EVIDENCE BASED PUBLIC HEALTH POLICY AND PRACTICE

Impacts of media coverage on the community stress level in Hong Kong after the tsunami on 26 December 2004

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Study objectives: The study investigated the prevalence and associated factors (media coverage in particular) of stress related responses to the December 2004 tsunami.

Design: An anonymous population based cross sectional telephone survey was conducted. Post-traumatic stress symptom was measured by the locally validated Chinese impact of event scale (CIES) and whether the respondent felt disturbed, apprehensive, or horrified because of the tsunami. Items related to media coverage included measures on frequency of exposure, level of distress caused by different types of images, and contents of the news messages were measured. Two summative scores, the weighted image unrest score (WIUS) and weighted content unrest score (WCUS) were formed.

Setting: Hong Kong, China.

Participants: A total of 604 adult Chinese respondents were interviewed.

Main results: Of the respondents, 33.8% were exposed to tsunami related mass media news reports >10 times per day; 56.5% to 64.7% felt severely or very severely disturbed by the six studied types of distressful messages; 52.6% to 71.4% felt similarly because of the eight studied types of distressful contents. Of the male respondents, 30% and 5.9% respectively showed signs of mild or moderate/severe post-traumatic stress symptoms (39% and 8.7%, respectively for women). Higher WIUS and higher WCUS were associated with mild or moderate/severe post-traumatic stress symptoms (multivariate OR = 1.72 to 14.67, p<0.05). These media exposure indicators, together with some other perception variables, were significantly associated with other stress indicators.

Conclusions: The intensive media coverage of the tsunami was consistently associated with different types of tsunami related stress indicators.

Various disastrous events have brought about important psychological impacts at the general population level. The psychological effects of the September 11, 2001 terrorist attack in the USA have been investigated by several researchers.[1 2] A study reported that about 16% of the population showed signs of post-traumatic stress symptoms at the ending phase of the SARS epidemic in Hong Kong; 72.9% felt horrified and around 40% reported increased work related or family related stress.[3] Other studies reported prevalent SARS related psychological problems in the general population.[4–7] Similar studies have been conducted for other disasters, such as the 1995 sarin attack in the Tokyo subway system[8] and the terrorist attack in Israel.[9] Furthermore, longitudinal studies have shown that some of the mental health problems could become chronic.[1 10]

The tsunami occurred on 26 December 2004 hit five countries (Thailand, Indonesia, Sri Lanka, India, and the Maldives). As of 19 January 2005, the global death toll was estimated to be 310 000 with millions left homeless.[11] As many of the dead or missing persons were travellers, people from many other countries may have much concern about the disaster.[12] There are few studies available on the psychological impacts of the tsunami[11 13] but none on them focused on the general public.

Mass media play an important part at times of disasters. They may have contributed to the control of the SARS epidemic.[14] The role of media coverage on public's responses to disasters has however, not been investigated.

The study investigated the prevalence of signs of post-traumatic stress symptoms and other relevant responses to the 26 December 2004 tsunami in the general population in Hong Kong. The frequency of media coverage and the magnitude of resulting unrest were recorded. The null hypotheses that the prevalence of tsunami related stress and responses were not associated with various factors including the frequency, visual images, and contents of the mass media coverage, optimism, relevant perceptions, and personal linkage with affected areas were tested.

METHODS

Participants

The study population comprised of adult Hong Kong Chinese men and women of age 18–60. A random telephone survey was conducted from 11 January to 16 January 2005. Almost 100% of the Hong Kong households have telephones.[15] The household member, whose birthday was closest to the day of the interview, was invited to participate in the study. All interviews were conducted between 6 pm to 10 30 pm. Unanswered telephone calls were given at least three attempts before being classified as invalid. Unavailable eligible households members were also given at least three calls. Households with refusers were replaced by another randomly selected telephone number of another household. A total of 292 men and 312 women completed the interview. Verbal informed consent was obtained from the respondents and the ethics approval was obtained from the research ethics committee of the Chinese University of Hong Kong. The response rate, defined as the number of completed interviews divided by the number of eligible households, was 53.6%.

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Table 1 Frequency of media exposure during the reference period (26 December 2004 to date of survey) and responses related to the tsunami

