# Changing weather factors implication on the prevalence of malaria in Ado-Ekiti, South west, Nigeria

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- Research questions, aim and objectives
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# Introduction

- According to **Hippocrates (Circa 400 B.C)** On Airs, Waters and Places.

- **Whoever wishes to investigate medicine properly, should proceed thus:**

  **-- Consider the seasons of the year;**

  **--what effects each of them produces.**

  **--Then the winds, the hot and the**

# Introd. Contd

- **Many of the major killers diseases are climate sensitive. Each year:**

  **-- Undernutrition kills 3.7 million**

  **-- Diarrhoea kills 1.8 million**

  **-- Malaria kills 1.1 million**

  **Each of the above is highly sensitive to temperature and precipitation(WHO 2007)**

# Introd. Contd

- **The health effects of changing weather and climate include:**

**--Temperature-related illness and death**

**--Extreme weather- related health effects**

**--Air pollution-related health effects**

**--Water and food-borne diseases**

**--Vector-borne and rodent- borne diseases**

# Introd. Contd

**Facts about malaria**

- **40% of world's population at risk**
- **World Health Organization (WHO 2007) estimates**
  1. **300-500 million/year diagnosed**
  2. **2,000,000 deaths/year**
  3. **90% of deaths in sub-saharan Africa**
  4. **Nearly ¾ of deaths are children under 5**
  5. **Roughly 1 African child dies every 30 seconds!**

# Scientific questions

- What is the state of the art of the disease early warning system?
- How is variation in occurrence of the disease linked with weather/climatic factors?
- How should the disease prevention and control be linked to changing weather and climate?
- How helpful are time series methods in forecasting the disease?

# Aim and objectives

- **AIM.**
- ✓ **To describe malaria occurrence in response to changing weather/climate and develop forecasting models for this disease.**

# Objectives

- **To asses the effects of selected weather parameters on malaria disease in Ado and establish if any correlation exists between them**
- **To study the variations in the occurrences of this disease linked with weather/climatic factors and;**
- **To develop early warning systems for this disease and discuss the implications for prevention and control towards effective and enhanced healthcare delivery system.**

# Possible gains

- Improved understanding of the changing effects of climatic factors on malaria prevalence

- High community awareness of individual actions will be in place to reduce climatic change related mortality

- Development of disease- climate models leading to;

  --Improved Prevention and control capability for better health care delivery

# Possible gains CONTD

- **More effective collaboration and coordination at the national and local levels between health and meteorological services**

