CORRELATION AND INFLUENCE OF WEATHER VARIABLES WITH ACUTE MYOCARDIAL INFARCTION

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ABSTRACT

This work shows how meteorological variables directly influence cardiovascular events, mainly acute myocardial infarction. Monthly, 2.702 diagnosis of acute myocardial infarction in the city of Campina Grande/PB were analysed. These data were collected in the Health municipal secretary´s office of Campina Grande/PB during the period of January 2000 to December 2009. The series were formalized by the data produced by the total observed during these ten years period, totaling 120 observations. The meteorological data were collected in the main meteorological station of the National Institute of Meteorology (INMET). To ascertain the influence of climatic factors in the onset of illness, this study tried to correlate these factors with the occurrence of morbidity and mortality from acute myocardial infarction, when the monthly averages of meteorological variables were studied.

Key Words: Weather variables, infarct

INTRODUCTION

The study of relations between the biosphere and the atmospheric environment has become nowadays a science whose purpose is to prevent people at risk .There is a growing need to increase research on the topic itself, especially by the great importance that such researches have in relation to human welfare, due to the influence of meteorological parameters on the human body. They show a branch of meteorology unexplored until recently in Brazil, due to the fact that most studies directed to this area is focused more for plants and animals than to humans.

Unsurprisingly climate change direct and indirectly affects on health, but there was never such attention to researches involving issues related to environmental variables and human health. What confirmes this new tendency of science are the various studies conducted worldwide by several professional researchers, both the exact sciences and biology, thus forming a union of these areas, increasing the level of research with an interdisciplinary approach, which seeks a better understanding of the interrelationships between living beings and the environment.

The changes that occur with the meteorological variables on the regions are seen as a concern by researchers in climatology. It is known that these changes not only influence the microclimate of these areas, but can also cause considerable physiological variations with regard to diseases related to climatic variables, exacerbating some pre-existing illnesses and promoting the development of others, becoming a problem of public health.

It is therefore of great importance to science to study the relationship of climate and health, which is an area of growing international concern on the part of health professionals and climatologists who jointly share information more deeply interdisciplinary between the Atmospheric Science and the Human Biology. Day after after, more evidences show that global warming could increase the chances of further spread of various diseases.

The World Health Organization (WHO) (2003), alert to the fact that chronic diseases, which included cardiovascular diseases are responsible for leading causes of death and disability worldwide, and its significant growth in countries development, alert to the potential impact on the poorer classes, representing a major challenge for the public health sector. Diseases of the circulatory system are a major public health problem in our country. They are the leading cause of death in Brazil, it´s been some decades.

Humans maintain their internal temperature regardless of outside, through different thermoregulatory processes according to their exposure to hot or cold. Due to the fact that these different physiological processes are regulated by specific enzymes and concentration of these is controlled by body temperature, thermal regulation may require a metabolic cost that not always the body is able to accomplish. Under these conditions the state of health may be compromised.

Identifying how climatic conditions affect the incidence of human morbidity, it´s important to implement the introduction of techniques to control the reduction of disease, using for this interdisciplinary between biology and climatology, in order to seek the welfare of man.

OBJECTIVES

The objective of this study was to evaluate changes in meteorological variables and correlations with acute myocardial infarction in Campina Grande, Paraíba State, Brazil in 2000 to 2009, identifying the occurrence of acute myocardial infarction due to weather variations and

getting its relationship with seasonal variations.

MATERALS AND METHODS

This study deals with an investigation of household-type observational, longitudinal time reference, since the same area at different times is investigated. From the data on exposures and frequency of the disease, one can then analyze, using several statistical methods, the association between the disease and certain meteorological variables.

The methods used in this context involve the use of methods of correlation or regression and linear models, single or multiple. They are suitable for investigating exposures more easily measurable at the population level and monitor the effectiveness of population interventions. The object of study area, was in Campina Grande - Paraíba, Brazil, located at 07 ° 13'50 "south latitude and 35 º 52'52" west longitude, altitude 543 m, with an area of 621Km^2 and with a population of approximately 383,764 inhabitants (IBGE, 2009).

The climate of the locality under study according to the Köppen classification is the type Aw'i considered as tropical humid, with rainy season from March to July, and an average total annual rainfall of 765 mm. Its dry season occurs from winter to summer (August-February), with average annual temperature of about 25°C, varying little throughout the year. In this paper, we analyzed monthly diagnoses of acute myocardial infarction in the city of Campina Grande / PB, totaling 2,702 cases of AMI. These data were collected in the Health Department of the Municipality of Campina Grande / PB corresponding to the period of January 2000 to December 2009. The series formalized by the data was produced by the total observed during the period of January 2000 to December 2009, totaling 120 observations. It is an important treatment in the meteorological data (independent variables) to match the period of data dependent variables (morbidity).

