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## An analysis of gastrointestinal symptoms in causalities of catastrophic earthquake of Bam, Iran.

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### Abstract:

Gastrointestinal diseases are among the most common problems occurring during the post earthquake period. This study conducted to determine the frequency of gastrointestinal disorders after the Bam earthquake disaster. The injured people of Bam earthquake, admitted in some hospitals of Tehran, Yazd, Esfahan and Shiraz during the first 10 days of earthquake were studied. The epidemiological data and gastrointestinal complaints were fulfilled in the questionnaires. According to the type and severity of the physical injuries, the patients were divided into four groups (grade 1-4). 737 injured people including 361 (49%) male and 376 (51%) female with mean age of 30±14 were studied. Abdominal pain 143(19.4%), nausea 167(22.7%), vomiting 104(14.1%) and excessive gas 161(21.8%), anorexia 287(38.9%), early satiety 200(27.1%), heartburn 188(25.5%), fullness 154(20.9%), bloating 144(19.5%), distention 114(15.5%), belching 93(12.6%), regurgitation 74 (10%), dysphagia 34 (4.65%), diarrhea 32 (4.3%) constipation 200 (27.1%), melena 24(3.3%), hematemesis 10(1.4) and hematochezia 5 (0.7%). According to the grade of physical injury, patients divided to 4 groups as follow: 139 (18.9%) patients in grade 1, 323(43.8%) patients in grade 2, 210(28.5%) grade 3 patients in and 65(8.8%) patients in grade 4. Excessive gas, abdominal pain, belching and dysphagia were significantly more prevalent among patients with grade 3 injury. Anorexia, early satiety, distention and constipation were significantly more prevalent among patients with grade 3 injury. As a result, gastrointestinal disorders are relatively frequent among injured people of earthquake. Excessive gas, abdominal pain, belching and dysphagia were more prevalent among patients with grade 3 injury.

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**Key Words:** Bam, earthquake, gastrointestinal diseases, and physical injury.

### **Introduction:**

On December 26, 2003, at 5:08 a.m., an earthquake measuring 6.3 on the Richter scale struck the Bam city of Iran. Bam earthquake destroyed much of the city. The human and physical devastation was staggering, with 41,000 people presumed to be dead, tens of thousands injured, and nearly all survivors among the original 100,000 inhabitants left homeless. Large numbers of injured people were evacuated to hospitals throughout Iran, especially in Tehran and the provincial capital Kerman, since all major hospital facilities in Bam had been destroyed, and their doctors and nurses injured or killed.<sup>1</sup>

Earthquakes are among the most important natural disasters that cause mass emergencies.<sup>2-5</sup> It is important to know that various disorders involving physical and psychological problems develop at different stages after a large-scale disaster.<sup>6</sup> Exposure to the disaster was related to a higher prevalence of medically unexplained physical symptoms, particularly gastrointestinal ones.<sup>7</sup> Both helicobacter pylori infection and various stresses are known to induce peptic ulcer disease of the upper GI tract after disasters.<sup>8,9</sup> Depending on the nature and location of the disasters, various infections have caused problems in the past.<sup>2-5</sup> After the earthquake, diarrheal diseases increase transiently, although the etiologies of most cases of diarrhea could not be identified.<sup>10</sup>

Because of high prevalence of gastrointestinal disorders reported in previous disasters, this study conducted to determine the frequency of the gastrointestinal disorders among affected people of the Bam earthquake.

### **Materials and Methods:**

**Patients:** A descriptive study of the frequency of GI disorders among injured people of Bam earthquake was carried out. The name of hospitals in Tehran, Yazd, Esfahan and Shiraz admitted injured people of Bam earthquake were listed. We enrolled 737 patients, transferred to those hospitals.

**Questionnaires:** The researchers of RCGLD (Research Center for Gastroenterology and Liver Diseases) interviewed all patients included in the study. All demographic and clinical data were obtained and recorded in standard questionnaire.

The questionnaire consisted four parts, a) demographic data of patients such as sex, age... b) the type and severity of the physical injury, c) somatic symptoms such as abdominal pain, nausea, vomiting and excessive gas and d) other gastrointestinal sign and symptoms such as heartburn, fullness, bloating, belching, regurgitation, anorexia, early satiety, melena and hematemesis, .... All the recorded sign and symptoms occurred or aggravated after the earthquake.

