

Prevalence and factors associated with social avoidance of recovered SARS patients in the Hong Kong general population

Joseph T. F. Lau*, Xilin Yang, Eric Wong and H. Y. Tsui

Abstract

The study investigated the general population's perceived infectivity of asymptomatic and recovered severe acute respiratory syndrome (SARS) patients and factors associated with avoidance and discriminatory attitudes, including demographic background, SARS-related perceptions and emotional response to the SARS epidemic. A population-based survey was conducted in Hong Kong during 3 December 2003 through 4 January 2004; 475 Hong Kong Chinese adults participated in the survey. Perceptions of the infectivity and health conditions of recovered SARS patients and avoidance and discrimination towards them were measured. Of the respondents, 75.7% and 16.2%, respectively, believed that SARS could be transmitted via asymptomatic SARS patients and those patients who have recovered from SARS for 18 months; 72.7% of the respondents believed that the health of SARS patients would severely and permanently be damaged; 16.6% showed some tendency of avoiding recovered SARS patients and 35.7% expressed some sort of job-related discriminatory attitudes. Perceived infectivity of asymptomatic and recovered SARS patients, health *sequelae* and emotional

distress from SARS were independently associated with avoidance and discriminatory attitudes. The study showed that misconceptions about the infectivity of asymptomatic and recovered SARS patients were common. Recovered SARS patients may also be facing avoidance and discrimination.

Introduction

Hong Kong had been badly hit by the severe acute respiratory syndrome (SARS) epidemic during March–June 2003. There were 1755 cases and 300 deaths reported, making up 20.8% and 32.8%, respectively, of all global cases [1]. SARS is a novel disease and people's perceptions on the disease had changed within a very short period of time [2]. Perceptions such as SARS-related perceived susceptibility, perceived mode of transmission, perceived consequences etc. were strongly associated with preventive behaviours [2–5]. To our knowledge, perceptions related to recovered SARS patients, including infectivity and health *sequelae*, discriminatory and avoidance attitudes have not been reported.

Discrimination towards people suffering from physical disability [6, 7], mental disability [8–10], human immunodeficiency virus (HIV)/acquired immunodeficiency syndrome (AIDS) [11–13] and other diseases [14, 15] has widely been reported. For instance, surveillance studies showed that discrimination towards people living with HIV/AIDS (PLWHA) is still very noticeable in the Hong Kong general population [12]. Given the fact that SARS has caused severe economic adversities and

Centre for Epidemiology and Biostatistics, School of Public Health, Faculty of Medicine, The Chinese University of Hong Kong, 5/F, School of Public Health, Prince of Wales Hospital, Shatin, NT, Hong Kong, China

*Correspondence to: J. T. F. Lau.

E-mail: jlau@cuhk.edu.hk

psychological distress in Hong Kong [16, 17], fear for contacting recovered SARS patients and associated discriminatory attitudes may occur. Recovered SARS patients would then have considerable difficulties in resuming their normal life.

Avoidance of recovered SARS patients may be due to the fear of contracting the virus. Psychological distress due to SARS is therefore relevant in predicting related avoidance/discriminatory attitudes. Avoidance of these patients may also be considered by the actor to be a form of preventive behaviour. The Health Belief Model (HBM) has been used to investigate preventive behaviours for various diseases [18, 19], including SARS [20]. The model specifies that the practice of preventive behaviours is affected by perceptions including perceived efficacy of the preventive behaviour, perceived consequences and perceived susceptibility of the disease, barriers and cue to actions, etc. [21]. In this case, perceptions related to infectivity and health conditions of recovered SARS patients (i.e. perceived susceptibility and consequences) are most relevant in predicting attitudes related to protective (avoidance) behaviours which can be translated into discriminatory attitudes against these patients.

Misconceptions about infectivity and health *sequelae* of recovered SARS patients may also be prevalent. These misconceptions would induce fear for contracting SARS from recovered SARS patients, hence resulting in avoidance or discriminatory attitudes/behaviours. Such relationships have been reported in many studies conducted for other infectious diseases. For instance, misconceptions about the mode of HIV transmission are common in Hong Kong [22] and were strongly associated with discriminatory attitudes towards PLWHA [12]. Discrimination towards PLWHA not only affects quality of life of these patients [23], but it also undermines community responses for effective prevention [24].

The study therefore investigated the general population's perceptions on susceptibility of contracting SARS via daily contacts with asymptomatic and recovered SARS patients and the disease's *sequelae* on the health of recovered patients. The

prevalence of avoiding daily contacts with recovered SARS patients (such as shaking hands, dining or working together with recovered SARS patients) and possible job-related discriminatory attitudes in the general population were reported. The hypotheses whether the aforementioned perceptions (perceived susceptibility and health *sequelae*) were associated with attitudes related to avoidance/discriminatory attitudes were tested. In addition, the associations between currently perceived emotional stress due to SARS and avoidance/discriminatory attitudes were also investigated.

Methods

Study population and sampling

The study population comprised all Chinese-speaking Hong Kong residents (~95% of the total population) who were of age 18- to 60-years old. Telephone numbers were randomly selected from up-to-date residential phone directories. Almost 100% of the Hong Kong residents have telephones at home (Hong Kong Office of the Telecommunications Authority, personal communication, 28 January 2000).