The meteorological data were collected in the main meteorological station of the National Institute of Meteorology (INMET) located in the Brazilian Agricultural Research Corporation (EMBRAPA) CNPA (National Research Center Cotton) in Campina Grande-PB. To verify the influences of climatic factors in the onset of illness, this study tried to correlate these elements with the occurrence of morbidity and mortality from acute myocardial infarction. For this work, the monthly averages of meteorological variables (independent variables) that had not still gone through any statistic filter were analysed.

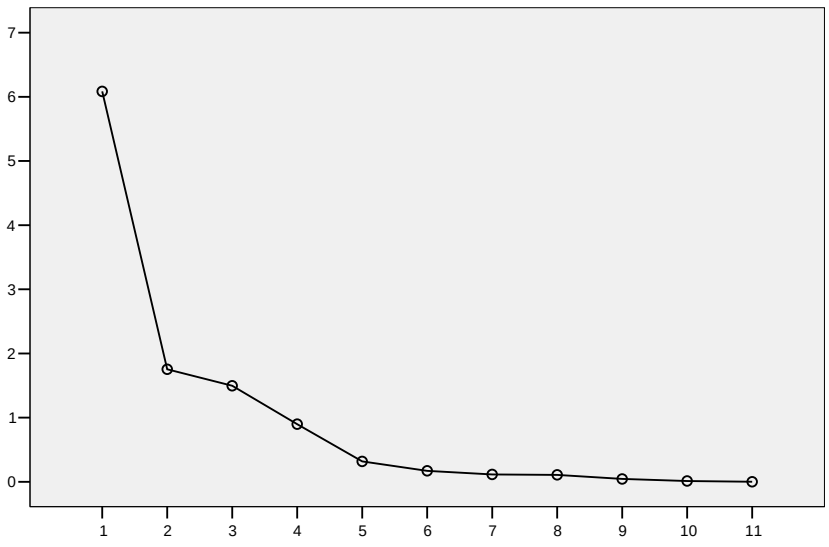
For the analysis of meteorological variables, data were standardize to apply statistical techniques, considering the methods of principal component analysis (PCA), smoothing Series Through the Use of Moving Averages, Linear Regression Analysis Multivariate (ARLM) as well as the statistical tool SPSS ® for Windows 9.0®.

RESULTS AND DISCUSSION

The results were obtained through observations made on 10 variables that were listed, as observed, to be evaluated in accordance with the methodology applied. Thus, the variables were placed in the statistical package SPSS for Windows ® which were obtained for each case of morbidity the main components that are formed by groups of independent variables that have a greater influence on each dependent variable, and then linear regression multivariate analysis was made.

For cases of acute myocardial infarction, ACP was made, where the total variance explained through the method of principal components analysis, four CPs were obtained, in which, through the total variance explained, the values were truncated above 1, where the inertia test showed which were the variable groups chosen . Thus it was observed that the variable studied in relation to a first CP is directly proportional to the maximum temperature, temperature range, sunshine, wind speed, evaporation and inversely proportional to relative humidity of air and rainfall.

It was applied the Kaiser-Meyer-Olkin (KMO) and Bartlett's test which corresponded to 76.6%. It was verified that the data fit that methodology principle, that is, when results are over 70% there is a an optimum correlation.



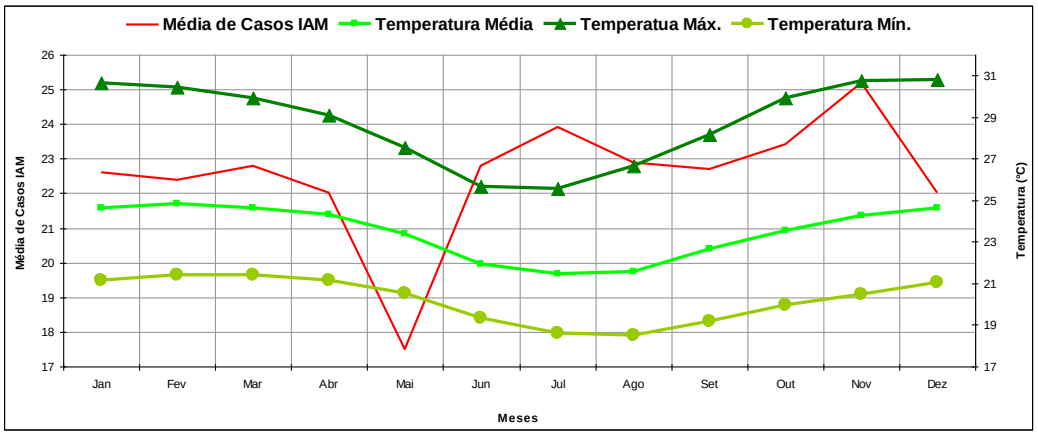
Inertia test for average media of AMI in the city of Campina Grande from January 2000 to December 2009