**Type of physical injury:** To find any association between the severity of the physical injury and severity of the gastrointestinal disorders, four grades were defined (1-4).

a) Grade 1:

- Minor fracture: clavicle fracture, finger fracture...)
- Contusion
- Abrasion

b) Grade 2:

- Major fracture: pelvic fracture, limb fracture

c) Grade 3:

- Crush injury with or without fracture

d) Grade 4:

- Spinal fracture with or without fracture

**Statistical Analysis:** All the obtained data were entered in data sheet with Soft ware SPSS for Windows Version 11. Chi Square Test was used for data analysis.

**Ethical considerations:** The RCGLD ethics committee at Shaheed Beheshti University of Medical Science approved the protocol of the study.

### **Results:**

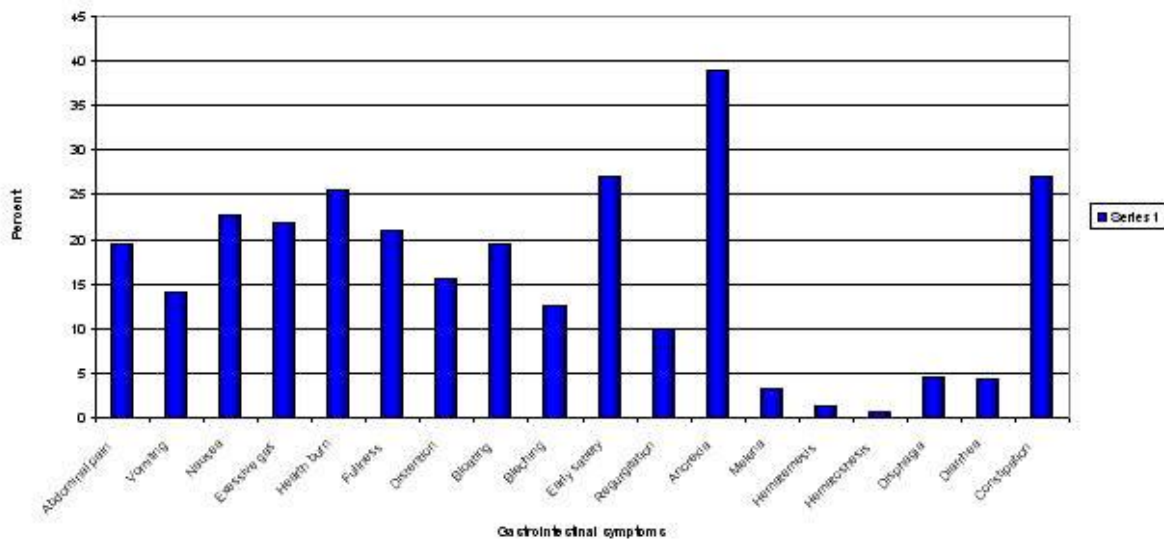
**Patients:** A total of 737 injured people were studied. 361 (%49) patients were male and 376 (%51) of them were female. The mean

age of patients was 30±14 years old. Somatic symptoms consisted: nausea 167(22.7%), excessive gas 161(21.8%), abdominal pain 143(19.4%) and vomiting 104(14.1%).

Other symptoms included: anorexia 287(38.9%), early satiety 200(27.1%), constipation 200 (27.1%),

heartburn 188(25.5%), fullness 154(20.9%), bloating 144(19.5%), distention 114(15.5%), belching 93(12.6%), regurgitation 74(10%), dysphagia 34(4.65%), diarrhea 32(4.3%), melena 24(3.3%), hematemesis 10(1.4) and hematochezia 5(0.7%)

**Figure 1: Frequency of gastrointestinal symptoms in injured people of Bam earthquake**



According to the grade of physical injury, patients divided to 4 groups as follow: 139 (18.9%) patients in grade 1, 323(43.8%) patients in grade 2, 210(28.5%) grade3 patients in and 65(8.8%) patients in grade 4. Excessive gas, abdominal pain, belching and dysphagia were significantly more prevalent among patients with grade 3

injury. Anorexia, early satiety, distention and constipation were significantly more prevalent among patients with grade 3 injury. The frequency of gastrointestinal sign and symptoms according to the grade of the physical injuries is shown in table one.

