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Impact of severe acute respiratory syndrome on anxiety levels of front-line health care workers

嚴重急性呼吸系統綜合症給前線醫護人員造成的焦慮

Objective. To identify anxiety levels among front-line health care workers during the 2003 severe acute respiratory syndrome outbreak.
Design. Questionnaire survey.
Setting. Regional hospital, Hong Kong.
Participants. All hospital staff were given a questionnaire; administrative staff who had not had any patient contact served as controls.
Main outcome measures. Levels of contact with patients who had severe acute respiratory syndrome were measured and correlated with anxiety levels as determined by the State-Trait Anxiety Inventory.
Results. Of 4252 questionnaires distributed between May and June 2003, 2040 (48.0%) were returned and 1926 (45.3%) were valid for analysis. Overall, 534 (27.7%) respondents had had contact with patients with severe acute respiratory syndrome. Anxiety scores ranged from 20 to 80, and mean (standard deviation) scores were higher among staff who had had contact with patients with severe acute respiratory syndrome than among those who had not (52.6 [10.5] versus 49.8 [10.1], respectively; P<0.01). Mean anxiety levels were higher among workmen, health care assistants, and nurses than among administrative staff controls or doctors (P<0.01). Anxiety scores were correlated with burnout scores (Pearson's correlation coefficient, 0.52-0.59) and with discomfort from wearing protective gear (0.21-0.32).
Conclusion. Severe acute respiratory syndrome has likely stressed the public health care system. Prediction and early identification of adverse factors in a crisis situation would allow early implementation of interventions to reduce and counteract the impact of this stress.

目的：確定在2003年嚴重急性呼吸系統綜合症爆發期間前線醫護人員的焦慮程度。
設計：問卷調查。
安排：一所分區醫院，香港。
參與者：醫院所有員工均獲發問卷，又把沒有和病患者有任何接觸的行政人員作為對照組。
主要結果測量：量度員工與嚴重急性呼吸系統綜合症患者的接觸程度，然後找出與焦慮狀態—特性量表(又稱 STAI)所定焦慮水平的相關程度。
結果：在 2003 年 5 月至 6 月期間，共派出 4252 份問卷，收回 2040 份(48.0%)，其中 1926 份(45.3%)用於分析。整體來說，共有 534 人(27.7%)曾經和嚴重急性呼吸系統綜合症患者接觸，焦慮得分從 20 到 80 不等，而平均得分(標準差)方面，曾經和嚴重急性呼吸系統綜合症患者接觸的員工比沒有接觸的為高（分別為 52.6 [10.5]比 49.8 [10.1]；P<0.01)。工人、醫護助理，以及護士的平均焦慮程度又比行政人員和醫生為高 (P<0.01)。研究亦把焦慮得分，分別與疲潰感得分和穿著保護衣物不舒服的感覺對應，以皮爾遜積差相關係數表示，相關度分別為 0.52-0.59 及 0.21-0.32 。
結論：嚴重急性呼吸系統綜合症給公共醫療系統造成了壓力。面對危機，如能及早預測和確定引致不良影響的因素，有利於及時採取措施，從而減輕和抗衡所造成的壓力。

Key words:
Anxiety;
Burnout, professional;
Health personnel;
Severe acute respiratory syndrome;
Stress

關鍵詞：
焦慮；
疲潰感，專業人員；
醫護人員；
嚴重急性呼吸系統綜合症；
壓力

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Introduction

The severe acute respiratory syndrome (SARS) was first recognised in Asia in

mid-February 2003 as a cause of severe pneumonia and death.[1] This serious emerging infection is caused by the SARS-associated coronavirus (SARS-CoV).[2,3] Patients present with a prodromal illness consisting of a sudden onset of high fever, myalgia, chills, rigor, and a non-productive cough.[4] According to the World Health Organization on 15 August 2003, SARS had been reported in a total of 8422 people in 29 countries, and 916 (11%) people had died.[5]