	Male (n = 292) (%)	Female (n = 312) (%)	All (n = 604) (%)	p Value (χ^2 test)	Odds ratio* (CIES>26)
% Exposed to media >3 times a day:					
TV news	43.2	48.1	45.7	0.23	1.34
Other TV programmes	19.9	23.4	21.7	0.29	2.47**
Newspapers	14.0	8.7	11.3	0.04	1.28
Video on public transportation vehicles	3.4	2.6	3.0	0.53	4.19*
Radio	21.2	21.9	21.6	0.85	3.15***
Internet	11.7	7.4	9.5	0.07	1.27
Any of above	57.9	59.6	58.8	0.66	1.98
% Frequently/very frequently exposed to distressful images:					
Buildings/cities being destroyed†	82.2	82.1	82.1	0.96	0.99
Land flooded by tide†	65.1	66.6	65.8	0.70	1.00
Dead bodies (near shot)†	21.2	25.6	23.5	0.20	2.68**
Dead bodies (distance shot)†	45.9	41.3	43.5	0.26	1.60
Crying victims†	58.2	64.7	61.6	0.10	1.52
Injured children†	43.2	51.3	47.4	0.05	2.04*
Loss/seeking of family members†	56.5	64.4	60.6	0.05	1.43
% Distribution much disturbed by images:					
Buildings /cities being destroyed†	51.0	71.9	61.8	<0.001	3.51**
Land flooded by tide†	51.7	69.8	61.0	<0.001	2.66*
Dead bodies (near shot)†	52.4	62.8	57.8	0.01	4.21**
Dead bodies (distance shot)†	47.3	65.1	56.5	<0.001	4.46***
Crying victims†	57.9	76.5	67.4	<0.001	4.09**
Injured children†	50.7	72.7	62.0	<0.001	6.75***
Loss/seeking of family members†	55.5	75.2	65.7	<0.001	2.95*
% Frequently/very frequently exposed to contents:					
Missing Hong Kong people‡	72.9	67.0	69.9	0.11	0.92
Outbreak of epidemics‡	59.9	61.2	60.6	0.75	1.04
Rising death tolls‡	84.2	83.3	83.8	0.76	1.56
Rotten dead bodies‡	50.0	59.3	54.8	0.02	1.49
Insufficient supply for relief work‡	53.4	54.5	54.0	0.79	1.73
Lack of food/shelter‡	72.6	75.6	74.2	0.39	2.88*
Children abducted‡	27.4	35.0	31.3	0.04	1.74
Riot or rape cases‡	15.8	23.1	19.5	0.02	1.60
% Distribution much disturbed by contents:					
Missing Hong Kong people‡	57.5	74.7	66.4	<0.001	7.66**
Outbreak of epidemics‡	55.1	69.5	62.5	<0.001	5.11**
Rising death tolls‡	64.4	77.9	71.4	<0.001	19.21**
Rotten dead bodies‡	52.1	67.0	59.8	<0.001	5.78***
Insufficient supply for relief work‡	45.5	59.2	52.6	0.001	4.50***
Lack of food / shelter‡	64.6	76.0	70.5	0.002	NA
Children abducted‡	54.0	75.0	64.8	<0.001	8.23***
Riot or rape cases‡	48.8	59.3	54.2	0.01	3.59**

*Univariate odds ratios for CIES >26 comparing those with media exposure of >3 times a day with those with exposure <3 times a day, those frequently/very frequently exposed to distasteful ways and contents to those who were not frequently exposed to such and those who were disturbed/much disturbed to images/contents compared with those who were not distributed by such images/contents. †Images. ‡Contents. NA, OR cannot be calculated because of presence of null cells (among those who did not feel unrest, none had CIES≥26).

Measurements

Sociodemographic characteristics and affiliation with the affected areas were measured. Optimism was measured by using the locally validated life orientation test (LOT) scale.[16–19]

Signs of post-traumatic stress was measured by the Chinese version of the impact of event scale (CIES),[20] which has also been used in a local SARS study.[3] It has an avoidance subscale (eight items, Cronbach's $\alpha = 0.65$), an intrusion subscale (seven items, Cronbach's $\alpha = 0.78$), and four items related to hyper-arousal responses (felt irritable and angry, was jumpy and easily startled, felt watchful and on-guard, reminders of the event would result in physical reactions such as sweating, trouble breathing, nausea, or a pounding heart). Three questions (whether respondents felt emotionally disturbed, much horrified, and apprehensive because of the tsunami) that had been used in similar SARS related studies[3] were also asked. Current smokers and drinkers were asked whether they had increased the frequency of drinking or smoking since the occurrence of the tsunami. Respondents were also asked about whether they would avoid visiting the affected countries because of the tsunami, in the coming 12 months, avoid travelling, avoid going to seashores, or avoid eating seafood in the coming three months. The frequency talking with family members on topics related to

tsunami and whether they had more sharing with family members during the reference period (interval between 26 December 2004 and the survey date) were measured.

The frequency (nil, <1 per day, 1–2, 3–5, 6–10, and >10 times per day) of exposure to six different types of mass media, including TV news, other TV programmes, newspapers, video on public transportations, radio, and internet, during the reference period, were measured. The exposure to different types of distressful visual images (destruction of homes and cites, land flood, close up shots of dead bodies, distant shots of dead bodies, crying victims, hurt or fearful children, scenes of losing family members, and searching for family members) were measured (1 = nil, 2 = quite infrequent, 3 = quite frequent, and 4 = extremely frequent). A scale, the DIES (distressful image exposure score), was formed by summing these item responses ($\alpha = 0.75$). The levels of unrest perceived because of these seven individual types of unpleasant visual images were also measured (1 = no unrest, 2 = somehow unrest, and 3 much disturbed). The rating on level of unrest was multiplied to the frequency of exposure of the individual items, a weighted visual unrest score (WVUS) was then resulted when the product of individual items were summed up (the range of WVUS was 7 to 84, Cronbach's $\alpha = 0.90$).

