LETTER TO THE EDITOR

Metabolic syndrome in survivors from the 2009 earthquake in Italy

On 6 April 2009 a devastating earthquake struck the Italian town of L'Aquila. The exposure to such a severe trauma can significantly affect the health status of the survivors due to conditions of persistent stress (long stays away from home, reduced participation in exercise, sudden disruption of the social environment, changed food quality and quantity). In the 6 months following the earthquake a study was conducted by the Nucleus of pharmacist volunteers of the Italian Civil Protection (Abruzzo, Italy) to evaluate the potential development of Metabolic Syndrome (MS), as a possible consequence of pathophysiological adaptation to chronic stress [1].

The study was performed on 278 unselected, voluntary individuals during a 20-day recruitment phase carried out in an emergency area using a camper appropriately equipped. Individuals have attended the emergency area for various reasons, and not always because they required a medical consultation. Biochemical analyses were performed using automatic devices (REFLOTRON, Roche Diagnostic and In2it, Bio-Rad, VODEN Medical, Meda (MI), Italy). The study group was compared to the cohort of the MOLI-SANI Study, randomly recruited from general population in the Molise region (Italy). A subsample of 5442 men and 8081 women frequency-matched for sex and age the L'Aquila group. MS was defined according to Adult Treatment Panel III criteria [2].

The two groups were comparable in the prevalence of history of hypertension (36% and 40% in L'Aquila and MOLI-SANI, respectively, $P = 0.10$) or diabetes (9.2% and 7.8%, $P = 0.30$), whereas the prevalence of dyslipidemia in MOLI-SANI group was higher (19% and 25%, $P = 0.010$). This information refers to the population's health status before the earthquake, so we can speculate that the two populations had been comparable before the event Individuals from the L'Aquila group had higher prevalence of MS as well as of components of MS, with the exception of blood pressure in men and of waist circumference and glucose in women (Table 1). A very high prevalence of MS persists in the fasting subgroup, or recalculating MS prevalence after a reduction of triglyceride and glucose values in any non-fasting

individuals or in comparison with representative data from the Italian population at large, as derived from the *CUORE* project. The prevalence of MS was higher in individuals staying in hotels (68%) or camps (53%) than among those who remained at home after the earthquake (42%).

Interestingly, Pollice et al. have recently demonstrated psychological distress and post traumatic stress disorder in young survivors of the L'Aquila earthquake [3]. This finding, confirms that a natural disaster produces high psychological distress with long-term sequelae [4,5]. Although mental stress can correlate with long-term worsening health conditions and incidence of cardiovascular disease [6], social disruption, displacement, or dietary and lifestyle changes might all have contributed to the increased risk factor status of L'Aquila earthquake survivors. Many people reported eating delivered foods, instant food products, fast foods and snacks in larger quantities and frequencies than usual. Of note, the prevalence of MS was significantly higher in individuals staying in hotels or camps than among those who remained at own home.

However, some cautions should be taken in considering our findings, given the observational nature of our work. In addition, we recognize that the study design (non random selection of the population) does not rule out the possibility that individuals included in the study might represent a selected population, not representative of the overall L'Aquila population.

Although only lipid components of the MS were significantly different in both men and women when compared with the general population, our findings indicate that a natural disaster such as an earthquake can be associated with increased prevalence of MS, probably induced by psychological stress and modification in lifestyle. This suggests that early intervention among survivors of collective trauma such as a devastating earthquake should be a primary goal for a program of Public Health. Such action can also be used prospectively to contain the increased health risk associated with natural disaster exposure.

Disclosures

None.

Table 1 General characteristics and metabolic syndrome (MetS).

Characteristic	L'Aquila				MOLI-SANI		P-values[a]	Progetto CUORE #	
	Mean or N	(SD) or %	Mean or N	(SD) or %	Mean or N	(SD) or %		Mean	(SD) or %
Men	**All (N = 116)**		**Fasting (N = 27)**		**N = 5442**				
Age (yr)	63	(11)	61	(15)	62	(13)	0.21		
Body mass index (Kg/m^2)	27	(4)	27	(4)	28	(4)	0.0066	27	(4)
SBP (mmHg)	153	(21)	156	(23)	147	(21)	0.0049	133	(17)
DBP (mmHg)	89	(9)	90	(7)	83	(10)	<0.0001	85	(11)
Total cholesterol (mg/dL)	196	(42)	193	(40)	206	(41)	0.015	202	(41)
HDL cholesterol (mg/dL)	45	(12)	44	(12)	53	(13)	<0.0001	48	(13)
Triglycerides (mg/dL)	194	(89)	154	(66)	142	(90)	<0.0001		
Glycemia (mg/dL)	105	(38)	105	(33)	108	(30)	0.016	93	(28)
Metabolic syndrome (yes)	57	50%	13	50%	1616	30%	<0.0001		26%
Component of MetS									
Waist circumference ≥102 cm	54	47%	12	44%	1664	31%	0.0003		
Triglycerides ≥ 150 mg/dl	77	66%	16	59%	1790	33%	<0.0001		
HDL <40 mg/dl	41	35%	9	33%	832	15%	<0.0001		
BP ≥ 130/85 mm Hg or treated	103	89%	25	93%	4609	85%	0.40		
Glucose ≥ 110 mg/dl or treated	22	19%	7	27%	1741	32%	0.0003		
Women	**All (N = 162)**		**Fasting (N = 46)**		**N = 8081**				
Age (yr)	59	(12)	57	(11)	59	(11)	0.89		
Body Mass Index (Kg/m^2)	26	(5)	26	(5)	28	(5)	<0.0001	28	(5)
SBP (mmHg)	143	(18)	140	(19)	142	(22)	0.44	132	(18)
DBP (mmHg)	84	(9)	87	(10)	81	(10)	0.0001	83	(10)
Total cholesterol (mg/dL)	207	(35)	202	(36)	220	(42)	<0.0001	202	(46)
HDL cholesterol (mg/dL)	53	(15)	51	(18)	63	(15)	<0.0001	55	(14)
Triglycerides (mg/dL)	197	(98)	196	(104)	117	(66)	<0.0001		
Glycemia (mg/dL)	100	(31)	96	(20)	99	(24)	0.42	87	(28)
Metabolic Syndrome (yes)	97	60%	25	54%	2381	30%	<0.0001		28%
Component of MetS									
Waist circumference ≥102 cm	99	62%	28	61%	5171	64%	0.50		
Triglycerides ≥ 150 mg/dl	119	73%	33	72%	1705	21%	<0.0001		
HDL <50 mg/dl	70	43%	23	50%	1463	18%	<0.0001		
BP ≥ 130/85 mm Hg or treated	137	85%	35	76%	5901	73%	0.0003		
Glucose ≥ 110 mg/dl or treated	32	20%	10	22%	1377	17%	0.40		

[a] P-values are for L'Aquila (ALL) *versus* MOLI-SANI comparison; it was conducted using both univariable analysis conditional to match and unconditional multivariable analyses adjusted for age and sex, and the findings were virtually identical # http://www.cuore.iss.it.

Competing interests

The authors have declared that no competing interests exist.

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