Several other recent outbreaks of infectious disease have required heightened public health responses. Examples are endemics of avian influenza in Hong Kong,[6] bovine encephalopathy in England,[7] and Norwalk virus infection in Melbourne, Australia.[8] The SARS outbreak, however, is unique in its rapidity of transmission, its concentration in health care settings, and the large number of health care workers who have been infected. Maunder et al[9] described adverse psychological effects of a SARS outbreak on staff in a teaching hospital in Toronto, Canada: uncertainty, stigmatisation, fear of the contagion and of infecting others were prominent themes. Anxiety is characterised by subjective feelings of tension, apprehension, nervousness, and worry, as well as by stimulation of the autonomic nervous system.[10] The State-Trait Anxiety Inventory (STAI) is well validated and has been used extensively in research and clinical practice.[11-13] The S-Anxiety scale, which is a component of STAI, consists of 20 statements that evaluate how respondents feel "right now", how they felt at a particular time in the recent past, and how they anticipate they will feel in a future encounter or hypothetical situation; the survey uses a four-point Likert scale ranging from "not at all" to "very much so".[14] The aim of this paper was to examine anxiety levels of front-line health care workers and to identify the factors that were associated with anxiety in a regional hospital in Hong Kong during the 2003 SARS outbreak. The findings may help to elucidate causes of increased anxiety and to devise interventions for alleviation or treatment.

Methods

Setting

A questionnaire survey that had been approved by the Ethics Committee of the Pamela Youde Nethersole Eastern Hospital (PYNEH) was administered to all staff of the PYNEH from late May to early June 2003. The hospital is a regional hospital in Hong Kong that serves a population of 850 000. During the SARS outbreak, 90 people (including 17 health care workers, of whom 11 worked at the PYNEH) tested positive for SARS and were treated in medical isolation wards. The first case of SARS at the PYNEH was diagnosed on 12 March 2003. Hong Kong was declared SARS-free on 23 June 2003.[15]

Data collection

Questionnaires were distributed by departmental supervisors, including chiefs of service, ward managers, and department managers, and they were collected in anonymously labelled return envelopes either by department supervisors or through the internal mail system; confidentiality was assured. The bilingual questionnaire survey collected demographic data and details of contact with patients with SARS, use of personal protective equipment, psychological and somatic symptoms, disruption of usual routines, satisfaction with interim arrangements and support from colleagues, family members and friends, concerns, perceptions and knowledge of SARS, and anxiety levels as determined by the STAI. A 'burnout' score—a multidimensional integrated representation of physical and psychological fatigue and motivation—was derived using components of the emotional exhaustion dimension of the Maslach Burnout Inventory.[16] Intensity scores for somatic symptoms and feelings were summed (score range, 0-24), and a discomfort score was created by combining the number of symptoms and the severity of symptoms related to the wearing of protective gear. Administrative staff who had had no patient contact served as controls. The original English version of STAI was translated into Chinese by Tsoi et al,[17] and the Chinese translation was found to be acceptable in measuring anxiety among the Hong Kong Chinese population.[18-20] Low scores reflect positive feelings (ie no or a low level of anxiety) and high scores indicate fear and apprehension (ie a high level of anxiety). Internal consistency has been reported to be 0.90.[18] A subsequent study also found that the Chinese version of the STAI significantly correlated with other measures of psychological well-being.[20]

Statistical analysis

Data were converted to means (standard deviations [SDs]) or percentages. Correlations were performed using Pearson's correlation test and were expressed in terms of the correlation coefficient (r). The Student's t test and analysis of variance were used to compare data between study groups. The cut-off P value for statistical significance was taken as 0.05. We used the Statistical Package for Social Sciences version 11.0 (SPSS Inc., Chicago, United States) for all analyses.

Results

Of 4252 questionnaires distributed, 2040 (48.0%) were returned and 1926 (45.3%) were valid for analysis (ie we excluded 114 responses containing more than two STAI omissions). Of the valid responses, 813 (42.2%) were from nurses; 349 (18.1%) from supporting staff, including health care assistants, technicians, workmen, and transport workers; 230 (11.9%) from administrative staff; 207 (10.7%) from allied health workers; 141 (7.3%) from doctors; and 186 (9.7%) from the 'unknown' staff group. Response rates within each type of staff at the PYNEH were highest for allied health workers (68.5%) followed by nurses (64.6%), administrative staff (42.0%), doctors (37.3%), and supporting staff (21.5%) [Fig 1]. Male-to-female ratios by type of staff were as follows: nurses, 1:5.3; supporting