**Table 1:** The Age, Sex, gastrointestinal symptoms distributions among 4 groups of injury

Kind of injury	Grade 1	Grade 2	Grade 3		Grade4	Total	P value
	( n=139 )	(n= 323)	(n= 210)		(n=65)	(n=737)	
Age	29.02±14.4	29.82±14.41	32.79±13.96		30.46±11.42		
Sex (M/F)	66:73	156:167	103:107		36:29	361:376	
<b>Somatic symptoms</b>							
Abdominal pain	21(14.7)	52(36.4)	55(38.5)		15(10.5)	143(100)	0.014

Nausea	33(13.8)	71(42.5)	60(35.9)		13(7.8)	167(100)	0.058
Vomiting	13(12.5)	42(40.4)	39(37.5)		10(9.6)	104(100)	0.091
Excessive gas	9(5.6)	31(25.5)	93(57.8)		18(11.2)	161(100)	0.001
<b>Dyspepsia symptoms</b>							
Heartburn	34(25.3)	83(44.1)	54(28.6)		17 (9)	188(100)	0.991
Fullness	18(11.7)	64(41.6)	54(35.1)		18(11.7)	154(100)	0.016
Distention	10( 8.8 )	49(43)	38(33.3)		17(14.9)	114(100)	0.003
Bloating	17(11.8)	64(44.4)	49 (34)		14 (9.7)	144(100)	0.780
Belching	9 ( 9.7)	29(31.2)	43(46.2)		12(12.9)	93(100)	0.001
Early satiety	20(10 )	76 (38)	75(37.5)		29(14.5)	200(100)	0.001
Regurgitation	13(17.6)	32(43.2)	21(28.4)		8(10.8)	74(100)	0.930
Anorexia	39(13.6)	137(47.7)	86 (30)		25(8.7)	287(100)	0.030
Dysphagia	2( 5.9)	10 (29.4)	20(58.8)		2(5.9)	34(100)	0.001
Diarrhea	1 (3.1)	15 (49.6)	11 (34.4)		5(15.6)	32 (100)	0.085
Constipation	17(8.5)	110(55)	43(21.5)		30(15)	200(100)	0.001
<b>GI bleeding symptoms</b>							
Melena	0( 0)	9(37.5)	11(45.8)		4(16.7)	24(100)	0.026
Hematemesis	1(10)	2 (20)	5(50)		2(20)	10(100)	0.186
Hematoshesis	0( 0)	2 (40)	3(60)		0(0)	5(100)	0.367

Figures in parentheses are percentages.

### Discussion:

The Bam earthquake hit southern Iran and killing over a third of 90000 Bam's populations. The main hospital buildings in Bam, and most urban and rural health clinics in the area, had collapsed, and many medical staff and health workers were killed or injured. The earthquake ruined 95 of the community healthcare units, all 23 health centers, and two of three hospitals. 12000 of the 30000 injured people had been airlifted to hospitals in other parts of the country. Because of cold temperature, pneumonia and respiratory tract infections was increased, particularly among vulnerable children.<sup>11</sup> As injured people are more prone to some diseases after mass emergencies, emergency preparedness must be based on carefully conceived priorities, information, and communications, and improved capabilities

must be developed to rapidly implement an emergency public health network.<sup>12,13</sup> The priorities usually are to take care of the survivors, reduce the negative health impacts of the harsh environmental conditions on them, re-establish systems that keep a look out for communicable diseases, and—if they are detected—make sure that they are quickly controlled, and restart healthcare services ensuring adequate psychological counseling and care to those who survived the tragedy.<sup>11</sup>

In present study, more than 700 injured people were interviewed to look for gastrointestinal sign and symptoms and also to find any association with the type and severity of physical injuries.

In our study about one half of injured people were male. The mean age of patients was  $30 \pm 14$  years old. The death rate was not evaluated in our studied population. In

one study earthquake-related deaths were estimated at 2347 deaths (death rate 116 per 100,000 population); the mean age of the decedents was 49.7 years. No significant difference was observed between males and females.<sup>12</sup>

After the Bam earthquake, somatic gastrointestinal symptoms such as abdominal pain, nausea, vomiting and excessive gas were seen relatively common among injured people. In one study, the authors prospectively examined the prevalence of somatization symptoms among community respondents after a natural disaster in Puerto Rico. Exposure to the disaster was related to a higher prevalence of medically unexplained physical symptoms, particularly gastrointestinal ones (abdominal pain, vomiting, nausea, excessive gas) and pseudoneurological ones (amnesia, paralysis, fainting, unusual spells/doublevision).<sup>7</sup>

Other important gastrointestinal symptoms in Bam injured people were heartburn, fullness, distention, bloating, early satiety, anorexia and constipation which were observed in about twenty to forty percent of them.