Rotated component matrix of the average of AMI in the city of Campina Grande January 2000 to December 2009, ACP extraction and Varimax rotation with Kaiser normalization, converging in five interactions

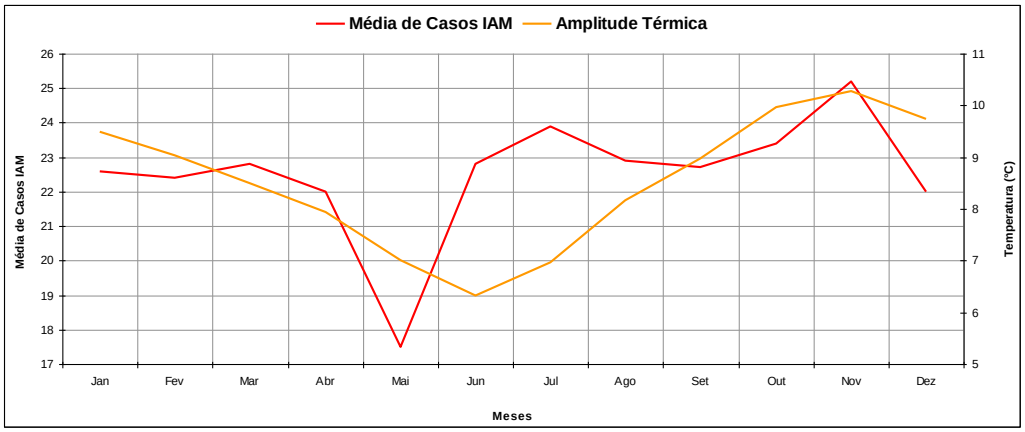
variables	components			
	1	2	3	4
Infarct	0,065	-0,043	0,056	0,994
Temperatura Média (ºC)	0,367	0,923	-0,016	-0,012
Average temperature (ºC)	0,671	0,728	0,023	0,020
Minimum temperature (ºC)	0,051	0,980	-0,071	-0,060
Temperature Range (ºC)	0,905	0,284	0,086	0,072
Relative Humidity (%)	-0,849	-0,225	0,301	0,092
Atmospheric Pressure (hPa)	0,059	-0,047	0,980	0,050
Insolation (w/m^3)	0,872	0,329	-0,184	0,033
Wind Speed (m s-1)	0,633	0,010	-0,753	-0,030
Rainfall (mm)	-0,873	0,054	-0,021	-0,090
Evaporation (mm)	0,855	0,396	-0,078	0,043

Kaiser-Meyer-Olkin (KMO) and Bartlett test for AMI

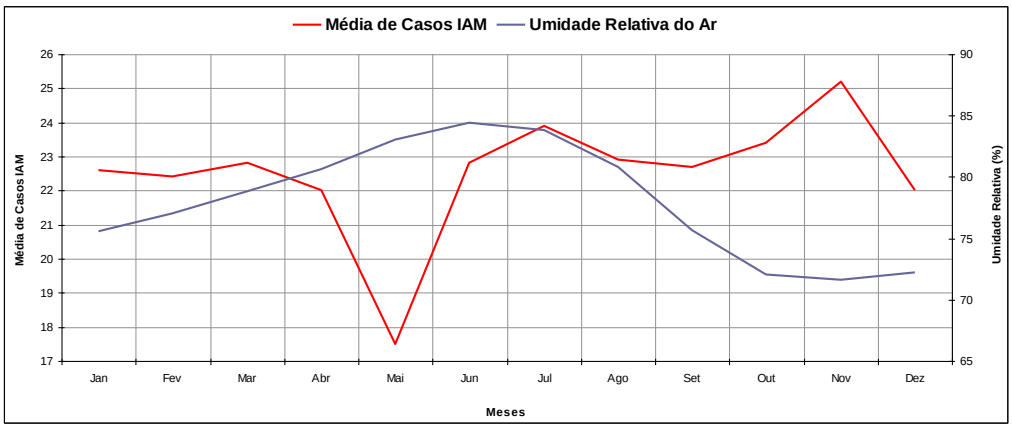
Kaiser-Meyer-Olkin measure of sampling adequacy.		0,766
Batlett test of sphericity	Approx. Chi-Square	2.331,508
	Df	55
	Sig.	0,000