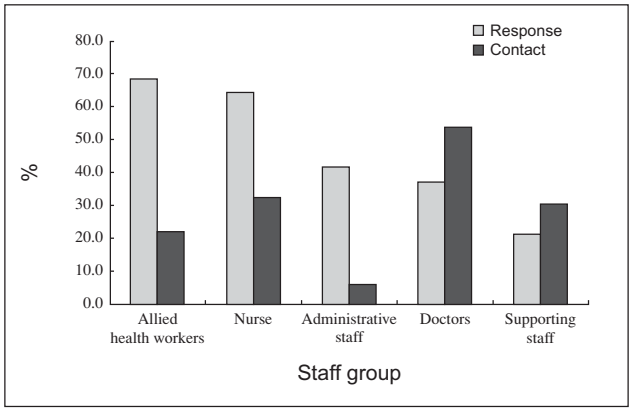

Fig 1. Questionnaire response rates and rates of contact with patients with severe acute respiratory syndrome, by staff group

staff, 1:2.3; allied health workers, 1.1:1; doctors, 2.2:1; and administrative staff, 3.9:1.

Overall, 534 (27.7%) staff members had had contact with patients who had SARS, comprising 264 (49.4%) nurses, 76 (14.2%) doctors, 62 (11.6%) health care assistants, 46 (8.6%) allied health workers, 30 (5.6%) workmen, 14 (2.6%) administrative staff, 12 (2.2%) transport workers, 3 (0.6%) technicians, and 27 (5.1%) from the 'unknown' staff group. Contact rates within each type of staff were as follows: transport workers, 92.3%; doctors, 53.9%; workmen, 37.0%; health care assistants, 36.0%; nurses, 32.4%; allied health workers, 22.2%; administrative staff, 6.1%; and technicians, 3.6% (Fig 1).

Anxiety scores ranged from a minimum of 20 to a maximum of 80 and mean scores were highest among workmen (55.9 [SD, 9.7]), followed by health care assistants (52.9 [8.6]), nurses (52.0 [9.8]), doctors (47.8 [11.1]), allied health workers (47.8 [10.9]), technicians (47.8 [9.8]), administrative staff (47.1 [10.6]), and transport workers (46.4 [9.4]). Scores among workmen, health care assistants, and nurses were significantly higher than scores among doctors ($P<0.001$ for each pairwise *t* test) and administrative staff controls ($P<0.001$).

The Table shows comparisons between front-line health care workers and administrative staff controls, and between staff who had been in contact with patients who had SARS and staff who had had no such contact. Mean (SD) anxiety levels among front-line health care workers were higher than those among controls (51.1 [10.2] versus 47.1 [10.6]; $P<0.001$). Compared with controls, front-line health care workers experienced greater discomfort from wearing protective gear, used more protective gear, had more burnout symptoms, experienced more prejudice from others, wore more items of protective gear outside work, were more worried about contracting SARS and about cross-infecting family members, and had a higher perceived risk of contracting, or becoming permanently disabled or dying

Table. Characteristics of front-line health care workers and administrative staff controls

Characteristic	Front-line health care workers, n=1696	Administrative controls, n=23	P value	Had contact with patients with SARS*, n=534	Had no contact with patients with SARS, n=1392	P value
Mean (SD) score						
Anxiety	51.1 (10.2)	47.1 (10.6)	<0.001	52.6 (10.5)	49.8 (10.1)	<0.001
Use of protective gear	11.9 (4.0)	4.1 (3.5)	<0.001	13.6 (2.9)	10.0 (4.9)	<0.001
Discomfort from wearing protective gear	3.4 (1.9)	2.1 (1.7)	<0.001	4.1 (2.0)	2.9 (1.8)	<0.001
Burnout symptoms	6.0 (5.1)	3.7 (4.0)	<0.001	7.3 (5.3)	5.1 (4.7)	<0.001
Personal protective equipment worn outside hospital	7.2 (2.2)	6.6 (2.6)	<0.01	7.3 (2.2)	7.1 (2.3)	NS†
Worry of infection	1.9 (0.8)	1.6 (0.8)	<0.001	2.0 (0.8)	1.8 (0.8)	<0.001
Worry of cross-infection	1.8 (0.9)	1.5 (0.9)	<0.001	2.0 (0.9)	1.7 (0.9)	<0.001
Perceived risk of contracting	3.0 (1.4)	2.6 (1.5)	0.01	3.2 (1.4)	2.9 (1.5)	<0.001
Perceived risk of becoming disabled	3.4 (1.4)	3.1 (1.6)	0.001	3.5 (1.4)	3.3 (1.5)	NS
Perceived risk of death	3.3 (1.4)	3.0 (1.5)	<0.001	3.2 (1.4)	3.2 (1.4)	NS
Prejudice from others	1.1 (0.9)	0.6 (0.8)	<0.001	1.2 (1.0)	0.9 (0.9)	<0.001
Encouragement from colleagues	2.4 (2.0)	1.1 (1.6)	<0.001	2.8 (2.1)	2.0 (1.9)	<0.001
Solidarity from colleagues	2.3 (1.6)	1.8 (1.5)	<0.001	2.5 (1.6)	2.2 (1.6)	0.001
Percent						
Taking showers	54.3	18.3		72.2	41.5	
Avoiding home	22.4	5.7		37.5	13.9	
Discontent with health authority' s response	65.6	57.8		71.3	62.1	
Discontent with government' s response	75.0	73.3		75.7	74.5	