A telephone survey was conducted from 3 December 2003 to 4 January 2004. Trained interviewers made calls between 6 p.m. to 10.30 p.m. to avoid under-sampling workers and students. Unanswered telephone calls were given at least two more follow-up calls, made at different hours and weekdays, before being classified as invalid. It was briefed that the study topic was related to studying impacts of the SARS epidemic. A household member between the age of 18-60 years, whose birthday was closest to the date of interviews, was invited to participate in the study.

Out of all telephone calls made ($n = 2397$), 25.6% ($n = 614$) were non-contacts and 24.8% ($n = 594$) were non-households or with phone line problems. Among those contacted households, 37.8% ($n = 449$) were invalid households (eligible respondents not available), 12.6% ($n = 150$) refused to participate and 11.1% ($n = 133$) did not com-

plete the survey. The cooperation rate therefore was 61.8% (457/740).

Measurement

Demographic information was obtained from the respondents (Table I). Respondents were asked whether they agree with a number of statements concerning asymptomatic properties, perceived infectivity and health *sequelae* related to SARS patients (Table II). An additional question about current emotional distress due to SARS was also asked (Table II). Further, questions on perceived avoidance of recovered SARS patients, related discriminatory attitudes, etc. were asked (Table III). These items were mainly modified from some relevant studies investigating stigmatization towards PLWHA [25]. The time frame of the questions refers to the time when the survey was conducted (i.e. ~8 months since the reporting of

the last SARS case in Hong Kong). Face validity of the questions was evaluated by a panel of researchers.

Statistical methods

The prevalence of perceptions was tabulated. Chi-square test was performed to test for significant group differences. Indicator variables were created to measure avoidance attitudes and possible job-related discrimination towards recovered SARS patients. Univariate analysis was carried out to identify significant predictors of avoidance and discriminatory attitudes. Multivariate stepwise logistic regression analysis was then carried out using all significant variables obtained from the above-mentioned univariate analysis as candidate variables. SPSS for Windows Release 11.0.1 (SPSS Inc., Chicago, IL, USA) was used to analyse the data and *P* values < 0.05 were considered as statistically significant.

Table I. Sociodemographic characteristics of respondents

	Male (<i>n</i> = 207) %	Female (<i>n</i> = 250) %	Overall (<i>n</i> = 457) %
Age group (years)			
18–29	25.1	20.4	22.5
30–44	37.7	43.6	40.9
45–60	37.2	36.0	36.5
Education level			
9 years or below	23.2	35.3	29.8
10–12 years	49.3	41.4	45.0
University	27.5	23.3	25.2
Current marital status			
Single	35.3	23.3	28.7
Married/divorced/ widowed	64.7	76.7	71.3
Employment status			
Full time	70.4	47.6	57.9
Housewife/students	10.2	44.0	28.6
Others	19.4	8.5	13.4
Monthly income (HKD) ^a			
4000 and less	25.4	46.3	36.9
4001–12 000	41.6	33.1	36.9
12 001–20 000	21.8	12.0	16.4
20 001 and above	11.2	8.7	9.8

^aUSD\$ 1.0 ≈ HKD\$ 7.8.

Results

Demographic characteristics

The demographic characteristics of the respondents are summarized in Table I.

Perceptions related to susceptibility of SARS transmission

Of the respondents, 61.1% believed that SARS could be asymptomatic and 24.1% believed that there are many asymptomatic SARS cases currently present in Hong Kong; 75.1% of them believed that SARS could be transmitted via asymptomatic SARS cases. Age, gender and education attainment were not significant factors (*P* > 0.05), except that those who were younger were statistically less likely (chi-square test, *P* = 0.004) to believe that there are many asymptomatic cases currently existing in Hong Kong (12.6, 29.9 and 24.6%, respectively, for those who were of age 18–29, 30–44 and 45–60 years).

There were 16.2, 15.5 and 11.1%, respectively, of all respondents believing that even having been fully recovered from SARS for 18 months, SARS

Table II. Perceptions related to asymptomatic SARS patients, recovered SARS patients and other features of SARS

% Agreeing with statements	Male (n = 207)	Female (n = 250)	All respondents	P value ^a
Asymptomatic patients				
SARS patients could be asymptomatic	58.9	62.8	61.1	0.399
Currently, there are many asymptomatic SARS patients in Hong Kong	22.2	25.6	24.1	0.400
SARS could be transmitted via asymptomatic SARS patients	76.8	74.8	75.7	0.618
Infectivity of recovered SARS patients				
SARS patients having recovered for 18 months could transmit SARS to others	17.5	15.2	16.2	0.512
Dining with recovered SARS case could transmit SARS ^b	16.4	14.8	15.5	0.633
Handshaking with recovered SARS patients could transmit SARS ^b	10.6	11.6	11.2	0.743
Recovered SARS patients would have very poor health in the very long run	64.3	78.8	72.2	0.001
An infected person is immune from contracting SARS in the future	20.3	18.4	19.3	0.610
Recovered SARS patients would not be able to handle demanding job duties ^b	35.7	50.8	44.0	0.001
Other features of SARS				
SARS could be transmitted via aerosols	52.2	52.8	52.5	0.894
The mortality rate for SARS patients of age <60 years was >10%	41.1	50.0	46.0	0.056
I am still much disturbed by SARS ^b	28.6	36.0	32.7	0.095