Table 2 Distribution of scores related to frequency of media exposure

	Sex			Age group				Currently married			All
	Male (%)	Female (%)	p Value (χ^2 test)	18–24 (%)	25–39 (%)	40–60 (%)	p Value (χ^2 test)	No (%)	Yes (%)	p Value (χ^2 test)	(%)
(1) Frequency of exposing to the studied types of mass media (number of times per day)*			0.86				0.30			0.12	
0–4	26.0	24.4		20.4	23.5	27.9		22.2	27.0		25.2
5–10	40.1	42.0		41.9	39.0	42.1		38.9	42.1		41.1
>10	33.9	33.7		37.6	37.6	30.0		38.9	30.9		33.8
Mean	9.53	9.43		8.94	10.14	9.18		10.08	9.14		9.48
(SD)	(6.60)	(6.26)		(4.45)	(7.22)	(6.33)		(6.67)	(6.27)		(6.42)
(2) Distressful images exposure score (DIES)			0.54				0.49			0.47	
Low (<25th centile) (≤16)	32.9	32.2		33.3	31.1	33.3		34.8	31.2		32.5
Medium (25th–75th centile) (17–20)	47.6	44.7		49.5	49.1	42.8		46.2	45.9		46.1
High (>75th centile) (≥21)	19.5	23.2		17.2	19.8	23.9		19.0	22.8		21.4
Mean	17.79	18.17		17.80	17.93	18.09		17.69	18.16		17.99
(SD)	(3.31)	(3.45)		(3.22)	(3.20)	(3.57)		(3.33)	(3.41)		(3.39)
(3) Weighted visual unrest score (WVUS)†			<0.001				0.04			0.009	
Low (<25th centile) (≤21)	34.2	18.6		30.1	32.1	20.9		33.5	22.1		26.3
Medium (25th–75th centile) (22–40)	53.1	52.6		53.8	48.6	55.5		48.4	55.3		52.8
High (>75th centile) (≥41)	12.7	28.8		16.1	19.3	23.6		18.1	22.6		20.9
Mean	29.21	35.15		31.56	31.02	33.38		30.82	33.10		32.25
(SD)	(12.87)	(13.98)		(14.58)	(13.23)	(13.85)		(14.20)	(13.47)		(13.76)
(4) Distressful content exposure score (DCES)			0.08				0.29			0.30	
Low (<25th centile) (≤18)	29.8	21.9		29.0	24.5	25.3		28.1	24.1		25.7
Medium (25th–75th centile) (19–23)	53.1	58.8		59.1	58.5	53.5		56.6	55.9		56.1
High (>75th centile) (≥24)	17.1	19.3		11.8	17.0	21.2		15.4	19.9		18.2
Mean	20.46	20.92		20.10	20.60	20.96		20.34	20.91		20.69
(SD)	(3.54)	(3.40)		(3.09)	(3.24)	(3.72)		(3.40)	(3.50)		(3.47)
(5) Weighted content unrest score (WCUS)			<0.001				0.46			0.16	
Low (<25th centile) (≤27)	32.6	18.4		26.9	27.8	23.1		29.9	22.8		25.3
Medium (25th–75th centile) (28–46)	51.5	54.0		54.8	52.8	52.0		49.8	54.5		52.8
High (>75th centile) (≥47)	15.8	27.5		18.3	19.3	24.8		20.4	22.8		21.8
Mean	34.91	40.30		36.68	35.98	39.26		36.69	38.29		37.69
(SD)	(14.10)	(14.55)		(14.55)	(12.80)	(15.64)		(14.86)	(14.41)		(14.57)

Reliability α values for (2) to (5) are 0.75, 0.90, 0.72, and 0.87 respectively, and the range of item were (2) 7 to 28, (3) 7 to 84, (4) 11 to 32, and (5) 11 to 96.
*Frequency of exposing to mass media was estimated by recoding the variable as no = 0, several times a day = 0.3 times, 1–2 times = 1.5 times, 3–5 times = 4 times, 6–10 times = 7 times, >10 times = 10 times. †WVUS formed by summing up products of frequency of exposure and level of unrest of individual items related to distressful images (see table 1); WCUS formed similarly by summing up product of frequency of exposure and level of unrest of items related to distressful contents (for items see table 1).

Similarly, a DCES (distressful content exposure score) was formed by summing up the frequency exposure rating (1 to 4) over the reference period; of the eight items related to contents describing missing Hong Kong people, outbreaks of infectious diseases in affected areas, rising death tolls, decomposing bodies, inadequate relief supplies, victims' lack of food and shelter, children being abducted, riots and rapes of women (ranged from 11 to 32, Cronbach's α = 0.72). The frequency exposure was weighted by the level of unrest (1–3, same as above) to form in the WCUS (weighted content unrest score, ranging from 11 to 96, α = 0.87).

Respondents were asked whether they perceived major natural disasters would occur in Hong Kong during their lifetime (strongly agree/agree/disagree/strongly disagree). In the traditional Chinese culture, disasters are believed to come from ''heaven'' or resulting from human misdemeanours; two questions on whether the tsunami was God's punishment to mankind and whether it was caused by damage done onto the global ecosystem by humans, were also asked.

Statistical analysis

Frequency of exposure to various types of mass media, distressful images, and contents as well as the level of unrest

because of relevant images/contents were cross tabulated by sex; associations (unvariate odds ratios) between these items and moderate/severe post-traumatic symptoms (CIES≥26) were reported. The Cronbach's α, mean, SD, and ranges of the constructed scales (DIES, DCES, WVUS, WCUS) were presented and significance of age, sex, and education level differences were tested by χ^2 test. Univariate analyses on factors that are associated with five CIES related outcomes and other relevant responses were conducted, followed by multivariate logistic regression using these univariately significant variables as candidates for selection. p<0.05 All statistical analyses were conducted using SPSS version 11.0.1 (SPSS for Windows, SPSS, Chicago, IL, 2000).

