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TEMPERATURE VARIABILITY AND OUTREAK OF MENINGITIS AND MEASLES IN YOLA, NIGERIA

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ABSTRACT

The influence of temperature on temporal variations of outbreak of meningitis and measles in Yola, Nigeria was examined. Data on monthly maximum temperature and reported cases of the two diseases for a period of 13 years were collected and analysed. The result shows that the reported cases of the two diseases are high between January and April when temperatures are also high. Correlation analysis indicates that the reported cases of the two diseases are positively and significantly related to temperature. Regression analysis suggests that 53% and 79% of the variations in the outbreak of meningitis and measles respectively can be attributed to temperature. Housing conditions in the city also aggravate the effect of temperature. Appropriate measures were suggested to minimise the effects of temperature in the study area.

KEY WORDS: Temperature, diseases, measles, meningitis

INTRODUCTION

Variations in weather and climate influence the human body significantly. The physiological functions of the human body respond to changes in weather. Several specific body disorders such as heat stroke occur only under particular climatic conditions. Likewise, the outbreak of several illnesses and diseases are induced by climate. Indeed, the periodic or seasonal nature of outbreaks of some human diseases suggests that climatic conditions play an important role. Climate influences the incidence of diseases in two major ways. First, climate affects the resistance of the human body to some diseases. Secondly, climate influences the growth, propagation and spread of some disease organisms or their carriers (Ayoade,1982).

According to Ayoade (1982), the climatic elements which directly affect the physiological functions of the body are four, namely: solar radiation, air temperature, humidity and wind. The two most commonly discussed in previous works, however, are air temperature and humidity (Ojo, 1977). Air temperature produces high heat dissipation while high relative humidity adds distress to organism at high environmental temperatures, since it interferes with the dissipation of heat through evaporative heat loss.

Despite the recognition of the influence of climate on human physiological processes and outbreak of diseases, relatively very little research has been directed at studying the actual health consequences of climatic variability in Nigeria. Cursory observation in Yola reveals that the outbreak of certain epidemic diseases is pronounced during the heat period (February - May). However, the extent to which increase in temperature influences the outbreak of these diseases had not been investigated.

It is against this background that this study is designed to examine the effects of temperature on the outbreak of some diseases in Yola, Nigeria. Two diseases are considered namely: meningitis and measles. These two diseases are among the six major causes of death in Nigeria (Barbour, 1962). Others are pneumonia, tetanus, malaria and tuberculosis.

METHODS

Description of the study Area

Yola is located on latitude $9^0$14' and longitude $12^0$38'. It lies within the Benue trough at an altitude of 185m above sea level. Yola falls within the tropical savanna climate with distinct wet and dry seasons. Dry season lasts for about six months (November to April) while the wet season spans from May to October. The means of climatic elements (1986-98) in the city are presented in Table 1. Temperature in Yola is high through out the year but there is usually a seasonal change. There is a gradual increase in temperature from January to April. The seasonal maxima usually occur in March or April. There is a distinct drop in temperature at the onset of rains. A slight increase after the cessation of rains (October - November) is common before the onset of harmattan in December when the temperature drops further.

Procedure

Data on the reported cases of meningitis and measles (both out and in-patients) were collected for the period 1986 - 98 from the Specialist Hospital, Yola (now Federal Medical Centre). This is the longest period for which consistent record of the diseases were available in the hospital. The hospital is a referral centre, which keeps daily record of reported cases of all diseases.

Monthly maximum and minimum temperature, relative humidity and rainfall data were collected from the meteorological station at the Yola Airport for the same period of time.

Data analysis includes the computation of means

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Table 1: Mean of climatic elements in Yola (1986-98).

