



The Psychosomatic Essence of Urban Thermal Emissivity on Residents in Calabar Central Business Districts, Calabar, Cross River State, Nigeria

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ABSTRACT

The study predicated on a clear understanding of the impact of urban thermal effect on the mental and physical health of aged persons in Calabar Central Business District (CBD). The choice of the location of this study is based on an appreciation of the current urban heat scenario in most cities of the world and specifically the CBD's are centres of teeming population and wholesale transformation of the natural landscape to artificial surface fabrics and intensely built environments. The problem identification stems from the observed heat trend by the researcher field survey and the general residents report on the gravity of the heat incidents on diurnal and daily regimes of weather. It therefore becomes expedient to investigate the true perspectives of the thermal incidence scenario in bid to identifying the heat morbidity incidence of it. The objective therefore is substantiated to focus on the heat sensitivity impact of aged person on the mental/Physiological health. The area of study has been well explained on the basis of its coordinates of location, the climatic parameter of its location and the socio cultural elements of the place. In this sense the population of the study remains adult resident persons of ages 50 years and above. The literature was reviewed on two thematic levels - the development of the urban heat incidence and the impact of heat incident in historical context as gleaned in the available study reports. The questionnaire is the primary instrument used for so cultural data collection while biophysical was analysed using instruments such as the global position system (GPS) and the thermometer.

Introduction

Literature abound to the point that urban centres are heat hearths. In another sense there are more or less like heat generating furnaces. The heat generating mechanisms are traceable to the diversity of human activities that cause the urban surface/landcover fabrics, changing them from natural land surface fabrics to the artificial fabrics in the form of concrete, tarmacs and other synthetic surface (Gray and Fishier, 2002, Marsh and Grossa, 2005, Ifatimehin 2001). These changes lead to the creation of completely altered microclimatic regimes for the city centre where sensible heat become more predominant above Latent heat of vaporization. The urban surface heat emissivity or albedo reaches all time high where condensation nuclei becomes at very low ebb. The central Business Districts (CBD) experience the highest level of this emissivity or albedo leading to the creation of highly sultry, unbearable ambient air with significant health implications.

The health impact embraces the mental as well as the physiological aspects. This calls attention to the phrase psychosomatic which becomes the catch phrase for the proposed study. The impact analysis demands a consideration of a number of interrelated factors such as sex, age, body morphology, genotype and lot's of Issues bordering on socio-cultural and socio economic aspects Prodigious research have been flushed to give direction to the essence of thermal emissivity impact on human health particularly the aged. Following an NOAA (1995) Report heat waves from solar beams have very detrimental effects on human health. Thus, it was stated that building with extreme solar exposure could develop heat waves. Accordingly, it was reported that the heat waves that killed 700 people in Chicago (1995) more than half of the victims lived on the top floor where solar heating was more intense.

The report such as above points to health magnitude of temperature event on human overall health. Similar other reports abound in the literature with respect to health impacts such as heat stroke, heat- syndrome, cerebrospinal meningities etc. meningities is an endemic morbidity incidence that is commonly prevalent in the dry season in the tropic due to increased solar emissivity and the receipt of enhance ultraviolet short-wave radiation caused by less clouds. Northern Nigeria is one region in the country where meningities is a common scourge. Clinical reports of the seasonal episodic occurrence are featured in the various media yearly. Considering the current scenario of global warming/climate change urban thermal. Emissivity may certainly be on the rise due to the unique characteristic of urban landscape fabric.

Enormous health implications of the urban thermal emissivity can be cited such as the production of radioactive particles of alpha, beta and gamma rays which have serious carcinogenic effects on human epidermis or skin cover. These particles with their radio-active effects have long-term and short term health impacts which have all formed the initial problem identification of this study.

Statement of the problem

Urban environmental health issues are all-pervading. Anthropogenic activities have contributed significantly to creation of new environmental niches that may be quite uncondusive to human natural body homeostatic. Thus, currently in all the cities of the world there is a great deal of imbalance in the form of pollution, waste production, landscape, landcover changes, flooding, and urban heat development and so on. These artificial environmental niches have several health implications that may be taken for granted.

