Treatment Effectiveness for Patients of Tuberculosis in Taiwan-A Population Based Study

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Importance of Tb in Taiwan

- Next to HIV/AIDS deaths
- Tb: 2nd leading cause of deaths among infectious diseases
- 15,000 new Tb cases annually in 23 m population.

Purposes

- Prevalence trend, 1996-2003, since NHI
- Incidence trend, 1997-2003
- Incidence differences by sex, age, ecological variation (north, central, south, east, off-shore areas).
- Risk of liver injury:
  - demographic, co-morbidity, Medication.

Data source/methods

- National Health Insurance Reimbursement Claims of1996 Cohort (N=168,977), NHRI.
- Variables: sex, age, area, ICD code,
  treatment, medication
- Descriptive: prevalence/incidence trends
- Analytical: Odds ratio,
  multivariable logistic regression

Results

- Trends of prevalence and incidence

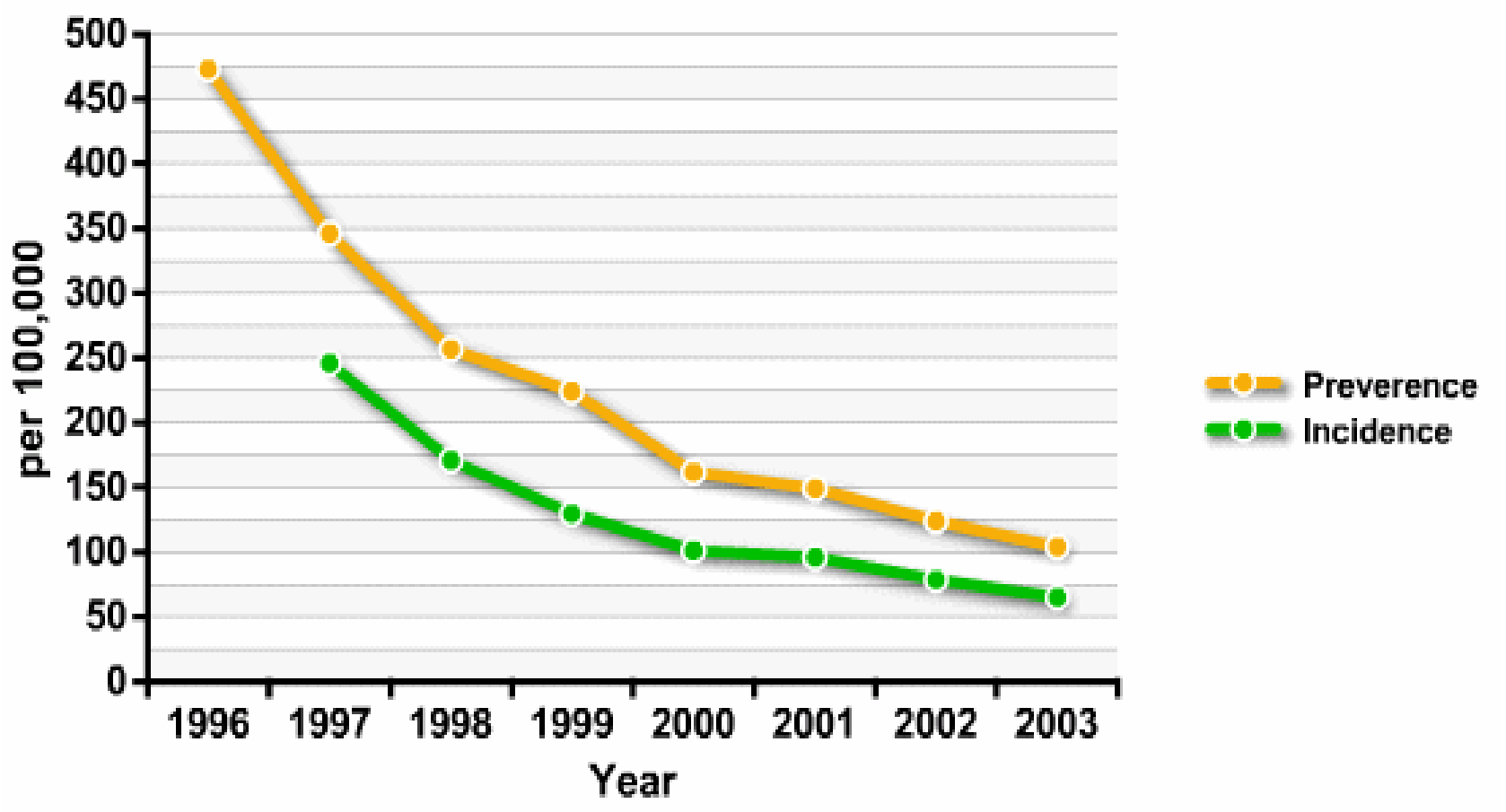

Figure 1. Trends of tuberculosis prevalence and incidence in Taiwan, 1996-2003

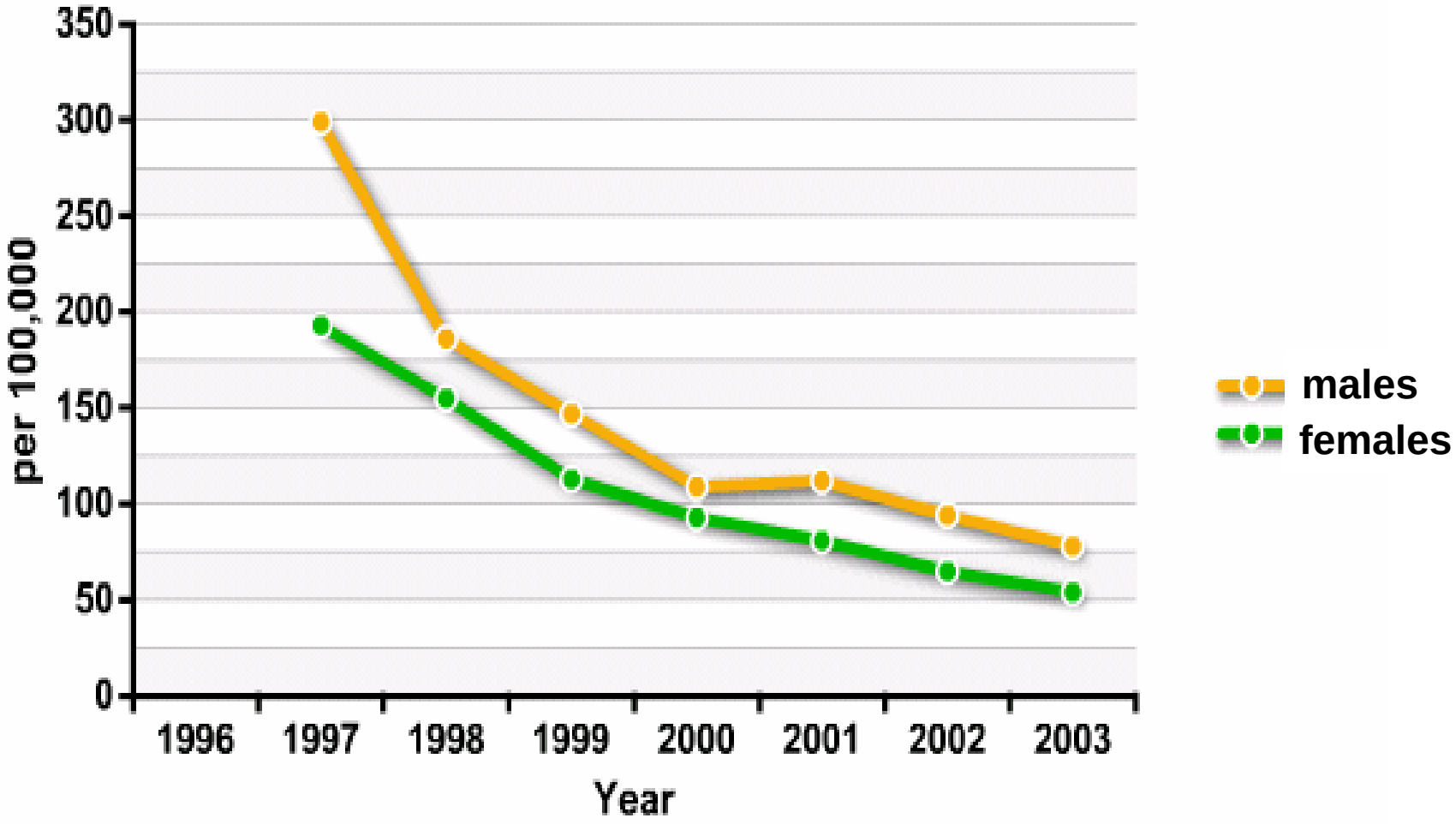

Figure 2. Trends of tuberculosis incidence by sex in Taiwan, 1997-2003

Results

- Trends of prevalence and incidence

  The above 2 figures show that there was a sharp impact in the Tb control since the launch of the insurance.

