BRIEF REPORT

A Quantitative Analysis of Antidepressant and Antipsychotic Prescriptions Following an Earthquake in Italy

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Because natural disasters provoke an increase in mental and medical disorders in survivors, an increase in psychotropic prescriptions has been observed following disasters. This study assesses the pharmacoepidemiology of antidepressant and antipsychotic drug prescriptions after an earthquake in Italy by using an administrative database. Statins and diabetic medications served as control medications. Comparison of the rates in the 6 months after the earthquake to the same period one year before revealed a 37% increase of new prescriptions for antidepressants and a 129% increase for antipsychotic prescriptions. Older age and female gender was associated with the increased number of prescriptions.

Even though clinical epidemiology has produced a number of studies on traumatic experiences after different kind of disasters (Galea, Nandi, & Vlahov, 2005), there is limited information on the pharmacoepidemiology of drug prescriptions after natural disasters or mass trauma (Boscarino, Galea, Ahern, Resnick, & Vlahov, 2003; Di Maggio, Galea, & Madrid, 2007). The need for immediate care for psychological distress after natural disasters (Brewin, Andrews, & Valentine, 2000; Leon, 2004; Norris, FriedmanWatson, Byrne, Diaz, & Kaniasty, 2002; van den Berg, Grievink, Yzermans, & Lebret, 2005) can lead to an increase in psychotropic drug prescriptions. The degree of this increase could help estimate the level of emotional disturbances in the context of general postdisaster difficulties. A pharmacoepidemiogical analysis (Hennessy, 2006; Strom, 2006) that utilizes an administrative database may provide guidance to general practitioners and other health agencies in optimizing the management of emotional disorders in such emergency settings (Di Maggio et al., 2007; Katz, Pellegrino, Pandya, Ng & DeLisi, 2002). Tracing antidepressant and antipsychotic prescriptions may be especially valuable.

On April 6, 2009, at 3:32 a.m., an earthquake (Richter magnitude 6.3) struck L'Aquila, Italy, a town with a population of 72,000 and a health district of 103,788. The L'Aquila earthquake caused the death of 309 people, with more than 1,000 injured and 66,000 displaced. This disaster provided the opportunity to retrospectively assess the incidence of new antidepressant and antipsychotic prescriptions using the resources of the National Health Care System. To compare changes in psychotropic medications to other medications, statins and antidiabetic prescriptions were also tracked. We looked at a 12-month timeframe prior to the earthquake and 6 months post-earthquake.

METHOD

Procedure

The study provided a quantitative evaluation of new prescriptions of antidepressants (Anatomical Therapeutic Chemical Classification System, code N06A) and antipsychotic (Anatomical Therapeutic Chemical Classification System, code N05A), as defined by the World Health Organization (2002) using the

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administrative electronic database records of the NHCS of L'Aquila. Benzodiazepine prescriptions were not assessed, as these are not refundable by the health system and therefore could not be traced in the database. Two medications were selected as controls to rule out a generalized drug prescription increase based on more vigilant health concerns and screening. These were statin drugs used for controlling cholesterol (code C10AA) and antidiabetic drugs (code A10).

The total number of new prescriptions was calculated for the period of 6–12 months prior to the earthquake, 6 months prior to earthquake, and 6 months after the earthquake. No substantial variations emerged between the two 6-month periods prior to the quake; therefore, we decided to analyze and compare the period 6–12 months prior to the earthquake to avoid confounding factors due to seasonal variations in drug prescription. We compared the period April–September 2008 to April–September 2009. Analyses were conducted for age ranges 14–44, 45–64, 65–74, and over 75 as suggested by the Working Group OSMED–National Epidemiology Registry (Gruppo di Lavoro OSMED, 2009).