* SARS severe acute respiratory syndrome
† NS not significant

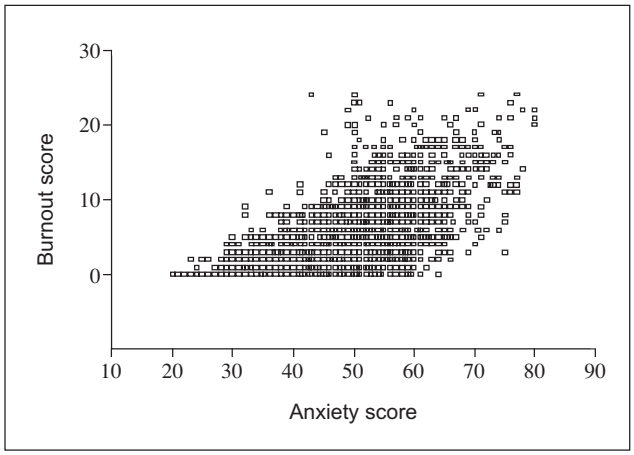

Fig 2. Scatter plot showing correlation between anxiety levels and burnout score*

* Pearson's correlation coefficient = 0.58; P<0.001

from the disease. Front-line health care workers also felt more encouraged and felt greater solidarity with fellow health care workers than did controls. A larger proportion of health care workers than of controls took showers before going home, stayed away from home, and were discontent about the government's and the health authority's handling of the crisis. Anxiety levels were higher among staff who had been exposed to patients with SARS than among staff who had not been exposed (52.6 [10.5] versus 49.8 [10.1]; P<0.001). Most other measures were also higher among the former group, except that there was no difference in use of protective gear outside work or in estimated risk of disability and death.

We tested whether anxiety correlated with each of the other factors studied. Anxiety scores correlated with burnout scores among front-line health care workers (r=0.58), controls (r=0.52), staff who had been in contact with patients who had SARS (r=0.59), and staff without such contact (r=0.56). In addition, anxiety scores correlated with discomfort scores from the use of protective gear among front-line health care workers (r=0.31), controls (r=0.21), staff who had been in contact with patients who had SARS (r=0.32), and staff without such contact (r=0.28). The P value for all correlations was less than 0.001 (Fig 2).

Discussion

We describe anxiety scores among front-line health care workers in a regional hospital during the 2003 SARS outbreak in Hong Kong. We believe that responses truly reflected how participants felt, because anonymity and confidentiality of responses were assured. Response rates were highest for allied health care workers and nurses, lowest for doctors and supporting staff, and intermediate for administrative staff controls. These differences may reflect the time constraints, levels of motivation, and administration methods in the different groups. The rate of staff contact with patients with SARS were highest among transport workers and doctors, next highest among health care assistants, nurses, and allied health care workers, and lowest among administrators and technicians. These findings reflect the different job natures of respondents. Anxiety scores were highest among workmen and health care assistants (about 53-56) and lowest among administrators and transport workers (about 46-47). Furthermore, workmen, health care assistants, and nurses experienced significantly higher levels of anxiety than did doctors or administrative staff controls. Other local researchers who also used the Chinese version of the STAI have reported anxiety levels of 49 to 55 among Chinese patients immediately after stoma surgery,[21] and of 35 to 40 among Chinese patients just before prostate surgery.[22] In addition, the mean score of a group of Chinese men undergoing cardiac catheterization was approximately 39,[23] whereas that of a group of healthy working adult males was 36.[14] These figures indicate that health care workers in our study generally felt very anxious because of the SARS epidemic.