^aChi-square test. ^bThe time frame was set to be the time of the survey, which was ~8 months since the reporting of the last SARS case in Hong Kong.

patients would still be able to transmit the virus to others, and dining or shaking hands with recovered SARS patients of survey might still result in transmission of the virus (Table II). Further, about half of the respondents (52.2%) believed that the SARS coronavirus could be transmitted via aerosols (Table II). Age, gender and education attainment were not significant factors.

Perceptions related to health consequences of contracting SARS

Of the respondents, 72.7% perceived that recovered SARS patients would have very poor health in the very long run and that they were unable to handle demanding job duties around the time of the survey. Respondents who were male (poor health: OR = 2.07 and unable to handle demanding job: OR = 1.86), younger (poor health: OR = 1.94 and 2.51 when the 30–44 and 45–60 groups were compared with the 18–29 group and unable to handle

demanding job: OR = 1.79 and 3.80 when the 30–44 and 45–60 groups were compared with the 18–29 group) and attained university education (poor health: OR = 0.52 and unable to handle demanding job: OR = 0.38, when those with and without university education were compared) were less likely than others to possess such perceptions ($P < 0.05$). Besides, 19.3% of the respondents believed that SARS patients would be immunized from further infection of the coronavirus; those who were older were more likely to hold such a belief (OR = 1.59, respectively, when the 45–60 group was compared with the 18–29 group, $P = 0.046$).

Of respondents, 46.0% believed that the mortality rate of SARS patients of age <60 years exceeded 10% and 32.7% of the respondents felt that they were still emotionally disturbed by the SARS epidemic. Age and education level were not significant factors ($P > 0.05$), except that older age was associated with emotional disturbance (OR = 2.60

Table III. Behaviours and attitudes related to avoidance and possible job-related discriminatory attitudes towards recovered SARS patients

	Male (n = 207)	Female (n = 250)	All respondents	P value ^a
Avoidance of recovered SARS patients				
% Would avoid shaking hands with recovered SARS patients	4.8%	6.4%	5.7%	0.471
% Would avoid dining together with recovered SARS patients	5.3%	7.2%	6.3%	0.410
% Would avoid working together with recovered SARS patients	3.4%	4.4%	3.9%	0.577
% Would avoid having close contacts with recovered SARS patients	10.6%	10.0%	10.3%	0.826
% Would avoid using a lift together with recovered SARS patients	6.3%	6.4%	6.3%	0.958
% Would avoid kids having close contacts with recovered SARS patients	10.1%	11.7%	11.0%	0.588
% Would interaction with recovered SARS patients	7.7%	8.8%	8.3%	0.680
% Any one of above	16.9%	16.4%	16.6%	0.885
Overall feelings				
% Would worry about contracting SARS when interacting with recovered SARS patients	8.7%	12.4%	10.7%	0.203
% Would express their care towards recovered SARS patients	76.7%	83.2%	80.3%	0.083
Job-related discriminatory attitudes				
% Believing recovered SARS patients should avoid serving as				
Catering staff	35.0%	26.8%	30.5%	0.060
Teachers	28.5%	20.8%	24.3%	0.056
Medical personnel	27.5%	20.4%	23.6%	0.074
Children-care workers	29.0%	25.2%	26.9%	0.364
Any one of the above	38.6%	33.2%	35.7%	0.226

^aChi-square test.

and 3.43, respectively, when the 30–44 and 45–60 groups were compared with the 18–29 group).

Attitudes related to avoidance, support and job-related discrimination towards recovered SARS patients

A number of the respondents stated that they would definitely avoid shaking hands (5.7%), dining (6.3%), working together with recovered SARS patients (3.9%), making close contacts (10.3%) or allowing their children to make close contacts (11.0%) with recovered SARS patients; 16.6% of the respondents were having at least one item reflecting avoidance behaviours (Table III). Overall, 10.7% of the respondents would worry about contracting SARS if interacting with recovered SARS patients. On the other hand, 80.3% of the

respondents would like to express their care towards recovered SARS patients. Gender, education and age were not significant factors ($P > 0.05$), except that those who were younger were less likely than others to allow their child to have close contacts with recovered SARS patients (OR = 5.38 and 4.90 when the 30–44 and 45–60 groups were compared with the 18–29 group, $P = 0.0251$).

There were 25–30% of the respondents believing that recovered SARS patients should avoid serving in the food catering industry or working as teachers, childcare workers or medical personnels. Age was significantly associated with the first three items (OR ranged from 1.35 to 2.19, when the 30–44 and 45–60 groups were compared with the 18–29 group). Overall, 35.7% of the respondents showed some discriminatory attitudes in at least one of the

four above-mentioned items (Table III). Age, gender and education level were not significantly associated with this indicator variable (Table IV).