Data Analyses

To estimate the size of the effect as well as the statistical significance, χ^2 and relative risk (RR) were derived to examine the impact of earthquake exposure on drug prescription patterns. We examined the number of new prescriptions for the total population before and after the earthquake (Campbell & Swinscow, 2009). The effect of sex was expressed with an odds ratio (OR). Age category analysis was performed with the Cochrane-Armitage test for a linear trend (Fleiss, Levin, & Paik, 2003).

RESULTS

The total population analyzed was 103,788: this number can be considered quite stable because subjects could be easily traced in the electronic database using their social security number even if they had been displaced and had to relocate.

There were 833 new antipsychotic prescriptions and 2,176 new antidepressant prescriptions with an 8.03 per 1000 and 20.97 per 1000 rate of incidence, respectively. New prescriptions analysis documented an increase of 129.5% for antipsychotics, χ^2 (1, $N = 103.788$) = 184.69, $p < .001$; RR = 1.40; 95% CI [1.34, 1.45] and of 36.6% for antidepressants χ^2 (1, $N = 103.788$) = 90.18, $p < .001$; RR = 1.16, 95% CI [1.13, 1.19] . In the same period, there was an increase in incident prescriptions of statins and diabetic medication of 37% and of 51.4% respectively: χ^2 (1, $N = 103.788$) = 54.63, $p < .001$, RR = 1.16, 95% CI [1.12, 1.20] and χ^2 (1, $N = 103.788$) = 56.42, $p < .001$; RR = 1.20, 95% CI [1.15, 1.25].

Table 1 shows drug prescriptions by age and sex. Females showed higher prescription rates than males for both drugs (OR = 1.92 and 1.51 for antidepressants and antipsychotics, respectively). This effect was stronger for antidepressants in age ranges 15–44 and 45–64, and for antipsychotics in age ranges 45–64 and over 75 (OR = 2.41, 2.11, 1.57, and 1.43, respectively). The linear trend analysis showed a significant increase in drug prescription in elderly females, for both psychotropics. The result for antidepressants was $\chi^2_{trend} = 7.86$, $p = .025$. It was particularly strong for antipsychotics: $\chi^2_{trend} = 11.10$, $p = .005$.

DISCUSSION

In the 6 months following the earthquake the national health care system was partially replaced by civil defense because the local

Table 1. Gender and Age Distribution of New Antidepressants and Antipsychotics 6 Months Post-earthquake

Male	Female														
		Antidepressant Prescriptions							Antipsychotic Prescriptions						
Total sample		M	%	F	%	χ^2	OR	95% CI	M	%	F	%	χ^2	OR	95% CI
43,705	47,513	722	1.65	1,488	3.13	210.8***	1.92	[1.76, 2.11]	312	.71	509	1.07	32.6***	1.51	[1.31, 1.74]
Ages 15–44														
20,037	19,506	125	0.62	291	1.49	71.5***	2.41	[1.95, 2.98]	71	.35	53	.27	2.15	0.77	[0.54, 1.09]
Ages 45–64														
13,914	14,470	236	1.69	509	3.52	92.1***	2.11	[1.81, 2.47]	60	.43	98	.68	7.75*	1.57	[1.14, 2.17]
Ages 65–74														
5,076	5,696	170	3.34	256	4.49	9.3**	1.36	[1.11, 1.65]	55	1.08	59	1.03	0.05	0.96	[0.66, 1.38]
Ages 75 or older														
4,678	7,841	191	4.08	432	5.50	12.6**	1.37	[1.15, 1.63]	126	2.69	299	3.81	11.2***	1.43	[1.16, 1.77]

Note. M = Male, F = Female.
* $p < .05$. ** $p < .01$. *** $p < .001$.

services had been seriously affected. The town population, about 72,000 inhabitants, and the health district, approximately 103,000 inhabitants, received assistance in the emergency conditions that prevailed. In one sense, all residents were directly "exposed" to the disaster, though this clearly introduces a broad range of possible individual exposures (Galea, Nandi, & Vlahov, 2005; Leon, 2004). For example, all people were displaced in locations within a 150 km area from the town or in tents located in the urban area. Even 6 months after the earthquake, only 25% of the inhabitants were able to return to their homes. Because antidepressant and antipsychotic prescriptions can be considered a proxy measure of mental health issues, we found that the mental health needs of the inhabitants of L'Aquila increased in the first post-earthquake period we considered.

