compatible with the population distribution of the districts we selected. Mean age of the study population was 26 years with standard deviation of 5.58.

Nearly 53% of the study population was above 25 years of age with the male female ratio of 1:1. When compared with the male female ratio of 2 : 1 for all TB cases for the country, there was a significant increase of TB cases in the study population. This may be attributed to the exposures outside the family due to life style of this age group.

A majority (68%) of the study population was Sinhalese while nearly 70% of the study population has passed the O/L, A/L, Diploma or a degree. About one third of the study population was unemployed. Nearly half (50.4%) of the study population was having monthly income of about Rs. 20,000.00 or above. This finding is compatible with findings of other studies^{16,17} and reflects the link of TB with the social economic status .

Substantial percentage of the study population were current or past alcohol consumers (31%) which was compatible to the alcohol consumption pattern among males (30%) in the similar age group¹⁸ . Twenty nine percent of the study population were smokers while 7% of the study population were current or past cannabis consumers who used illicit drugs in their life time. Presence of these high risk behaviours among the study population might have impacted on the acquiring TB infection.

Nearly three fourth (72%) of the study population have been diagnosed by a consultant and 15.8 % was diagnosed by a District Tuberculosis Control Officer and only 12% were diagnosed by the persons outside the NTP and which reflect the need of involvement of other medical practitioners in diagnosis.

Great majority (77%) of the study population were under-nourished while 14% of them were less than 15 kg/m². This finding reflects the association between nutritional status on occurrence of active TB and compatible with the findings of other research studies¹⁵

Nearly 36% of the study population were living in slums or semi-detached house while a third (31%) of the study population were having three or more members living together in the house. But the majority (52.4%) of study units among families having less than three family members was from younger age group while 64.2% of families having more than three family members were from older age group. This observed difference was statistically significant ($\chi^2=5.063$, $df=1$, $p<0.017$) and may be attributed to long term exposure among older age groups due to overcrowding.

.A majority (62.7%) of the study units in younger group was from the district of Gampaha compared to the lowest (36.7%) reported from Rathnapura. However these observed differences were not statistically significant ($\chi^2=5.962$, $df=4$, $p<0.202$). A higher percentage (58.0%) of Sinhalese study units was reported from the older age group while that of Tamil study units (57.9%) was reported from younger group. This difference was statistically significant ($\chi^2=4.229$, $df=1$, $p<0.04$) and may be attributed the differences living habits in different ethnicities which have an impact on spread of the communicable diseases.

A majority (62.3%) of unemployed category was from younger study group while 75% of unskilled category was from the older group. This observed difference was statistically significant ($\chi^2=13.859$, $df=3$, $p<0.003$). This may attribute to the spread of TB due to poor living conditions.

Conclusion and Recommendations

According to results there were few areas which need more attention. The study identified low BMI as one of the key risk factors for TB in the study group. Therefore, more detailed assessment regarding the dietary habits of the patients should be taken at the time of diagnosis and nutritional interventions needed to be carried out .Emphasis should be given to community awareness regarding nutritional aspects. Actions should be taken to improve the nutritional status among adolescents and young adults.

Measures should be taken to modify risky life style factors, such as alcohol consumption, smoking and substance abuse which have an impact on nutritional status as well as spread of TB.

The study revealed association between socio-demographic factors such as low income, housing conditions, ethnicity, occupation category and TB in the study population.

Improvement of socio economic status is a must in control of TB. A system must be developed to enhance financial stability of patients and their families. Steps should be taken to minimize overcrowding and improvement of housing conditions.

The study revealed that the diagnosis of tuberculosis as nearly 70% of the patients made by the consultants and only 12 % of cases were detected outside the NTP. This might contribute to the delay in diagnosing and hence more chance to spread. Involvement of non NTP health care providers and health professionals need to be strengthened through capacity building and awareness.

Acknowledgement:

The technical and financial support was provided by SAARC TB & HIV/AIDS Center, Kathmandu, Nepal

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