Factors associated with avoidance behaviours and job-related discriminatory attitudes

Univariate analysis

Table IV shows that univariately those who were of older age (aged 30 years and above) and those who were married were more likely than others to report at least one item of avoidance behaviours (OR ranged from 1.93 to 3.38, $P < 0.05$). Gender and education level were not significant factors. Marital status but not other variables were associated with the total number of avoidance items (age was of marginal significance) (Table IV). The same pattern was observed for the factors related to the number

of reported items reflecting job-related discriminatory attitudes (Table IV). Employment status and monthly income were not significantly associated with above-mentioned attitudes (Table IV).

Those who believed that SARS could be transmitted via asymptomatic cases and SARS patients who had been recovered for 18 months were more likely than others to have at least one item reflecting avoidance behaviours (OR of ~ 2.1). Only the latter but not the former was significantly associated with the total number of reported avoidance items ($P = 0.122$ and 0.004 , respectively, see Table V). Similarly, those who believed that dining or shaking hands with recovered SARS patients was more likely than others to give at least one avoidance item in their responses (OR of 3.57 and 3.64) and more items of avoidance behaviours ($P < 0.001$, Table V). The same is true for those

Table IV. Factors associated with avoidance of recovered SARS patients: univariate analysis of sociodemographic factors

	Avoidance response to at least one item		Discriminatory response to at least one job-related item		Total number of avoidance items			Total number of job-related discriminatory items		
	%	OR (95% CI)	%	OR (95% CI)	Mean	SD	<i>P</i> value	Mean	SD	<i>P</i> value
Gender										
Male	16.9%	1.00	38.6%	1.00	0.5	1.4	0.624	1.2	1.7	0.076
Female	16.4%	0.94 (0.59, 1.58)	33.2%	0.79 (0.54, 1.16)	0.5	1.5		0.9	1.5	
Age group (years)										
18–29	7.8%	1.00	28.2%	1.00	0.2	1.0	0.060	0.7	1.4	0.069
30–44	16.6%	2.36 (1.04, 5.35)	38.5%	1.60 (0.95, 2.69)	0.6	1.6		1.1	1.6	
45–60	22.2%	3.38 (1.51, 7.59)	37.1%	1.51 (0.89, 2.57)	0.6	1.5		1.2	1.7	
Education level										
9 years or below	22.1%	1.00	30.1%	1.00	0.6	1.5	0.522	0.8	1.4	0.058
10–12 years	14.6%	0.61 (0.35, 1.06)	39.0%	1.48 (0.94, 2.35)	0.5	1.5		1.2	1.7	
University	13.9%	0.57 (0.29, 1.11)	36.5%	1.33 (0.79, 2.26)	0.4	1.3		1.0	1.5	
Marital status										
Single	10.7%	1.00	26.0%	1.00	0.3	1.1	0.045	0.6	1.3	<0.001
Married	18.8%	1.93 (1.04, 3.59)	39.7%	1.88 (1.20, 2.94)	0.6	1.6		1.2	1.7	
Employment status										
Full time	15.6%	1.00	33.8%	1.00	0.4	1.3	0.218	1.0	1.6	0.197
Housewife/students	16.2%	1.04 (0.59, 1.85)	36.9%	1.14 (0.74, 1.77)	0.5	1.5		1.0	1.5	
Others	21.3%	1.47 (0.73, 2.95)	41.0%	1.36 (0.77, 2.40)	0.8	1.8		1.4	1.8	
Monthly income (HKD)										
4000 and less	17.3%	1.00	34.0%	1.00	0.6	1.6	0.687	1.0	1.5	0.486
4001–12 000	12.3%	0.67 (0.36, 1.25)	36.4%	1.11 (0.71, 1.76)	0.4	1.3		1.2	1.7	
12 001–20 000	19.4%	1.16 (0.56, 2.35)	45.8%	1.65 (0.93, 2.90)	0.6	1.5		1.1	1.5	
20 001 and more	25.6%	1.65 (0.74, 3.65)	23.3%	0.59 (0.27, 1.28)	0.6	1.5		0.8	1.6	

Table V. Factors associated with avoidance of recovered SARS patients: univariate analysis of factors related to SARS-related perceptions

