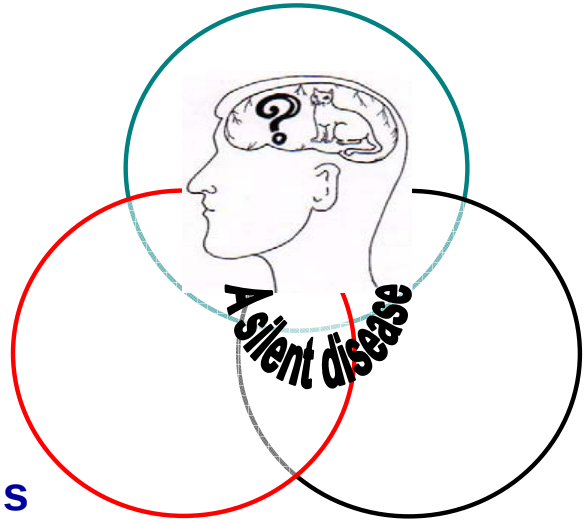
UNIVERSITY OF MALAYA
KUALA LUMPUR
FACULTY OF MEDICINE

Toxoplasma infection in diabetic patients: A current status

Refers to the clinical and/or pathological evidence of disease; which is asymptomatic (chronic/latent infection) in at least 90% of the world population.

(Wong and Remington, 1994)

Toxoplasmosis



Diabetes mellitus

Is a serious complication in immunocompromised which resulting from primary infection-more often, reactivation. Patients develop a variety of local or systemic forms.

(Mejia et al, 1983; Holliman 1988; Luft and Remington, 1988; Holland, 1989; Salt et al, 1990)

