

# Prevalence of Posttraumatic Stress Disorder in a Coastal Fishing Village in Tamil Nadu, India, After the December 2004 Tsunami

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Two months after the December 2004 tsunami in Tamil Nadu, India, we surveyed adults aged 18 years or older in a severely affected coastal village using structured interviews and the Harvard Trauma Questionnaire. The prevalence of posttraumatic stress disorder was 12.7% (95% confidence interval [CI]=9.4%, 17.1%), and odds of posttraumatic stress disorder were higher among individuals with no household incomes, women, and those injured during the tsunami.

In addition to promoting feelings of safety, interventions aimed toward populations affected by the December 2004 tsunami need to focus on income-generating activities. Also, there is a need to target initiatives toward women and those individuals injured during the tsunami, given that these groups are more likely to experience posttraumatic stress disorder. (*Am J Public Health*. 2007;97:99–101. doi:10.2105/AJPH.2005.071167)

The tsunami that struck south and southeast Asia on December 26, 2004, was one of the worst natural disasters in history, with estimates of more than 280 000 deaths, 27 000 individuals missing, and approximately 1.2 million people displaced; in addition, the extensive damage to homes and property altered the lives of millions of people.<sup>1</sup> The unprecedented calamity affected many coastal districts

of Tamil Nadu, India, resulting in 7983 deaths and the need to relocate 44 207 individuals to camps and 499 962 to safer areas.<sup>2</sup>

In the absence of information on the mental health consequences of the tsunami in Tamil Nadu, we organized and conducted a community-based household survey among adults in a tsunami-affected coastal village. Our objectives were to estimate the prevalence among residents of posttraumatic stress disorder (PTSD), identify risk factors for PTSD, offer psychiatric help to those in need, and formulate culturally appropriate responses to address mental health problems in tsunami-affected communities.

## METHODS

We conducted a cross-sectional survey 2 months after the tsunami event in a severely affected coastal fishing village in the Cuddalore district of Tamil Nadu where 61 deaths and extensive damage to houses and property had occurred. After the tsunami, the village population was completely evacuated and accommodated in temporary shelters; according to a door-to-door census, 515 individuals (327 adults) were residing in these shelters. We obtained data on household and demographic characteristics, tsunami-related factors, and selected risk factors for trauma-related psychiatric disorders.

We used the Harvard Trauma Questionnaire<sup>3</sup> to assess PTSD. This instrument has been shown to be reliable in different languages<sup>4</sup> and has been used and validated in many countries, including poor countries.<sup>5–7</sup> To identify PTSD, we used algorithms based on *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*<sup>8</sup> criteria employed in earlier studies.<sup>9</sup>

Questionnaires were translated into Tamil, back-translated into English, and pilot-tested prior to the assessment. Trained field workers conducted the interviews privately in individuals' households and administered a general questionnaire and the Harvard Trauma Questionnaire to all consenting individuals. Two psychiatrists (1 man and 1 woman) were available to the community throughout the survey to provide professional assistance. Those seeking help were evaluated and treated if necessary. The primary care

physician was trained in the identification and treatment of common mental disorders, and follow-up mental health care was ensured through the existing primary care system.

We explained the purpose of the study to all the participants in the Tamil language and obtained their written informed consent. The database did not include personal identifiers, and all personal information confided to the 2 psychiatrists was managed confidentially.

## RESULTS

A total of 314 adults aged 18 years or older participated in the survey; the overall response rate was 96%. Participants' median age was 33 years, and their mean age was 35.8 years (SD=14, range=18–76 years). Sample characteristics are presented in Table 1. The prevalence of PTSD (identified via the Harvard Trauma Questionnaire) among the participants was 12.7% (n=40; 95% confidence interval [CI]=9.4, 17.1). Among both men and women, recurrent thoughts and sleep disturbance were the most prevalent PTSD symptoms; irritability and emotional numbness were the least prevalent symptoms. Thirty-one women and 16 men (15% of the overall sample) sought help from the psychiatrists. Among these individuals, 48.9% (n=23) were diagnosed with major depressive disorder and 31.9% (n=15) with PTSD. The level of agreement on PTSD diagnoses between the Harvard Trauma Questionnaire and the psychiatrists' independent evaluations was high ( $\kappa=0.8$ ).

A univariate analysis showed that, relative to their comparison groups (Table 1), individuals with no household incomes (odds ratio [OR]=2.93; 95% CI=1.25, 6.86), women (OR=2.83; 95% CI=1.36, 5.91), and those who had experienced a personal injury during the event (OR=2.81; 95% CI=1.25, 6.32) were nearly 3 times as likely to exhibit PTSD symptoms. In addition, those who had experienced a death in their family were more than twice as likely as those who had not to exhibit such symptoms (OR=2.05; 95% CI=1.05, 4.01). In a multivariate logistic regression analysis, odds of PTSD were higher (relative to comparison groups; Table 2) among individuals with no household incomes (OR=3.32; 95% CI=1.38, 7.99), women (OR=3.08; 95% CI=1.44, 6.58), and those

**TABLE 1—Sample Characteristics and Odds of Posttraumatic Stress Disorder After Tsunami Event in December 2004: Tamil Nadu, India, 2005**