RESULTS

Background characteristics

Of the male and female respondents, 49.5% and 49.0% were of age 40–60; 50.9% and 40.1% respectively achieved some post-secondary education, 60.1% and 66.3% respectively were currently married, and 26.1% and 34.5% respectively had some religion affiliation (17.2% and 22.1% respectively were Christians; 7.6% and 8% respectively were Buddhists/Taoists, and 1.4% and 4.5% worshipped their ancestors).

Table 3 Responses related to the tsunami

	Sex		All	
	Male (n = 292) (%)	Female (n = 312) (%)	(n = 604) (%)	(χ2 test) p value
CIES outcomes				
% Non-case (0–8)	64.1	51.8	57.7	0.009
% Mild (9–25)	30.0	39.5	34.9	
% Moderate/severe (>=26)	5.9	8.7	7.3	
% Feel irritated and angry when thinking about the tsunami	3.1	5.1	4.2	0.21
% Feel very jumpy and easily startled when thinking about the tsunami	7.2	15.8	11.6	0.001
% Feel watchful and on-guard when thinking about the tsunami	31.3	37.0	34.2	0.14
% Reminders of the tsunami resulted in physical reactions§	2.1	3.5	2.8	0.28
% Any one of above	34.1	45.3	39.9	0.005
Frequency of talking with family members/friends about tsunami (per day)				0.68
% <1 times	33.2	30.9	32.0	
% 1–3 times	46.9	50.5	48.8	
% ≥ 4 times	19.9	18.6	19.2	
Sharing more frequently with friends or family members				0.54
% No	71.8	69.6	70.6	
% Yes	28.2	30.4	29.4	
Perceptions				
% Agree tsunami caused by damages done to ecosystem*	38.2	47.2	42.8	0.03
% Agree natural disasters are punishments by God*	30.2	35.8	33.2	0.15
% Agree would encounter major natural disaster in Hong Kong during lifetime*	22.3	21.3	21.8	0.78
% Feel emotionally disturbed because of the tsunami†	32.1	48.6	40.6	<0.001
% Feel horrified because of the tsunami†	73.1	85.5	79.5	<0.001
% Feel apprehensive because of the tsunami†	65.2	81.0	73.4	<0.001
% Any one of the above†	84.5	92.3	88.5	0.003
% Would avoid visiting affected countries because of the tsunami‡	22.3	32.4	27.5	0.005
% Would avoid travelling‡	18.9	29.3	24.3	0.003
% Would avoid going to seashore‡	12.4	25.4	19.1	<0.001
% Would avoid eating seafood‡	11.7	22.5	17.3	<0.001
% Any one of the above‡	40.9	59.5	50.5	<0.001

*Agree or strongly agree to the statements: the tsunami causes me serious emotional disturbance; I feel horrified by the tsunami; I feel unrest because of the tsunami. †''Sometimes'' or ''Always'' to the statements: feel irritated ant angry; feel anxious; feel cautious; have psychosomatic responses because of tsunami. ‡Likely or very likely to the statements: would avoid visiting affected countries because of tsunami; would avoid travelling; would avoid going to seashore; would avoid eating seafood. §Including perspiration, dyspnea, barf, tachycardia.

Of the male and female respondents, 29.0% and 26.1% respondents have ever travelled to the affected areas; 14.0% and 13.7% knew someone then staying at the affected areas, and 12.8% and 13.8% respectively had some relatives then living in the affected countries (data not tabulated).

Frequency of media exposure
During the reference time period, 45.7%, 21.7%, and 21.6% of all respondents respectively were exposed to coverage on the tsunami on TV news, other TV programmes, and radio programs for ≥3 times a day (table 1); 23.5% to 82.1% of respondents reported that they had frequently or very frequently been exposed to one of the seven types of studied distressful images (table 1); 56.5% to 67.4% of the respondents were having severe or very severe level of unrest when viewing these seven types of images (see table 1). Similarly, high percentages of respondents reported that they had frequently or very frequently been exposed to the eight studied types of distressful news contents (19.5% to 83.8%, table 1). High percentages (from 52.6% to 71.4%) of respondents were also having severe or very severe level of unrest when being informed about these 8 different types of contents (see table 1).

Of all respondents, 33.8% were exposed to tsunami-related information via one of the six studied types of media for over 10 times per day (table 2). Those who were female, older, and currently married were more likely than others to have higher

WVUS (table 2). Women were more likely than men to have higher WCUS (table 2).

CIES outcomes and disturbance attributable to the tsunami
Of the male and female respondents, 30% and 39.5%, respectively, were experiencing mild post-traumatic stress symptoms (CIES: 9–25) and 5.9% and 8.7%, respectively, were having moderate to severe post-traumatic stress symptoms (CIES≥26) (p = 0.009 for sex differences, table 3). Besides, 34.1% and 45.3% respectively of the male and female respondents reported at least one of the four studied types of hyper-arousal behaviours (table 3). Furthermore, 32.1%, 73.1%, and 65.2% of the male respondents and 48.6%, 85.5%, and 81.0% of the female respondents, respectively, felt emotionally disturbed, horrified, or apprehensive because of the tsunami. Sex differences of these variables were of statistical significance (table 3).

Other tsunami related responses
Noticeable percentages of respondents stated that they would avoid visiting affected countries, travelling to other countries, going to seashores, and eating seafood in (17.3% to 27.5%). Women were more likely than men to report such avoidance behaviours (p<0.001) (table 3).

