

Seasonality in pulmonary tuberculosis among migrant workers in Kuwait

Saeed Akhtar^{1,*}

Hameed GH. Mohammad²

¹Department of Community Medicine and Behavioural Sciences,
Faculty of Medicine, Kuwait University
PO Box 24923, Safat 13110, Kuwait

²Ports and Borders Health Division, Ministry of Health,
PO Box 32830, Rumaihiya 25410, Kuwait

Background:

- contribution of immigrants to the changing TB rate exceeds 50% in Europe & US
- Little is known about migrants contribution in TB burden in middle-east & more so in Kuwait

TB in Kuwait,

1965 - 88: declined in TB incidence *(MoH, 1989)*

1989 - 99: steady increase in TB incidence (nationals & expatriates)
(Behbehani et al., 2002)

1997 - 06: Curvilinear pattern *(Akhtar & Mohammad, 2007)*

Potential reasons for increased TB incidence in Kuwait

- Disruption of TB control program post first Gulf war
- Concomitant increase in proportion of migrants

Study Rationale

- Few studies elsewhere have described seasonality in TB notification but none from Kuwait
- Knowledge of possible seasonal pattern in the disease incidence may be used to;
 - predict the future magnitude
 - develop an effective public health program,
 - utilize available resources more effectively

Specific Objective

We took advantage of the routine screening data (1997-06) on migrants from TB high-burden regions;

to examine possible seasonal variation in positive TB diagnosis among migrants to Kuwait.

METHODS

Data Collection Period: Jan 1, 1997 - Dec 31, 2006

Study Population

India (31%); Bangladesh (14%); Sri-Lankan (14%); Egypt (12%); Indonesia (9%); Philippine (5%)' Pakistan (5%), Others (12%)

TB Diagnosis

Chest radiograph
Sputum examination
Sputum culture
Tomogram

Data analysis

- Monthly series of proportions (per 100,000) of TB positive migrants
- Weighted mean month-specific proportions (95% CI)
- Plot of smoothed (de-trended) data suggested seasonal pattern - a circannual (12 month) cycle

Seasonality analysis

- ***Edward's test, 1961***

H_0 : proportions of TB positive migrants have uniform distribution across all months

H_a : proportions of TB positive migrants follow a sinusoidal curve with a period of one year (*i.e. amplitude* > 0)

