Original article

Seasonality of tuberculosis among suspect patients visiting National Medical College, Teaching Hospital, Birgunj, Nepal

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Abstract

Introduction: Seasonal variations of tuberculosis have been demonstrated in a number of studies with reported peaks in late winter and early spring or summer. The study was to analyze effect of seasonal variation on tuberculosis suspects across the calendar year.

Methods: The research work was conducted in National Medical College & Teaching Hospital from January to December 2012. The sputum samples were collected and processed for acid fast bacilli from suspected tuberculosis patients.

Results: Among 1403 suspected tuberculosis patients, 57.0% were male and 43.0% were females. 11.3% male and 4.0% female were present among the suspected cases of tuberculosis. The highest number of cases was in the age group 51-60 .There was no any significant difference in between positive cases and age group (P=0.637). The positive cases of tuberculosis were found in 8.7% Muslim and 8.1% Hindu .significant difference was not found in religion and tuberculosis (P=0.780%). The highest cases of tuberculosis was detected in June (14.9%) and to decline from august (13.2%) through December (4.4%). There was significant relation for cases and month (P=0.00001). More severe (3+) cases were found more (10.6%) in June, 2+ (4.4%) in July and 1+ (9.7%) in August which was statistically significant (P=0.00001).

Conclusion: The seasonal variability of tuberculosis case detection showing mostly a peak in numbers in early spring and summer months.

Keywords: Seasonal variation, Tuberculosis, Religion, severity

Introduction

It is well known that the incidence of many respiratory infections shows seasonal variation, and it is much less well documented for tuberculosis (TB)[1]. Seasonal variation of tuberculosis (TB) has been reported from different parts of the world, although no definite and consistent pattern has been observed. Although the exact mechanism underlying the fluctuation of tuberculosis in a particular time of the year is still not clear, several researchers have suggested that the environmental and social factors such as temperature, humidity, sunlight, as well as crowding and person-to-person contacts, are a source of TB seasonality, particularly, in winter time[2,3]. Few studies have shown variable periods of peak seasonality in TB incidence/case notification rates in late winter to early spring in South Africa[4,5], during summer in UK[6,7] and Hong Kong [8,9], during summer and autumn in Spain [10,11] and Japan [12,13].

However, to our knowledge, no studies so far have described TB seasonality in Nepal especially in Tarai

region. So, the study analyzed the current situation and controversies related to seasonal variability of tuberculosis by describing intensively the data made on seasonal notification rate/TB incidence and by reviewing comprehensively scientific literature that investigates the seasonal fluctuations of tuberculosis and by summarizing the critical sequences that need to be expressed for clinical presentations of tuberculosis at different periods of the year. The identification of the reasons for seasonality may offer the possibilities for preventive measures, and can even help in the development of effective policies and allowing for use resources more efficiently and effectively.

Methods

Laboratory settings: The research work was conducted in National Medical College & Teaching Hospital, Nepal.

Study group: All Tuberculosis suspected patients (regarding their age, sex, religion) visiting National Medical College & Teaching Hospital, Nepal.

Study period: This study was performed from January to December end 2012

Sample Processing: The total 1403collected sputum samples from suspected tuberculosis patients were processed and confirmatory TB diagnosis was made by sputum smear examination for acid fast bacilli (AFB) using Ziehl -Neelsen as per WHO guideline.

Statistical methods:

Daily number of tuberculosis suspects tested and daily number of TB cases detected were used to generate the monthly series of proportions of TB cases over a period of 12 months from January, to December 2012.We computed un-adjusted month-specific (within 12 month period) proportion (95% confidence interval: (CI)) as well as adjusted overall mean monthly proportion (95% CI) of TB cases (per 100,000) for the entire study period. Analysis was performed using SPSS Analysis (version 16).

Results

Among the total 1403 suspected tuberculosis patients, 57.0% were male and 43.0% were female. The numbers of positive tuberculosis cases among males were slightly more (11.3%) frequent than the cases among females (4.0%) (Figure 1).

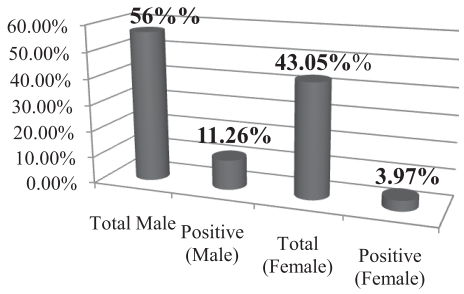

Figure 1. Sex-wise distribution of total Tuberculosis Cases Patients

The highest number of cases was reported in the age group 51-60 followed by 41-50 (Figure 2). Regarding the religion shown more cases (8.7%) in Muslim community than in Hindu community (8.1%). The highest numbers of cases were found in summer increases from May 10.6%, June (14.2%) to decline in August (13.2%) through December (4.4%) as shown in (Figure 3). The seasonal variations also affect the severity of tuberculosis cases. More 3 cases were found in June (10.5%), 2 cases in July (4.3%) and 1+ cases in August (9.6%) (Figure 4).