During the reference period, 19.2% of all respondents have been talking about the tsunami for ≥4 times a day with their

Table 4 Factors predicting CIES related outcomes

	Number	CIES ≥26 (moderate/severe)			CIES ≥9 (mild/moderate/severe)			Intrusive score (CIES) (>75th centile)			Avoidance score (CIES) (>75th centile)			At least one hyper-arousal behaviour (sometimes/always)		
		(row %)	OR^u	OR^m	(row %)	OR^u	OR^m	(row %)	OR^u	OR^m	(row %)	OR^u	OR^m	(row %)	OR^u	OR^m
(All)	604	7.3	NA		42.3	NA		28.0	NA		24.1	NA		39.7	NA	
Sex																
Female	312	8.7	1.00	–	48.2	1.00	NS	33.4	1.00	NS	26.0	1.00	–	45.2	1.00	NS
Male	292	5.9	0.66		35.9	0.60**		22.1	0.56**		22.0	0.80		33.9	0.62**	
Age group																
18–24	93	9.7	1.00	–	52.7	1.00	NS	34.4	1.00	–	34.4	1.00	1.00	38.7	1.00	–
25–39	213	5.2	0.51		39.9	0.60*		25.8	0.66		19.2	0.45**	0.46*	34.7	0.84	
40–60	297	8.1	0.83		40.7	0.62*		27.5	0.72		24.3	0.61	0.56*	43.8	1.23	
Employment status																
Full time	373	6.7	1.00	–	35.8	1.00	1.00	21.2	1.00	1.00	21.2	1.00	NS	36.7	1.00	1.00
Part time	23	4.3	0.63		43.5	1.38	1.04	26.1	1.31	1.14	21.7	1.03		39.1	1.11	1.18
Not employed	207	8.7	1.33		53.9	2.10***	1.98**	40.3	2.50***	2.43***	29.6	1.57*		45.4	1.43*	1.61*
Religion status																
No religion	419	6.5	1.00	–	41.0	1.00	NS	26.6	1.00	NS	22.0	1.00	NS	37.9	1.00	1.00
Christian/Catholic	119	7.6	1.18		37.8	0.88		26.1	0.97		24.4	1.14		37.0	0.96	1.00
Buddhist/Taoist	47	12.8	2.11		61.7	2.32**		40.4	1.87*		40.4	2.41**		63.8	2.89**	2.55**
Folk religion	18	11.1	1.81		50.0	1.44		38.9	1.75		27.8	1.36		38.9	1.04	0.73
Ever travelled to affected areas																
No	429	6.8	1.00	–	40.8	1.00	–	26.8	1.00	–	23.2	1.00	–	36.1	1.00	1.00
Yes	163	8.6	1.29		45.4	1.20		30.7	1.21		25.8	1.15		47.9	1.62**	1.76**
Relatives then living in affected countries																
No	520	6.2	1.00	NS	40.3	1.00	1.00	26.6	1.00	–	23.2	1.00	–	38.5	1.00	–
Yes	80	13.9	2.46*		55.7	1.86*	1.99*	36.7	1.60		30.0	1.42		47.5	1.45	
Number of times of media exposure/day																
<5	152	5.9	1.00	NS	34.2	1.00	1.00	20.4	1.00	1.00	24.3	1.00	–	37.5	1.00	–
5–10	248	3.2	0.53		39.7	1.27	1.15	24.3	1.25	1.15	19.8	0.77		36.3	0.95	
>10	204	13.4	2.45*		51.5	2.04**	1.68*	38.1	2.40***	2.04*	29.1	1.27		45.6	1.40	
Distressful image exposure score (DIES)																
Low (≤16)	196	4.1	1.00	NS	36.6	1.00	NS	20.1	1.00	NS	24.6	1.00	–	34.2	1.00	NS
Medium (17–20)	278	5.8	1.43		39.4	1.12		25.3	1.34		21.3	0.83		35.3	1.05	
High (≥21)	129	15.5	4.27**		57.4	2.33***		45.7	3.35***		29.5	1.28		58.1	2.67***	
Weighted visual unrest score (WVUS)																
Low (≤21)	157	2.5	1.00	NS	22.3	1.00	1.00	12.7	1.00	1.00	11.5	1.00	1.00	26.8	1.00	NS
Medium (22–40)	316	5.4	2.19		41.1	2.43***	2.67***	24.5	2.23**	1.29	25.1	2.59***	2.36**	40.5	1.86**	
High (≥41)	125	18.4	8.63***		71.2	8.62***	14.67***	56.0	8.72***	4.04***	38.4	4.81***	4.74***	54.4	3.27***	
Distressful content exposure score (DCES)																
Low (≤18)	155	3.2	1.00	NS	36.4	1.00	NS	17.5	1.00	NS	24.0	1.00	–	30.3	1.00	NS
Medium (19–23)	338	8.0	2.60		39.5	1.14		28.5	1.87*		22.6	0.92		39.6	1.51*	
High (≥24)	110	11.0	3.69*		59.6	2.59***		41.3	3.31***		29.1	1.30		52.7	2.56***	
Weighted content unrest score (WUS)																
Low (≤27)	152	0.0	–	–	21.7	1.00	NS	9.9	1.00	1.00	13.8	1.00	NS	23.7	1.00	1.00
Medium (28–46)	317	6.7	1.00	1.00	42.5	2.67***		28.6	3.65***	1.85	24.4	2.02**		42.0	2.33***	1.72*
High (≥47)	131	17.7	3.01**	5.61***	66.9	7.30***		48.5	8.59***	2.62*	35.9	3.49***		53.4	3.70***	2.43**
Tsunami caused by human damaging ecosystem																
Disagree	334	6.6	1.00	–	39.5	1.00	–	25.0	1.00	–	20.4	1.00	NS	37.1	1.00	–
Agree	250	8.0	1.23		45.0	1.25		30.5	1.32		28.5	1.55*		43.2	1.29	
Natural disasters are punishments by God																
Disagree	393	5.9	1.00	–	36.1	1.00	1.00	23.3	1.00	1.00	19.2	1.00	1.00	38.4	1.00	–
Agree	195	9.2	1.63		54.9	2.16***	1.75**	36.9	1.93**	1.55*	33.8	2.16***	1.83**	42.1	1.16	
Major natural disaster would occur in Hong Kong in lifetime																
Disagree	290	4.5	1.00	1.00	41.2	1.00	–	24.9	1.00	–	24.2	1.00	–	41.0	1.00	–
Agree	295	9.6	2.24*	2.67*	42.3	1.05		30.0	1.29		23.8	0.98		39.7	0.95	
Sharing more frequently with friends or family members																
No difference/disagree	426	4.5	1.00	1.00	35.9	1.00	1.00	21.1	1.00	1.00	20.9	1.00	NS	31.9	1.00	1.00
Agree	177	14.3	3.57***	3.19**	57.7	2.44***	2.25***	44.6	3.00***	2.69***	31.8	1.77**		58.8	3.04***	2.41***

