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Atmospheric front patterns and acute cardiovascular diseases, a new perspective in the cardiovascular threat of global climate change

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Background:

There is substantial evidence that the health threat of global climate change is real and it could be a medical emergency. The impact of climate change on health is mediated through atmospheric parameters which are direct environmental stressors on the human body and have a potential cardiovascular (CV) morbidity and mortality effect. Acute cardiovascular diseases (ACVDs) are already major public health issues and in the future unfavourable atmospheric situations, such as increasingly volatile fronts and their negative effects can further increase this problem. Despite evidence about the importance of different atmospheric parameters on health outcomes, there have been few results for atmospheric front patterns’ CV effects. Weather fronts are the most complex atmospheric phenomena therefore these atmospheric parameters might have the greatest influence on ACVDs.

Purpose:

We aimed to explore the effects of atmospheric front patterns on ACVDs.

Methods:

A time series Poisson-regression analysis was used to analyse 6499 ACVD hospital admissions, during a five-year period (2009-2013), in light of front patterns. Covariates were three-day (target day and the two previous days) front sequence patterns comprised of the five major front types (no front, warm front, occluded front, cold front, stationary front). Relative risk (RR) estimates for front effects were adjusted for seasonality. The relationship on all ACVDs combined and separately on patient groups by major CV risk factors (hypertension, hyperlipidaemia, diabetes, previous CV diseases) was examined.

Results:

We found that in general, front patterns containing warm front days had a detrimental effect. A warm front, when followed by two days with no fronts present, increased RR by 46% (CI: 4-89%, p=0.015). Cold fronts however were protective. A no front – cold front – occluded front pattern corresponded to a 28% (CI: 8-49%, p=0.037) decrease in RR, with this pattern being present in 1.1% of all days of the study period. Out of the group specific results an occluded front, following days with no fronts present, showed to have the largest effect on hyperlipidaemic patients, increasing RR by 144% (CI: 51-295%, p<0.001).

Conclusions:

This work provides both independent evidence of front patterns’ CV effects and a novel tool to investigate and help the understanding of complex associations between atmospheric fronts and ACVDs. The importance of
our findings is growing in the context that extreme atmospheric conditions and changes are likely to become more common in the future as a result of climate change. Medical meteorology may open up a new horizon and become an important field of preventive cardiology in the future. In conclusion, a better understanding of atmospheric front effects is of particular importance in order to help identify possible targets for future prevention strategies.