Independent variables		At least one avoidance item		Any one job-related discriminatory item		Total number of avoidance items			Total number of job-related discriminatory items		
		Row %	OR (95% CI)	Row %	OR (95% CI)	Mean	SD	<i>P</i> value	Mean	SD	<i>P</i> value
Currently, there are many asymptomatic SARS patients in Hong Kong	Disagree	15.0%	1.00	34.6%	1.00	0.5	1.3	0.098	1.0	1.5	0.045
	Agree	21.8%	1.58 (0.92, 2.72)	39.1%	1.21 (0.78, 1.89)	0.7	1.7		1.3	1.8	
SARS could be transmitted via asymptomatic SARS patients	Disagree	9.9%	1.00	22.5%	1.00	0.3	1.2	0.122	0.6	1.2	<0.001
	Agree	18.8%	2.10 (1.07, 4.15)	39.9%	2.28 (1.39, 3.74)	0.6	1.5		1.2	1.7	
Patients having recovered for 18 months could transmit SARS to others	Disagree	14.7%	1.00	31.9%	1.00	0.4	1.3	0.004	0.9	1.5	<0.001
	Agree	27.0%	2.16 (1.20, 3.88)	54.1%	2.51 (1.51, 4.16)	1.0	2.1		1.7	1.8	
Dining with recovered SARS case could transmit SARS ^a	Disagree	13.2%	1.00	32.4%	1.00	0.4	1.2	<0.001	0.9	1.5	0.001
	Agree	35.2%	3.57 (2.02, 6.31)	53.5%	2.40 (1.44, 4.02)	1.3	2.2		1.6	1.7	
Handshaking with recovered SARS patients could transmit SARS ^a	Disagree	14.0%	1.00	33.5%	1.00	0.4	1.1	<0.001	1.0	1.6	0.006
	Agree	37.3%	3.64 (1.93, 6.85)	52.9%	2.23 (1.24, 4.02)	1.7	2.7		1.6	1.8	
Recovered SARS patients would have very poor health in the very long run	Disagree	8.7%	1.00	22.0%	1.00	0.2	0.9	0.005	0.6	1.3	<0.001
	Agree	19.7%	2.59 (1.32, 5.08)	40.9%	2.45 (1.52, 3.93)	0.6	1.6		1.2	1.7	
Recovered SARS patients would not be able to handle demanding job duties ^a	Disagree	10.9%	1.00	30.1%	1.00	0.3	1.1	0.001	0.8	1.5	0.001
	Agree	23.9%	2.56 (1.54, 4.25)	42.8%	1.74 (1.18, 2.56)	0.8	1.8		1.3	1.7	
SARS could be transmitted via aerosols	Disagree	13.8%	1.00	28.6%	1.00	0.4	1.3	0.164	0.8	1.4	<0.001
	Agree	19.2%	1.48 (0.90, 2.45)	42.1%	1.82 (1.23, 2.68)	0.6	1.6		1.3	1.7	
The mortality rate for SARS patients of age <60 years was >10%	Disagree	14.6%	1.00	28.7%	1.00	0.5	1.4	0.473	0.9	1.5	0.013
	Agree	19.0%	1.38 (0.84, 2.26)	43.8%	1.93 (1.31, 2.85)	0.6	1.5		1.3	1.6	
I am still much disturbed by SARS ^a	Disagree	14.0%	1.00	30.6%	1.00	0.4	1.2	0.003	0.9	1.5	<0.001
	Agree	22.1%	1.75 (1.06, 2.88)	46.3%	1.95 (1.31, 2.93)	0.8	1.9		1.4	1.8	

^aThe time frame was set to be the time of the survey, which was ~8 months since the reporting of the last SARS case in Hong Kong.

who perceived that recovered SARS patients would have a very poor health status in the very long run, and that such patients would not be able to take up demanding jobs around the time of the survey (Table V). The SARS-related perception factors that were significantly associated with job-related discrimination attitudes were almost the same as those that were associated with avoidance behaviours (Table V).

Perception on whether SARS could be transmitted via aerosols and whether mortality rate of SARS patients aged <65 years was >10% were not significantly associated with tendency for avoidance. Those who felt that they were still much emotionally disturbed by the SARS epidemic were more likely than others to have avoidance behaviours (Table V). All the three above-mentioned variables (aerosols, mortality and emotional disturbance) were significantly associated with the two indicator variables on job-related discriminatory attitudes (Table V).

Multivariate analysis

Multivariately, age, perceptions related to infectivity of those who had fully recovered from SARS for 18 months and health conditions of recovered SARS patients were associated with giving at least one item reflecting avoidance responses (Table VI).

Similarly, perceptions related to infectivity among asymptomatic patients and patients who had recovered for 18 months, perceived health conditions of recovered SARS patients and emotional disturbance due to SARS were associated with giving at least one item reflecting job-related discrimination towards recovered SARS patients (Table VI).

Discussion

The results show that there exist some common misconceptions about the infectivity of transmission of SARS via asymptomatic and recovered patients. In a study of 87 health care workers of

Table VI. Multivariate analysis to identify predictors for avoidance and discriminatory attitudes towards recovered patients (stepwise logistic regression analysis)

	OR	95% CI of OR	P value
Model one (dependent variable: having at least one item showing avoidance behaviour)			
Age group (years)			
18–29	1.00		
30–44	2.080	0.908–4.763	0.083
45–60	3.004	1.323–6.818	0.009
SARS patients having been recovered for 18 months could transmit SARS to others			
Disagree	1.00		
Agree	1.908	1.042–3.492	0.036
Recovered SARS patients would have very poor health in the very long run			
Disagree			
Agree	2.093	1.048–4.181	0.036
Model two (dependent variable: having at least one item showing possible job-related discriminatory attitude)			
SARS could be transmitted via asymptomatic SARS patients	2.097	1.245–3.532	0.005
SARS patients having been recovered for 18 months could transmit SARS to others	1.928	1.136–3.273	0.015
Recovered SARS patients would have very poor health in the long run	1.874	1.137–3.088	0.014
I am still much disturbed by SARS	1.644	1.074–2.515	0.022
Mortality rate for SARS patients of age <60 years was >10%	1.574	1.046–2.370	0.030

a hospital with SARS outbreak, no asymptomatic case was found and it was concluded that sub-clinical SARS is not an important feature of the disease [26]. About 16% of the respondents believed that even 18 months after recovery, SARS patients are still infectious and that at the time of the study, dining and shaking hands with recovered SARS patients would transmit the virus. Yet, no SARS cases had been detected after the reporting of the last case in the SARS epidemic in Hong Kong.

