Stress Responses of Nurses in the 2004 Niigata-Ken Chuetsu Earthquake

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Abstract

An aim of this study is to discuss what were the facts (ages, employment positions, Acute Stress Response) for nursing professionals whether they suffer from post-traumatic stress disorder or not, and what made the difference for the seriousness of the disorder. Niigata-Ken Chuetsu Earthquake occurred in 2004, and one year and 10 months after that, the authors proceeded with a written questionnaires to 824 nursing professionals out of 15 hospitals in devastated areas over July 2006.

According to the analyses, the higher their ages were, and the stronger their Acute Stress Response was, examinees tended to have symptoms of experiencing difficulty in re-experiencing / intrusion, and avoidance in acknowledging post-traumatic stress disorder (PTSD). And among them, the younger they were, the more of them thought about retiring from their work.

An analysis of open-ended answers showed that many nursing professionals felt mentally stressed when they were blamed or criticized for not going to work. On the other hand, many felt relieved and felt like keeping up with their jobs when they were encouraged or appreciated for what they were doing throughout the disaster.

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Key words : Critical Incident Stress, Post Traumatic Stress Disorder PTSD,
Impact of Event Scale-Revised IES-R, Disaster worker

I　Introduction

In recent years, whether at home or abroad, unexpected catastrophes, not only natural disasters but also man-made disasters occurred on a regular basis, throughout these periods, nurses continued to work in the devastated areas contributing their help and professional expertise even though they are also suffering. Some lost their homes but they were still required to take care of any casualties or victims in need of help. Even at work they were also suffering, they probably were anxious about the safety of their families, but couldn't leave their jobs. They continually looked out for the wellbeing of their patients and worked their hardest to accept as many casualties as possible without sleeping or taking a rest. Under these circumstances, they had to keep their distress levels and feelings to themselves.

Society expects that nurses are trained and educated enough to endure difficult circumstances and apply nursing care as professionals. With their occupational culture and their sense of duty, quite a few sacrificed their family life or even their own lives during a disaster. Since they have pride in their jobs and a sense of responsibility, they give priority to patients. They tend to think or take care of their problems later. They were educated to think and behave so naturally as a professional and society presumed it to be a virtue.

In our country, after the Hanshin-Awaji Earthquake, Critical Incident Stress came to be recognized widely. There could be mental health problems for nurses who do both daily duties and relief operations in disaster areas. Various kinds of approaches were taken because people need to take care of their mental

state and physical health. For instance, the Japanese Nursing Association cooperated with 47 prefectural nursing associations to build ”the Disaster Nursing Assistance Program” which is a mutual support network system for nurses in order to help and support them at a disaster area. However in the 2004 Niigata-Ken Chuetsu Earthquake the Disaster Nursing Assistance Program reached the area only a few days later.

After the Chuetsu Earthquake occurred, the Niigata Nursing Association held mental care workshops at four places from September to October in 2005.

At the workshops nurses retold their experiences of the disaster choked up and in tears. They didn't care for sympathy, but wanted to receive a proper evaluation. They wanted to rush to the hospitals, but couldn't make it under such circumstances. And in return, they were blamed for not getting there at all and they felt that they were left out of the loop. Quite a few nurses have something wrong with their physical and mental condition since they had kept their problems to themselves. It is obvious that nurses in disaster areas need special care because they are nursing professionals but are also affected by the circumstances at the same time.

However there aren't many studies in these specific areas. Laube[1] carried out an unstructured interview with 27 nurses who continued nursing care in hurricane conditions and he analyzed their psychological reactions. Shih, Liao, Chan & Gau[2] did an unstructured interview with 46 nurses who had been involved in nursing care at the Taiwan Earthquake of 1999. Burns & Harm[3] researched 682 members of the Emergency Nurses Society and Su, Lien, Yang, Su, Wang, Tsai,&Yin[4] analyzed the stress of nurses who were engaged in the SARS outbreak, but they were both not directly similar to the massive disasters mentioned before.

This study is intended for nurses who suffered through the Chuetsu Earthquake, grasping Critical Incident Stress(CIS) of nurses after the extensive disaster ,aiming to consider the factors of PTSD.

Ⅱ Method

1. Participants

842 nurses at 15 hospitals located in disaster areas who assented to answer the questionnaires.