Table 4 Continued

	Number	CIES ≥26 (moderate/severe)			CIES ≥9 (mild/moderate/severe)			Intrusive score (CIES) (>75th centile)			Avoidance score (CIES) (>75th centile)			At least one hyper-arousal behaviour (sometimes/ always)		
	Number	(row %)	OR^u	OR^m	(row %)	OR^u	OR^m	(row %)	OR^u	OR^m	(row %)	OR^u	OR^m	(row %)	OR^u	OR^m
Frequency talking with family members/ friends about the tsunami (per day)																
<1	193	4.7	1.00	NS	32.3	1.00	NS	19.8	1.00	NS	21.4	1.00	–	31.1	1.00	1.00
1–3	294	7.2	1.57		45.4	1.74**		30.4	1.77*		26.6	1.34		45.6	1.86**	1.58*
≥4	116	12.2	2.82*		51.3	2.21**		35.7	2.25**		22.4	1.06		39.7	1.46	1.10

OR^u, odds ratio is calculated univariately. OR^m, odds ratio is obtained by multivariable logistic regression models, using variables significant in the univariate analyses; only significant items were tabulated in the table. Variables that are non-significant in all the univariate analysis were not tabulated in this table, including education level, current marital status, LOT score, knew someone from Hong Kong then staying in affected countries. NA, not applicable; NS, univariate significant but multivariate non-significant; – univariate non-significant.

family members or friends and 29.4% were having more frequent sharing of their feelings with their family members (table 3).

Factors predicting CIES outcomes

Univariately but not multivariately, men were less likely than women to have unfavourable CIES outcomes. Higher age was univariately associated with lower risk for having two of the adverse CIES outcomes (CIES≥9 and avoidance score >75th centile); one of which (avoidance score) was multivariately significant. Those who were currently unemployed were more likely than others to have adverse CIES related outcomes. Buddhists and Taoists were more likely than others to have at least one hyper-arousal response, as shown in the multivariate analysis; similar associations were univariately significant for three other CIES related outcomes (table 4).

Multivariately, those who had travelled to the affected areas were more likely than others to show at least one hyper-arousal behaviour; those whose relatives were then living in the affected countries were more likely than others to have CIES≥9 and CIES≥26 (table 4).

Higher frequency of exposure to different types of media on tsunami related news were univariately associated with cases of CIES≥26 and multivariately associated with cases of CIES≥9 and higher intrusive scores (>75th centile). Both WVUS and WCUS were univariately and multivariately associated with all but one CIES related outcomes—that is, higher avoidance score (multivariate OR = 2.32 to 14.7, p<0.05). Multivariately, DIES and DCES were not associated with any of the five CIES related outcomes, although for both cases, four of the five univariate associations were statistically significant.

The belief that the tsunami was caused by human errors was not multivariately associated with any of the five outcomes. Yet, belief that natural disasters are God's punishment to mankind was multivariately associated with three of the five outcomes. The multivariate analysis also showed that those who felt susceptible for encountering a major natural disaster in Hong Kong in their lifetime were more likely than others to have CIES≥26 (table 4).

Increased frequency of sharing over feelings with friends and family members were univariately but not multivariately associated with three of the outcomes (CIES≥26, CIES≥9, and higher instrusion score). Higher frequency in talking with family members over tsunami related matters was multivariately associated with all but one CIES related outcomes (avoidance subscales) (table 4).

The univariate associations between individual items related to media coverage and CIES≥26 were listed in table 1. Items related to dead bodies, children, missing

Hong Kong people, and rising death tolls seemed to present larger odds ratios.

Factors predicting other tsunami related responses

The multivariate analysis shows that those with higher WVUS or higher WCUS were more likely than others to report feeling disturbed because of the tsunami (table 5). Furthermore, those who were men, those with higher WVUS, and those who were having more frequent sharing with friends or family members after the incident were more likely than others to exhibit some avoidance behaviours (table 5). Smokers and drinkers, who were working part time, those who belonged to a folk religion, were more likely than others to have increased their frequency of drinking or smoking. All those who increased the frequency of drinking or smoking were having higher WVUS or WCUS (>75th centile) (table 5).