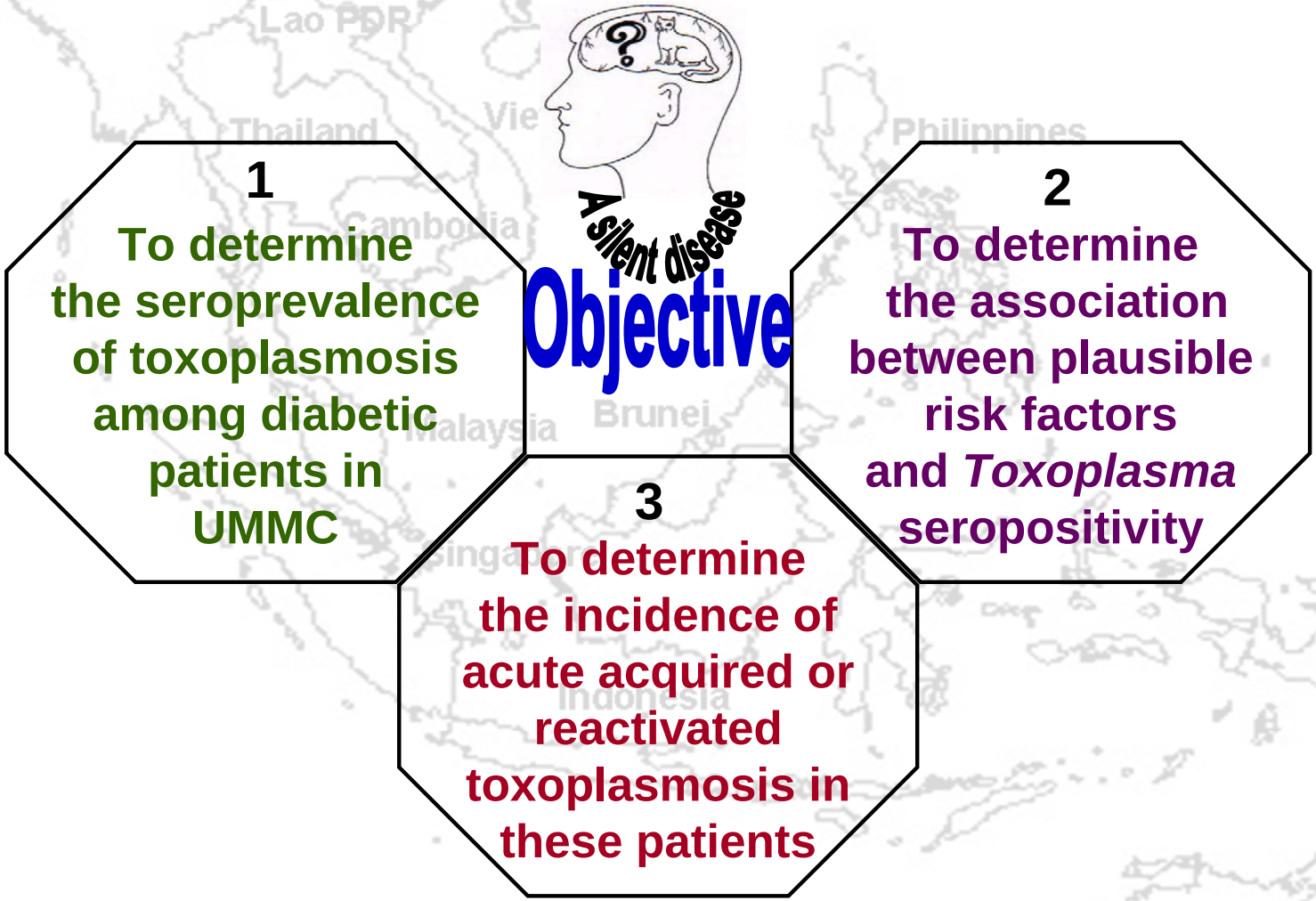
Literature

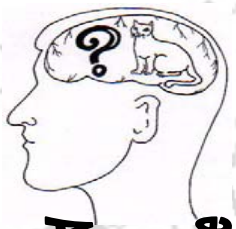
Parasitic diseases; amoebiasis, cryptosporiasis, cut-leshimaniasis, strongyloidiasis, and hydatid cyst have been consistently reported in associating with diabetic patients.

(Bredin et al, 2004; Treviño-Pérez et al, 1995; Radwan et al, 2007; Mendonca et al, 2006; Bel Hadj Youssef et al, 2007)

However, the studies on toxoplasmosis in diabetic patients are scanty.

(Cavallazzi, 1985; Johnson et al, 1997; Yamamoto et al, 2003)


A silent disease
Objective
1
To determine the seroprevalence of toxoplasmosis among diabetic patients in UMMC
2
To determine the association between plausible risk factors and *Toxoplasma* seropositivity
3
To determine the incidence of acute acquired or reactivated toxoplasmosis in these patients