# Methodology

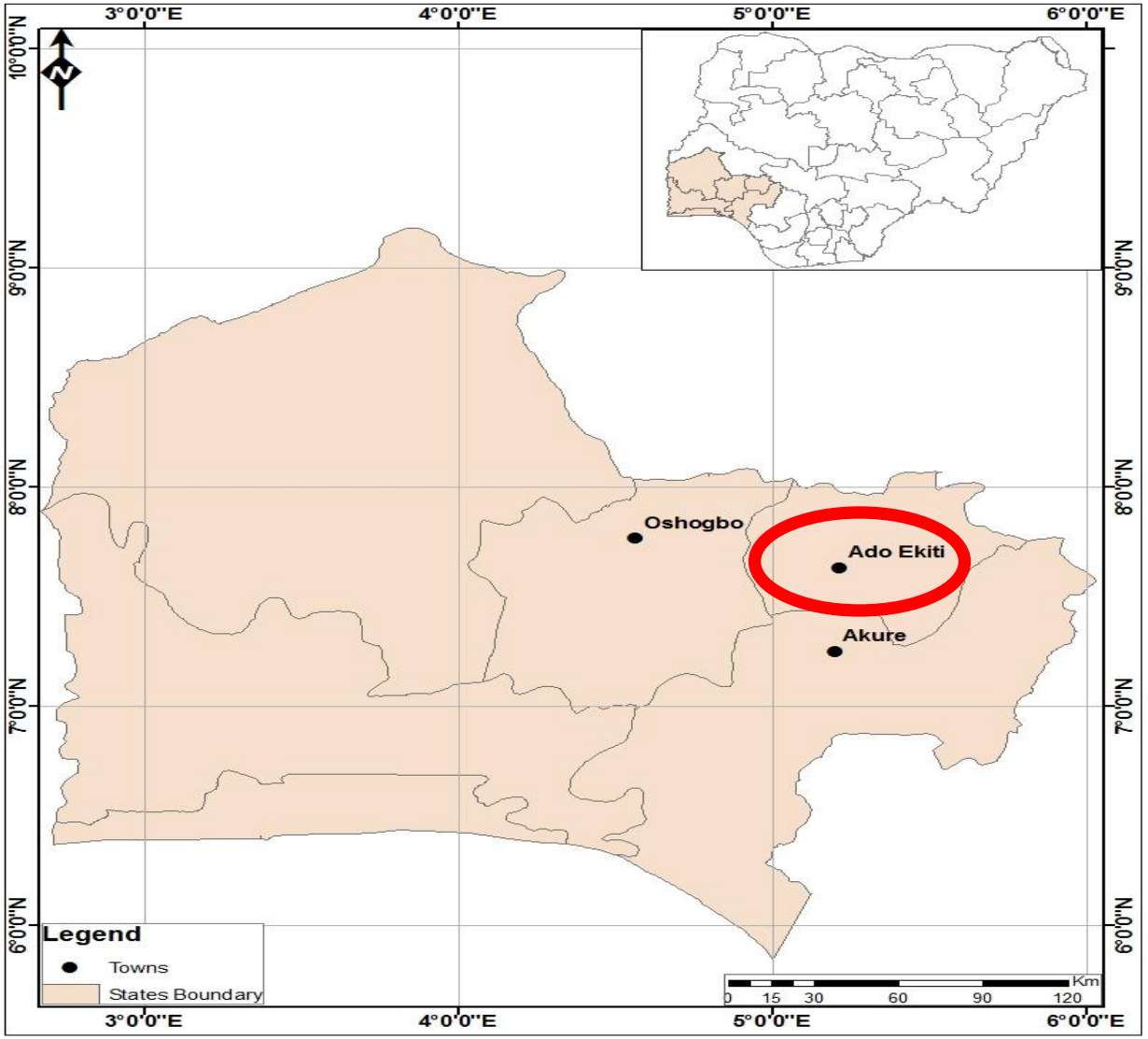



Fig 3: Map of Nigeria showing the station used for the study

# Climate of the study area

- The climate over the area of study is tropical wet and dry climate
- It experiences a bimodal rainfall of May, June, July (MJJ) rainy season which peaks in July and September –November (SON) rains which peak in September.
- A brief dry spell is experienced in August
- the long dry spell setting in mid/late December to late February/early March

# Methodology

- **Two types of data were used, namely medical records and weather/climate records.**

**-- Medical records.**

***Monthly numbers of ;**

**-malaria cases**

# Methodology Contd)

* **for years (**2005-2012) **were obtained from standard government hospitals located in the city.**

# Methodology Contd

- **Meteorological records;**

  *** Monthly values of ;**

  **-maximum and minimum temperature( $^0$C)**

  **-relative humidity (%),**

  **-rainfall (mm)**

  **for the same period and stations from the Nigerian Meteorological Agency (NIMET) Oshodi, Lagos .**

# Methodology

**Data Quality Control**

- The cumulative mass curve technique was used to test

  the homogeneity of the data

# Methodology

- Mean monthly, seasonal trends of the variables were computed.

