

Chelyabinsk event: injuries

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Abstract

Data on injuries caused by the impact of the Chelyabinsk meteoroid are reported. The data were collected based on interviews of eyewitnesses and on the official sources.

1. Introduction

In the morning of 2013 February 15 (at 3:20 UT), a 20m in size meteoroid entered the Earth atmosphere in the Chelyabinsk Region of Russia and caused an airburst strong enough to create widespread glass damage [1]. This event is the first impact which resulted in numerous injuries in the surroundings. Most recent tally shows that 1613 people asked for medical assistance at hospitals, much more people were affected but didn't ask for medical help.

2. Main sources of the information

Most people asking for medical assistance did so on the day of the event (~1200, Figure 1) [2]. Most injuries were caused by cuts from broken glass and by trauma from the impact of the shock wave (falls and being hit by objects, causing brain concussions, bruises, etc.). In the next days, more people reported in. The reasons given were vegetative-emotional syndrome, reaction to stress, hypertension. The same tendency was for hospitalized people. A "call-in phone line" was organized for psychological help.

69 people were hospitalized, 2 in serious condition (1-cut eyeball, 2-spinal fracture, both from Kopeysk, evacuated for treating to Moscow). The fraction of injured people was largest in regions closer to the trajectory the most populated. One week after the event 38 people still were in hospitals (Figure 2-3).

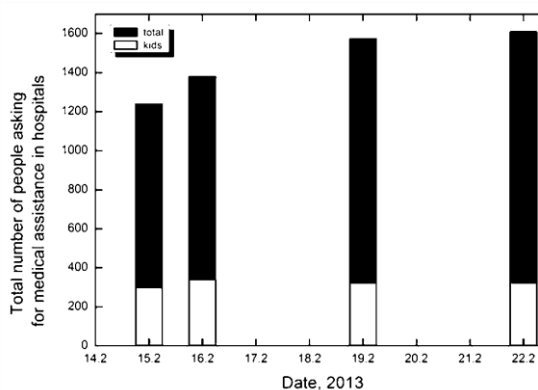


Figure 1: Summarized number of people asking for medical assistance in hospitals (empty days – absence of precise data).

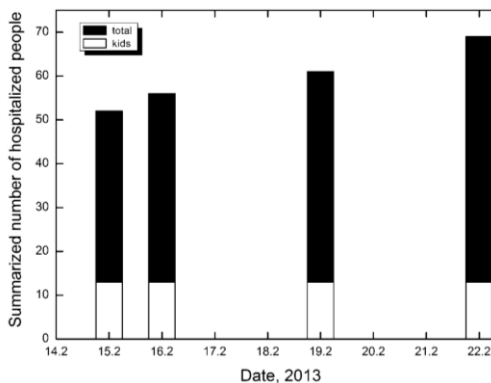


Figure 2. Increase of summarized number of hospitalized people (empty days – absence of precise data).

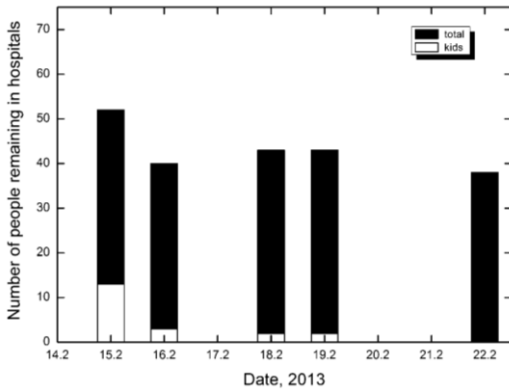


Figure 3. Number of people remaining in hospitals (empty days – absence of precise data).

1754 residents filled out web-based query forms, which provide information about sensations of heat, smells, sounds, the occurrence of sunburn, and the nature of injuries. Of the 377 people affected, 22 (5.8%) reported sunburn, 210 (55.7%) felt eyes hurt, 14 (3.7%) sensed retinal burns (no official data), 82 (21.7%) sensed temporal stunning, 37 (9.8%) reported the brain concussion.

Telephone interview with residents of Chelyabinsk 23-24 February 2013 (500 respondents) was organized by Public Opinion Foundation (FOM). Two percent of respondents reported personal injuries, 7% of respondents said that relatives were affected.

There were no reported damage of eardrums, so we may suppose that overpressure never exceeded 16.5 kPa (threshold level, probability of eardrum rupture is 1% [3]). According to Gel'fand and Sil'nikov [4] 10% of people suffer from temporal hearing loss when shockwave pressure is 1.4 kPa. So we can suppose that overpressure might be 1kPa and higher, which also agrees with the data on the broken out glass [5].

New information was obtained from official data kindly provided by few hospitals in the area. Few bone fractures cases were confirmed (previously not reported).

3. Summary

As it was mentioned above the impact of relatively small asteroid caused numerous injuries. The detail study of their reasons, types and distribution in the

impact area provides important information. A better understanding of what happened might help future impact hazard mitigation efforts.

Acknowledgements

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