- ***Chi-square goodness-of-fit test***

adequacy of the description of the data by simple harmonic curve was evaluated

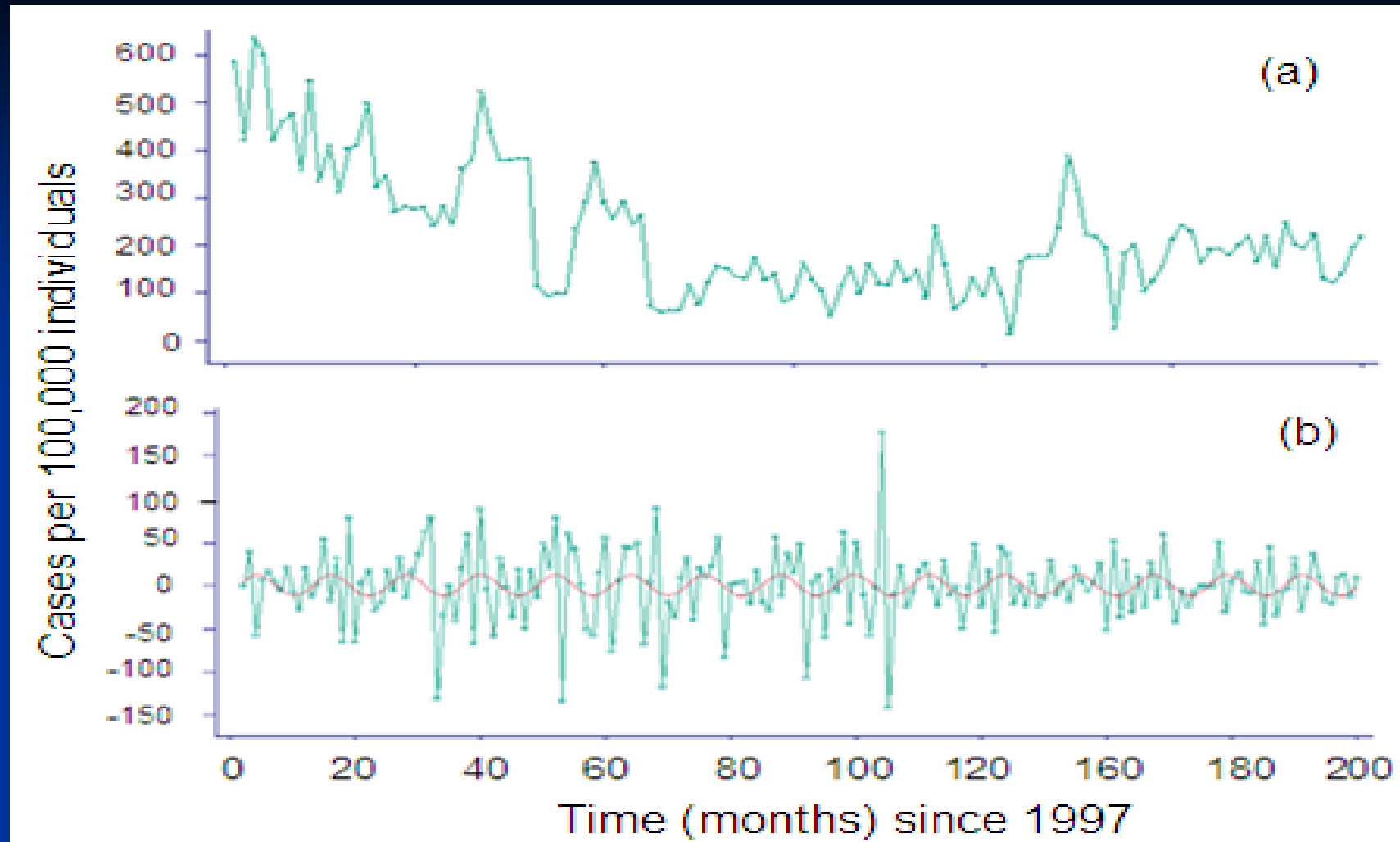


Figure 1. Pulmonary tuberculosis positive (per 100,000/month) migrants to Kuwait, 1997- 06; (a) raw data; (b) de-trended data

Table 1. Month-specific proportions of pulmonary tuberculosis (TB) positive migrants to Kuwait; January 1, 1997 to December 31, 2006.

Month	Total number tested	Number TB positive	Number positive per 100,000	95% confidence interval
Jan	178369	368	206	186 – 229
Feb	164296	337	205	184 – 228
Mar	185643	451	243	222 – 266
Apr	166038	392	236	214 – 261
May	182716	418	229	208 – 252
June	189070	422	223	206 – 242
July	211844	437	206	188 – 227
Aug	206166	406	197	179 – 217
Sept	204200	356	174	157 – 193
Oct	227064	308	136	121 – 152
Nov	210846	362	172	155 – 190
Dec	202330	351	174	156 – 193
Total	2328582	4608	198	192 - 204

Adjusted (weighted by average number of monthly migrants tested) monthly mean number of pulmonary tuberculosis positive cases was 384.

Table 2. The observed* and expected* number of pulmonary tuberculosis positive migrants by month in Kuwait; Jan 1, 1997 to Dec 31, 2006.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Observed	396	394	466	453	439	428	396	378	335	260	330	333
Expected	374	414	446	462	456	432	394	354	322	306	312	336

* The observed number of cases is weighted by the average monthly number of migrant workers tested (i.e. observed proportion of TB positives in given month x average monthly number of workers tested)

The expected (calculated for the best simple harmonic curve) number of cases has been adjusted by the number of days in the month