Predicated on the introduction/back ground to this study, a few of the health implications of urban thermal emissivity have been highlighted. Environmental ignorance goes with enormous cost as can be cited from report of 700 persons who died from heat waves in Chicago (1995). An earlier warning or awareness would have simply saved them from the annihilation that they went through. Environmental ignorance has for reaching implication in the sense that many city residents have little or no knowledge of the fact concerning the thermal particulate emissivity of the sunrays that are injurious to the melanin tissues of the human body. These concerns and many others propel the ingrained objective of this study which it is hoped will contribute significantly to urban environmental capacity building in the city of Calabar and other local areas.

Justification

Urban environmental issues are of major concern to all and sundry. This is because urban centres are rallying points or socio-logical hearths to many who relish urbane life. Urban centres are threshing grounds to many because many rural dwellers look up to urban centres for their relaxation and comfort. A good knowledge of the entire gamut of urban livelihood sustainability is vital for coping with some inherent problems as identified such as the one that formed the problem statement of this envisaged study. Urban environmental managers need a clear view of some inherent problems to adequately plan for its residents. Residents require a clear awareness of these incidents to properly adjust, cope or mitigate the ensuing problems. Urban transit population should be sufficiently informed based on the findings of this study to properly make a choice of their destination during their visit.

The study will provide findings that was generally beneficial as a basis for

Objectives of the study

The specific objectives of this study include.

- i. Assessment of the impact of the thermal emissivity (heat radiation effect) on the physical health of the aged population in Calabar Cross River State.
- ii. Investigation of the heat radiation effect on the mental health of aged resident population in the study area.

Research Hypothesis

Following the research objectives, two hypotheses have been formulated as follows:

1. Ho: There is no Significant variation in the impact of thermal emissivity on the physical health of aged residents in Calabar CBD.

Hi: There is a significant variation in the impact of thermal emissivity on the physical health of residents in Calabar CBD

2. Ho: There is no significant variation in the impact of thermal emissivity on the mental health of aged residents in Calabar CBD.

Hi: There is significant variation in the impact of thermal emissivity on the mental health of aged residents in Calabar CBD

LITERATURE REVIEW

Over view

Urban thermal emissivity is function of surfaces fabric albedo. Albedo is the degree of the temperature reflectivity from the surface. (Phelan 2015) Oke (1988), introduced the transient energy to predict the urban surface temperatures. Deriving from his model and several other complex models it was revealed that man-made materials such as concrete and pavement store more thermal energy than bare or vegetation covered ground and may also reflect less sun light (Mirzeai 2010) Gray and Fisher (1999) reported that land use and surface types were elements of the urban fabric that are commonly altered during the development of metropolitan areas NOAA (1995) reported that urbanization transform the landscape into a completely different environment characterised by forms, materials and activities that are vastly different from the rural landscapes. NOAA further stated the spatial pattern of the temperature are concentric around the city centre producing heat island in the city.

Another factor of significance in the explanation of urban thermal Emissivity is the concept of the Bowen Ratio which is the measure of the sensible heat released from the surface in relation to the latent form (NOAA 1995). The Bowen ratio phenomenon is at the heart of urban thermal emissivity. Following the NOAA study the Bowen ratio is higher in the urban centre than the rural areas. Sensible heat has a desiccating enervating effect on human body system. The latent heat reduction is a function of the impervious surface which influences the hydrological process and meteorological conditions of the entire catchment (Fitra et al 2021).

Accordingly, it was further explained that the impervious surfaces affect the land surface temperature (LST) of urban areas due to low soil moisture and reduced evapotranspiration. This condition of high land surface temperature and reduced evapotranspiration is called the urban Heat Island (UHI). The urban heat island phenomenon informs the problem statement of this study.

Thermal Emissivity and human health implication

In the background to this study allusion has been made to the diverse health effects of heat waves and death tolls reported by NOAA (1995) in Chicago where 700 people died. Accordingly it was reported that heat Island can exacerbate the impact of naturally occurring heat waves, which are periods of abnormally hot and often humid weather sensitive population which are particularly at risk (Santamous 2020).

