

THE INFLUENCE OF METEOROLOGICAL PARAMETERS ON INTENTIONAL SELF-HARM EMERGENCY ADMISSIONS

Hrvoje Falak¹, Ante Silić², Majda Golob¹, Ana Perišić³, Andro Košec² & Mario Udovičić¹

¹Department of Internal Medicine, University Hospital Dubrava, Zagreb, Croatia

²University Hospital Center Sestre Milosrdnice, Zagreb, Croatia

³Polytechnic of Šibenik, Šibenik, Croatia

* * * * *

Dear Editor,

The confounding influence of meteorological parameters on human health and behavior has been widely observed from ancient history onwards. Intentional self-harm emergency admissions are critical issues among the general population and are classified among the leading causes of death and injuries worldwide. Approximately 3 million individuals die by suicide each year (Nock et al. 2008).

The aim of this research was to test the hypothesis of a positive association between meteorological parameters and self-harm incidents. It was tested in the Krapinsko-zagorska county, Republic of Croatia, that includes about 130,000 inhabitants. This study is based on retrospective evaluation of intentional self-harm admissions to Emergency Medical Departments in Krapina-Zagorje County, Croatia, registered in one year (between April 2012 and March 2013).

This study differentiates days with no emergency admissions and days with at least 1 emergency admission using a categorical binary outcome. The binary outcome was compared with the meteorological conditions on that specific day and meteorological conditions on the preceding day. The meteorological parameters were considered as possible predictors and were based on data collected by the Meteorological and Hydrological Service of Croatia. The parameters included temperature measured at 7 AM (°C), temperature measured at 2 PM (33°C), maximum, daily temperature (°C), minimum daily temperature (°C), temperature amplitude (°C), humidity measured at 7 AM (%), humidity measured at 2 PM (%), pressure measured at 7 AM (hPa), pressure measured at 2 PM (hPa), cloud cover at 7 AM and cloud cover at 2 PM (decas), mean wind speed (m/s) and season (categorical variables).

Most of the emergency admissions occurred during winter (33.33%) and spring (30.16%), while lower emergency admission frequencies were recorded during summer (19.05%) and fall (17.46%). Air pressure at 2 PM is significantly negatively related to emergency admission odds. An increase of 10 hPa in air pressure at 2 PM was accompanied by a 78.17% decrease in emergency admission odds and this decrease could be as little as 0.3% or high as 95.2% with a 95% confidence interval (while keeping all other variables in the model constant). Mean daily wind speed is significantly related

to emergency admission odds. The relationship is non-linear in logit, thus the effect must be described at each level. The emergency admission odds are positively related to mean wind speed for mean daily wind speed up to 2.539 m/s. At wind speed of 1 m/s, an increase in 1 m/s in wind speed was accompanied by 63.35% increase in emergency admission odds and this increase could be as little as 3.92% or high as 156.78% with a 95% confidence interval (while keeping all other variables in the model constant). The emergency admission odds are negatively related to mean wind speed for mean daily wind speed higher than 2.539 m/s. Moreover, at wind speed 5 m/s, an increase in 1 m/s in wind speed was accompanied by 99.63% decrease in emergency admission odds and this decrease could be as little as 10.32% or high as 100% with 95% confidence (keeping all other variables in the model constant). Winter season is significantly positively associated with emergency admission odds. For instance, admissions during winter are 2.215 times as likely as emergency admissions during fall. The multiple logistic regression model was statistically significant. The area under the ROC curve (AUC=66.12%) which is measuring the model's ability to discriminate between the days with admissions and days without admission, suggests that the model provides acceptable discrimination between the days with emergency admissions and days without emergency admissions. The residual deviance (D=303.98, df=356, p=0.98) suggests that there is no evidence on the lack of model fit.

The results in this research support the hypothesis of an influence of meteorological parameters on emergency admissions of patients diagnosed with intentional self-harm. More precisely, the results showed that the emergency admission odds are significantly related to pressure and wind speed. This study has limitations that must be considered. The first limitation of our study is that the study period is rather short. It would be beneficial to include several years in order to capture possible seasonal variations in emergency admissions of patients diagnosed with intentional self-harm. The second limitation is due to aggregated data collection while the data collection tool only recorded the incidence of self-harm and did not delve into specifics such as number of instances or types of self-harm. Moreover, it would be interesting to examine separate models for

different age groups, as well as separate models for men and women. Some studies have shown opposite the correlation between meteorological factors and suicide attempt due to gender.

To conclude, meteorological factors may be helpful in predicting emergency admissions of patients diagnosed with intentional self-harm. In particular, emergency admission odds are significantly related to daily wind speed (non-linear logit) and pressure (negatively). Winter season is significantly positively associated with emergency admission odds.

Acknowledgements: None.

Conflict of interest: None to declare.

References

1. Nock MK, Borges G, Bromet EJ, Cha CB, Kessler RC, Lee S: Suicide and suicidal behavior. *Epidemiol Rev* 2008; 30:133-54

Correspondence:

Hrvoje Falak, MD

Department of Internal Medicine, Clinical Hospital Dubrava

Avenija G. Šuška 6, 10 000 Zagreb, Croatia

E-mail: hrvoje.falak@gmail.com