Materials & Methods

Prospective Case Control Study

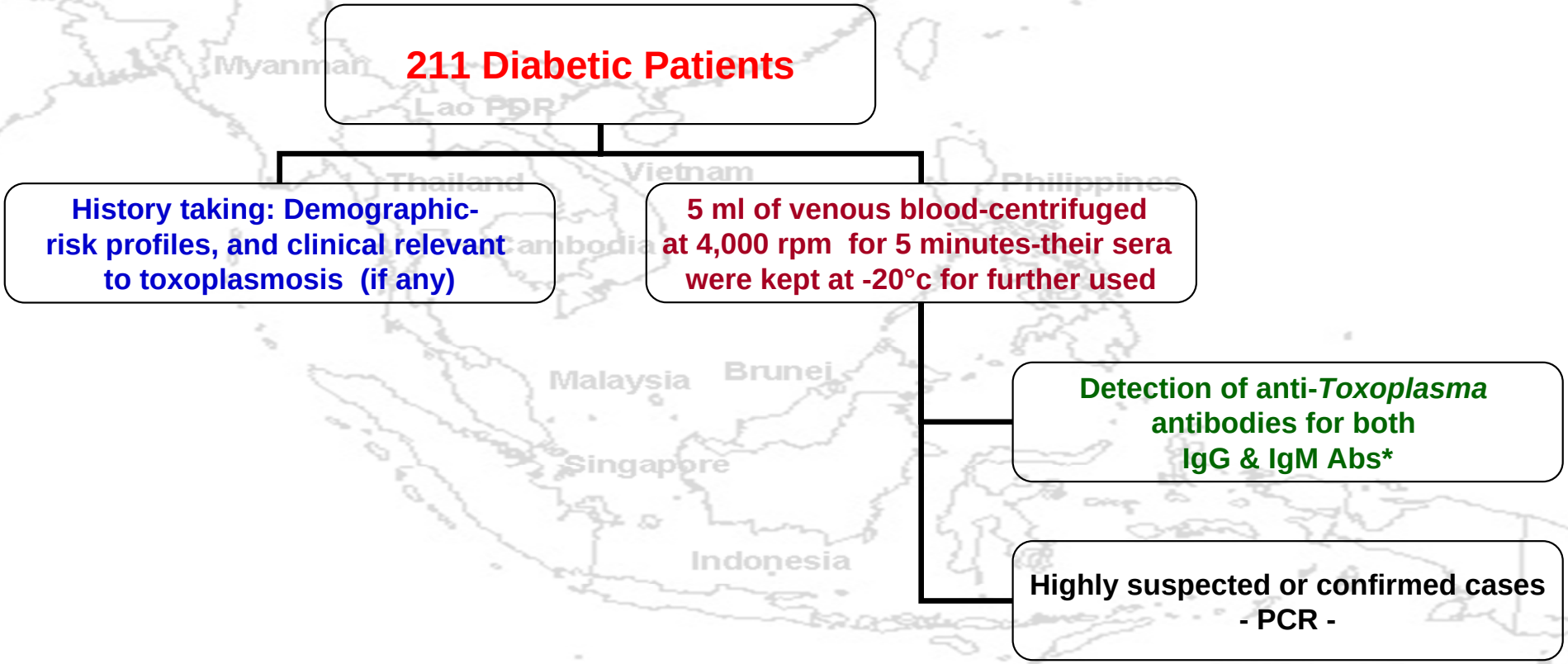
Department of Medicine (Endocrinology clinic)
December, 2007 to March, 2008

Inclusion criteria

- 211 diabetic patients with age of > 15 years old;
  19 type 1 (IDDM) + 192 type 2 (NIDDM)
  (New or Chronic/long standing cases)
- Informed consent were taken to participate in the study.
  The duration of DM ranges from < a month to
  ≈ 30 years with a median of 7 years.
- Negative for anti-HIV serostatus
  indicated by the ELISA technique

A random selection method was employed for eligible subjects during the specific study period using a standardised structured questionaire.

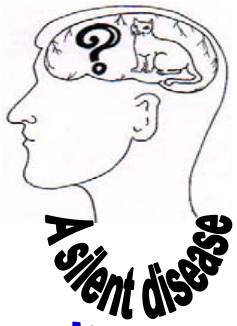
This study was approved by ethical committee of UMMC (Ref. No. 611.17).



*Standard ELISA commercial kit (IgG-Trinity Biotech PLC-USA; IgM-Trinity Biotech PLC-USA). A result of > 51 IU/ml of anti-*Toxoplasma* (IgG or IgM) antibodies positive indicating latent infection and recently acquired *Toxoplasma* infection, respectively.