2. Time frame

From July 26th to August 16th, which is about a year and 10 months after the Chuetsu Earthquake.

3. Contents

Submitted questionnaires to the group. Below are the main points within are the details of the investigation.

1) Attributes

Asked about their sex, age, marriage, work positions

2) Impact of Event Scale Revised(IES-R), during the past 22 months

To measure the respondents' symptoms of PTSD, used IES-R. Weiss and Marmar[5] developed this scale, and Asukai[6] translated it into Japanese. The original scale defines the symptoms over one or two weeks, but we changed it 22 months after the disaster. IES-R comprises 22 items covering 3 symptom categories including re-experience/intrusion, avoidance, and hyperarousal.. Respondents were assessed by the following instructions. “Please indicate the level of importance of each item. For example how much you were distressed or bothered right after the earthquake.“ They were asked to rate using a scale ranging from 1(not at all), 2(a little bit), 3(moderately), 4(quite a bit), to 5(extremely).

3)Acute Stress Response Checklist

In order to measure whether participants have Acute Stress Response(ASR) or not, they were asked

to answer from our original ASR checklist. It is comprised from 14 items related to stress response right after the disaster. The items are related to concentration such as feeling lethargic and so on. (Table 1) They were required to answer with yes or no.

4)Thought about retiring from their job or not

We assessed the question to the participants. "Did you ever think of retiring from your job after the earthquake?" They had to answer either yes or no. If they answered yes, additional questions were asked. "Did you think about it often?"(yes or no), "When did you think about it?(free answer)", "The reason for retiring(free answer, possibly several)"

5) The responses they felt were negative or positive from their fellow coworkers

Asked to answer freely whether the participants had any negative or positive responses from their work surroundings. Also asked what nurses expected from the managerial staff.

6) Ethical concerns

All answer sheets were filled out anonymously and collected in hospital facilities, so researchers were unable to identify individuals. We made it clear that even if the participants couldn't cooperate with the research or quitted halfway, their identity wouldn't be in any way divulged. We guaranteed the secrecy of the answers, they would not be used outside of this research study / having the strict custody of the answer sheets / destroying the answer sheets instantly after the study, and having obtained the participants' consent.

Table 1 Principal component analysis of ASR checklist

Items	Factor loading	Positive/yes
Have trouble in concentrating	.735	5.6%
Feel lethargic	.642	9.4%
Problems in decision making	.639	3.6%
Trouble interacting with others	.632	2.7%
Unable to appreciate general life style as before	.632	4.8%
Difficulty in trusting others	.575	1.9%
Have palpitations/racing heart	.552	5.3%
Loss of appetite, restful sleep, active bowels	.529	9.7%
Have a headache or feels hazy	.493	6.4%
Quarrels frequently with family, friends and coworkers	.461	2.1%
Feels meaningless in their job	.456	0.8%
Cries without any reason	.451	2.7%
Being pointed out by family or friends for your irritability	.442	5.2%
Unable to feel that the world is safe	.392	24.9%
value	4.29	
(%)	30.65	
α	.768	

Table 2 Principal component analysis of re-experiencing and intrusive thoughts

Items	Score
Memories kept reoccurring.	.856
Other things brought on memories of my experience.	.763
I had strong emotional recurring feelings about it.	.761
Pictures about it popped into my mind often(flashbacks)	.747
By chance, when I remembered the event, I felt the same emotions as then.	.731
I found myself acting or feeling like I was back at that time.	.681
Memories of it caused me to have physical reactions, such as sweating, trouble breathing, nausea, or a pounding heart.	.643
I had trouble staying asleep.	.572
(%)	53.39%
α	.855

Table 3 Principal component analysis of avoidance

Items	Score
I was aware that I still had a lot of feelings about the event, but I didn't deal with it.	.869
I tried not to think about it.	.855
I stayed away from things that would remind me of it.	.757
I tried not to talk about it.	.745
I tried to suppress it from my memory.	.690
I avoided letting myself get upset when I thought about it or was reminded of it.	.671
I felt as if it hadn't happened or wasn't real.	.501
My feelings about it were kind of numb.	.493
(%)	50.46%
α	.848

Table 4 Principal component analysis of hyperarosal

Items	Score
I was jumpy and easily startled.	.751
I felt watchful and on-guard.	.750
I had trouble concentrating.	.734
I had trouble falling asleep.	.701
I had dreams about it.	.647
I felt irritable and angry.	.601
(%)	48.95%
α	.773