	Overall, No. (%)	PTSD, No. (Row %)	PTSD Odds Ratio (95% Confidence Interval)	P
Gender				<.01
Women	161 (51.3)	29 (18)	2.83 (1.36, 5.91)	
Men	153 (48.7)	11 (7.2)	1.00	
Marital status				.25
Married	249 (79.3)	35 (14.1)	1.96 (0.74, 5.23)	
Not married	65 (20.7)	5 (7.7)	1.00	
Occupation				.28
Fisherman	106 (33.8)	10 (9.4)	0.61 (0.29, 1.32)	
Other	208 (66.2)	30 (14.4)	1.00	
Literacy status				.84
Illiterate	86 (27.4)	12 (14)	1.16 (0.56, 2.4)	
Literate	228 (72.6)	28 (12.3)	1.00	
Household income				<.05
No	202 (64.3)	33 (16.3)	2.93 (1.25, 6.86)	
Yes	112 (35.7)	7 (6.3)	1.00	
Household size				.16
<5	200 (63.7)	30 (13.6)	1.84 (0.86, 3.9)	
≥5	114 (36.3)	10 (8.8)	1.00	
Alcohol use				.41
Yes	92 (29.3)	9 (9.8)	0.67 (0.3, 1.47)	
No	222 (70.7)	31 (14)	1.00	
Sleep problems				.26
Yes	64 (20.4)	5 (7.8)	1.92 (0.72, 5.12)	
No	250 (79.6)	35 (14.0)	1.00	
Psychiatric help before tsunami				>.99
No	298 (94.9)	38 (12.8)	0.98 (0.1, 4.52)	
Yes	16 (5.1)	2 (12.5)	1.00	
Household damage				.17
Yes	281 (89.5)	38 (13.5)	2.42 (0.56, 10.54)	
No	33 (10.5)	2 (6.1)	1.00	
Boat damage				.23
Yes	239 (76.1)	34 (14.2)	1.91 (0.73, 5.30)	
No	75 (23.9)	6 (8.7)	1.00	
Personal injury during tsunami				<.05
Yes	193 (61.5)	32 (16.6)	2.81 (1.25, 6.32)	
No	121 (38.5)	8 (6.6)	1.00	
Death in family				.05
Yes	103 (32.8)	19 (18.5)	2.05 (1.05, 4.01)	
No	211(67.2)	21 (10)	1.00	
Perception of support received after tsunami				.42
Inadequate	104 (33.1)	16 (15.4)	1.41 (0.71, 2.79)	
Adequate	210 (66.9)	24 (11.4)	1.00	

Note. PTSD = Posttraumatic stress disorder.

**TABLE 2—Multivariate Logistic Regression Analysis of Factors Significantly Associated With PTSD After the Tsunami Event in December 2004: Tamil Nadu, India, 2005**

	Adjusted Odds Ratio (95% Confidence Interval)	P
Gender		<.01
Men	1.00	
Women	3.08 (1.44, 6.58)	
Household income		<.01
Yes	1.00	
No	3.32 (1.38, 7.99)	
Death in family		.061
No	1.00	
Yes	1.97 (0.97, 4.00)	
Personal injury during tsunami		<.05
No	1.00	
Yes	2.93 (1.27, 6.77)	

Note. PTSD = posttraumatic stress disorder. All variables with a P value of .05 or less in the univariate analysis were entered into the multivariate logistic regression analysis.

injured during the tsunami (OR=2.93; 95% CI=1.27, 6.77).

**DISCUSSION**

The findings of our study indicate that in a severely affected coastal fishing village in the Cudalore district of Tamil Nadu, India, PTSD

was common among adults aged 18 years or older (12.7%). The odds of PTSD were higher among individuals with no household incomes, women, and those individuals injured during the tsunami.

Because our survey was conducted in a single, severely affected village, it is difficult to generalize the findings to all tsunami-affected

communities. However, the data could be used to conduct further investigations as well as to plan social and mental health interventions for individuals affected by such disasters. Given our finding that individuals with no household incomes were more likely to experience PTSD, implementing social interventions such as income-generating activities and facilitating early return to work are critical.<sup>10</sup> Also, initiatives focusing on women should be a priority. It has been shown that women exposed to trauma are more likely than men with such exposure to develop PTSD,<sup>11</sup> and, apart from biological factors, cultural and social issues could explain this difference in women's vulnerability to PTSD.<sup>12</sup>

Because individuals injured during the tsunami were more likely to experience PTSD, it was important to provide support and promote a feeling of safety among them. Trained field researchers administered the Harvard Trauma Questionnaire, and the diagnoses generated through this instrument were in good agreement with the clinical diagnoses made by psychiatrists. Capacity for mental health delivery<sup>13</sup> can be enhanced by training local

personnel in making assessments,<sup>14</sup> particularly assessments of those experiencing injuries, and further referrals. Depression is prevalent among tsunami-affected individuals seeking mental health assistance but can be managed at the community level. Most of the approximately 3000 psychiatrists in India are located in urban areas,<sup>15</sup> and thus, in rural areas, it is necessary to provide treatment for disorders such as depression through general medical doctors. Our experience suggested the feasibility of training primary care doctors in the management of common psychiatric disorders.

In conclusion, interventions designed to reduce PTSD among populations affected by the December 2004 tsunami should focus on women and individuals suffering personal injuries, and these interventions should support income-generating activities. The trained field personnel can assist with mental health assessments and referrals, and the existing rural health care services can be used to provide treatment for common psychiatric disorders. ■

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### Contributors

M.S. Kumar drafted the article, and all of the coauthors contributed to conceptualization of ideas, interpretation of findings, and review of the article. M.S. Kumar, M.V. Murhekar, Y. Hutin, and M.D. Gupte designed and supervised the implementation of the project. M.V. Murhekar analyzed the data.

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### Human Participant Protection

This study was approved by the ethics committee of the National Institute of Epidemiology, Indian Council of Medical Research. All of the survey participants provided written consent for participation after having been provided an explanation about the study in a language they were able to comprehend. The database did not include personal identifiers, and all personal information confided to the 2 psychiatrists was managed confidentially.

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