Older Adults are said to be the most vulnerable to extreme heat events. Also that many physio-logical, psychological and socio-economic factors contribute to the danger. It was further stressed that older adults are more likely to be in poor health, to be less mobile and more isolated, and to be more sensitive to high heat and live on reduced income (Gamble et al 2013).

Further on, young children are likely to be more susceptible to extreme heat due to their small size and other characteristics. And that children more rapid breathing rates relative body size, time spent outdoors and their developing respiratory systems raise the chances of aggravated asthma and other lung diseases caused by ozone air pollution. Ozone air pollution is associated with high thermal radiation (U.S. climate change programme 2008, Montgomery 1995).

Adeyinka (2014), reported on the effect of heat waves which he said may lead to cases of cerebro spinal meningitis which he said has its peak in the dry seasons.

Rogema and Chamski (2022) reported on climate sensitive diseases which are of increasing global concern and the environmental suitability for the transmission of all infective disease is increasing. They reported further that high temperatures resulted in extreme heat-related health impacts affecting the emotional and physical well being of populations around the world.

Phelan et al (2015) in their findings report on that the impact of high heat temperature manifests in different outcomes with death as the extreme (Chuan 2013). They further reported on the 1995 Chicago heat wave which caused the death of 700 people. Other impact cases according to the report are allergic respiratory diseases such as asthma resulting from increased air pollution, malaria, dengue, West Nile virus etc. (D'Myato 2013).

Vaidyanathan et al (2020) reported that populations with low income are at greater risk of heat related illnesses due to poor housing conditions including lack of air condition and small living spaces.

Another related report had it that people who spend their working hours outdoor are more prone to conditions such as heat exhaustion and heat stroke. Also that they have higher exposure to ozone air pollution and heat stress.... Again that people in poor health conditions, disabilities, morbidity constraints are vulnerable to extreme temperature (U.S. Climate Change Science Programme 2008).

Conclusion

The review focused on two related themes – explanation and analysis of thermal incidence in the urban domain and diverse review of existing studies and reports on impact of the thermal effect on human health generally. From the submission, fresh insights have been garnered on issues of vulnerability, adaptation and mitigation of such impacts. The report of the findings of this study will provide information that will lend support to urban environmental health management.

METHODOLOGY OF THE STUDY

Research design

This research design is a form of descriptive epidemiological field survey design aimed at field data collection from respondents based on defacto approach. Secondary data sources from clinical reports from hospital admission also provided ancillary case reports.

Study area

The study area Calabar is geographically located in a subequatorial belt where the subtropical low pressure is situated. This region is a zone of intense solar radiation with adequate receipt of ultraviolet radiation (UVR) (Faniron 2014) Except for the ameliorating effect of the tropical maritime airmass (MT air Mass), the insolation effect would be unbearable. Calabar is an urban centre with all the paraphernalia of city domains such as predominance of concrete and Tarmac landscape fabrics, less availability of vegetation cover, and predominance of built environments. These attributes contribute to the generation of more sensible heat as against latent heat of vaporization which has more cooling effect. The central Business Districts (CBD) where this study is focused are areas with compact built environment where the urban heat effect (thermal emissivity) is most intense. Majorly they include the Etim Edem – watt market Nuclei, the Mariam, Nidem Usang Isong axis and the MCC/flour mill cluster. It is within and from these nuclei that the population was drawn.

Population of the study

The population of the study comprises elderly persons of the age range 50-80 years. Both male and female categories found within this age bracket were considered. Those to be considered are those domiciled within the selected clusters called Central Business District (CBD).

Sampling

Multistage sampling was employed such as:

Purposive sampling based on selection of population nuclei or clusters. Systematic sampling involving systematic house hold enumeration and stratified sampling for selection of persons based on gender considerations. (Male/Female)

Instruments for data collection

The instruments employed in field data collection were of two categories as follows:

- i. Socio-cultural data involving information from respondents will involved the employment of the questionnaire and/or the checklist.