Table 5 By ages, the result of IES-R score's analysis of the breakup

		under 29	30-39	40-49	above 50	
	N	152	179	238	106	analysis of variance
re-experiencing	average	2.72	3.68	3.65	4.65	F(3,674)=4.371＊＊
	standard deviation	3.80	3.97	4.36	5.03	twenties＜above fifties
avoidance	average	1.74	2.37	2.38	3.49	F(3,674)=4.845＊＊
	standard deviation	3.05	3.42	3.53	4.86	twenties＜above fifties
hyperarousal	average	1.91	2.41	2.27	2.84	F(3,674)=1.901 n.s.
	standard deviation	2.94	2.95	3.16	3.58	
all items	average	6.37	8.47	8.30	10.98	F(3,674)=4.447＊＊
	standard deviation	8.80	9.25	10.16	12.22	twenties＜above fifties

＊＊ p ＜.01 multiple comparison by Tukey method

Table 6 By work positions IES-R score's analysis of the breakup

		head nurse	charge nurse	staff	
	N	77	181	440	analysis of variance
re-experiencing	average	3.52	3.83	3.57	F(2,697)=0.267 n.s.
	standard deviation	4.67	4.61	4.07	
avoidance	average	2.04	2.58	2.45	F(2,697)=0.586 n.s.
	standard deviation	3.66	4.06	3.53	
hyperarousal	average	1.84	2.46	2.40	F(2,697)=1.164 n.s.
	standard deviation	3.30	3.27	3.06	
all items	average	7.40	8.87	8.42	F(2,697)=0.569 n.s.
	standard deviation	10.75	10.90	9.62	

Ⅲ Result

1. Attributes of the participants

Participants were composed of 69 males (8.3%), 765 females (91.7%), and 8 uncertain. The average ages were 39.9 years old (from 21 to 64, standard deviation was 9.8). Married were 583 (69.7%). Their employment positions were: 95 head nurses (11.5%), 218 charge nurses (26.4%), 514 general nursing staff (62.2%), 15 uncertain. Work places consisted of 115 outpatient wards , 203 general internal medicine wards, 38 pediatric wards, 36 obstetric and gynecological wards, 76 psychiatric wards, 13 emergency rooms, 59 operation rooms, 52 orthopedic wards, 3 ICU, 97 outpatient, 150 uncertain.

2. IES-R scaling (over 22 months)

In order to check out the one-dimensional nature of each subordinate scaling of IES-R (over 22 months) ,which are re-experiencing, intrusive thought, avoidance, and hyperarousal, we provided principal component analysis(from Table 2 to 4). According to the results, the scaling item had the principal loading component which was over 49 and the one-dimensional nature of each scale was confirmed.

3. Comparison in IES-R (over 22 months) scores

We provided a one-way analysis of a variance in order to examine whether their employment positions made a difference (from Table 5 to 6). Analysis of variance in age order, shows that re-experiencing / intrusive thought and avoidance showed a significant difference. Among them, we added multiple comparisons (Tukey method). The score in re-experiencing / intrusive thought and avoidance was significantly higher in the 50s comparing to the 20s. An analysis of the variance in employment positions showed that each score didn't show significant differences.

4. Comparison of risk group rate of IES-R (over 22 months)

Referring to Askai's[6] cut off point, we classified participants who got over 25 points in IES-R in a high risk group and under 24 points in a low risk group. The high risk group ratio was 7.9%. To examine if the risk rate of IES-R score differs by the participants' ages, and employment positions, we provided Chi-square test based on a cross-tabulation table (Table 7, 8). The result showed that there wasn't a significant difference.

Table 7 IES-R risk group rate by age

	high risk	low risk
under 29	6	146
	3.9%	96.1%
30-39	12	167
	6.7%	93.3%
40-49	22	216
	9.2%	90.8%
over 50	11	95
	10.4%	89.6%

$x^2(3)=5.197$, n.s.

Table 8 IES-R risk group rate by work positions

	high risk	low risk
head nurse	3	74
	3.9%	96.1%
charge nurse	17	164
	9.4%	90.6%
staff	36	404
	8.2%	91.8%

$x^2(2)=2.252$, n.s.