DISCUSSION

The study clearly reports that the residents of Hong Kong had been bombarded by media coverage of the tsunami during the reference period. The visual images and the contents of the messages caused much psychological unrest. The information supply seems excessive. Very intensive reporting of relevant news may have also occurred in other cities.

A high level of stress existed in the community as 34.9% have a CIES of 9–25 and 7.3% had CIES ≥26. A local study conducted at the ending phases of the SARS epidemic reported that about 16% had CIES ≥26.[3] Furthermore, 79.% and 73.4% respectively of all respondents felt horrified or apprehensive because of the tsunami and 40.6% felt emotionally disturbed; similar responses obtained from a SARS related study were 72.9%, 37.7%, and 64.4%, respectively.[3] The collective damage of the tsunami to Hong Kong could in no way be matched to those of the SARS epidemic.[12] Yet, comparable mental health consequences were seen. The stress levels in other affected communities may even be higher than that observed in this study. Longitudinal studies, suggested that long term problems may be resulted.[1 10] The problem of community responses to disasters is therefore an important public health topic.

Media coverage, in terms of frequency of coverage, visual images, and distressful contents was a strong predictor of stressful responses related to the tsunami. Those individual items that were related to children, dead bodies, and death tolls tended to have stronger associations with CIES ≥26 outcomes. The mass media should be made cognisant of the detrimental mental health effects of the visual images and contents presented and when reporting major disasters in the future. Principles regarding reporting such news should also be established by mass media workers.

Table 5 Factors predicting other responses related to the tsunami

	Number	Disturbance items* (at least one item) (among all respondents)			Avoidance behaviours† (at least two items) (among all respondents)			Smoked or drank more frequently (among all smokers or drinkers, n=121)			Sharing more frequently with friends or family members (among all respondents)		
		(Row %)	OR^u	OR^m	(Row %)	OR^u	OR^m	(Row %)	OR^u	OR^m	(Row %)	OR^u	OR^m
(All)	604	88.5	NA					4.1	NA		29.4	NA	
Sex													
Female	312	92.3	1.00				1.00	8.7	1.00	–	30.4	1.00	–
Male	292	84.5	0.46**		17.5	0.42***	0.52**	3.1	0.33		28.2	0.90	
Education level													
Form 3 or below	142	90.1	1.00	–	25.4	1.00	–	10.0	1.00	–	31.7	1.00	–
F4–F5	187	89.2	0.92		28.3	1.17		0.0	0.00		31.6	0.99	
Above form 5	272	87.5	0.77		24.4	0.95		2.6	0.24		26.8	0.79	
Employment status													
Full time	373	85.8	1.00	NS	23.4	1.00	–	2.1	1.00	1.00	28.7	1.00	–
Part time	23	100.0	NA‡		34.8	1.75		33.3	23.25*	86.45*	34.8	1.33	
Not employed	207	92.7	2.12*		29.5	1.37		8.7	4.43	7.45	30.0	1.06	
Religion status													
No religion	419	88.5	1.00	–	23.7	1.00	NS	2.1	1.00	1.00	27.9	1.00	–
Christian/Catholic	119	87.4	0.90		26.1	1.14		8.3	4.23	6.04	29.4	1.08	
Buddhist/Taoist	47	91.5	1.40		42.6	2.39**		10.0	5.17	18.81	38.3	1.60	
Folk religion	18	94.4	2.21		33.3	1.61		25.0	15.50*	44.37*	38.9	1.64	
Number of times of media exposure per day													
<5	152	90.1	1.00	–	21.1	1.00	–	5.9	1.00	–	27.0	1.00	–
5–10	248	87.9	0.80		25.5	1.28		2.1	0.35		29.6	1.14	
>10	204	88.2	0.83		30.0	1.61		5.0	0.84		30.9	1.21	
Distressful image exposure score (DIES)													
Low (≤16)	196	87.2	1.00	–	22.4	1.00	NS	0.0	0.00	–	25.0	1.00	1.00
Medium (17–20)	278	89.2	1.21		22.7	1.02		6.9	2.07		27.4	1.13	1.02
High (≥21)	129	89.1	1.21		37.5	2.07**		3.4	1.00		40.3	2.03**	1.78*
Weighted visual unrest score (WVUS)													
Low (≤21)	157	73.1	1.00	1.00	10.8	1.00	1.00	0.0	0.00	–	19.1	1.00	NS
Medium (22–40)	316	93.0	4.91***	3.00*	26.0	2.90***	2.45**	3.3	0.20		30.8	1.88**	
High (≥41)	125	96.0	8.84***	3.84*	44.4	6.56***	4.58***	14.3	1.00		38.4	2.64***	
Distressful content exposure score (DCES)													
Low (≤18)	155	80.4	1.00	NS	18.8	1.00	NS	0.0	0.00	–	20.1	1.00	NS
Medium (19–23)	338	91.7	2.70***		27.3	1.62*		3.2	0.21		33.4	1.99**	
High (≥24)	110	90.9	2.20*		31.8	2.01*		13.6	1.00		30.0	1.70	
Weighted content unrest score (WCUS)													
Low (≤27)	152	73.0	1.00	1.00	13.8	1.00	NS	0.0‡	NA	NA	14.5	1.00	1.00
Medium (28–46)	317	92.4	4.48***	2.26*	26.7	2.27**		0.0			34.8	3.16***	2.52**
High (≥47)	131	96.9	11.73***	7.92**	38.9	3.98***		19.2			34.4	3.09***	2.07*
Tsunami caused by human damaging ecosystem													
Disagree	334	87.4	1.00	–	22.8	1.00	NS	3.0	1.00	–	27.3	1.00	–
Agree	250	90.0	1.29		30.1	1.46*		5.88			33.2	1.32	
Natural disasters are punishments by God													
Disagree	393	86.5	1.00	NS	22.3	1.00	NS	3.5	1.00	–	24.7	1.00	1.00
Agree	195	93.3	2.18*		34.4	1.83**		6.5	1.89		39.0	1.94***	1.86**
Major natural disaster would occur in Hong Kong in lifetime													
Disagree	290	90.0	1.00	–	26.6	1.00	–	6.7	1.00	NS	31.0	1.00	–
Agree	295	86.7	0.73		25.5	0.94		1.7	0.04***		26.9	0.82	
Sharing more frequently with friends or family members													
No difference/disagree	426	87.3	1.00	–	19.7	1.00	1.00	2.4	1.00	–	NA	NA	NA
Agree	177	92.1	1.70		40.9	2.82***	2.32***	7.9	3.47		NA	NA	
Frequency talking with family members/friends about the tsunami (per day)													
<1	193	84.8	1.00	–	18.8	1.00	NS	4.5	1.00	–	19.8	1.00	1.00
1–3	294	89.8	1.58		28.2	1.71*		1.7	0.37		35.0	2.19***	1.81*
≥4	116	91.4	1.90		32.2	2.06**		10.5	2.47		31.0	1.82*	1.35