Statistical analysis

Statistical software SPSS version 10 (SPSS Inc., Chicago, III., USA)
Qualitative data: Frequency & Percentage
Quantitative data: Mean (± SD) & Range
Univariate and multivariate analysis: Pearson Chi-square or Fisher's exact tests
P-value < 0.05 was considered as statistical significant



Results & Discussion

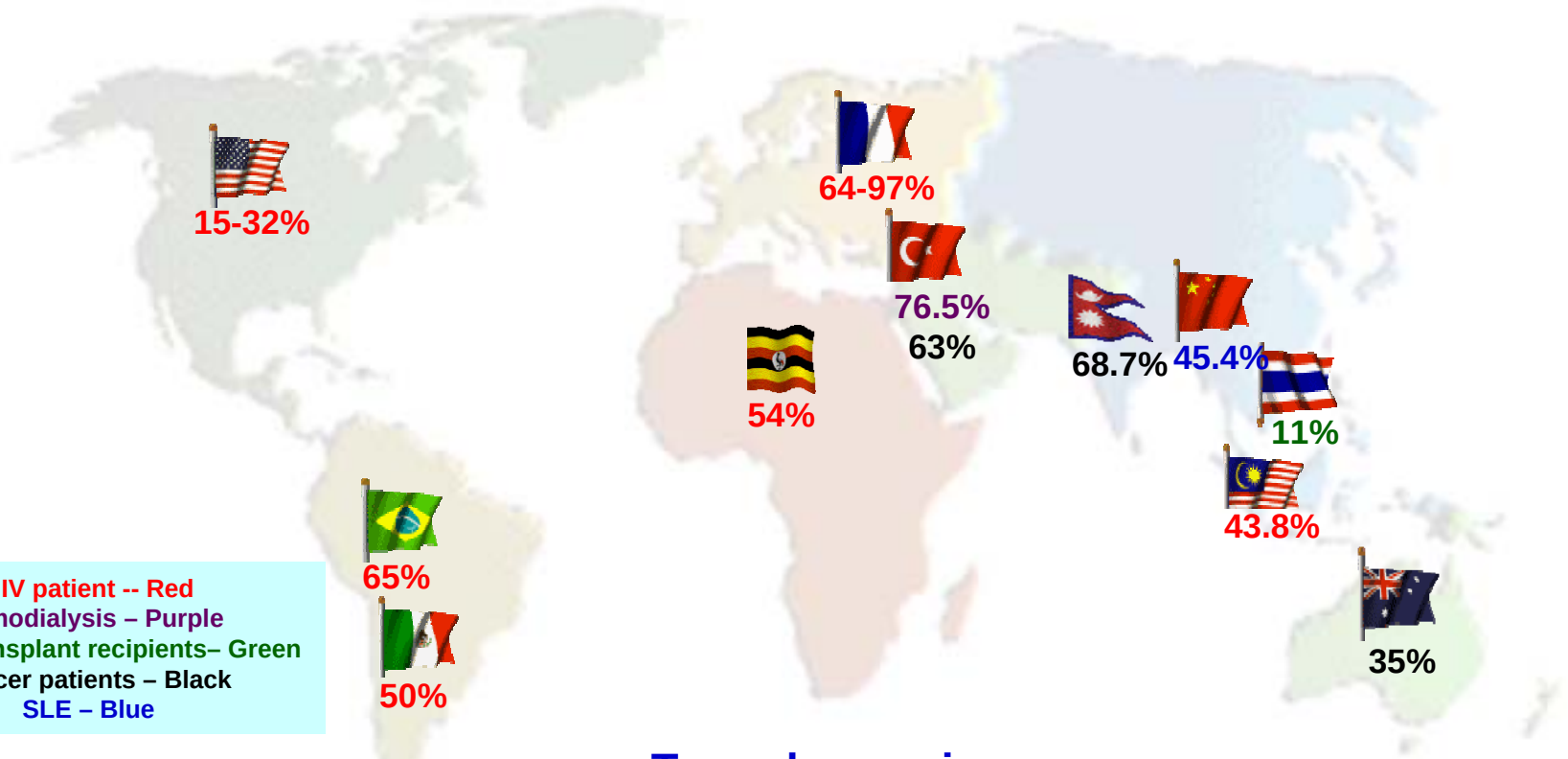
Table 1: Demographic and baseline characteristics of the study subjects.