5. Scale structure of acute stress response check list

To check the one-dimensional nature of an Acute Stress Response check list, we provided analysis of the principal components (Table 1). Since every item except for "cannot feel the world is safe" was over 0.40 in loadings, the remaining 13 items were taken as an acute stress response on the check list.

6. Connection between acute stress check list and IES-R (over 22 months) risk groups

From the numbers of checks from the Acute Stress Response check list, we sorted the group from 0, 1 to 3, and over 4. Then we examined the connection between each group and IES-R (over 22 months) risk groups. The Chi-square test based on the cross-tabulation table showed a significant difference at a 1% standard level (Table 9). As a result of the residual analysis, high risk persons were significantly few in 0 group, but significantly higher in other groups.

Table 9　Ratio of ASR checklist and IES-R risk group

		IES-R					
		low risk			high risk		
		number	%		number	%	
stress	0	546	95.5%	↑↑	26	4.5%	↓↓
response	1-3	87	82.1%	↓↑	19	17.9%	↑↑
	over 4	20	64.5%	↓↓	11	35.5%	↑↑
	all	653	92.1%		56	7.9%	

$x^2(2)=55.92$,　$p<.05$.

↑↑　high rate at a 1% standard level by a result of the residual analysis

↓↓　low rate at a 1% standard level by a result of the residual analysis

7.　Considerations about early retirement

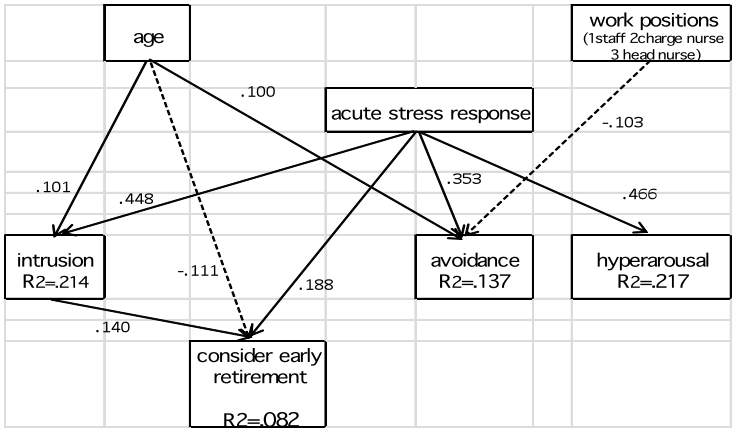
After the earthquake, 128 (15.7%) nurses answered that they wanted to retire from their jobs. Among them, 103 (80.5%) thought about it over and over.　The term when they thought about retiring was from the 3rd day to the 7th day after the quake, which was the largest number (55.5% of nurses who thought about retiring at that time).　"Economical reasons" was the biggest reason why they didn't retire.　There were 89 checks in multiple choices.

8.　Multiple linear regression analysis of Acute Stress Response, IES-R (over 22 months), and thoughts of retiring

To search for the factor why they thought about retiring from their jobs, we combined multiple linear regression analysis and path analysis.　In the path analysis, age and employment positions were in the first level, the score of the Acute Stress Response check list was in the second level, re-experiencing/intrusive thoughts, avoidance, and hyperarousal of IES-R (over 22 months) was the third level, thought about retiring or not was the fourth level.　Set the upper levels as explanatory variables and provided multiple linear regression analysis again and again (Fig.1).　Step-up procedure was used to analyze, we stopped populating data at the 5% level in partial regression recurrence.

In consequence of the analysis, the higher their age was, the higher score they got in re-experiencing/intrusive thought, avoidance, and a few thoughts about early retirement.　The higher ranking their positions were, the lower marks they got in the avoidance category.　The higher they marked in the Acute Stress Response test, all the IES-R scores were high and many of them thought about early retirement.　The higher score they got in re-experiencing , intrusive thoughts, the more of them thought about retiring.

Fig. 1　Result of multiple linear regression analysis



Solid line shows a positive path at a 5% standard level, broken line shows a negative path

9. Negative or positive responses from their work surroundings ,and what nurses expect from the managerial staff.

Nurses said encouraging each other and receiving positive feedbacks made them feel like continuing their jobs toward the reconstruction after the disaster. What is more, conversations such as "You kept a stiff upper lip, well done!", "Yes, we got through this. " made nurses feel they could communicate well and felt relieved.