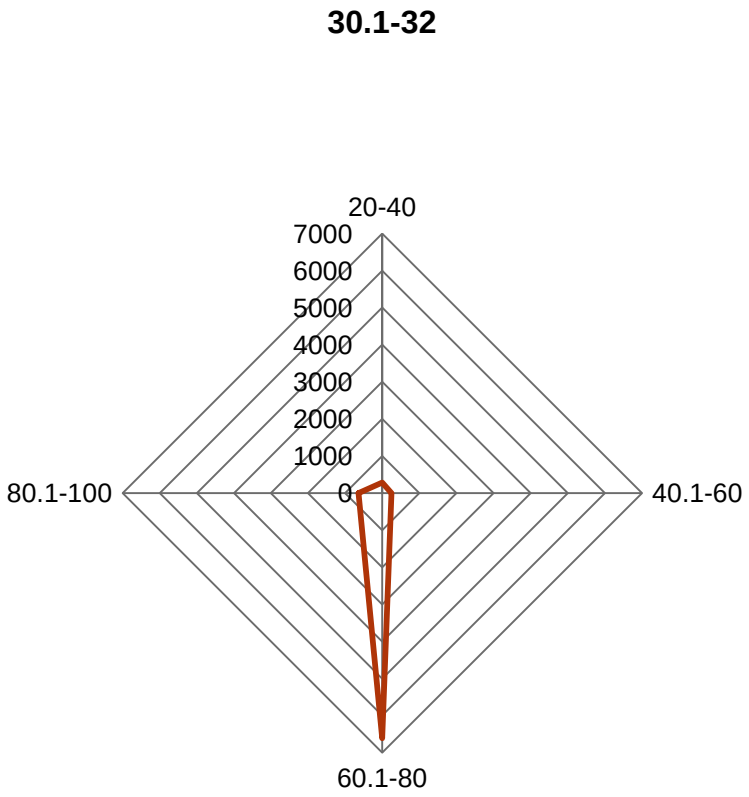
- Correlation were found between the Medical and Meteorological variables to identify any relationship before further analysis.

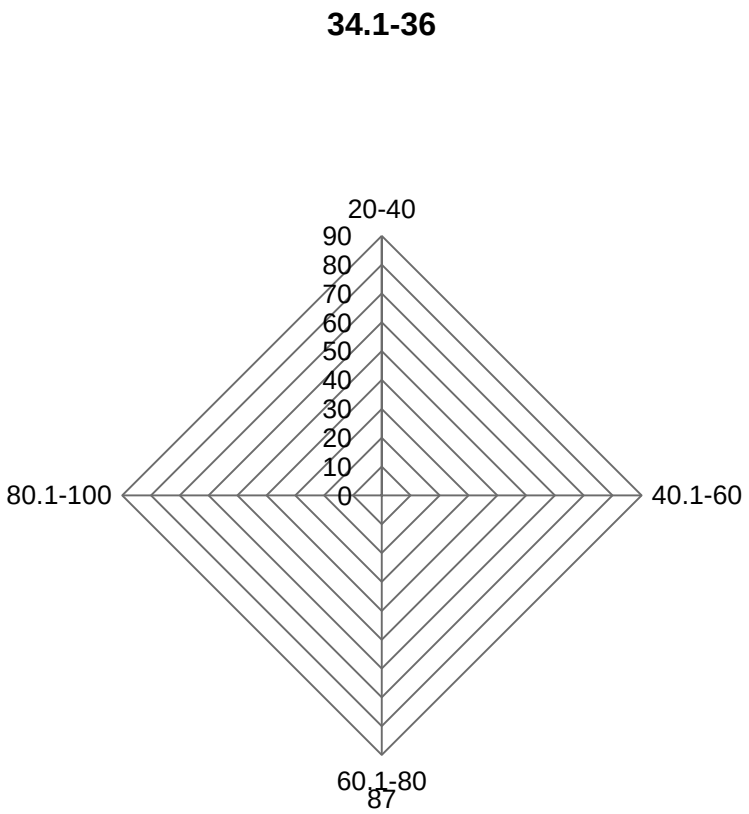
# Methodology

**Temperature and relative humidity threshold**

- There were various numbers of this disease occurrence under different temperature and relative humidity.
- Based on this behaviour, a temperature range of 2$^{o}$C was assumed against relative humidity range of 20%.
- The number of disease occurrences was classified into the temperature and relative humidity threshold they assume.