Method/procedure for data collection

Data collection was phases as follows

- i. Biophysical Baseline information for determination of location and temperature regimes as was under taken. Temperature measurement at selected points during periods of maximum solar flux (2-4pm) on selected days. GPS Readings were correspondingly carried out at such points to determine the coordinates of locations.
- ii. Socio-cultural information was derived based on the use of the questionnaire and checklists for eliciting responses from respondents.

DATA ANALYSIS

- i. Socio cultural data was analysed using the statistical technique of ANOVA (analysis of variance).

Hypothesis One

Ho: There is no Significant difference in the impact of thermal emissivity on the physical health of aged residents in Calabar CBD.

Hi: There is a significant effect of thermal emissivity on the physical health of residents in Calabar CBD

SUMMARY				
<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>
Mental Bodily Stimulus during cold weather	4	155	38.75	239.5833
Mode of disposition during wet Days	4	133	33.25	160.9167
Feeling During dry cold weather regime	4	131	32.75	252.9167
Feeling during Hot Weather	4	142	35.5	309.6667

ANOVA						
<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	89.6875	3	29.89583	0.124167	0.944022	3.490295
Within Groups	2889.25	12	240.7708			
Total	2978.938	15				

Here, we can see that the F-Critical is greater than the calculated value for the alpha level of (0.05). Therefore, we reject the alternative hypothesis and accept the null hypothesis to say there is no significant difference in the impact of thermal emissivity on the physical health of residents in Calabar Central Business District

HYPOTHESIS TWO

Ho: There is no significant difference in the impact of thermal emissivity on the mental health of aged residents in Calabar CBD.

Hi: There is significant impact of thermal emissivity on the mental health of aged residents in Calabar CBD.

SUMMARY				
<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>

Sleep interference in Hot Weather conditions	4	150	37.5	345
Sleep interference during cold Weather	4	151	37.75	128.25
Rigor or cold during cold weather	4	131	32.75	240.9167

ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	63.5	2	31.75	0.133372	0.876837	4.256495
Within Groups	2142.5	9	238.0556			
Total	2206	11				

DECISION RULE

Here, we can see that the F-Critical is greater than the F-Tab value for the alpha level of (0.05). Therefore, we reject the alternative hypothesis and accept the null hypothesis to say there is no significant difference in the impact of thermal emissivity on the mental health of aged residents in Calabar CBD

RESULTS/FINDINGS

Data analysis predicated on the investigation of two related parameters relating to thermal heat discomfort of residents in the area under investigation. These are the parameters of physical heat discomfort and mental heat discomfort indices. Hypothesis one focused on physical heat discomfort while hypothesis two focused on mental heat discomfort respectively. Four indices each were selected for identification of residents responses.

The decision showed that the null hypothesis was favoured in each of the two cases based on the recognition that the f-critical values were greater than the f-calculated value at 0.05 alpha level. It therefore follows that there is no significant difference in the impact of thermal emissivity on both the physical and mental health of residents in the area under investigation.

The results depart fundamentally from Rogema and Chamski's (2022) report that high temperatures results in extreme heat related health impacts affecting the emotional and physical well being of populations around the world. They are equally non comfort with Phelan et al (2015) report that the impact of light heat temperature manifest in different outcomes with death as the extreme. Gamble et al (2013) also presented another quite lucid explanation relative impact sensitivity of persons by stating that older adults are said to be more vulnerable to extreme heat events and that they are more likely to be your health, to be less mobile and isolated and to more sensitive to heat and that live on reduced income.

Along similar lines young children are likely to be more susceptible to extreme heat due to their small size and other characteristics. However, certain insights may be gleaned from the results based possibly on such explanation as the marine coastal location of the city of Calabar producing congenial marine weather condition by way of land and season. Or the state government urban "Green Agenda" which introduce landscaped green fields and urban canopy areas in different parts of the city or the urban renewal programmes which has caused the decongestion of over crowded areas as well as the reduction of the urban tarmacked surface which has reduced the prevalence of sensible heat and raised the latent heat of vapourization.

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