$$\chi^2 = 0.224, df = 11; P > 0.1$$

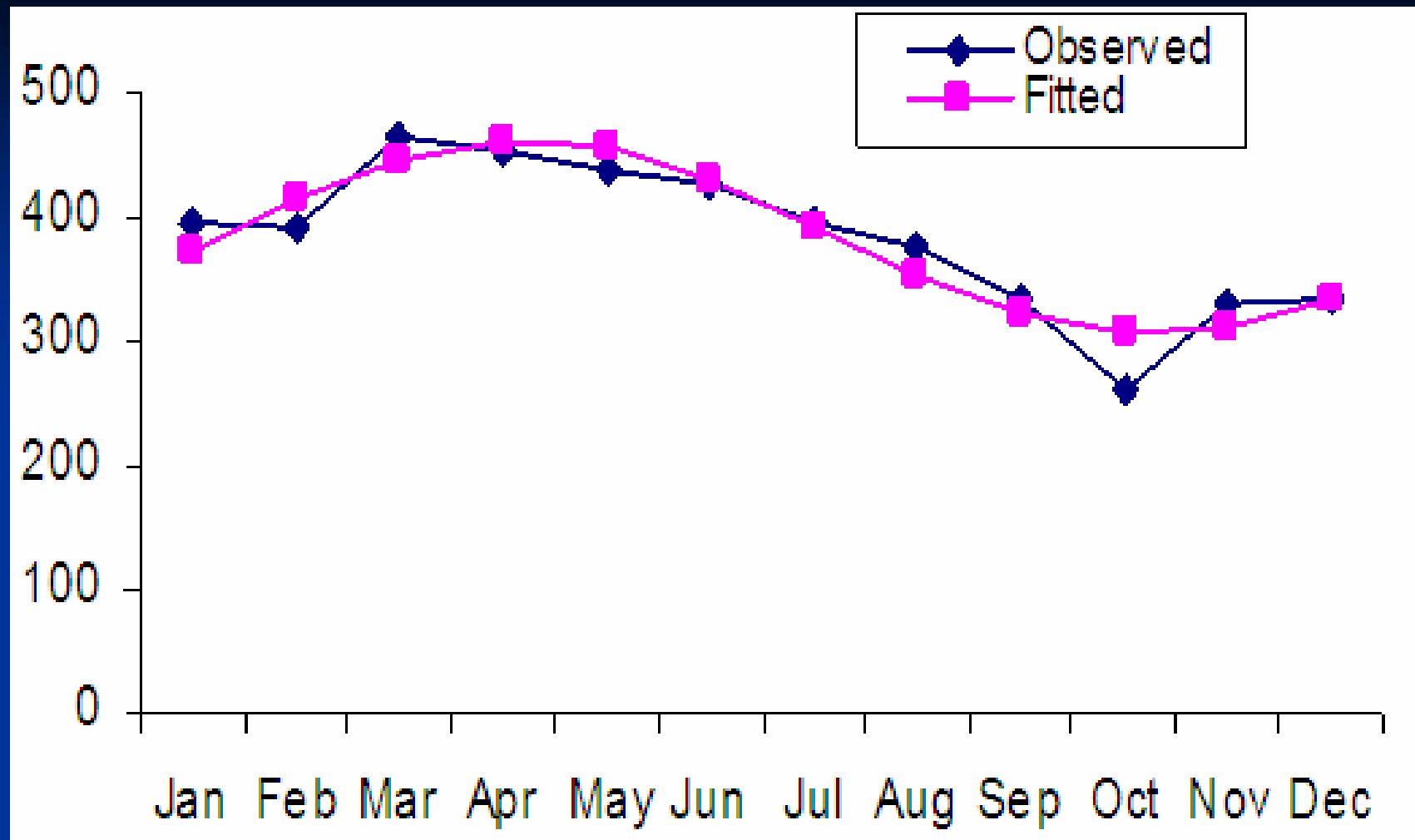


Figure 2. Observed and predicted (Edwards' model) seasonal distribution of pulmonary tuberculosis positive migrant to Kuwait: 1997-2006.

Results' Summary

- H_0 : amplitude = 0, was rejected ($P < 0.001$).
- Amplitude (\pm se) of simple harmonic curve ($\alpha = 0.204 \pm 0.04$)
- Significant peak during the last week of April
($\theta^\circ = 120^\circ$; $P < 0.001$)
- Peak to low ratio = 1.51 (95% CI: 1.39 -1.65).

Discussion

- A peak (spring - late April) in positive TB diagnosis in migrants
- Variable peak in seasonality has been reported:
UK (Summer), Spain & Japan (summer and autumn)
- Transmission during winter due to overcrowding
- Re-activation of latent *M. tuberculosis* infection perhaps due to
 - circannual variation in lymphocytes subsets due to viral infections
 - impaired host immunological defense due to vitamin D deficiency
 - climatic and meteorological seasonal changes

Study Limitations

- data deficiency on demographic variables of migrants
- monthly grouped data precluded a more sensitive analysis

Conclusion

- Results corroborate the evidence for seasonality in positive TB diagnosis (notification)
- Regularity of peak seasonality in TB diagnosis warrants a better attendance of migrants