The greatest number of negative responses were about laying blame on fellow workers such as criticism for not showing up for work. Some answered they were unable to reach their workplace since the roads were impossible to navigate through because of extensive damage but they were blamed and criticized from coworkers and their superiors, saying "It's your fault for living in such inconvenient places." Some were asked why they couldn't come as others had managed to get there. And some said they went to their workplace after they had dropped off their children at their nursery but they were ostracized because they couldn't come sooner.

A number of answers what nurses expected from the managerial staff were about flexible work times, more communication for better teamwork, and regular anti disaster drills and continuous practice of mental care.

Ⅳ Consideration

It became obvious that nurses at disaster areas suffer from various forms of mental and physical stress since the earthquake occurred. The risk rate of IES-R (over 22 months) was 8%, and less than 1 % nurses showed symptoms of strong PTSD which occurred within 22 months. 16% of them thought about taking early retirement after the disaster. The result of free writing answers showed that they were physically and mentally placed in extreme situations. They were fully prepared for their death and continued relief operations in order to keep the patients' safe, but while still worrying about their own family's situation and wellbeing. Even they couldn't reach their hospitals as the roads were impossible to navigate through because of the damage, they still worried about the hospital and their coworkers.

1. Background which triggers stress for nurses at disaster areas

At the Hanshin Awaji Earthquake, one of the problems for nurses at the disaster areas was the mental stress they felt, when it was pointed out that they couldn't reach their hospitals because of the extensive damage to the infrastructure. This study revealed at the Chuetsu Earthquake, just like the former one, nurses who couldn't show up because of the infrastructural damage were wrongly blamed and criticized from coworkers and their superiors. Nurses who suffered in this disaster made an all out effort to reach their hospitals, but when they failed, they were quickly subjected to severe criticism from others and even themselves, and that surely caused stress for them.

16 % of nurses desired early retirement, which is quite a big number, and 80 % of which said, they considered about retirement many times. From the 3rd day to the 7th day, these thoughts occurred the most. We suppose nurses felt mentally and physically exhausted during that term. Noguchi [7] stated nurses who suffered and worked at a flood disaster area had physical and mental health problems as time went by and the first week was the most severe time period for them. Noguchi's study concurred with ours that over the period of this study, our participants thought about early retirement within the first week. This term should be applied to the utopian period of the disaster syndrome study[8]. People feel they are glad that they survived but on the other hand, it's time they recognize their mental and physical changes since the disaster. Matsui [9] and Sato [10] explained that from Hans Selye's study, that the time to change should be from the stage of resistance to lowered resistance of the three phases of stress response. Managerial nurses should regard this is an important study term for stress care, and need to intervene with

the workers constructively and provide mental care as a set system within the hospital treatment curriculum.

2. The relationship between nurses' ages, stress response, and the desire for early retirement

From the IES-R score (over 22 months), re-experiencing and avoidance subscale were high with nurses in their 50s. Path analysis results showed that the more experienced nurses were, the higher their score became. Although, the desire for early retirement was less among elder nurses, elder and more experienced nurses didn't have this tendency despite that they were re-experiencing the trauma from the disaster, and they were aware of their stress symptoms and so avoided thought processes related to the disaster.

Many nurses who answered this study questionnaire were married, and there were a lot of elder nurses in the disaster areas. The elder they became, the more roles they had to take on such as being a wife, a mother, and a caregiver so one would suppose they were exposed to various stress levels. Besides, not being able to contribute to their daily routines and usual care for the patients because of the quake, and for their sense of responsibility, it is estimated that experienced nurses felt stressed. On the other hand, many nurses answered they didn't choose to retire because of economical reasons. It is assumed elder nurses are regarded as breadwinners, or high income earners in their respective families.

3. More communication with coworkers

Nurses wrote in the free writing part that conversations such as "You kept a stiff upper lip, well done!", "Yes, we got through this. " made nurses who shared fearful experiences felt they could communicate well and felt relieved. By talking with others who experienced the same situation, people could sympathize and express their hardships. It is called informal debriefing and known to be effective to relieve stress. Managerial staffs need to create relaxing conditions and opportunities to communicate well with others in their work places.

