THE EFFECT OF SURROUNDING ENVIRONMENTAL TEMPERATURE ON CARDIAC PROPERTIES AMONG NORMAL INDIVIDUALS

Submitted By

Marwa Nasr Al-Sayed Soliman

B.Sc. of Pharmaceutical Science, Faculty of Pharmacy, Cairo University, 1996

A thesis submitted in Partial Fulfillment
Of
The Requirement for the Master Degree
In
Environmental Sciences

Department of Environmental Medical Sciences
Institute of Environmental Studies and Research
Ain Shams University

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APPROVAL SHEET

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This thesis Towards a Master Degree in Environmental Sciences

Has been Approved by:

Name Signature

1-Prof. Dr. Mohamed Salah El Din Mostafa
Prof. of Preventive Medicine and Epidemiology
Institute of Postgraduate of Childhood Studies
Ain Shams University

2-Prof. Dr. Mahmoud Serry El Bokhary
Prof. of Chest Diseases and Head of Department of Environmental Medical Sciences
Institute of Environmental Studies and Research
Ain Shams University

3-Prof. Dr. Mostafa Hassan Ragab
Prof. of Public Health, Department of Environmental Medical Sciences
Institute of Environmental Studies and Research
Ain Shams University

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Environmental Sciences

Under The Supervision of:

1-Prof. Dr. Mostafa Hassan Ragab
Prof. of Public Health, Department of Environmental Medical Sciences
Institute of Environmental Studies and Research
Ain Shams University

2-Dr. Ahmed Salah El-Din Mohammed
Lecturer of Cardiology
National Heart Institute

2016

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Marwa Nasr Al-Sayed

ABSTRACT

Back ground and aim of the study: Cardiovascular disease is the most prominent circulation disorder around the world and regarded to be the main cause of serious health and economic problems in developing countries as the three fourth of the global deaths due to coronary heart disease occur in the middle income countries. Extreme cold episodes significantly have its impact on health, especially on the cardiovascular system by different mechanisms. This is a community based study aimed to detect the influence of the surrounding environmental temperature on cardiac function.

Subjects and method: Thirty of apparent healthy individuals submitted for longitudinal study along winter and summer seasons. all subjects undergo specified inclusion and exclusion criteria. will be exposed to the following investigations at one of the coldest day in Winter (below 14 º C) and one the hottest day in Summer (above 34 º C):

- Measurement of arterial blood pressure.

- Local examination of heart.

- Recording electrocardiograph (ECG).

Results of the present study showed significant elevation in the blood pressure, associated with cold weather, the percentage increase in the MAP was 6.98% , in systolic pressure was 8.36% and in diastolic pressure was 6.23%.On the other hand there were no- significant changes in the heart rate or other ECG findings.

Conclusion: From the previous results we can conclude that Cold weather is associated with slight increase in the arterial blood pressure (systolic and diastolic).but there is no change in the other cardiac properties.

Key Words: Environmental Temperature – Cardiac Properties – Blood Pressure – Electrocardiograph.

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List of Abbreviations

Abb.	Full term
AMI	*Acute myocardial infarction*
AV node	*Atrioventricular Node*
BP	*Blood Pressure*
bpm	*Beats Per Minute*
CHD	*Coronary Heart Disease*
CVD	*Cardiovascular Disease*
CVS	*Cardiovascular System*
DBP	*Diastolic Blood Pressure*
ECG	*Electrocardiogram*
GHG	*Greenhouse gas*
IHD	*Ischemic heart disease*
NHANES	*National Health and Nutrition Examination Survey*
RP	*Raynaud's phenomenon*
SA node	*Sinoatrial Node*
SBP	*Systolic Blood Pressure*
UV	*Ultra Violete*
WHO	*World Health Organization*

INTRODUCTION

Many studies that connects between temperature and health revealed that the climate change related to seasonal variation has a great influence on cardiovascular, cerebrovascular and respiratory disease deaths. On the other hand a few of these studies were from the Middle East region, so investigations and researches in this area with its desert climate is a must **(Farajzadeh & Darand., 2009).**

Extreme variation in the surrounding temperature that referred to seasonal changes is directly related to many diseases and health disorders such as heat stroke which occurs due to exposure to high temperature and hypothermia which may relates to exposure to very low temperature **(Zanobetti & Schwartz, 2015).**

One of the most important problems that facing human is the climate change that related to seasonal variation as it has serious impacts on human health and activities, also it affects most population whether directly or indirectly **(Costello *et al., 2009)*.**

Exposure to extreme environmental temperature has a serious effect on health but still human has a capability to adapt by his body thermo- regularity mechanisms, on the other hand any decrease or increase in internal body temperature can lead to acute health problem that may lead to death. Elevation in skin blood flow and sweating are the primary heat exchange mechanisms in human that protect against a heat-related injury **(Crandall & Gonzalez-Alenzo, 2010).**

Considerable predicted health effects of long term climatic change include skin and eye damage from increased exposure to ultraviolet radiation, increased incidence of respiratory and cardiovascular diseases, increased incidence of vector – borne and water -borne diseases, and heat related morbidity and mortality **(Semenza *et al.*, 1996).**

The effect of environmental temperature on human health can be modified by different factors which are related to population, others are climatic and environmental factors, these factors such as: age (children and elders are most affected), gender (female more than male), presence of chronic disease (person with chronic disease is more liable to adverse effects of seasonal variation). Population of low socioeconomic communities has less adaptive properties, demographic factors, access to air conditioning and availability of health care services **(Grize *et al.*, 2005)**.

Kysely *et al.* (2009) have reported that the cases that are highly injured due to exposure to extreme temperatures were mostly in elders and women than the young and men. Other studies **(Miron *et al.*, 2012; McGregor *et al.*, 2004)** found that extreme environmental temperatures have adverse effects on People who are suffering cardiovascular or respiratory diseases than healthy people.

Cardiovascular symptoms, such as arrhythmias and chest pain are commonly detected in people exposed to extreme temperature (e.g. in cold it appears by 4% of the general population) these results were mentioned in the population studies **(Ratikka *et al.*, 2007).**

A strong association has been reported between seasonal changes and blood pressure **(Kristal *et al.*, 1996)**.

Heat related mortality may achieve greater public health significance during the coming decades. Because of the predicted consequences of global warming and the increased frequency and intensity of heat waves **(Meehl *et al.*, 2001).**

Aim of the Work

To detect the influence of surrounding environmental temperature on cardiac properties.

Chapter 1
ENVIRONMENT AND CLIMATE CHANGE

The Environment is defined as: All circumstances, objects or conditions by which one is surrounded , which regarded to be a mixture or complex of climatic, edaphic (i.e. soil based) and all biotic factors act on an organism or community **(Lean *et al., 1990).***

Global warming

It is defined as the apparent increase in temperature measured on the earth surface due to continuing rise in the average temperature of earth's climate system **(Stocke *et al.,* 2013).**

A study by **Johnson *et al.* (2005)** found that the oceans and seas have the main role in energy storage as 90% of warming has occurred in oceans since 1971**.**

As a result of these studies, **(Stocke *et al.,* 2013)** the increase in the average temperature of the earth's surface whether in air or sea is due to global warming.

Acute climate changes since the early 20th century, an increase in the global air and sea at earth's surface temperature about 0.8º C and two – thirds of this increase has occurred since 1980, and lead to increased frequency and intensity of heat waves which is responsible for heat related morbidity and mortality nowadays and in the coming decades.