Month	Jan	Feb	Mar.	Apr.	May	Jun.	Jul	Aug	Sep.	Oct.	Nov.	Dec.
Max. Temp^{0}C	33.4	34.7	38.9	38.7	33.2	33.3	32.6	31.4	31.1	32.9	34.8	32.5
Min. Temp^{0}C	16.7	18.8	18.8	26.7	25.3	23.6	23.1	22.8	22.8	23.1	18.8	17.1
Rainfall mm	0	0	3	45	112	110	184	218	174	69	6	0
Humidity %	23.6	17.8	30.2	48.2	65	72	75.4	79	76.2	76.2	42.6	29.6

Table 2: Monthly Distribution of reported cases of Meningitis and Measles at Yola Specialist Hospital (1986-98)

Month	Jan	Feb	Mar.	Apr.	May	Jun.	Jul	Aug	Sep.	Oct.	Nov.	Dec.	Total
Meningitis	20(12.3)	21(12.9)	34(20.8)	21(17.9)	13(8.0)	7(4.3)	8(4.9)	10(6.1)	10(6.1)	7(4.3)	5(3.1)	7(4.3)	163
Measles	25(4.5)	63(11.4)	123(22.3)	146(26.5)	57(10.3)	39(7.1)	32(5.8)	28(5.1)	10(1.8)	10(1.8)	11(1.9)	7(1.3)	551

Figures in parenthesis are percentages.

Table 3: Correlation and Regression of Temperature with reported cases of meningitis and measles in Yola.

Disease	Correlation coefficient (r)	R^2	Regression equation
Meningitis	0.73	0.53	Y = -67.1 + 2.37x
Measles	0.89	0.79	Y = -471 + 15.2x

$r \geq 0.70$ is significant at 5%

and percentages and the use of correlation and regression analysis to examine the relationship between temperature and the outbreak of the diseases.

RESULTS AND DISCUSSION

The monthly distributions of the reported cases of the two diseases are presented in Table 2. The distributional patterns of the outbreak of the two diseases are similar. There is general increase in the outbreak of the diseases from January to April. The number of cases starts falling from May when the rains are steady. For the whole year, 64.6% and 65% of all the cases of meningitis and measles respectively, occurred between January and April. This finding corroborated the assertion by Barbour (1982) that two thirds of the reported cases of meningitis in Nigeria occurred in three months of