# Results





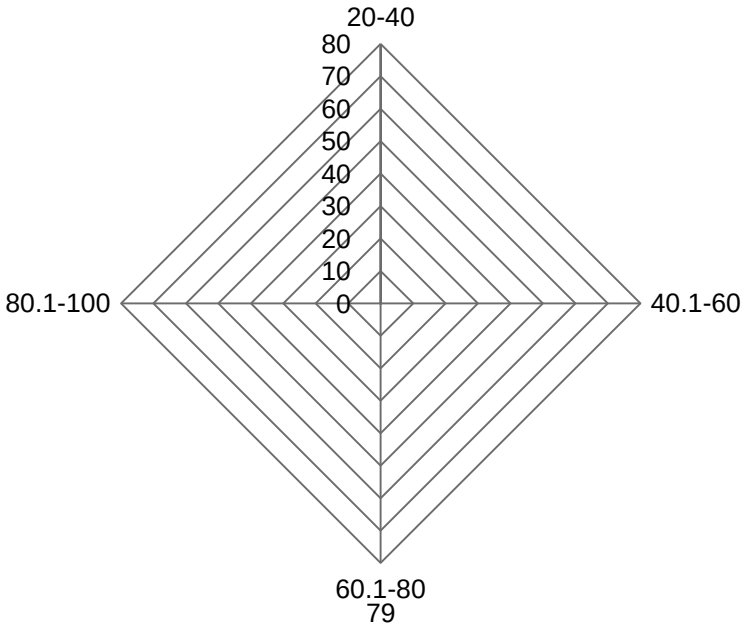

*Tmax and RH threshold for malaria in pregnancy*

# Results

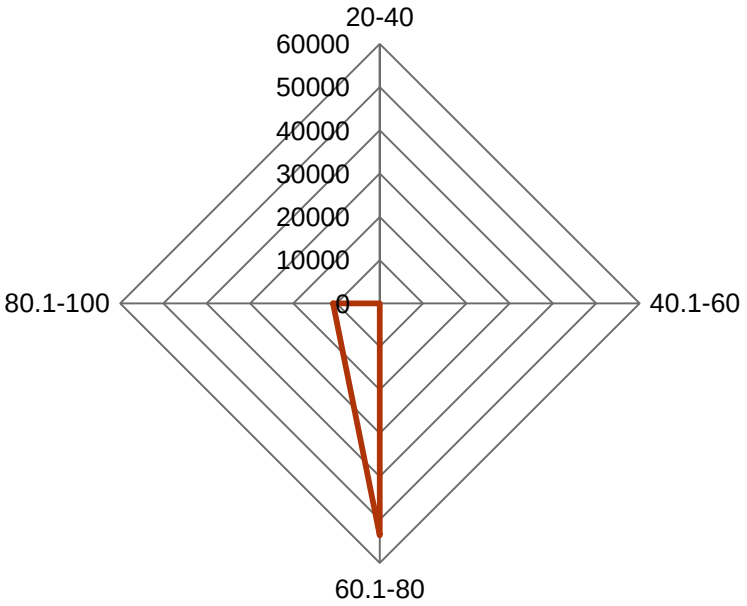
- These figures indicate that between this temperature range of (30.1-32) and relative humidity range of (60.1-80) there were 6700 number of malaria cases recoded for pregnant women.
- While about 87 number of malaria cases were recorded at temperature between 34.1-36 and relative humidity of between (80.1-100) % which shows that at (30.1-32)°c of temperature and (60.1-80) of relative humidity favours the prevalence of this disease.