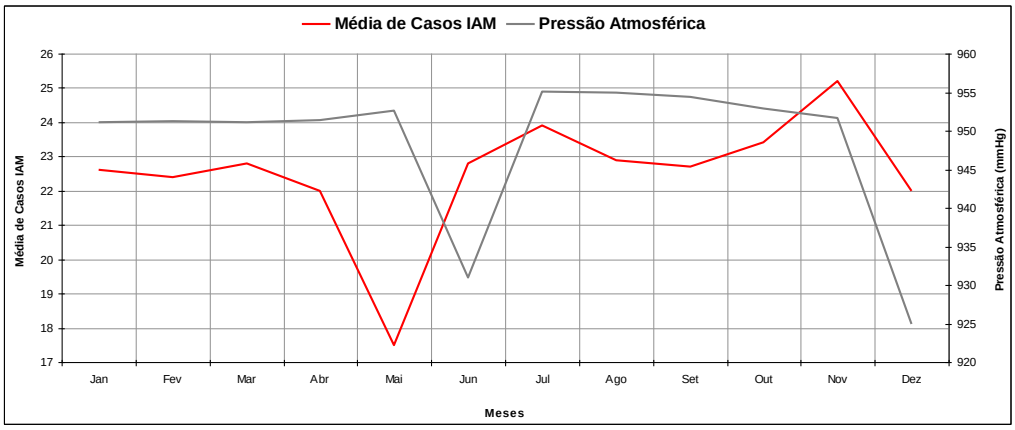
Relationship between the average of cases of AMI and average temperatures, maximum and minimum in the city of Campina Grande January 2000 to December 2009



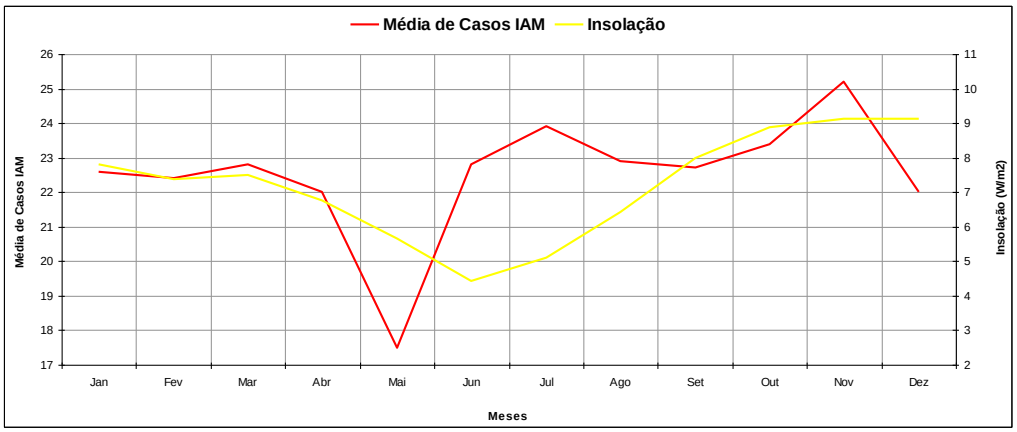
Relationship between the average of cases of AMI and temperature range in the city of Campina Grande January 2000 to December 2009



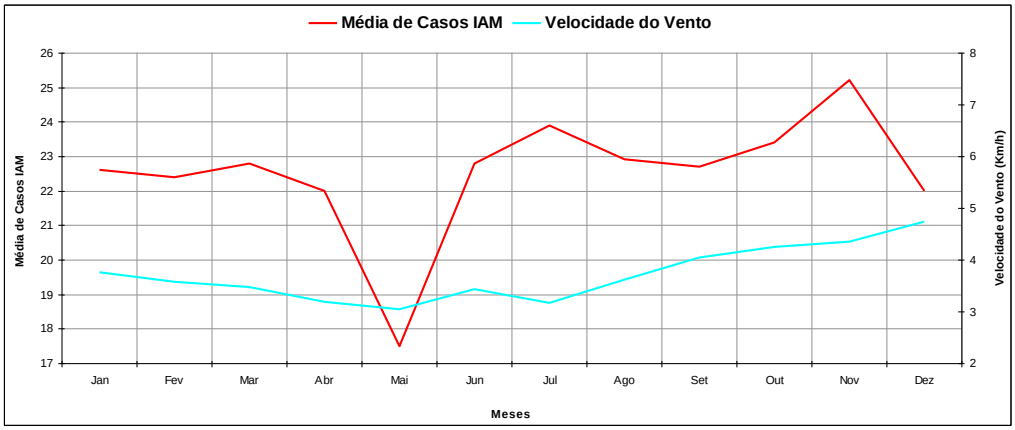
Relationship between the average of cases of AMI and relative humidity in the city of Campina Grande January 2000 to December 2009