The mortality of SARS has been overestimated. The case fatality rate in Hong Kong was <5% for those who were of age <65 [27]. However, 45% of the respondents believed that the rate was >10%. Around April 2003, ~52% of the general population believed that SARS was lethal [2]. Further, 75% of the public believed that the health *sequelae* of contracting SARS are severe and irreversible and about half of them believed that recovered SARS patients were unable to handle demanding jobs at the time of the survey. According to the Hospital as stated in some local study studies, 4.7–15% of the recovered SARS patients in Hong Kong developed avascular necrosis of head of femur [27]. At the time of the study, very little information about the health conditions of recovered SARS patients has been disseminated to the public.

With the above-mentioned background, it is not surprising that ~20–35% of the respondents showed some tendency for avoidance and discrimination. It is expected that many SARS patients would be facing considerable difficulties in returning to their normal life. In fact, a high percentage of the recovered SARS patients in Hong Kong have been suffering from psychological morbidity (Y. K. Wing *et al.*, unpublished data). It is important to investigate whether such morbidity is related to avoidance and discriminations towards the patients.

The null hypotheses that perceptions related to perceived susceptibility and health consequences were not associated with avoidance and discriminatory attitudes against recovered SARS patients were rejected by the results of this study. The HBM is therefore supported by results of this study. The data suggested that avoidance of recovered SARS patients may have been seen as a protective

behaviour and according to the HBM, such health seeking behaviours will be invoked when one perceives high susceptibility (e.g. high infectivity of recovered SARS patients) and serious consequences (e.g. health *sequelae*). SARS differ from other infectious diseases in that it became a severe global epidemic within a short period of time while there was almost no information about recovered patients' infectivity and health consequences. Fear was therefore easily induced and avoidance/discrimination against recovered SARS patients was prone to develop. The provision of knowledge has been shown to be successful in reducing HIV-related discrimination and is much warranted [28]. It is important to rectify misconceptions in the general populations. The results of this study therefore show that HBM may also be applicable for studying avoidance behaviours related to infectious diseases, especially those new ones with incomplete knowledge (e.g. SARS and human avian flu).

Those who were older were more likely to have tendencies for avoidance and discrimination, which was similar to relevant studies on HIV [12, 29]. Gender difference was also not of statistical significance in this study, whereas the gender effects of HIV-related discrimination have been mixed [28]. Education level was, however, not statistically significant, which was different from results of similar studies on discrimination on HIV/AIDS [12]. It is possible that there is a better knowledge base for HIV/AIDS or disability as compared with SARS and such favours those who attained university education. SARS, however, being a novel disease would be much less affected by gender or education level. Seemingly, there may be less gender and sociodemographic differences in SARS-related discrimination, as compared with HIV-related discrimination. In HIV research, similar findings that knowledge and misconceptions about modes of transmission (such as HIV transmission via daily social contacts) were associated with discrimination towards PLWHA were reported [12, 29, 30]. Therefore, there are both similarities and differences in factors associated with disease-related discriminations among different types of infectious disease. Knowledge and perception about

mentally ill and disabled persons were also associated with relevant discriminatory attitudes [8, 9].

Emotional disturbance due to SARS was also associated with avoidance and discriminatory attitudes. The media often covered stories about the number of new cases and deaths, the lack of effective treatment, etc. Fear and possible discrimination may have resulted. Media should take a more proactive role in disseminating up-to-date information to the general public and to rectify relevant misconceptions. The role of the media and the content of the disseminated information should be better studied.

Further, while a substantial proportion of the general public in Hong Kong may avoid or discriminate towards recovered SARS patients, it seems contradictory to find out that the majority of the public would like to express their care towards recovered SARS patients. It is speculated that SARS patients may not be as much stigmatized as their HIV/AIDS patient counterparts. Most of them were likely to have been seen as victims, whereas HIV/AIDS patients are more often seen to be personally responsible for contracting the disease, as compared with patients of other illnesses such as cancer [31]. Therefore, it is speculated that the chance of removing discrimination towards SARS patients should be quite high, where proper information being provided. The government and health workers should now systematically compile information to remove misconceptions and fear.

It has been pointed out that we often have more knowledge about the epidemiological aspects but less knowledge about the sociocultural aspects of infectious diseases and that interpretation of contagion may be culturally determined, depending on social organization and other factors [32]. Though not documented, there seems to be saying that SARS is nature's (or even god's) response to the environmental damages caused by human beings. Those cultural interpretations may also affect SARS-related discrimination. More in-depth studies on the cultural aspects of SARS and SARS-related discrimination are therefore warranted.