Characteristics	No. of diabetic patients (n=211, %)
Age	Range 23-70 years Median 58 years
Age group	
23-37	10 (4.7)
38-52	56 (26.5)
≥ 53	**145 (68.7)**
Sex	
Male	103 (48.8)
Female	**108 (51.2)**
Race	
Malay	**87 (41.2)**
Chinese	46 (21.8)
Indian	76 (36.0)
Foreigner	2 (0.9)
Marital status	
Single	10 (4.7)
Married	**201 (95.3)**
Education	
Primary	49 (23.2)
Secondary	**120 (56.9)**
Tertiary	42 (19.9)
Occupation	
Unemployed	**137 (64.9)**
Labourer	2 (0.9)
Nonlabourer	72 (34.1)
Address	
Kuala Lumpur	**120 (56.9)**
Outsider	91 (43.1)

Table 2: The seroprevalence of toxoplasmosis in diabetic patients as assessed by the ELISA test.

ELISA test	Number of diabetic patients with *Toxoplasma* seropositivity		
	IgG+	IgM+	IgGM+
Positive	96 (45.5%) OR=9.840 95%CI=6.294-15.385	30 (14.2%) OR=0.541 95%CI=0.346-0.846	3 (1.4%) OR=0.034 95%CI=0.011-0.108
Negative	115 (54.5)	181 (85.8)	208 (98.6)
Total	211	211	211

The overall seroprevalence of toxoplasmosis in diabetic patients was found in 129 (61.1%) being; 45.5%, 14.2% and 1.4% for anti-*Toxoplasma* IgG, IgM and both IgG and IgM antibodies, respectively.



Toxoplasmosis

is a silent disease and is one of the leading systemic parasitic diseases capable of causing a broad spectrum of diseases in different groups of patients.

A screening program for *Toxoplasma* infection

should be initiated particularly In areas where latent toxoplasmosis is still high prevalent and with the uprising numbers of diabetic patients in this region.

This similar surveillances

would be very helpful in closely monitoring the case of secondary reactivation of latent toxoplasmosis which may occur at the time of rapidly decrease in immunity and the concurrent of diabetic sequelae.

Grant et al, 1990; Ryan et al, 1993; Letillois et al, 1995; Bossi et al, 1998; Wang et al, 2000; Sukthana et al, 2001; Falusi et al, 2002; Rai et al, 2003; Yazar et al, 2004; Ocak et al, 2005; Lindström et al, 2006; Nissapatorn et al, 2007

Table 3: The seroprevalence of toxoplasmosis in diabetic patients by demographic profiles.

Variables	No. of diabetic patients (211)		
	Total (%)	*Toxoplasma* seropositivity[1] 129 (61.1%)	P-value
Age group (years)			0.046
23-37	10	9 (90)	
38-52	56	36 (64.3)	
≥ 53	145	78 (53.8)	
Sex			0.269
Male	103	64 (62.1)	
Female	108	59 (54.6)	
Race			0.223
Malay	87	58 (66.7)	
Chinese	46	25 (54.3)	
Indian	76	39 (51.3)	
Foreigner	2	1 (50)	
Marital status			0.911
Single	10	6 (60)	
Married	201	117 (58.2)	
Education			0.033
Primary	49	35 (71.4)	
Secondary	120	61 (50.8)	
Tertiary	42	27 (64.3)	
Occupation			0.258
Unemployed	137	76 (55.5)	
Employed	74	47 (63.5)	
Address			0.265
Kuala Lumpur	120	66 (55)	
Outsider	91	57 (62.6)	

We found that diabetic patients in the younger age group and had primary level of education were significantly associated with *Toxoplasma* seroprevalence (p<0.05).

[1]**Overall seroprevalence of anti-*Toxoplasma* antibodies (IgG, IgM and IgG+IgM) in the study subjects.**

Table 4: The association between possible risk factors and *Toxoplasma* seroprevalence in diabetic patients.