Anxiety levels were higher among front-line health care workers than among administrative staff controls. Still, relatively high scores in the latter group may reflect the increased administrative support required to cope with the huge demand from clinical staff. By the nature of their work, front-line health care workers wore more protective gear, experienced greater discomfort, disruption and prejudice from others. Although in general, front-line health care workers reported more burnout, worry, and dissatisfaction than did controls, the former group experienced more encouragement and solidarity. Much of these positive experiences, however, emanated from outside of work. Anxiety levels correlated with discomfort from the use of protective gear and with burnout scores. Evidence in the literature correlating anxiety and burnout is conflicting. Patients with irritable bowel syndrome experienced more emotional mental exhaustion related to larger differences in diurnal cortisol levels but not to differences in anxiety level.[24] Audiovisual stimulation, such as brain-wave synchronisation, reduced immediate levels of anxiety but had no long-term effect on burnout levels.[25] Bargellini et al[26] found a positive correlation between anxiety and Maslach burnout inventory scores among physicians. Pelosi et al[27] compared nurses in general medical units with those in intensive care units and found that they had similar anxiety scores but that nurses reported more depression and burnout.

Differences in the working environment, such as the use of protective equipment, nature of work (ie extent of patient contact), and availability of supportive measures (eg access to and communication of information), may account for factors contributing to differences in anxiety levels. These factors may be amenable to intervention in a similar manner to other anxiety-reduction measures.[21-23,28] Relaxation training in patients undergoing stoma surgery,[21] having

a nurse present in the preoperative waiting area,[22] teaching coping strategies to patients undergoing cardiac catheterization,[23] and supplying preoperative information[28] all significantly reduced anxiety levels; these are all simple yet effective interventions. The effects of such interventions are likely to be beneficial in the long term. In times of stress, psychosocial and spiritual support is essential.[29] In addition, the experiences of Maunder et al[9] are worth considering: "the hospital's response required clear communication, sensitivity to individual responses to stress, collaboration between disciplines, authoritative leadership, and provision of relevant support".

Limitations of this study include the varying questionnaire response rate among staff groups, which ranged from 3.6% to 92.3%. The timing of administration may have affected the results to the extent that an enquiry that began too early during the SARS outbreak may have elicited uncertainty and ignorance, whereas a later enquiry may have overlooked the period during which respondents were most anxious. We administered the questionnaire after the height of the outbreak but before Hong Kong was declared SARS-free.[15] Longitudinal studies would be helpful in this respect. Finally, age and sex are potential confounding variables. Although all ages were represented in all staff groups, there were significant differences in distributions of sex. Nurses, being a predominantly female group, experienced more anxiety but were also required to use more protective gear than other groups. Reports of anxiety levels in healthy working adults, however, show similar scores in both sexes.[13]

Anxiety levels were correlated with burnout scores. Maslach and Leiter[30] identified six sources of burnout or stressors: work overload, lack of control, insufficient reward, loss of job security, lack of fairness, and value conflict. Stress in itself does not cause burnout; it occurs when one's work has no meaning and when stress continuously outweighs support and rewards.[31] Stress intervention can be separated into worker interventions and work-oriented interventions, or primary and secondary or tertiary interventions.[32] Cherniss[33] presented guidelines on dealing with stress and burnout on the basis of empirical analyses: external job demands (stressors) should be reduced; personal goals, expectations, and preferences changed; resources increased to meet demands; and coping substitutes provided. According to Cherniss, prevention is more effective and less costly than treatment, and it is easier to restructure the role of the work than to restructure the character of the individual or society.[33]

Conclusion

The SARS has likely stressed the public health care system. We have identified higher levels of anxiety among health care workers who have had contact with patients with SARS than among those who have not, as well as higher levels of anxiety among workmen, health care assistants, and nurses than among administrative staff controls or doctors. Elements causal to these observations may be related to the environment and nature of each job. By further investigating relevant factors, we may formulate and implement interventions to prevent, alleviate, or treat increased anxiety during future SARS epidemics and similar crisis situations.

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