SURVEY EVALUATION OF COVID-19 PANDEMIC IN NIGERIA USING GOOGLE TRENDS DATA

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ABSTRACT

The use of Google Trends data to evaluate the prevention against the spread of COVID-19 in some countries had been documented in some literatures. However, there was need to evaluate the preventive interest of the spread of COVID-19 in Nigeria using similar method. Google Trends Relative Search Volume (TRSV) data were mined for six periods in Nigeria ranging between January 30 (the day World Health Organization declared COVID-19 as Public Health Emergency of International Concern (PHEIC) and July 17, 2020 (as at the time of this survey). TRSV data were mined on the four non-pharmaceutical preventive measures (face mask, social distancing, hand washing and hand sanitizer) and the four major symptoms of COVID-19 (fever, dry cough, tiredness and difficulty in breathing). The Nigeria COVID-19 daily infected cases were also collected from the World Health Organization (WHO) dashboard. Kruskal-Wallis test, Mann-Whitney test, multiple linear regression model and post-hoc test were used to analyze the data. Results revealed that Nigerians had low usage interest of the use of these four non-pharmaceutical preventive methods. It was observed that Nigerians significantly preferred the term **coronavirus** over **COVID-19** in any public sensitization program. Nigerians had significant interest in fever but insignificant interest in dry cough, tiredness and difficulty in breathing, as the symptoms of COVID-19. This insignificant interest was suspected to reduce Nigerians interest in visiting the hospital when they have sickness with any of these three symptoms. Strategic COVID-19 sensitization programs and question, based on Nigerians search interest, were recommended to increase the public interest in the prevention of the spread of COVID-19 in Nigeria.

Keywords: COVID-19, coronavirus, Google Trends, non-pharmaceutical preventive measures, COVID-19 symptoms

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Introduction

World Health Organization (WHO) declared Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV-2) as a deadly virus in China that requires international concern in January 30, 2020 (WHO, 2020a). This virus is said to be a respiratory disease caused by Coronavirus disease in year 2019 (COVID-19). The index death of COVID-19 was documented in Wuhan of Hebei in China in December 31, 2019 (IFRC, 2020). Zhou (2020) had that this respiratory disease is characterized with cough, headache, fever, muscle pains, among other symptoms. This disease had remained in our community following human-to-human community transmission mode. As at August 14 2020, almost all the countries in the seven continents have had their share of the infected cases of this virus. WHO (2020b) gives the daily report of the countries that have record infected and death cases of COVID-19 on her situation dash board. These countries included China, United States of America, Brazil, Russia, South Africa, Australia, India and Nigeria. Unfortunately, there had not been any official pharmaceutical solution to COVID-19 reported. However, non-pharmaceutical solutions had been proposed and implemented by countries for the prevention of the spread of COVID-19 around the globe.

Nigeria reported her index infected case of COVID-19 in February 27, 2020 from an Italian who worked in Ogun state. Nigeria had total of 48445 infected cases,

35998 discharge cases and 973 death cases as at August 15 2020 (NCDC, 2020a). The community transmission had been reported in 36 states and the Federal Capital Territory (FCT) in Nigeria (NCDC, 2020a). Nigeria among the infected countries had introduced different non-pharmaceutical measures against the spread of COVID-19 in the country. These measures include lockdown of the hotspot states (Lagos state, Kano state Ogun state and FCT), compulsory use of face mask by all Nigerians, social distancing, hand washing, inter-state movement restriction, identification and quarantine of the infected cases, among others.

However, the study of people's interest on these non-pharmaceutical preventive measures had been studied by many authors in order to scientifically evaluate the significant usage of these measures to control the spread of COVID-19 in different countries. Zhong *et al.* (2020) had evaluated the Knowledge, Attitudes and Practices (KAP) of the Chinese using online survey questionnaire administration method for data collection. Some countries had used telephone data collection method, as against the face-to-face data collection method, in order to prevent the contraction and spread of COVID-19 among the correspondents (IASS, 2020).