Risk factors	No. of diabetic patients (211)		
	Total (%)	*Toxoplasma* seropositivity[1] 129 (61.1%)	P-value
Contact with cat			0.067
Yes	33	24 (72.7)	
No	178	99 (55.6)	
Undercooked meat			0.193
Yes	32	22 (68.8)	
No	179	101 (56.4)	
Blood transfusion			0.136
Yes	15	6 (40)	
No	196	117 (49.7)	
Source of drinking water			0.493
Boiled	132	77 (58.3)	
Filtered/mineral water	78	46 (59.0)	
Piped/tap water	1	1 (100)	
Drinking milk			0.906
Boiled	24	13 (54.2)	
Pasteurised milk	94	55 (58.5)	
No	93	55 (59.8)	
Contact with soil			0.481
Yes	50	27 (54)	
No	161	96 (59.6)	
Contact with other animals			0.240
Yes	39	26 (66.7)	
No	172	97 (56.4)	

[1]**Overall seroprevalence of anti-*Toxoplasma* antibodies (IgG, IgM and IgG+IgM) in the study subjects.**

We found that among diabetic patients who had contacted with other animals 64% (25/39) were significantly associated with latent *Toxoplasma* (IgG) infection (p=0.010).

Table 5: Multivariate-adjusted odds-ratios for various risk factors associated with *Toxoplasma* (Total Ig) seropositivity in diabetic patients.

Variables	Group	Multivariate-adjusted Odds-ratio (95% CI)	P-value
Age group (years)			
	23-37	40.69 (1.37-1205.13)	0.03
	38-52	2.61 (0.09-61.30)	0.10
	≥ 53 (ref)		
Education			
	Primary	4.80 (1.21-19.07)	0.03
	Secondary	1.02 (0.35-3.01)	0.97
	Tertiary (ref)		

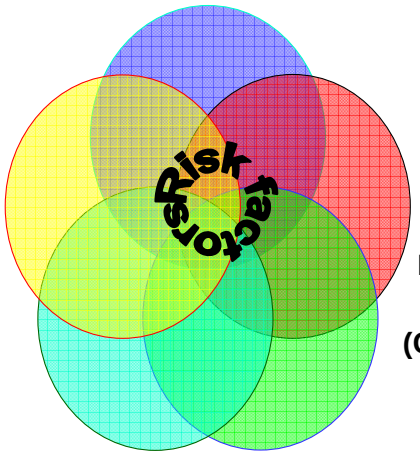
The significant predictive factors for *Toxoplasma* seropositivity were diabetic patients in younger age group and who had primary level of education found in this study.

? **An important question is whether risk assessments help in evaluating the real situation of toxoplasmosis among diabetic patients as one of the high risks population in Malaysia.**

Blood transfusion

Meat VS *Toxoplasma* sero+
(Fallah *et al*, 2004; Han *et al*, 2008).
Avoiding consumption of not properly cooked meat as well as other raw items seems to be the ultimate option in reducing the greater risk of getting this parasitic infection.

Meat



Cat

Cat VS *Toxoplasma* sero+
(Mark et al, 1993; Cook et al, 2000; Nissapatorn et al, 2001; Alvarado-Esquivel et al, 2006).
Malays ~ the highest rate
(Cheah et al, 1975; Tan and Mak, 1985; Zainul et al, 1992; Nissapatorn et al, 2003).