It is interesting to note that even in April–September 2008 there was an increase in prescriptions with an incidence of 3.50 per 1000 and 15.35 per 1000 for antipsychotics and antidepressants, respectively (Rossi, Stratta, & Allegrini, 2010). This figure is confirmed by data from a national examination of drug use in Italy regarding the increase in antidepressant prescriptions, which reached 17% from 2000 to 2008 (Gruppo di Lavoro OSMED, 2009). An opposite trend in the post-earthquake period was observed, with a greater increase of antipsychotics over antidepressants. The relative risk reported for antipsychotics, 1.40, allows us to compare the magnitude of the increase of prescriptions to the other drugs (antidepressants, diabetic medication, and statins) all of which showed smaller, but significant increases.

Trend analysis indicated that the increase in antipsychotic prescriptions was higher for elderly female subjects. It is likely that low-dose antipsychotics have been prescribed to treat agitation, anxiety, stress-related behavioral disturbances, or insomnia. Unfortunately, we do not have data on benzodiazepine prescriptions that could have supported this explanation. It is within reason that antidepressant use would show a larger increase in the 6 months postdisaster. In emergency situations, behavioral or externalizing problems could exceed mood or internalizing disorders (Mellsop, Bower, & Baxendine, 2010), leading to more antipsychotic than antidepressant prescriptions. Although we have no data about the actual onset of psychosis, given that more new prescriptions were prescribed to elderly female subjects, and that typical psychosis onset is much earlier in life, the increase in prescriptions is likely driven by postdisaster mental health problems.

A further observation concerns the appropriateness of prescribed drugs to a potentially vulnerable group such as the elderly. The majority of prescriptions were made by primary care physicians. This may partly explain the somewhat unusual increase in prescriptions for antipsychotic medications. It has been reported that antipsychotic medications are disproportionately prescribed to elderly subjects (Wang et al., 2005) and need further regulation (Alexopoulos, Streim, & Carpenter, 2004). This is particularly true in emergency and disaster situations (Ticehurst, Webster, Cart, & Lewin, 1996) , with some epidemiological reviews of natural disasters reporting a higher prevalence of mental disorders in women (Galea et al., 2005).

The fact that statins and diabetic medication also showed an increase suggests that an overall increase in drug prescription cannot be excluded due to general health demands in emergency situations. It has been reported that after a disaster, physical and mental health problems are strongly associated with trauma (Dirkzwager, Grievink, van der Velden, & Yzermans, 2006; Dirkzwager, van der Velden, Grievink, & Yzermans, 2007; van Kamp et al., 2005), which could explain multiple prescriptions. An additional explanation for the increase in prescriptions is that in the newly built communities postdisaster, medical inquiry was increased overall as well as integrated into social and public activities. Nevertheless, we should be very cautious in inferring actual medical conditions merely from drug prescriptions because there may be a number of reasons for the increase in prescriptions. One potential outcome of our analyses is the opportunity to promote a more appropriate prescription policy, one that avoids possible longer-term iatrogenic problems (Alexopoulos et al., 2004); such a policy would have more than local impact and benefit.

This first set of data should be regarded as a preliminary indicator of response for both the national system and for those subjects directly and indirectly affected by the earthquake. Whether these prescriptions are temporary, intermittent, or continuous prescriptions is not known and is one limitation of the study. The data from our analysis indicates that natural disasters can promote short-term mental health problems (Di Maggio et al., 2007; Katz et al., 2002), and that mental disorders are a key component of the public health issue postdisaster (Burkle, 1996; Car, Lewin, Webster, & Kenardy, 1997).

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