# Results

**36.1-38**




**28-30**



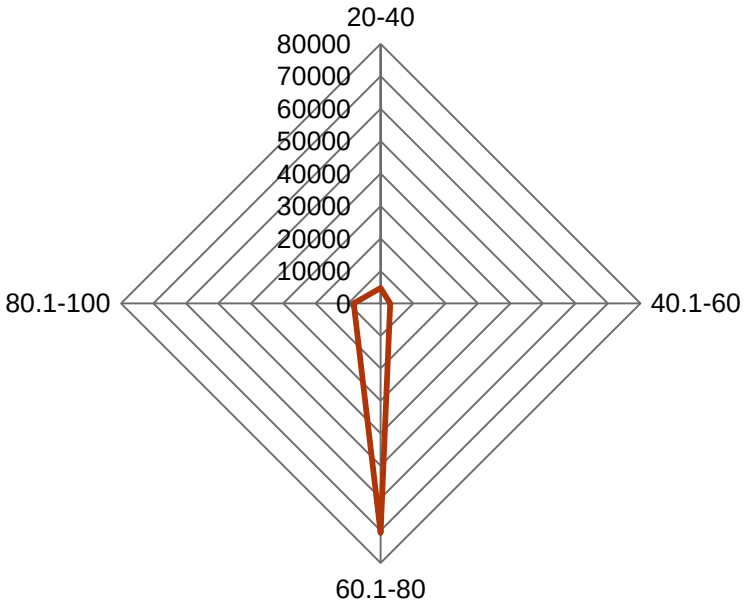

*Tmax and RH threshold for malaria in children more than 5years*

# Results

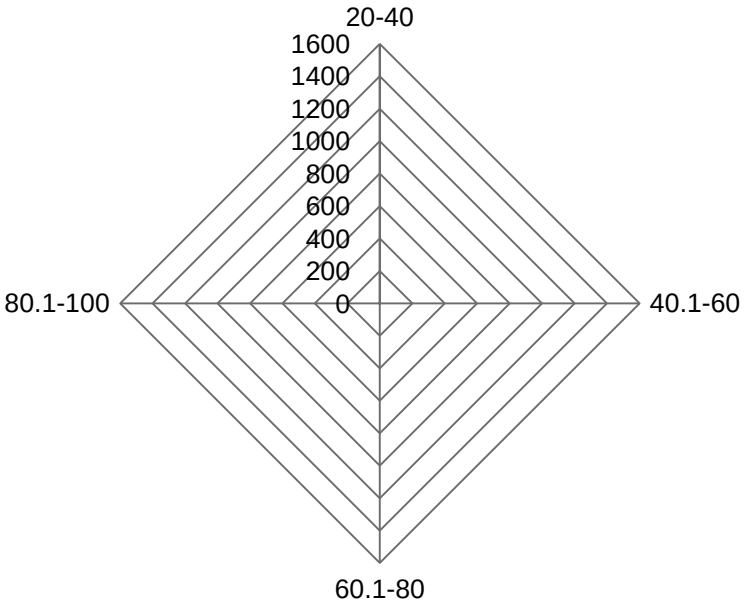
- The figures show that of people 5yrs and above in the station.  it shows that at (36.1-38) of temperature and (60.1-80) of relative humidity about 80 cases of malaria were recorded.
- At (28-30) of temperature and (60.1-80) of relative humidity about 53500 cases of malaria incidence were recorded

# Results

**30.1-32**




**34.1-36**




*Tmax and RH threshold for malaria in children less than 5years*

# Results

- At (30.1-32) of temperature and (60.1-80) of relative humidity  malaria cases recorded for children below 5yrs was about 72000.while at (34.1-36) of temperature and (60.1-80) of relative humidity we have very reduced number of malaria cases recorded within this threshold.

# Further work

- Climate drivers of malaria
- Rainfall : provides breeding sites for larvae.
- Temperature: larvae growth, vector survival, egg development in vector, parasite development in vector.
- Relative Humidity : dessication of vector.
- Wind : Advection of vector, strong winds reduce CO2 tracking.
- >2 bites are required to pass on the disease:

# Further work

- VECTRI: VECtor-borne disease community model of ICTP, TRIeste

# Further work

- A model for the impact of weather on malaria, with:
- daily timestep
- surface hydrology
- regional to global scales with resolution down to 5km
- incorporating population interactions (migration, immunity) and interventions (spraying, drugs, bednets).

# Further work

Uses:

- Community model
- Research and operational tool
- Seasonal forecasting
- Climate projections
- Further info:

http://www.ictp.it/~tompkins/vectri Tompkins

- A.M. and Ermert V, 2013: A regional-scale, high resolution
- dynamical malaria model that accounts for population density,

climate and surface hydrology, Mal. J., DOI:10.1186/1475-2875-12-65

# Conclusion

- The incidence of malaria is more prevalent especially among the age less than 5 years.

# Recommendations

- Daily comprehensive records of reported cases of the diseases should be kept in all the hospitals
- More meteorological stations should be established
- Extensive collaborations between climate scientist and medical sciences should be enhanced

# Recommendations Contd.

- Increasing interest in climate-health links particularly with operational predictions

- Need to raise awareness at all levels
  – students and practitioners to researchers to decision and policy makers