Hong Kong has been experiencing low prevalence of infectious diseases in the last few decades. Except for HIV/AIDS, stigmatizations towards

people affected by infectious diseases have not been studied. As seen, there are both similarities and differences. Comparison with other infectious diseases is difficult and influences from other infectious diseases may be relatively small.

We counted the respondents who would 'definitely' avoid making contacts with recovered SARS patients. If we relax the definition to include those who would 'definitely' or 'probably' avoid contacts with recovered SARS patients, the percentage showing avoidance in the individual items listed in the Table III would be much higher (13–22%, instead of 4–11%). About 31% of the respondents would have at least one avoidance item (instead of 17%). Avoidance attitudes may be more common than what the previous analyses suggest. With the new definition, the results of the univariate and multivariate factors are largely the same. Univariately, a few more significant associations were found (e.g. aerosols, mortality rate and asymptomatic transmission). Multivariately, one more significant variables would be added to the model listed in Table VI (SARS could be transmitted via asymptomatic patients).

The study has a number of limitations. First, telephone surveys were used. Similar Knowledge, Attitude, Beliefs and Practices studies using telephone surveys are quite common [2, 22]. Second, the response rate was not very high (61.8%) though it is comparable with many other telephone surveys conducted in Hong Kong [2, 22, 33]. The gender and age compositions of this study are similar to those of the Census distribution (Census: % male = 47.5% and % aged 45–60 = 32.9%; this study: % male = 45.3% and % aged 45–60 = 36.5%) [34]. Reporting biases due to social desirability may exist. Yet, the direction of such biases should favour under-reporting of avoidance/discrimination responses. Measurement of avoidance/discriminatory attitudes may be another limitation although the items were mainly adopted from local HIV surveys; validated scales on measuring avoidance/discrimination towards SARS patients was used as they do not exist. A panel of researchers assessed the face validity of these items but test-retest had not been performed. Further,

only the dimensions on avoiding contacts and job-related discrimination have been studied. It is uncertain whether such perceptions would persist over time. The study only investigated perceptions, not behaviours. Perceptions may not result in behaviours though the two are correlated with each other. The role of the media has not been covered by this study. The reasons for exhibiting discriminatory attitudes behind have not been sought in this study. Qualitative studies are required to investigate reasons operating behind the observed perceptions. Further studies are therefore warranted.

It is expected that the above-mentioned problems may have even been much more serious in countries where information is less available. Cross-cultural comparisons would hence be useful. It also seems that there may be both similarities and difference between SARS and other infectious diseases such as HIV/AIDS. This study provides a broader picture on the understanding of the relationships between infectious disease and relevant discrimination behaviours and attitudes. For outbreaks of other new infectious diseases, factual information about the mode of transmission and health consequences should be disseminated to the public promptly. The government, the researchers and the media should also work closely together to disseminate timely information to rectify misconceptions and to alleviate fear.

Avoiding recovered patients may be seen by some to be a preventive measure. Yet, if not knowledge based, the act is problematic as it would do harm to both the patients involved and future prevention efforts. Further, as learned from other diseases (e.g. HIV/AIDS), provision of knowledge could only resolve discrimination-related problems partially. It is also likely that avoidance of recovered SARS patients is a reflection of the fact that discrimination towards some minority groups exists in society.

Acknowledgements

This study is solely funded by the Chinese University of Hong Kong.

Conflict of interest statement

None declared.

References

1. World Health Organization. *Summary Table of SARS Cases by Country, 1 November 2002–7 August 2003*. Available at: http://www.who.int/csr/sars/country/2003_08_15/en/. Accessed: 15 September 2003.
2. Lau JT, Yang X, Tsui H *et al.* Monitoring community responses to the SARS epidemic in Hong Kong: from day 10 to day 62. *J Epidemiol Community Health* 2003; **57**: 864–70.
3. Lau JT, Yang X, Tsui HY *et al.* SARS preventive and risk behaviours of Hong Kong air travellers. *Epidemiol Infect* 2004; **132**: 727–36.
4. Lau JTF, Yang X, Tsui HY *et al.* SARS-related preventive and risk behaviours practiced by Hong Kong-mainland China cross-border travelers during the outbreak of the SARS epidemic in Hong Kong. *J Epidemiol Community Health* 2004; **58**: 988–96.
5. Tang CS, Wong CY. Psychosocial factors influencing the practice of preventive behaviors against the severe acute respiratory syndrome among older Chinese in Hong Kong. *J Aging Health* 2005; **17**: 490–506.
6. Ravaud JF, Madiot B, Ville I. Discrimination towards disabled people seeking employment. *Soc Sci Med* 1992; **35**: 951–8.
7. Rosenthal E, Bauer E, Hayden MF *et al.* Implementing the right to community integration for children with disabilities in Russia: a human rights framework for international action. *Health Hum Rights* 1999; **4**: 82–113.
8. Corrigan P, Thompson V, Lambert D *et al.* Perceptions of discrimination among persons with serious mental illness. *Psychiatr Serv* 2003; **54**: 1105–10.
9. de Mendonca Lima CA, Levav I, Jacobsson L *et al.* Stigma and discrimination against older people with mental disorders in Europe. *Int J Geriatr Psychiatry* 2003; **18**: 679–82.
10. Dinos S, Stevens S, Serfaty M *et al.* Stigma: the feelings and experiences of 46 people with mental illness: qualitative study. *Br J Psychiatry* 2004; **184**: 176–81.
11. Lau JT, Wong WS. AIDS-related discrimination in the workplace—the results of two evaluative surveys carried out during a three-year period in Hong Kong. *AIDS Care* 2001; **13**: 433–40.
12. Lau JT, Tsui HY. Surveillance of discriminatory attitudes toward people living with HIV/AIDS among the general public in Hong Kong from 1994 to 2000. *Disabil Rehabil* 2003; **25**: 1354–60.
13. de Bruyn T. HIV-related stigma and discrimination—the epidemic continues. *Can HIV AIDS Policy Law Rev* 2002; **7**: 8–14.
14. Jacoby A. Stigma, epilepsy, and quality of life. *Epilepsy Behav* 2002; **3**: 10–20.
15. Fong CY, Hung A. Public awareness, attitude, and understanding of epilepsy in Hong Kong Special Administrative Region, China. *Epilepsia* 2002; **43**: 311–6.

