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RESEARCH ARTICLE

CORONARY HEART DISEASE AND SEASONAL CLIMATIC IMPLICATIONS: A STUDY INVOLVING BORBOREMA REGION – PB

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ABSTRACT

Aim: To investigate the coronary heart disease aggravated by climate variations in Borborema region*****.

Method: It was used a quantitative non-experimental method in a cross-sectional and exploratory field research, conducted through medical records from *João XXIII* Hospital and the use of questionnaires to cardiac patients, from February 2010 to February 2012. The survey sample used consisted of 712 respondents, which was the total data collected. For data analysis, it was used the Pearson's correlation coefficient. It was considered for this study the maximum, minimum, and medium temperatures provided by INMET - the meteorological station of the National Institute of Meteorology, located on the premises of Embrapa - Brazilian Agricultural Research Corporation in the city of Campina Grande, Paraíba (PB), Brazil. The research was registered by the Ethics Committee of UEPB – State University of Paraíba, under number: CAAE 0007.0.133.000-1.

Results: The data revealed no relevant statistical correlation between coronary morbidity and climatic variations.

Conclusion: Climate variability in the researched area does little influence on the onset and / or worsening of coronary heart disease

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INTRODUCTION

Since modernity has emerged, men have experienced a significant revolution in their way of life. As a result, the number of people with high stress and unhealthy eating habits has increased. Therefore, the society has lived with a great number of cardiovascular disorders, and among them one of the most lethal diseases in this group: Coronary Insufficiency (CI). Coronary insufficiency is a pathological medical condition in which the coronary artery system has no physiological capacity to supply the myocardial oxygen demand and metabolites needs (Sociedade Brasileira de Cardiologia, 2008). The IC is considered a major worldwide public health issue. That is because besides being associated with high morbidity, it implies high costs to the health system, once the associated medical procedure (hospitalization, treatment, medication, etc.) have very high costs. Currently, an important mitigation tool of the effects of IC is the use of information from the weather (observations of weather and climate forecasts) for issuing alerts and adopting policies by public health officials (Mcgregor *et al*., 2006).

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The recent literature on the subject shows the importance that it has received lately. It addresses that the relationship between atmospheric variables and coronary insufficiency is not unique. People from different parts of the world, with different ages, genres and multiple lifestyles, are subject to different risks in certain atmospheric conditions (Goerre, 2007). In Brazil, weather forecasts have experienced intense increase in quality in recent decades. That means the establishment of consistent relationships between weather and climate variables, and the occurrence of IC can contribute substantially to public health policy. Nevertheless, Brazilian scientific production is very scarce and most of the studies in this area although associate the disease with the climatic variation, it only addresses the relationship of it with the pollution. Another aspect that also corroborates the complexity of the subject is that the assessment of the likely impacts of the procedures of global climate changes on health is hampered by the inadequacy of traditional methodologies, used for the analysis of similarities between environment and health. The major challenges are the disability or lack of historical data on the incidence of diseases in Brazil. Most of the national database was created in the 1980s and 1990s encumbering an assessment of long-term trends (Barcellos, 2009). Recent studies point to the

emblematic perception of the relationship between atmospheric variables and the health of human beings signalling the need to expand the understanding of its specificities, so that mitigation measures involving the use of weather and climate information can be adopted by public health services and the population in general. Thus, the effects of atmospheric conditions, such as climate fluctuations, that cause migration; the extremes of seasonal times, that cause hunger; and the various disasters, which lead to death and destruction, could be considered phenomena of global magnitude.

Having access to data from climate and environmental nature in a more direct way is the key to the new challenges of health prevention in territorial basis. Working this integration is vital to the health sector. It does not only require a technological connection, but also a multi institutional, interdisciplinary and multidisciplinary effort, as well as the formation of human resources for health, with capacity to produce, collect, store, retrieve, process and analyse such data and information. To achieve these parameters, it is indispensable the use of Social and Environmental Information Systems for health from local to national. Given this approach, the clinical experience and the catalogued hospital records in Campina Grande-PB, suggested that there may be seasonality in the disease events, especially in the coronary ones (IC). Therefore, it is important to understand the prevalence relationship between seasonality and cardiovascular diseases. In order to achieve this purpose, this study aimed to investigate coronary heart disease aggravated by climate variations in Borborema region – PB.

