TIME SERIES REGRESSION: MALARIA VERSUS TIME

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ABSTRACT: This study attempt an assessment of malaria cases in Nigeria, Malaria is a major public health problem in Nigeria. Most of the malaria infections are dangerous to health, affecting children and adult. Time series analysis was therefore used to formulate the appropriate model for the malaria cases with respect to time and to know whether the trend of malaria is either increasing or decreasing for the period of 1990 to 2020. Trend analysis of the case of malaria reported which indicated that the rate of malaria reported cases is increasing as the year is moving gradually and the reported cases of malaria by 2029 will increase to 443.463 per 1000 population. Malaria is still increasing and causing big problem in the health of children and adult.

KEYWORDS: Time series, Malaria Infection, Trend Analysis, model, health

1. INTRODUCTION

The high intensity of the spread of malaria makes it an enormous public health problem. Malaria, a noticeable, preventable and curable disease is highly endemic in most parts of Nigeria, where the vast majority of cases occur in children under the age of five [4]. Children are among those in the higher risk group [5]. Human behavior affects health promoting and disease preventing activities, increasing risk in some instances and in others reducing it [2].

Globally, Malaria is increasingly becoming a disease of serious concern to everybody. This is because day by day, the impact of Malaria in human existence, the world over, becomes more ravaging and damaging as a result of high morbidity and mortality experienced in different parts of the globe especially the developing countries of which Nigeria is one. Malaria parasite has been with man since the dawn of time. Hippocrates, a physician born in ancient Greece, today regarded as the "father of medicine" was the first to describe the manifestation of the disease.

The association with stagnant water (breeding grounds for the Anopheles Mosquito) led the Romans to begin drainage program, the first intervention against Malaria. The first recorded treatment of Malaria dates back to 1600, when the bitter bark of cinchona tree in Peru was used by the native Indians. Not until 1889 was the protozoa (single celled parasite) cause of Malaria discovered by Alphonse. Understanding people's perceptions of malaria and the factors which influence this perception must be a central part of mounting successful interventions to the control of malaria throughout the world [1]. Findings have shown that good knowledge, attitude and practices of any public health disease by individuals and communities seems necessary if effective treatment and preventive measures are to be realistic [3].

2. METHODOLOGY

The secondary data for this work were extracted from the Annual reported cases of malaria of the World Health Organization portal through the National Health Insurance Scheme publication between 1990 and 2020.

Time series model takes the form $y = g + ht + e$, $y = $ Malaria

$$g \text{ and } h \text{ are the regression coefficient,}$$

$$t = Time \text{ and}$$

$$e = error$$

$$y = g + ht + e \qquad\qquad 1$$

$$e = y - g - ht$$

$$\sum e^2 = \sum(y - g - ht)^2$$

$$s = \sum(y - g - ht)^2 \qquad\qquad 2$$

$$\frac{\partial s}{\partial g} = -2\sum(y - g - ht)$$

$$0 = -2\sum y + 2gn + 2h\sum t$$

$$\sum y = gn + h\sum t \qquad\qquad 3$$

$$\frac{\partial s}{\partial h} = -2\sum t(y - g - ht)^2$$

$$0 = -2\sum t(y - g - ht)$$

$$\sum ty = g\sum t + h\sum t^2 \qquad\qquad 4$$

Solving Equation 3 and 4 simultaneously gives:

$$\sum t\sum y = gn\sum t + h(\sum t)^2$$

$$n\sum ty = gn\sum t + hn\sum t^2$$

$$h = \frac{n\sum ty - \sum t\sum y}{n\sum t^2 - (\sum t)^2} \qquad\qquad 5$$

$$\bar{y} = g + h\bar{t}$$

$$g = \bar{y} - h\bar{t} \qquad\qquad 6$$

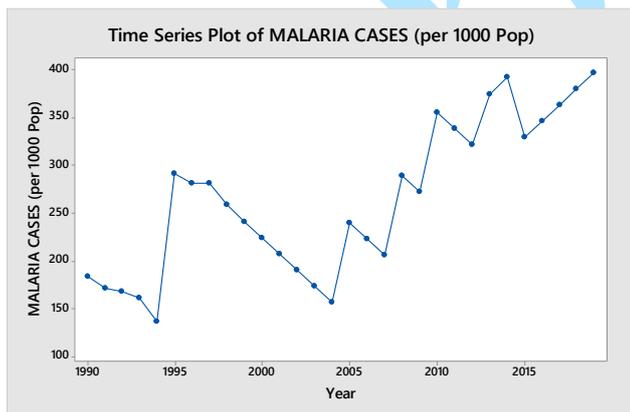## 3. TIME SERIES PLOT OF MALARIA CASES

Fig. 1. Time Series Plot

The plot shows that the rate of malaria cases is in sinusoidal movement and the trend form indicates the increase in yearly data of malaria cases.
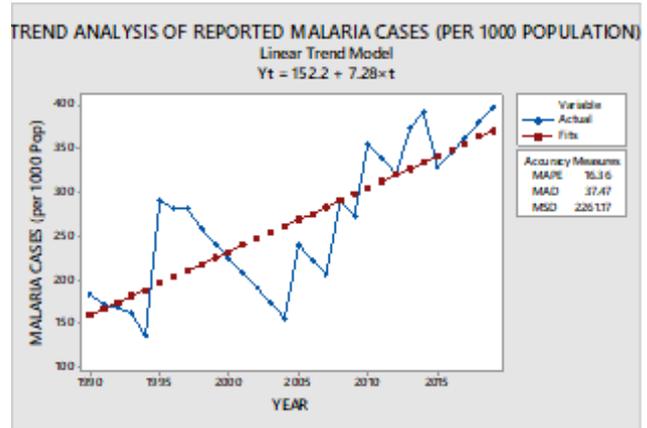

Fig. 2. Trend analysis plot for malaria cases
(per 1000 population)

The plot indicates that the chart is in sinusoidal movement and in trend form.

4. FORECASTS VALUE OF THE YEAR 2021 TO 2029

Table 1 shows the forecast value of the reported malaria cases for the period of 9 consecutive years. It shows that the cases of reported malaria cases is growing yearly.

Period	Forecast
2021	385.218
2022	392.498
2023	399.779
2024	407.060
2025	414.340
2026	421.621
2027	428.902
2028	436.182
2029	443.463

CONCLUSION

In this study, the reported cases of malaria is regressed against time and objectives of the research were achieved and the findings are outlined below.
$Malaria = 152.2 + 7.28\, Time$
The coefficient of Time i.e. 7.28 indicates that if time is increased, then the reported cases of malaria will be increased.

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