16. British Broadcasting Corporation. *SARS 'Could Cost Asia \$28bn'*. 2003. Available at: <http://news.bbc.co.uk/2/hi/business/3012821.stm>. Accessed: 22 January 2006.
17. Lau JT, Yang X, Pang E *et al.* SARS-related perceptions in Hong Kong. *Emerg Infect Dis* 2005; **11**: 417–24.
18. Burak LJ, Meyer M. Using the Health Belief Model to examine and predict college women's cervical cancer screening beliefs and behavior. *Health Care Women Int* 1997; **18**: 251–62.
19. Ali NS. Prediction of coronary heart disease preventive behaviors in women: a test of the Health Belief Model. *Women Health* 2002; **35**: 83–96.
20. Tang CS, Wong CY. Factors influencing the wearing of facemasks to prevent the severe acute respiratory syndrome among adult Chinese in Hong Kong. *Prev Med* 2004; **39**: 1187–93.
21. Rosenstock IM. The Health Belief Model and preventive health behavior. *Health Educ Monogr* 1974; **2**: 354–86.
22. Lau JT, Tsui HY. Surveillance of HIV/AIDS-related attitudes and perceptions among the general public in Hong Kong from 1994 to 2000. *AIDS Educ Prev* 2002; **14**: 419–31.
23. Heckman TG. The chronic illness quality of life (CIQOL) model: explaining life satisfaction in people living with HIV disease. *Health Psychol* 2003; **22**: 140–7.
24. Mann JM. Global AIDS: critical issues for prevention in the 1990s. *Int J Health Serv* 1991; **21**: 553–9.
25. Lau JTF, Tsui HY. Discriminatory attitudes toward people living with HIV/AIDS and associated factors—a population-based study in a Chinese general population. *Sex Transm Infect* 2005; **81**: 113–9.
26. Chow P, Ooi E-E, Tan H-K *et al.* *Healthcare Worker Seroconversion in SARS Outbreak*. *Emerg Infect Dis*. Available at: <http://www.cdc.gov/ncidod/EID/vol11no2/03-0397.htm>. Accessed: 24 February 2004.
27. World Health Organization. *Consensus Document on the Epidemiology of Severe Acute Respiratory Syndrome (SARS)*. Available at: <http://www.int/csr/sars/en/WHOconsensus.pdf>. Accessed: 26 February 2004.
28. Lau JTF, Tsui HY, Chan K. Reducing discriminatory attitudes toward PLWHA in Hong Kong—an intervention study using a knowledge based, PLWHA participation and cognitive approach. *AIDS Care* 2005; **17**: 85–101.
29. Inagaki T. [Changes in knowledge of HIV/AIDS and attitudes for PWA in Tokyo: 1992–1995]. *Nippon Koshu Eisei Zasshi* 1997; **44**: 952–65.
30. Danziger R. Discrimination against people with HIV and AIDS in Poland. *Br Med J* 1994; **308**: 1145–7.
31. Peters L, den Boer DJ, Kok G *et al.* Public reactions towards people with AIDS: an attributional analysis. *Patient Educ Couns* 1994; **24**: 323–35.
32. Caprara A. Cultural interpretations of contagion. *Trop Med Int Health* 1998; **3**: 996–1001.
33. Wong IL, So EM. Prevalence estimates of problem and pathological gambling in Hong Kong. *Am J Psychiatry* 2003; **160**: 1353–4.
34. Department of Census and Statistics, HKSAR. *Population by Age Group and Sex*. Available at: http://www.censtatd.gov.hk/hong_kong_statistics/statistical_tables/index.jsp?subjectID=1&tableID=002. Accessed: 25 March 2006.

Received on April 20, 2005; accepted on June 5, 2006