Table 1. Incidence of tuberculosis by age, area and population density in Taiwan, 1997-2003

	Person-years		Incidence				
	M	F	Males		Females		*p* value
Age,yr			n	rate	n	rate	
<30	319346	321722	156	49	211	66	0.005
30-39	116244	119946	148	127	160	133	0.507
40-49	89510	91874	194	217	166	181	0.046
50-59	51853	53834	204	393	114	212	<0.0001
60-69	45559	40155	274	601	140	349	<0.0001
70-79	23760	19826	261	1098	101	509	<0.0001
>80	4746	5684	78	1643	42	739	<0.0001
Area							
North	297107	310974	521	175	358	115	0.081
Central	149862	151608	301	201	205	135	0.560
South	163761	167160	414	253	322	193	0.002
East	15035	14813	53	353	41	277	0.013
Off-shore	3938	4014	8	203	5	125	0.002
Population density							
High	322528	341956	581	180	439	128	0.090
Moderate	222415	222385	493	222	334	150	0.580
Low	84760	84228	223	263	158	188	<0.0001

Table 2. Odds ratios of tuberculosis associated with demographic factors in Taiwan, 1996-2003

	n	Crude OR (95%CI)	Adjusted OR[c](95%CI)
Sex			
Females	934	1.00	1.00
Males	1315	1.25 (1.14-1.36) **	1.30 (1.19-1.42) **
Age			
<30	367	1.00	1.00
30-39	308	0.73 (0.64-0.83) **	2.45 (2.08-2.90) **
40-49	360	1.14 (1.01-1.28) *	3.53 (3.01-4.13) **
50-59	318	1.92 (1.69-2.18) **	5.58 (4.74-6.58) **
60-69	414	3.39 (3.02-3.80) **	9.05 (7.75-10.6) **
70-79	362	4.67 (4.11-5.30) **	12.80 (10.8-15.1) **
>80	120	4.25 (3.53-5.12) **	12.70 (10.3-15.8) **
Area			
North	879	1.00	1.00
Central	506	0.98 (0.89-1.09)	1.10 (0.97-1.27)
South	736	1.46 (1.33-1.60) **	1.45 (1.30-1.63) **
East	94	2.02 (1.55-2.63) **	1.69 (1.25-2.28) **
Off-shore	13	0.99 (0.54-1.79)	0.81 (0.44-1.51)
Population density			
High	1020	1.00	1.00
Moderate	827	1.07 (0.98-1.18)	0.98 (0.88-1.10)
Low	381	1.43 (1.27-1.61) **	1.14 (0.99-1.32)

*p<0.05

**p<0.001

Results

- Non-EtOH liver injuries for Tb patients.

  Prevalence/risk: age, ecology

  risk: co-morbidity

  medication.

Table 3. Non-alcoholic liver injury among tuberculosis patients in Taiwan, 1996-2003

	Liver injury				Total	*p* value*
	No N=1253		Yes N=740			
Sex	n(%)		n(%)			
Females	708	(61.2)	449	(38.8)	1157	0.068
Males	545	(65.2)	291	(34.8)	836	
Age						<.0001
<30	270	(77.8)	77	(22.2)	347	
30-39	183	(64.4)	101	(35.6)	284	
40-49	188	(58.6)	133	(41.4)	321	
50-59	148	(52.9)	132	(47.1)	280	
60-69	208	(58.3)	149	(41.7)	357	
70-79	186	(61.2)	118	(38.8)	304	
>80	70	(70.0)	30	(30.0)	100	
Area						0.170
North	513	(65.9)	266	(34.1)	779	
Central	277	(62.7)	165	(37.3)	442	
South	389	(59.1)	269	(40.9)	658	
East	55	(65.5)	29	(34.5)	84	
Off-shore	6	(54.5)	5	(45.5)	11	
Population density						0.132
High	606	(65.4)	321	(34.6)	927	
Moderate	425	(59.9)	285	(40.1)	710	
Low	209	(62.0)	28	(38.0)	337	

* chi-square test

Table 4. Odds ratio of non-alcoholic liver injury for Tb patients in Taiwan, 1996-2003

	Liver injury		Total	Crude OR (95%CI)	Adjusted OR[§] (95%CI)
	No N=1253 n(%)	Yes N=740 n(%)			
Sex					
Females	545 (65.2)	291 (34.8)	836	1.00	1.00
Males	708 (61.2)	449 (38.8)	1157	1.15 (0.93-1.41)	1.05 (0.85-1.30)
Age					
<30	270 (77.8)	77 (22.2)	347	1.00	1.00
30-39	183 (64.4)	101 (35.6)	284	0.94 (0.71-1.24)	1.92 (1.32-2.80)**
40-49	188 (58.6)	133 (41.4)	321	1.27 (0.98-1.66)	2.41 (1.67-3.47)**
50-59	148 (52.9)	132 (47.1)	280	1.60 (1.21-2.11)**	2.87 (1.96-4.18)**
60-69	208 (58.3)	149 (41.7)	357	1.18 (0.90-1.55)	2.20 (1.51-3.20)**
70-79	186 (61.2)	118 (38.8)	304	1.20 (0.88-1.63)	2.21 (1.47-3.32)**
>80	70 (70.0)	30 (30.0)	100	0.62 (0.36-1.08)	1.20 (0.65-2.21)
Area					
North	513 (65.9)	266 (34.1)	779	1.00	1.00
Central	277 (62.7)	165 (37.3)	442	0.98 (0.77-1.25)	0.98 (0.72-1.34)
South	389 (59.1)	269 (40.9)	658	1.25 (1.01-1.55)*	1.20 (0.92-1.56)
East	55 (65.5)	29 (34.5)	84	0.96 (0.56-1.66)	0.84 (0.44-1.59)
Off-shore	6 (54.5)	5 (45.5)	11	1.70 (0.42-6.82)	1.39 (0.33-5.92)
Population density					
High	606 (65.4)	321 (34.6)	927	1.00	1.00
Moderate	425 (59.9)	285 (40.1)	710	1.09 (0.88-1.35)	1.12 (0.86-1.46)
Low	209 (62.0)	128 (38.0)	337	1.23 (0.94-1.61)	1.40 (0.99-1.96)