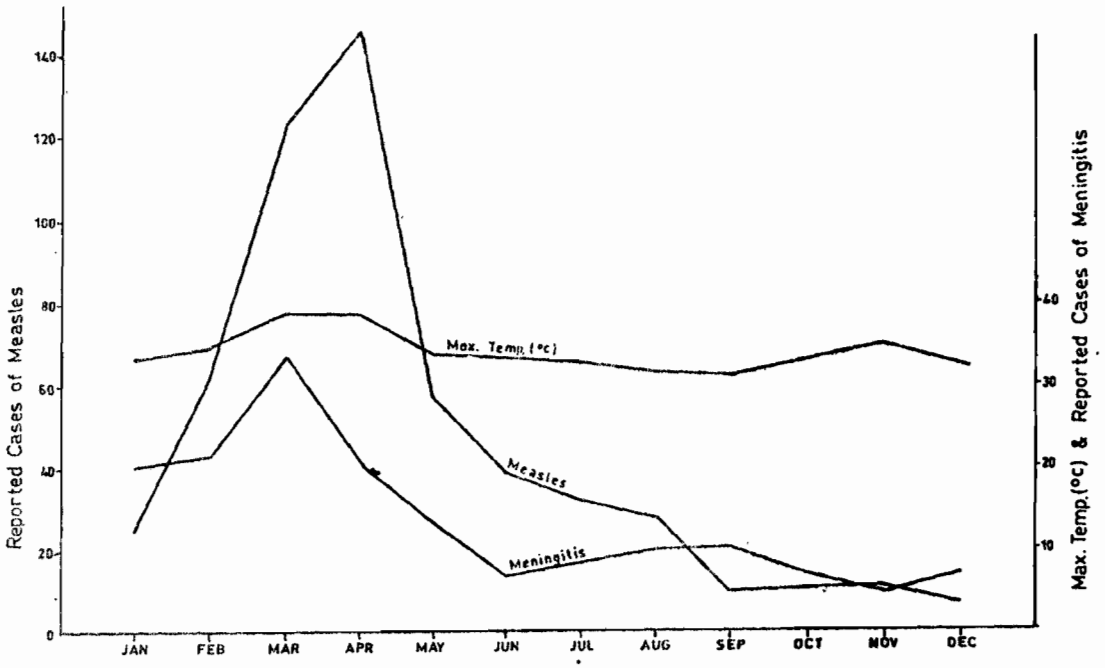

FIG. 1: MONTHLY VARIATION OF MAXIMUM TEMPERATURE, MENINGITIS & MEASLES

February, March, and April.

The seasonal variation of the cases of meningitis and measles follows the seasonal march of temperature (Fig 1). The incidences of the diseases are higher between January and April, when the temperatures are high and low during the wet season and the period of harmattan (November - December).

The two diseases show positive and significant correlation with maximum temperature, indicating that the higher the temperature, the higher the outbreak of these diseases (Table 3). The Table shows further that 53% and 79% of the cases of meningitis and measles respectively can be attributed to high temperature. The regression equations suggest that the cases of meningitis and measles increase by 2.4 and 15 respectively for every 1^0 C increase in temperature.

The situation, however, is probably being aggravated by some housing conditions in the city. These include over crowding, poor ventilation and poor building and street layout designs.

The structural plan of houses in Yola reflects the religion and culture of the people. The need for security and privacy is a strong factor determining the form of houses in the city, especially among the Moslems who practise purdah (segregation and seclusion of married females). The basic structure is an enclosed compound, which is divided into compartments, with individual accessibility and privacy but all open into a common courtyard. The rooms are poorly ventilated and the compound walls are built high enough to prevent a view from the windows. High occupancy ratio also prevails in the city. For example, Makama (1997) found occupancy ratio of between 3 and 6 in 50% of houses in a high-density ward in the city. These conditions help to maximise the effect of high temperature and outbreak of the two diseases, which are air borne.

CONCLUSION

In order to minimise the effect of high temperature in the city, the following measures are suggested. Since appreciable cooling can be achieved through adequate ventilation, windows should be fixed in such a way as to ensure cross ventilation. The commonest type of houses in the city is the 'room and parlour' apartment, which are poorly ventilated and often over crowded. Building of this type of houses should be discouraged. The Urban Planning Authority, which approves building plans, should ensure that all new buildings are properly ventilated and oriented.

Secondly, the idea of building high block fence (sometimes taller than the building itself), usually for security reasons, should be discouraged. Apart from preventing free flow of air, it encourages the storage of heat within the building during the day. Wire-mesh and perforated blocks fences are better alternatives.

Finally, since layout of streets affects intra urban circulation of air (Adebayo, 1987), it is recommended that the direction of wind should be taken into consideration in the planning of new streets so that major streets are laid parallel to the direction of the predominant wind.

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REFERENCES

Adebayo Y. R., 1987. Atmospheric considerations for Building Design in a Tropical Sub-Region. A general Analysis of the conditions in Ibadan, Staff/Postgraduate Seminar, Geography Department, University of Ilorin, 10pp.

Ayoade J.O., 1982. Introduction to Climatology for the tropics. John Wiley & Sons, New York, 258pp

Barbour K.M., 1982. Human diseases and health facilities. In Barbour K.M. et al (eds). Nigeria in Maps. Hodder and Stoughton, London, 148pp.

Makama A.G., 1997. Urban renewal proposal of Alkalawa ward in Jimeta-Yola, Nigeria. Unpublished B.Tech project, Department of Urban and Regional Planning, Federal University of Technology, Yola.

Ojo O., 1977. The Climates of West Africa. Heineman, London, 219pp.