OR^u, odds ratio is calculated univariately. OR^m, odds ratio is obtained by multivariable logistic regression models, using variables significant in the univariate analyses; only significant items were tabulated in the table. Variables that are non-significant in all the univariate analysis were not tabulated in this table, including age, current marital status, LOT score, ever travelled to affected areas, knew someone staying in affected countries then, have relatives living in affected countries then. *Agree/very agree to the disturbance items: The tsunami causes me serious emotional disturbance; I feel horrified by the tsunami; I feel unrest because of the tsunami. †Likely or very likely to the avoidance behaviours: would avoid visiting affected countries because of tsunami; would avoid travelling; would avoid going to seashore; would avoid eating seafood. ‡Variable not used as candidates for the multivariate stepwise regression because of the presence of null cells. NA, not applicable; NS, univariately significant but multivariate non-significant; – unvariately non-significant.

Age and sex effects were largely non-significant in the multivariate models. Those who were Buddhist or Taoist were however, more likely than the others to have adverse mental health outcomes. Optimism was not a significant predictor of any of the studied mental health outcomes. The stressful responses were hence not only limited to people who were pessimistic. It is interesting to note that perceptions that the disasters are caused by human error or God's punishment and the perception that Hong Kong is susceptible to major natural disasters were associated with mental health outcomes. Therefore, how the public looked at the cause of a natural disaster would affect how they felt about it. Further study would discuss whether this association is unique to the cultures that frequently attribute natural disasters to heavenly reasons.

Another interesting similarity between results of this study and those of SARS is that about 29.4% of the respondents of this study reported that they were having more sharings in feelings with their friends and family members. This was also seen in some SARS related studies.[21] In face of major disasters, family members and friends were drawing more closely to each other, even that they were not directly affected by the disasters.

The study has a few limitations. Firstly, telephone surveys were implemented. However, telephone surveys had also been done for similar studies.[3][22] The age and sex composition of our sample is comparable to those of the census population. For instance, 49% of those of age 18–60 belong to the 40–60 age group in this study, as compared with a similar census figure of 51.3%. Secondly, the response rate was not too high but that is typical for surveys conducted in Hong Kong.[23–26] Thirdly, responses are self reported and post-traumatic symptoms were only assessed by a questionnaire, instead of clinical psychologists or psychiatrists. Yet, such have also been done in other studies[7][27] and this study covers various types of responses that yield consistent results. Fourthly, the scales on unrest because of images/contents conveyed in the mass media have been constructed for this study. No similar studies have been reported and hence no previous validation was available. The internal consistencies of these constructed scales have however been high. The coverage of the scale items is comprehensive (frequency and unrest level, images as well as contents). Finally, the survey was conducted less than one month after the occurrence of the tsunami. It is possible that the observed impacts may not be lasting. However, the scale of the disturbance constitutes a threat and even if a smaller proportion would be chronically affected, the number of people affected in Hong Kong (with a population of 7 million) and in other countries would be substantial. Longitudinal studies are warranted.

The study has however, clearly reported the level of community stress and the extraordinary high level of mass media coverage on the topic in a timely manner. Strong and consistent associations between media coverage and community stress related to the tsunami have been found. The results fill in a gap of the study on the health consequences of large scale disasters on the mental health of the general population. Such should be established as a new field in public health studies. Results should be disseminated to mass media workers, health workers, and the general population to avoid overreporting of disasters in the future. A few natural disasters (for example, Hurricane Katrina, the Northern Pakistan earthquake) occurred in the past two years and understanding of factors mediating their impacts on community responses is much warranted.

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