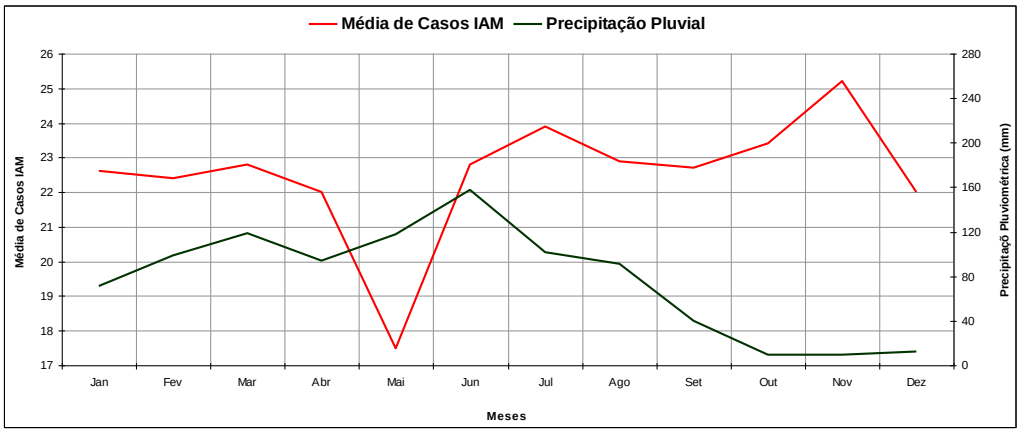
Relationship between the average of cases of AMI and atmospheric pressure in the city of Campina Grande January 2000 to December 2009



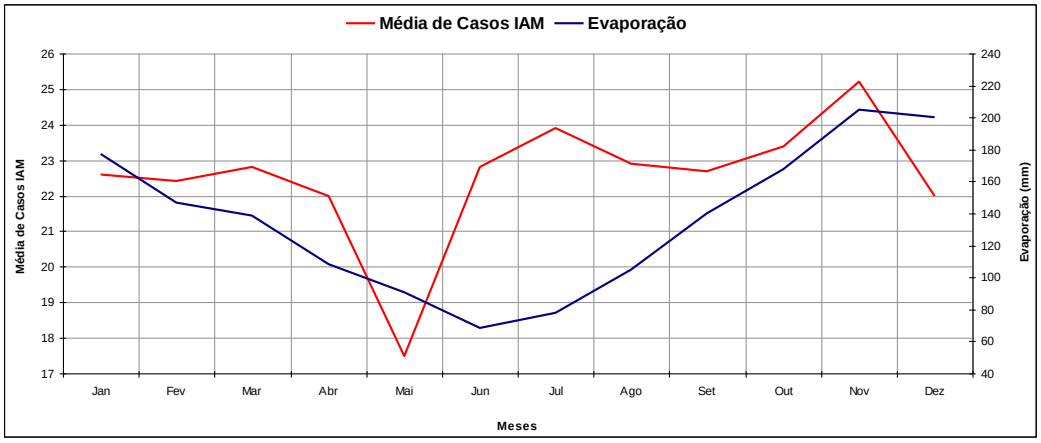
Relationship between the average insolation cases of AMI and the city of Campina Grande January 2000 to December 2009



Relationship between the average of cases of AMI and wind speed in the city of Campina Grande January 2000 to December 2009



Relationship between the average AMI cases and rainfall in the city of Campina Grande January 2000 to December 2009



Relationship between the average of cases of AMI and evaporation in the city of Campina Grande January 2000 to December 2009

CONCLUSIONS

Overall, the results show that the maximum and minimum temperatures have a direct correlation with acute myocardial infarction, as well as sunshine, wind speed and evaporation. Thus , the 1st CP consists of the following predictor variables: maximum temperature (positively), temperature range (positively), relative humidity (negatively), insolation (positively) wind speed (positively), rainfall (negatively) and evaporation (positively).

Within the specifications of the KMO test methodology, observed in this study (76.6%), it was verified that the data fit that methodology which tells us that over 50% there is correlation. From 50% to 60% there is weak to moderate correlation, above 60%, there is good correlation, above 70%, there is optimum correlation and from 80% to 100% there is exceptional correlation.

Thus, the data used had a great value for the use of this methodology component analysis.

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