* $p<0.05$; ** $p<0.001$;

§ logistic regression: sex, age, area, population density adjusted

Table 5. Co-morbidity and liver injury among Tb patients in Taiwan, 1996-2003

Co-morbidity	Liver injury		Crude OR(95%CI)	Adjusted OR@(95%CI)
	No (N=1253) n(%)	Yes (N=740) n(%)		
Hepatitis B and C				
Yes	35 (23.2)	116 (76.8)	6.47 (4.37- 9.55) **	5.80 (3.87-8.68) **
Hyperlipidemin				
Yes	203 (43.1)	268 (56.9)	2.94 (2.38- 3.63) **	2.04 (1.60-2.60) **
Gout				
Yes	162 (46.3)	188 (53.7)	2.29 (1.82- 2.89) **	1.45 (1.12-1.88) *
Arthritis				
Yes	739 (56.5)	569 (43.5)	2.29 (1.89-2.84) **	1.68 (1.33-2.12) **
Diabetes				
Yes	1033 (60.5)	674 (39.5)	2.18 (1.63- 2.91) **	1.44 (1.05-2.00) *
Hypertension				
Yes	443 (54.4)	372 (45.6)	1.85 (1.54- 2.22) **	1.09 (0.85-1.39)
Cardiac disease				
Yes	492 (55.2)	399 (44.8)	1.81 (1.51-2.18) **	1.39 (1.11-1.75) *
Sex				
Male	708 (61.2)	449 (38.8)	0.84 (0.70- 1.01)	1.20 (0.97-1.48)
Age				
35-59(versus<35)	424/365	321/122	2.26 (1.76-2.91) **	1.40 (1.06-1.86) *
>60(versus <35)	464/365	297/122	1.92 (1.49-2.46) **	0.86 (0.61-1.19)
Therapy [a]				
Yes	290 (62.6)	173 (37.4)	1.30 (1.07-1.67)*	1.32 (1.03-1.73) *

*p<0.05;**p<0.001; @: logistic regression: hepatitis B and C, hyperlipidemin, gout, arthritis, diabetes, hypertension, cardiac disease, sex, age, therapy adjusted;
a : use anti-TB drugs therapy, National Health Insurance Reimbursement (1997-2002).

Table 6. Non-alcoholic liver injury associated with medication

Drug	Liver injury		Adjusted OR* (95% CI)	*p* value
	No(N=768) n(%)	Yes(N=392) n(%)		
Isoniazid				0.051
Yes	147 (60.2)	97 (39.8)	1.34 (1.00-1.80)	
Ethambutol				0.082
Yes	255 (62.0)	156 (38.0)	1.26 (0.97-1.62)	
Pyrazinamide				0.002
Yes	96 (55.5)	77 (19.6)	1.67 (1.20-2.33)	
Rifampim				0.002
Yes	143 (57.4)	106 (27.0)	1.56 (1.17- 2.09)	
SM				0.909
Yes	10 (66.7)	5 (33.3)	0.94 (0.32-2.78)	
EMB+INH				0.001
Yes	138 (56.3)	107 (43.7)	1.63 (1.22- 2.18)	
RIF+INH				0.035
Yes	165 (60.2)	109 (39.8)	1.35 (1.02-1.80)	
RIF+INH+PZA				0.116
Yes	148 (61.4)	93 (38.6)	1.27 (0.94-1.70)	
INH+EMB+RIF+PZA				0.089
Yes	142 (60.9)	91 (39.1)	1.30 (0.96-1.75)	
INH+EMB+RIF				0.128
Yes	43 (56.6)	33 (43.4)	1.45 (0.90-2.33)	

*logistic regression: age and sex adjusted

Conclusion

- The National Health Insurance was effective in increased early detection of cases—accounts for the decreasing trend.
- For enhance the Tb control, cases identification should be focused into the elderly & the remote area populations.
- Preventing liver injury associated with Tb treatment is important for patients with co-morbidity, particularly of persons w the HBV and/or HCV infection.

Thanks