MATERIALS AND METHODS

This research was conducted in Borborema region, more precisely in the city of Campina Grande - PB, located between coast and hinterland, which has a semi-arid climate that predominates in the state's countryside and in the western part of the city.

It was used a quantitative non-experimental method in a cross-sectional and exploratory field research, conducted through medical records from João XXIII Hospital (a reference in cardiovascular care and heart surgery in the studied area) and the use of questionnaires to cardiac patients, from February 2010 to February 2012. The survey sample used consisted of 712 respondents, which was the total data collected. Regarding scientific research, it was essential to broach the diseases considered in this study, and take morbidity as the most important parameter. Climatic parameters were surveyed, more precisely the ambient temperature in the natural determining incidence of cardiovascular diseases in people, regardless of gender. In the lack of data information of cardiovascular disease and seasonality, it was elaborated a database with questions that consider both the cardiac profile, and the symptoms involving personal and medical history – as clinical indication, among others -, properly catalogued in the period of research.

This research is registered at UEPB- State University of Paraíba, in the PRPGP - Postgraduate Studies and Research Department - CEP - Ethics Committee Research involving human beings, Ministry of Health - SISNEP - National System of Ethics Research, under number: CAAE 0007.0.133.000-1. For data analysis, the method used was Pearson's correlation coefficient, which is the measure of the degree of linear correlation between two quantitative variables. It was considered for this study the maximum, minimum and medium temperatures provided by INMET - the meteorological station of the National Institute of Meteorology, located on the premises of Embrapa - Brazilian Agricultural Research Corporation in the city of Campina Grande, Paraíba, Brazil.

Data analysis

Comorbidities - as Table 1 presents, 22.2% of respondents had systemic arterial hypertension; 17.8% had Diabetes Mellitus and around 12.6% had diabetes mellitus and systemic arterial hypertension.

Table 1. Percentage distribution of comorbidities of cardiac patients from João XXIII Hospital - Campina Grande – PB

Comorbidity	Quantity	Percentage (%)
Systemic arterial hypertention	158	22,2%
Without specific cause	135	19,0%
Diabetes mellitus	127	17,8%
Smoking	105	14,7%
Dyslypidaemia	97	13,6%
Diabetes mellitus and systemic arterial Hypertention	90	12,6%
Total	712	100%

Source: direct investigation (2012)

Table 2. Percentage distribution of electrocardiographic findings of cardiac patients from João XXIII Hospital - Campina Grande – PB

Comorbidity	Quantity	Percentage (%)
Lower Ischemia	161	22,6%
Anterior Ischemia	110	15,6%
Cardiac Arrhythmia	109	15,4%
Abnormalities of Ventricular Repolarization	102	14,5%
Ventricular Hypertrophy	94	13,2%
Lateral Ischemia	89	12,1%
Posterior Ischemia	47	6,6%
Total	712	100%

Source: direct investigation (2012)

However, approximately 19.0% reached the hospital without any definite cause. The prevalence of systemic arterial hypertension increases progressively with age, being upper to 50% among the elderly (Diretriz da Sociedade Brasileira, 2008). Considering the ages until 55 years old, a higher percentage of men have systemic arterial hypertension. On the other hand, the percentage of women is slightly higher between 55 and 74 years old, and considering the ages superior to 75 years old, the female predominance is significantly higher. Thus, approximately 80% of women eventually develop systemic arterial hypertension in menopausal. Therefore, the incidence of systemic arterial hypertension increases with age as much as with the early postmenopausal.

