THE CORRELATION COEFFICIENT BETWEEN THE NUMBER OF COVID-19 INFECTED PERSONS AND TREATED PERSONS IN SOUTH-EAST NIGERIA

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Abstract
Covid-19 is a pandemic that is ravaging the world. Nigeria is not an exception. As at 12th of April, 2021, almost ten thousand people were infected in South-East, Nigeria. There are 163, 837 confirmed cases in Nigeria, 154, 177 treated and discharged and 2061 deaths. NCDC has been at the frontline of the fight against the virus and has always provided all that is needed for the testing across the nation. Government of each state is saddled with the responsibility of treating the infected persons. 2019 persons are infected in Ebonyi state, 1826 persons have been treated in Anambra state. 1683 persons are infected in Abia state, 1592 persons have been treated in Imo state and 2281 persons have been infected in Enugu state. Using Pearson Product Moment Correlation, the correlation coefficient between the Covid-19 infected persons and treated persons in South-Eastern Nigeria was calculated to be 0.96. The scatter diagram of the set of values shows a positive and strong relationship. This figure is a clear indication that all the stakeholders saddled with the responsibilities of detecting and treating south-easterners in Nigerian on corona virus are on the top of the game. However, they have to keep the good work in other to sustain the achievement made so far.

Coronavirus and COVID-19

Towards the end of 2019, there was an outbreak of corona virus, SARS-CoV-2, which causes COVID-19. It was noticed in Wuhan, China. The virus spread rapidly around the world, and the World Health Organization (WHO) declared it a pandemic at the end of the first quarter of 2020 (Abdul-Rasol *et al*., 2010)

The virus has killed many people around the world. The mortality rate varies from country to country. An individual will experience the symptoms of the virus 2-14 after exposure to the virus. Loss of taste, loss of smell, headache, vomiting, fatigue, congestion or a runny nose, sore throat, shortness of breath or difficulty in breathing, cough, fever and chills are all symptoms of the virus (Mallapty, 2020). The infection can be detected by a test even if there are no symptoms. The infection leads to multiple organs failure as the virus progresses to severe complications (Mallapty, 2020).

Coronavirus is very contagious. It is the believe of researchers that the virus transmit via fluids from the respiratory system (Paules *et al*., 2020). Transmission happens when a person:

- Sneezes or coughs without covering their mouth, dispersing droplets containing the virus into the air
- has physical contact with someone who has the infection
- touches a surface that contains the virus, and then touches their eyes, mouth or nose.

Transmission of the virus can be avoided by:

- wearing a face mask in public
- avoid touching the face, especially the mouth and nose
- coughing or sneezing into a tissue, then disposing of it and washing the hands right away
- regularly and thoroughly washing the hands with a soap and a running water
- application of alcoholic hand sanitizer on the hands frequently

During the ongoing COVID-19 pandemic, people should also do the following, even if they are well:

- Stay home whenever possible.
- Avoid contact with others.
- Wear a face covering in public.
- Stay at least 6 feet away from others in public.

Nigeria Centre for Disease Control and COVID-19

Nigeria recorded its first case of corona virus on 27th of February, 2020 (NCDC, 2021). The Nigeria Centre for Disease Control (NCDC) is Nigeria's national public health institute mandated to protect Nigerians from the impact of communicable diseases of public health significance among other responsibilities (NCDC, 2021). The centre achieves this through evidenced-based integrated disease surveillance, prevention and response activities. The centre's operations are tailored towards the following five goals (NCDC, 2021):

- Accurately measure the burden of infectious disease in Nigeria
- Ensure Nigeria is able to meet its international obligations as a member of the World Health Assembly
- Develop a public health laboratory service network to support the detection and prevention of, and response to critical infectious diseases
- Reduce the adverse impact of predictable and unpredicted public health emergencies
- Create an efficiently managed and evidence-based organization with a clear focus on health promotion and disease prevention (NCDC, 2021).