4. Daily communication is the key to a positive work place

Appreciating each other was taken as a positive response, and criticism for not showing up to the hospital was taken as a negative response. These responses and attentiveness are not built in a day. Also things cannot be changed so quickly due to the said disaster. Daily communication is a key to better understanding. Build a trustful relationship in the work place by accepting each other, cooperating together, and paying attention to each other. This will lead to better treatment and work conditions for nurses who continue to work in disaster areas.

5. Proposal

We propose three viewpoints to consolidate the organizational system in order to relevantly treat the mental and physical health of the nurses after the disaster as soon as possible.

1. Make flexible work times： these facilities need to renew the work times and shift times after such a disaster, and need to ask for support from outside depending on the circumstances. They need to adjust working shifts in order to prepare and guide the volunteers should they need help. This study indicated the phenomenon that stress levels increase over the 3 to 7 day period after the disaster occurred. After a couple days preceding the disaster, facilities need to give nurses equal rest throughout this period. So they can recuperate.
2. Through anti disaster drills, disaster nursing training, and seminars, facilities should take notice and observe to learn about the worker's mental care.
3. Build "the Disaster Nursing Assistance Program" (to make a support system from acute phase and from outside the region)： the Japanese Nursing Association cooperates with 47 prefectural nursing

associations, should improve the fast and smooth support system at disaster areas. Also it is required to hold the nursing assistance training and development program.

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Bibliographical reference

1) Laube J, 1973 , Psychological Reactions of Nurses in Disaster, Nursing Research, 22 : 343-7.
2) Shin FJ, Liao YC, Chan SM, et al, 2002, Taiwanese nurses' most unforgettable rescue experiences in the disaster area after the 9-21 earthquake in Taiwan, International Journal of Nursing Studies, 39 : 195-206.
3) Burns C, Harm I, 1993, Emergency nurses : perceptions of critical incidents and stress debriefings, Journal of Emergency Nursing, 19 : 431-6.
4) Su TP, Lien TC, Yang CY, et al , 2007, Precalence of psychiatric morbidity and psychological adaptation of the nurses in a structured SARS caring unit during outbreak : A prospective and periodic assessment study in Taiwan, Journal of Psychiatric Research , 41 : 119-30.
5) Weiss DS, Marmar CR, 1997,The Impact of Event Scale-Revised, In Wilson JP & Keane TM (Eds.), Assessing psychological trauma and PTSD. Guilford Press, New York, pp 168-89.
6) Nozomu Asukai , 1999, Post Traumatic Stress Disorder (PTSD), Annals of Clinical Psychiatry extra Edition, 28 : 171-7.
7) Norihito Noguchi, 2006, A study of the process of the change on psychosomatic and measure method of the volunteer coordinator who participated in restoration activity, Journal of Japan Society of Disaster Nursing, 7 : 2-15.
8) Yutaka Matsui, 2005, Group meeting, ed. Yutaka Matsui, Critical Incident Stress Care, Tokyo, Brain Press, pp155-78.
9) Above-mentioned 8) pp19-21.
10) Akio Sato, etc al, 2005, Stress & Health, The Journal of Health Sciences of Mind and Body, 4 : 10-1.
11) Aya Urabe, Natsumi Miyazono, 2007, A study on the stress of nurses who work in disaster areas : the process of how nurses cope with stress, Bulletin of the School of Health Sciences, Faculty of Medicine, Kagoshima University 17 : 25-32.
12) Kikuko Tani, 2006, Consider the stress of rescue workers, Kangotenbo, 31 : 898-901.
13) Hiroshi Kato, 2004, Disaster Workers and Critical Incident Stress, Japanese journal of clinical psychology 4 : 753-7.
14) Yoshiharu Kim, 2006, The understanding and treatment of psychological trauma, Second edition, Jiho, Tokyo.
15) Miho Hatanaka, et al, 2004, Critical Incident Stress in fire fighter in Japan, Journal of Traumatic Stress, 2 :2.
16) Kazumi Fujimori, Tatsuo Fujimori, 1995, Kokorono kea to saigaishinrigaku, Geibunsha, Tokyo.
17) Hidehito Hirotsune, 2007, Disaster Mental Health Care System, NPO Humanitarian Medical Assistance (HuMA) Society of Disaster Nursing Research Conference edited, Global Disaster Nursing Manual, Shinko Trading Company Ltd. Publication Department of Medical Books, Tokyo.