Table 3. Percentage distribution of the functional class of cardiac patients from João XXIII Hospital - Campina Grande – PB

Comorbidity	Quantity	Percentage (%)
Nyha 2	444	62,4%
Nyha 3	204	28,7%
Nyha 1	60	8,4%
Nyha 4	4	0,6%
Total	712	100%

Source: Direct Research (2012)

Table 4. Percentage distribution of the reason of hospitalization of the cardiopathic patients from João XXIII Hospital – Campina Grande – PB

Comorbidity	Quantity	Percentage (%)
Coronary Insufficiency	499	70,1%
Hypertensive Crisis	149	20,9%
Outher	64	9,0%
total	712	100%

Source: Direct Research (2012)

Table 5. Percentage distribution of electrocardiogram numbers hospitalization of the cardiopathic patients from João XXIII Hospital – Campina Grande – PB

Comorbidity	Quantity	Percentage (%)
More than one electrocardiogram	129	18,1%
One Electrocardiogram	583	81,9%
Total	712	100%

Source: Direct Research (2012)

Nonetheless, the occurrence of hypertension depends on the interaction between genetic susceptibility and environmental factors, although it is not yet fully understood how these interactions may occur. Smoking, dyslipidaemia and diabetes are also present in the list of potentially harmful factors for coronary heart diseases. Paradoxically, there is a greater manifestation of coronary heart disease being associated with the new conditions of life that are often imposed on us. The increase of stress, the unhealthy eating habits and the few hours that are dedicated to sleep, are just some examples of these factors, which corroborate this contradiction.

Diabetes mellitus, especially type 2 (DM2), is also considered one of the most serious public health issues around the world, particularly in Brazil, because of the it high prevalence that stands out as an important cardiovascular risk factor. Cardiovascular diseases in patients with DM2 are responsible for 80% of decease. In diabetics, the relative risk of death for patients with cardiovascular disease adjusted for age is about three times higher than for the general population (Stamler, 1993). Nevertheless, in recent years an observational study indicated that the risk of cardiovascular diseases mortality in patients with DM2 and non-diabetic patients who have suffered myocardial infarction are similar (Haffner, 1998). Smoking is considered one of the major public health issues, and millions of people in the world are affected by its effects. Approximately 1.2 billion people smoke and almost four million people die each year from diseases associated with smoking (Who, 2003). If current expansion trends of consumption are maintained, around 2030 it will reach ten million deaths annually, constituting a risk factor for dozens of diseases, including coronary heart disease.

In the specialized literature there are several examples revealing the relationship between mortality and temperature variations, but little is known about changes in disease patterns (morbidity). Most of the studies of these climatic paroxysms that resort to statistical mortality were mainly conducted in mid-latitude regions, characterized not only by large annual temperature range, but also by significant variations in daily scale. This fact was not verified in our studied environment in which the atmospheric conditions does little change during the year, and does not imply in platelet aggregation and coronary spasms, that are studied during severe temperature fluctuations, especially in countries with temperate and polar climates (Kalkstein, 1989).

Electrocardiographic Findings - According to the studied participants' diagnostic, approximately 57.0% had some type of ischemia, being the lower ischemia the most common one, identified in 22.6% of cases, according to Table 2.

Functional Class - The participating patients in the study were classified according to the functional class of the New York Heart Association (NYHA). According to the data, 62.0% are in class 2 of the NYHA, since they have mild symptoms (mild breathlessness and / or angina) and slight limitation during normal activity. As for NYHA class 3, were catalogued 28.7% of the patients, whose marked characteristic is limitation of physical activity due to symptoms, even during low activities such as walking short distances (20 to 100 m). 8.4% of respondents were in NYHA class 1, because they did not have symptoms or limitation in ordinary physical activity, for instance, they did not present breathlessness when walking, climbing stairs etc. Finally, patients in NYHA class 4 (0.6%) are those with serious limitations that present symptoms even at rest. We can check the data in Table 3.

Reason of Hospitalization - Table 4 shows the reasons that led patients to the hospital. As can be seen 70.1% of the causes of hospitalization were for coronary insufficiency and 20.9% for hypertensive crisis associated with their clinical condition.