NCDC has five directorates. Namely:

- Prevention and knowledge management directorate
- Public health laboratory services directorate
- Health emergency preparedness and response directorate
- Administration and human resources directorate
- Finance and Accounts directorate (NCDC, 2021)

Federal government established Presidential Task Force on covid-19 (PTF) on March 9, 2020. Headed by the secretary to the government of the federation, the task force has a national coordinator and ten other members (NCDC, 2021). These includes: Honorable ministers of health, interior, environment, information, aviation, education, humanitarian affairs, disaster management and social services, director general of department of security services, NCDC and the country representative of the world health organization. PTF serves as a coordination hub for covid-19 response in Nigeria, with leadership at the highest level of government (NCDC, 2021). When it was necessary, PTF took the decision of closing all schools in the country, restriction of commercial flights, restriction of movements and others. World health organization (WHO) identified Nigeria as a high risk of possible importation of the virus. NCDC and partners had a

risk assessment and identified some states as priority areas (NCDC, 2021). Only four laboratories in the country could test for covid-19 when Nigeria recorded its first case. HIV and TB laboratories were activated to test for covid-19, besides performing their routine testing. Today, NCDC had established 70 public health laboratories and supported the activation of 36 laboratories by private firms (NCDC, 2021). NCDC supported the training of over 70 staff of the correctional services across the nation. 17 states have been supported by NCDC in the establishment of infectious disease treatment centers. Four states have completed the centers (NCDC, 2021).

During NYSC orientation camp, NCDC assisted NYSC to train, identify and activate infection Prevention and Control vanguards. Their role is to monitor and coordinate compliance to safety protocols among officials of NYSC and corp members (NCDC, 2021).

Correlation Coefficient

Correlation coefficient is a statistical measure of the strength of the relationship between the relative movements of two variables. The value ranges between -1.0 and 1.0. A correlation coefficient greater than 1.0 or less than -1.0 means that there is an error in the measurement (Edwards, 1976). A correlation of -1.0 shows a perfect negative correlation, while a correlation of 1.0 shows a perfect positive correlation. A correlation of 0.0 shows no linear relationship between the movements of the two variables (Gonick and Smith, 1993).

There are many types of correlation coefficients, but the one that is most common is the Pearson product moment correlation (*r*). This measures the strength and direction of the linear relationship between two variables. It cannot capture nonlinear relationships between two variables and cannot differentiate between dependent and independent variables.

A correlation coefficient (r) of exactly 1.0 means there is a perfect positive relationship between the two variables (Acton, 1966). For a positive increase in one variable, there is also a positive increase in the other variable. A value of -1.0 means there is a perfect negative relationship between the variables. This shows that the variables move in opposite directions - for a positive increase in one variable, there is a decrease in the other variable. If the correlation between two variables is 0, then, there is no linear relationship between the two variables.

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n(\sum x^2) - (\sum x)^2]\,[n(\sum y^2) - (\sum y)^2]}}$$

The Pearson Product-Moment Correlation equation (r)

Correlation Coefficient Between the Number of COVID-19 Infected Persons and Treated PersonsiIn South-Eastern Nigeria

South-Eastern Nigeria consists of five states, namely: Abia, Anambra, Ebonyi, Enugu and Imo states. The following data was obtained from the website of NCDC. The data shows the number of infected persons and number of treated and discharged persons in South-Easter Nigeria up to 12th of April, 2021.

Table 1: Numbers of Covid-19 infected persons and treated and discharged persons in South-East Nigeria

	Nos of Infected Persons (X)	Nos of Treated and Discharged Persons (Y)
EBONYI	2019	1965
ANAMBRA	1909	1826
ABIA	1683	1645
IMO	1655	1592
ENUGU	2281	2013
TOTAL	9547	9041

Finding the Pearson Moment Correlation Coefficient (r), we generate the table below:

Table 2: Squares of the number of Covid-19 infected persons and treated and discharged persons in South-East Nigeria

	X	Y	XY	X^2	Y^2
Ebonyi	2019	1965	3967335	4076361	3861225
Anambra	1909	1826	3485834	3644281	3334276
Abia	1683	1645	2768535	2832489	2706025
Imo	1655	1592	2634760	2739025	2534464
Enugu	2281	2013	4591653	5202961	4052169
TOTAL	9547	9041	17448117	18495117	16488159

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n(\sum x^2) - (\sum x)^2]\,[n(\sum y^2) - (\sum y)^2]}}$$

Substituting the values above in the formula, we have

r = (5(17448117) – (9547)(9041))/(√(5(18495117) − (9547)) ** 2)(5(16488159) − (9041) ** 2))

r = 0.958967 ≅ 0.96.