The presence of the *H. pylori* infection and its association with gastrointestinal symptoms especially abdominal pain or peptic ulcer could not be evaluated in our study. However, immediately after the Great Hanshin Earthquake in Kobe in 1995, the recurrence rate of peptic ulcer in patients infected with *Helicobacter pylori* was higher than that in patients in whom *H. pylori* had been eradicated. *H. Pylori* infection influences the development of gastric mucosal injury in the early phase of stress exposure), particularly in the elderly; cytokines do not play a major role in this process.<sup>9, 14, 15</sup>

Although physical stresses are known to induce peptic ulcers in the upper gastrointestinal tract, it remains controversial whether emotional stress can cause peptic ulcers. The influence of the Hanshin-Awaji earthquake was shown on the occurrence of peptic ulcer disease

among noninjured residents.<sup>8</sup> An earthshaking association between mental stress and peptic ulcers has been reported.<sup>16</sup> In our study the sign of gastrointestinal bleeding such as melena, hematemesis and hematochezia were observed among one to four percent of the patients studied. In one study, during the following three months of earthquake, the number of peptic ulcer patients increased: 39.5% had a giant gastric ulcer and 34.8% had bleeding complications. It is important to recognize that various disorders involving physical and psychological problems develop at different stages after a large-scale disaster.<sup>6</sup> Hemorrhagic gastric ulcer were often found in the population who suffered from the Great Hanshin-Awaji earthquake. The stress of the earthquake, the infection of *H. pylori* and the production of CagA protein of the organism were combined and this caused hemorrhagic gastric ulcers.<sup>17</sup> A clinical study of acute medico-surgical complications occurring in patient's hospitalized following psychical stress, myocardial infarction, operatory shock and after the earthquake showed that in patients with duodenal ulcers and hyperacidity due to vagal neurogenic origins, the presence of a sympatico-adrenergic constitutional background is noted frequently.<sup>18</sup>

Diarrhea was present in about five percent of our patients but the etiology of it was not evaluated. In one study, the number of cases of acute respiratory infections and acute gastroenteritis in the affected area was higher than that of neighboring unaffected counties in the post-earthquake phase.<sup>12</sup> Most recent studies of natural disasters had shown little increase in post-disaster infectious disease. The result had been a re-emphasis of the disease control portion of many disaster relief programs.<sup>19</sup> A high prevalence of giardiasis was found in children living in temporary houses after the 1999 earthquake in Armenia (Colombia). Giardiasis is an emerging disease in post-disaster situations and adequate prevention measures should be implemented during these circumstances.<sup>20</sup> Unfiltered and inadequately chlorinated

surface water was implicated as the vehicle of transmission in the outbreak.<sup>21</sup> Immediately after the devastating earthquake in Turkey in August 1999, an infectious disease surveillance system was established and mainly focused on diarrheal diseases. Of the identified causes, *Shigella* species were the most common. This study indicated a multifocal, multiclonal increase in diarrheal diseases after this massive disaster, thus indicating the necessity to set up infectious disease surveillance systems after such events.<sup>22</sup> The first task in prevention of diseases after an earthquake is to quickly provide an adequate source of safe drinking water. Otherwise, the incidence of infectious intestinal diseases will increase rapidly. Additional health measures, such as disinfecting drinking water, protecting the water source, and treating disaster area residents, must be taken at the same time.<sup>23</sup> How many cases of diarrhea in our study were due to irritable bowel syndrome, was a subject that could not be determined.

Finally, the most important finding in our study possibly was a significant association between the severity of physical injury and prevalence and also severity of gastrointestinal symptoms. Although this association has not been seen in grade 4 (spinal cord injury). For example excessive gas, abdominal pain, belching and dysphagia were significantly more prevalent among patients with grade 3 injury. Anorexia, early satiety, distention and constipation were significantly more prevalent among patients with grade 2 injury.

In conclusion, gastrointestinal disorders are relatively frequent among injured people of earthquake and Excessive gas, abdominal pain, belching and dysphagia were more prevalent among patients with grade 3 injury.

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