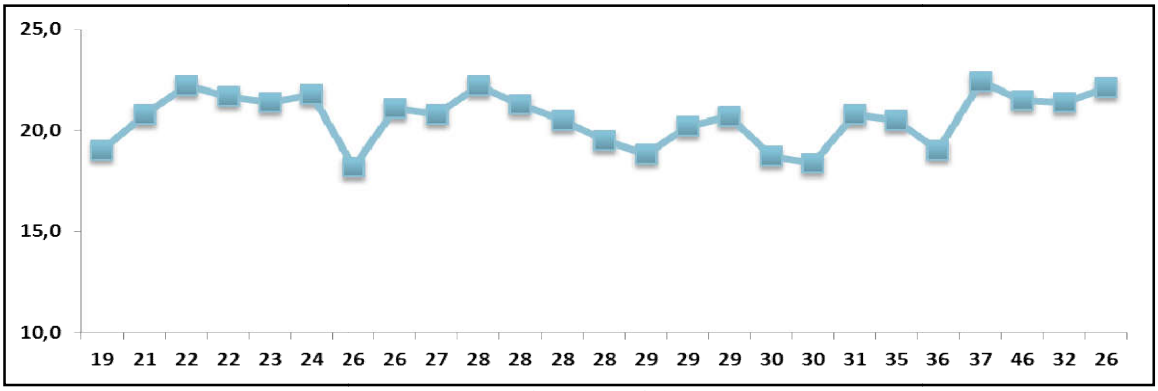
Electrocardiogram number - According to the data presented in Table 5 approximately 82.0% of respondents did just one electrocardiogram to have a diagnosis.

Minimum Temperature – We can observe from Graph 1 that according to the data dispersion, there is no significant

relationship between the number of cases and the temperature in Borborema region (PB), which can be confirmed by Pearson correlation coefficient test. From Pearson's correlation coefficient test, the null hypothesis was accepted, that is, there is no correlation between the variables: number of cases and minimum temperature.

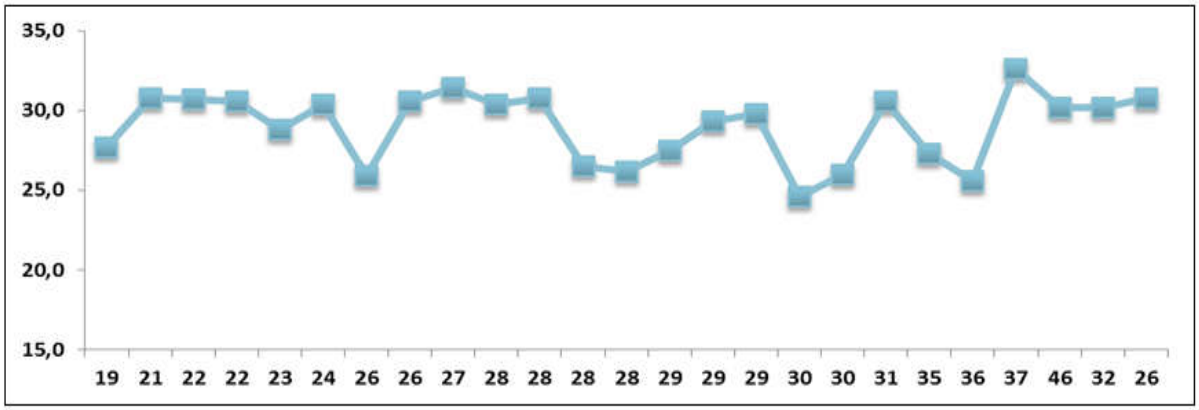
Maximum temperature – It is possible to observe according to Graph 2, from the dispersion of the data above, that there is no relationship between the number of studied patients and the analysis of the temperature in Borborema region (PB), which can be confirmed by Pearson's correlation coefficient test.

Graph 1 – Percentage distribution of minimum temperature (monthly average) in the period of research in Borborema region – Campina Grande – PB