The correlation coefficient of 0.96 shows that there is a strong relationship between the number of infected persons and the number of treated and discharged persons. It means that about 96% of the infected persons are treated and discharged. Below is a scatter diagram of the values.

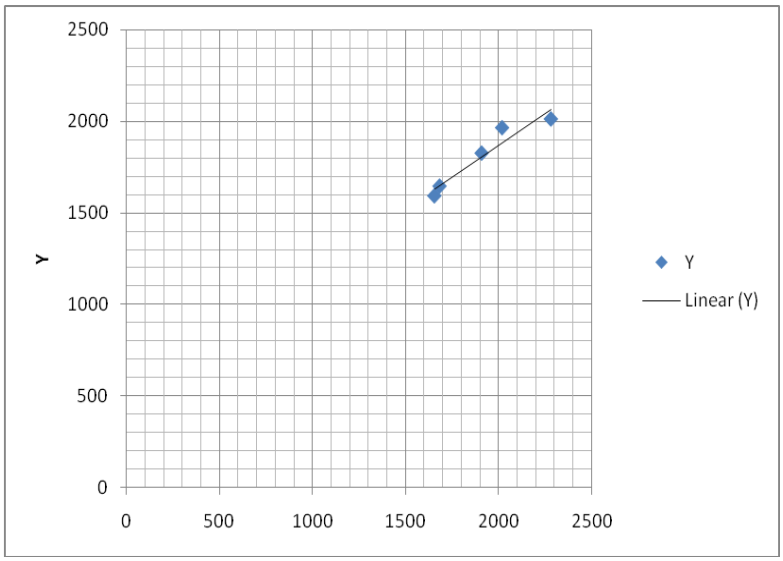

Figure 1: Scatter diagram of the number of Covid-19 infected persons and the number treated and discharged persons in South-East Nigeria

Discussion of Result

Correlation coefficient (r) in this study is a statistical measure of the strength of the relationship between the number of infected persons and the number of treated and discharged persons on Covid-19 in South-East Nigeria. The coefficient obtained using Pearson Product Moment Correlation coefficient is 0.96. The value is very close to 1. This means that there is a perfect positive relationship between the number of infected persons and the number of treated and discharged persons of Covid-19 in South-Eastern Nigeria. If the number of infected person increases, the number of treated and discharged persons also increases. The scatter diagram affirms this assertion. The scatter diagram gives a straight line and almost most of the points are very close to the gotten straight line.

Conclusion

Nigeria recorded its first case of Covid-19 on the 27th of February, 2020. Before then, all stakeholders including PTF, NCDC and the governors have been on standby. Though, as at 12th of April, 2021, 2061 persons have died in Nigeria, 32 persons have died in Ebonyi state, 19 in Anambra state, 22 in Abia state, 37 in Imo state and 29 persons have died in Enugu state. A lot of measures were taken by stakeholders to curb the spread of Covid-19 in Nigeria. Schools were closed for a period of time, markets were closed, restaurants and bars were closed at a time, among other measures. Face mask is made compulsory for everybody, people are asked to stay at home except when it is very necessary to go out. Even when it is necessary to go out, social distancing should be adhered to, among other guidelines. All these measures helped to stem down the number of infected persons in South-East and the country in general. This gives a total of Covid-19 deaths in south – east to be 139 persons under the period of review. Covid-19 is still ravaging the world. NCDC has been at the frontline of the fight against the virus and has always provided all that is needed for the testing across the country. Government of each state is saddled

with the responsibility of treating the infected persons. 2019 persons are infected in Ebonyi state, 1826 persons have been treated in Anambra state. 1683 persons are infected in Abia state, 1592 persons have been treated in Imo state and 2281 persons have been infected in Enugu state. Using Pearson Product Moment Correlation, the correlation coefficient between the Covid-19 infected persons and treated persons in South-Eastern Nigeria was calculated to be 0.96. The scatter diagram of the set of values shows a positive and strong relationship between the number of infected persons and the number of treated and discharged persons. This figure is a clear indication that NCDC, PTF and the other stakeholders saddled with the responsibilities of detecting and treating South-Easterners in Nigerian on corona virus are on the top of the game. However, they have to keep the good work in other to sustain the achievement made so far. Prevention is better than cure; hence, people should avoid contracting the virus by adhering to the guideline stated by the federal government.

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