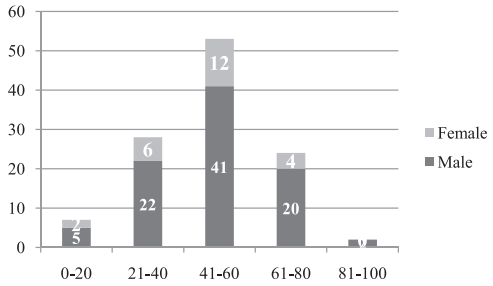

Figure 2. Age-wise distribution of tuberculosis cases Patients

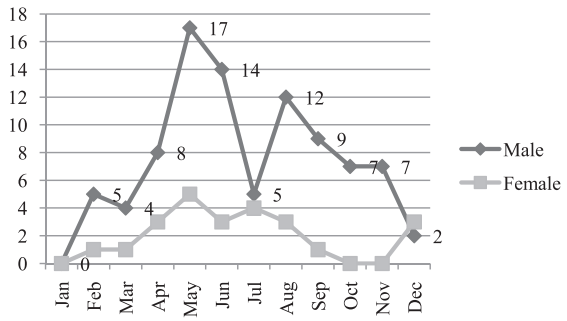

Figure 3. Proportion of tuberculosis positive cases with month,

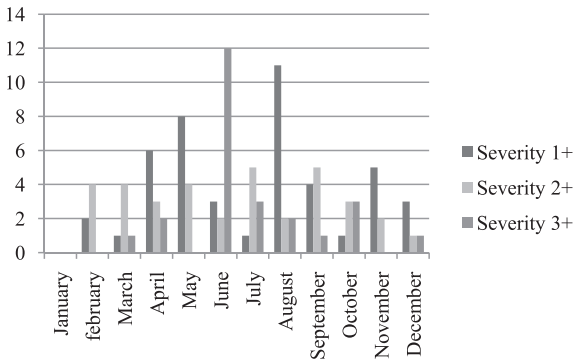

Figure 4. Proportion severe cases of tuberculosis with month

Discussion

The numbers of tuberculosis cases in male were more than in female. This finding is statistically significant indicating male are more susceptible to tuberculosis as compare to the female. Gender differences may be explained in terms of differences in exposure as a result of different social-roles [15] and responsibilities between men and women. This finding was supported by other similar studies like Kuban et al., (2002) reported 65.76% male and 34.25% female tuberculosis cases among 111 cases[16], Tuberculosis Control Programme, Nepal reported 66.77% male and 33.23% female cases among 14,384 cases & Rijal (2004) reported, 75.69% male and 24.30% female [17].

In this study, all of the detected tuberculosis cases were old aged (51-60 years), and most of the TB cases in old patients are considered to be the results of reactivation of latent M. tuberculosis infection. In the absence of HIV infection or immunosuppressive therapy, such tuberculosis cases resulting from re-activation of latent M. tuberculosis infection are attributed to poor nutrition and low socio-economic status. Although the exact mechanism of this re-activation of M. tuberculosis infection remains unclear [18], yet, cell mediated immunity in M .tuberculosis infection seems to play role because of variation in lymphocyte subsets. This study demonstrated that high prevalence of tuberculosis in old age group.

More cases of tuberculosis were found in Muslim community (8.7%) than in Hindu community (8.1%). The potential factor that has been linked to vitamin D level and M. tuberculosis infection[19]. Several studies from various regions, ethnic groups, and cultures show positive association between the serum level of vitamin D and susceptibility to TB infection[20]. Serum vitamin D concentrations are significantly lower in tuberculosis patients. The low level of Vitamin D in Muslim community could be due to that heavy clothing and spend longer periods of time indoors which may be considered as a barrier that can reduce ultraviolet radiation reaching the body and thus, the conversion of vitamin D. Muslim cultural factors such as style of clothing (veiled clothing) and indoors time were shown as potential factors which influence serum vitamin D concentrations, particularly in women and thus the more cases of tuberculosis in Muslim community especially in woman [21,22].

A number of studies[23] have shown seasonal variation in trends of tuberculosis. Seasons exert external influences but also result in modification of endogenous factors. Externally, seasons and weather influence human behavior. In the colder seasons people tend to stay in indoors as a result to prolonged exposure time to patients with transmissible pulmonary tuberculosis, and resulting more frequently in successful transmission. Adverse weather may not only force people to spend more time indoors, but may also hamper accessibility to health care facilities. Endogenously, the role of vitamin D deficiency has been reported as a possible explanation for an increased risk for progression to disease, and such deficiencies might be seasonal in areas with a long cold season like Mongolia, resulting in deficient monocyte and macrophage function (cellular immunity), leading to reactivation of dormant mycobacterium infection[24]. In our study, there was a marked decrease in the number of cases during the coldest months in (October-January) and highest number of cases during in summer (April- august). Such huge alterations in number of positive cases of tuberculosis regarding the cold month as well as hot month are due to indoor activity, vitamin D variability, regional variability: rural areas have higher TB incidences than urban areas, because of low health awareness and poor knowledge among rural people about TB[25].Delay in diagnosis, the average time from the onset of symptoms to diagnosis and starting treatment was estimated to be between 11 and 18 weeks[26].Therefore, theoretically people who are infected in autumn or winter (as suggested above) and develop active tuberculosis shortly after infections are on average diagnosed 3-4 months after the first onset of symptom, resulting in a higher number of notifications in spring and summer. Seasonal immunity competence, the natural killer cells and CD4 T-cells have been reported to be increased in winter associated with an increased level of Interleukin-6 [27].This could be a reason for a better immune response against Mycobacterium in winter compared to summer, obviously not preventing infection, but allowing to control it in winter, whereas the infection later progresses to disease in summer.

The seasonal variation also affects the severity of positive cases of tuberculosis. The notification of more severe cases

(3+ & 2+) was found in summer season especially in June and July than in winter season. Less severe cases were found in late summer season (August). The explanation behind this finding is as above explained as effect of seasonal variation of number of positive case of tuberculosis. If the results of this and previous studies seem to corroborate the evidence for seasonality in detection of tuberculosis cases, which peaks in early spring and summer months. The knowledge of the role of environmental factors (infection, cold, etc.) or other triggers (indoor activity, vitamin D intake) could be used to improve prevention measures and educational strategies, especially in people with a risk of infection.

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Conflict of interest: None declared.

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