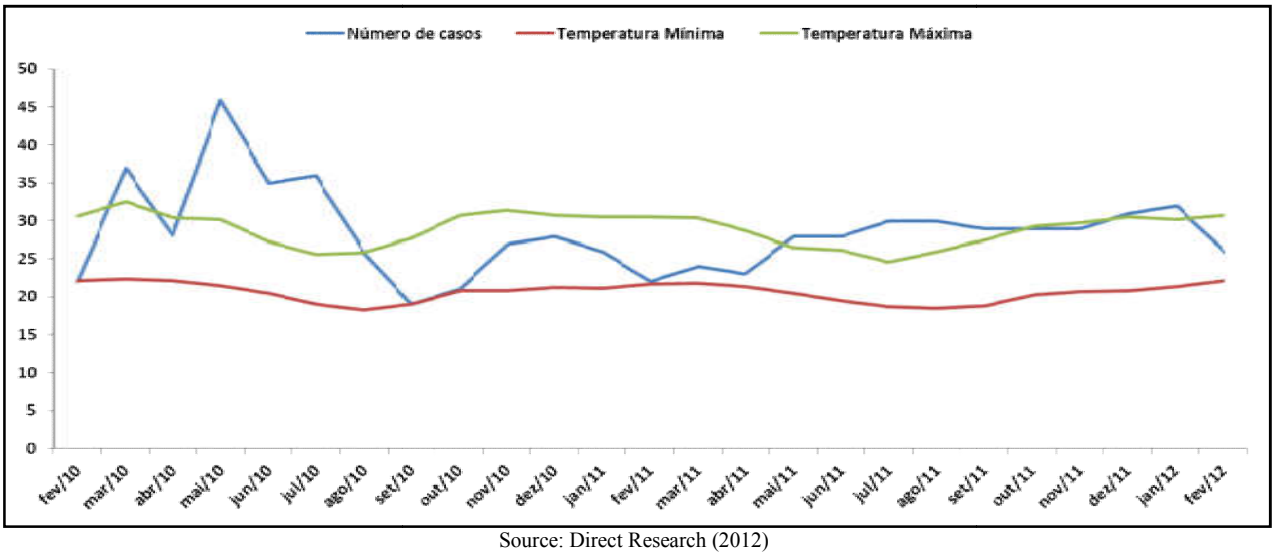
Source: Direct Research (2012)

Graph 2 - Percentage distribution of maximum temperature (monthly average) in the period of research in Borborema region – Campina Grande – PB



Source: Direct Research (2012)

Graph 3 – Correlation between variables - months dedicated to the research realization, numbers of cases, minimum temperature and maximum temperature



Source: Direct Research (2012)

When the correlation between the variables "number of cases" and "maximum temperature" (month to month) was verified from Pearson's correlation coefficient test, the null hypothesis was accepted, that is, there is no correlation between the variables: number of cases and maximum temperature.

Correlation between variables - months dedicated to the research realization, numbers of cases, minimum temperature and maximum temperature

We can see according to Graph 3 that the maximum temperature variation occurs in December and the minimum temperature variation occurs in July. However, it was not during that period of time that occurred neither the greater nor the smaller number of cases. We can also graphically observe that there is no relationship between the variables analysed. That is, the maximum and minimum temperatures do not affect the number of heart problems cases in the studied area.

Conclusion

The results showed no significant statistical correlation between coronary morbidity and temperature. Those results partially confirm the hypothesis that climate variability in our region does little influence in triggering and / or worsening of coronaropathy. In the specialized literature there are several examples revealing the relationship between mortality and temperature variations, but little is known about changes in disease patterns (morbidity). It is worth pointing the limitation of this study, despite the hospital referred be a reference in cardiovascular diseases in the region. The lack of systematic and reliable information related to hospitalizations in the rest of the municipality's hospital network did not allow evaluating a broader universe. This research therefore, evaluated just the correspondent hospitalizations to the acute effects of the disease.

The atmospheric variables studied contributed in the natural determination of cases of cardiovascular diseases, since the days of greater occurrence of pathologies related to this study were associated to isolated rain or long periods of drought; and to higher temperature ranges or sudden atmospheric changes, in other words, with low relative humidity values. Thus, the consequences of climate on health can vary from a simple discomfort to a severe clinical damage that is sometimes irreversible. Therefore, it is necessary to understand the subclinical manifestations, that is, the ones that do not necessarily lead to hospitalization. It is considered that more comprehensive information on coronary heart disease should be produced and systematized in order to increase knowledge of climate effects on health and encourage the search for solutions to improve the lives of human beings.

It is necessary to refine the models of analysis of the relationship between climate and health, especially in large metropolitan areas, because of the exodus of the rural worker in search for better living conditions in the urban environment.

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