Other animals

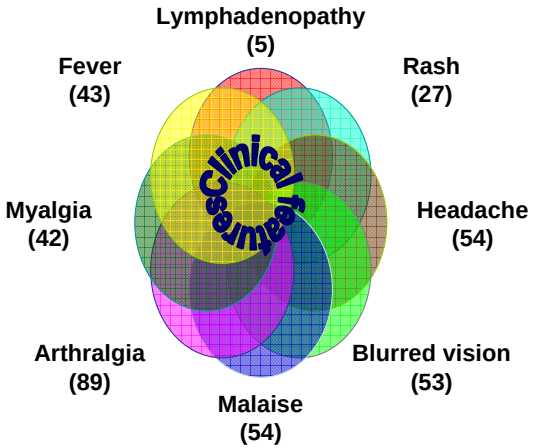
Dog VS *Toxoplasma* sero+
common sense measures- adequate hand washing, proper disposal of animal waste, and ensuring that infected animals are diagnosed and treated
(Rabinowitz *et al*, 2007).

Drinking water

H_2O VS *Toxoplasma* sero+
Drinking clean water
safety of drinking water---microbial safety
(WHO, 2006).

Primary preventive behavioral practices

Education per se is warranted in promoting self awareness or health education on *Toxoplasma*-associated knowledge, behavior and risk of seroconversion in these patients.



94 (44.5%) of DM-complications relating to eye (38), heart-IHD (43), kidney (12) and foot (28).
171 (81%) of these patients showed compliance to treatment.

Clinical features	Number of diabetic patients with *Toxoplasma* sero+			
	IgG+ (96, %)	IgM+ (30, %)	IgGM+ (3, %)	Total Ig (129, %)
Lymphadenopathy	3 (3.1)	0	0	3 (2.3)
Fever	15 (15.6)	10 (33.3)	1 (33.3)	24 (18.6)
Myalgia	16 (16.7)	7 (23.3)	1 (33.3)	22 (17.1)
Arthralgia	39 (40.6)	14 (46.7)	1 (33.3)	52 (40.3)
Malaise	23 (24.0)	8 (26.7)	0	31 (24.0)
Blurred vision	29 (30.2)	6 (20.0)	0	35 (27.1)
Headache	29 (30.2)	6 (20.0)	1 (33.3)	34 (26.4)
Rash	15 (15.6)	2 (6.7)	0	17 (13.2)

The evidence from this study suggests that diabetic patients with good metabolic control is a major factor in limiting the development and spread of infections and, most importantly, the development of diabetic complications which predispose to infections

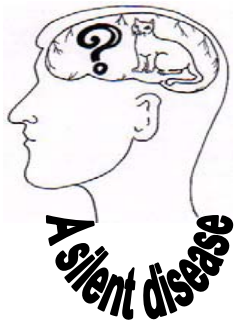
(Pozilli and Leslie, 1994).

Symptomatic toxoplasmosis in diabetic patients which is more commonly found involving the eye with necrotizing retinitis and the brain as cerebral toxoplasmosis

(Cavallazzi, 1985; Johnson et al, 1997; Yamamoto et al, 2003).

Toxoplasmosis, therefore, should be considered in the differential diagnosis in diabetes patients particularly in the elderly who may be more susceptible to severe ocular *Toxoplasma* infections because of age-related decline in cell-mediated immunity and chronic underlying diseases

(Johnson et al, 1997).



Conclusion

1

Latent (chronic) *Toxoplasma* infection shows high prevalent in diabetic Patients.

2

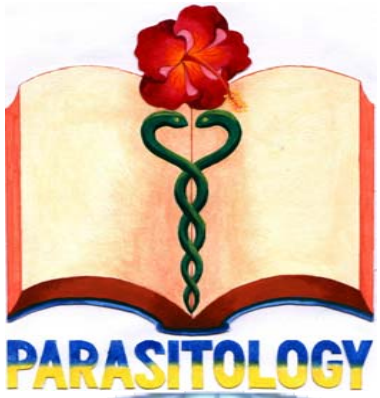
Few of risk factors had strongly played their roles in associating with *Toxoplasma* acquisition.

3

Screening for *Toxoplasma* infection, health education and promoting a healthy lifestyle.

4

Further studies as similar clinico-epidemiological surveillance. (seroconversion & incidence of toxoplasmosis)



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Thank you...Till we meet again.

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