Many literatures had used Google Trends as data collection method. Jansen and Molina (2005) reported that at least 80% of the web visitors commence their web search experience with web search engine. Net Market Share (2020) revealed a real time analysis that 82.98% of search engine users use Google search engine on all hardware versions between January 2019 and June 2020. This result justifies the popularity of Google web search engine over other web search engines. Google search engine receives millions of search activities everyday around the globe. The search activities represent the interests, wants and moods of the users on different topics (Jun *et al.*, 2018). The collection of these activities could be compared with the traditional survey but without demographic information. Google Inc.™ had compiled these search activities and released it to the public domain through the online application called Google Trends.

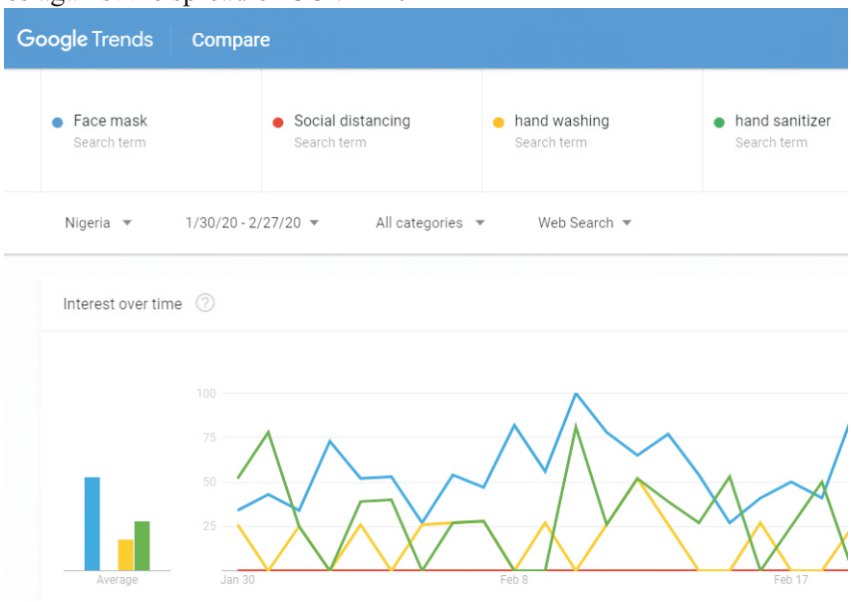
Google Trends was developed and released for the public usage in May 11, 2006 (Jun *et al.*, 2018). It gives the Relative Search Volume (RSV) of the search activities on Google search engine. It normalizes and standardizes the data between 0 and 100% for the purpose of reducing the noise in the data (Askitas, 2015). Google Trends RSV had been used in now cast and forecast of many human endeavors. Such include automobile sales, travel destination planning, unemployment claims and consumer confidence (Choi and Varian, 2011). Recently, Google Trends RSV data had been used to investigate COVID-19 pandemic in different countries. Sharma and Sharma (2020) used Google Trends data and the infected case data to detect the escalating cases of COVID-19 in eight different countries using comparison and correlation analyses. It was affirmed that Google Trends data are good representative of the people's intention on COVID-19. Ciaffi *et al.* (2020) established the importance of Google Trends data in the management and control of COVID-19 in Italy using **fever** and **Cough** search terms. It was concluded that Google Trends data analysis is good for the control of COVID-19. Dey and Zhao (2020) analysed COVID-19 data for France, Switzerland and Italy using Google Trends data. It was concluded that Google Trends data were effective to monitor the clinical features of Kawasaki disease and COVID-19 in real time. Leventhal (2020) envisage with evidence that Google Trends in academic research will increase overtime considering its easy-to-use and high speed characteristics. However, it cautioned users against the wrong interpretation. Husnayain *et al.* (2020) monitored the public interest on the spread of COVID-19 pandemic in Taiwan using Google Trends data. Data were collected using the coronavirus, hand washing and face masks search terms in Google Trends. Results revealed the importance of Google Trends data in tracking the location and time of the appropriate practice of the correct attitude against the spread of COVID-19. Similarly, Effenberger *et al.* (2020) confirmed the validity of Google Trends data in reflecting the significant interest of some selected countries on the seven continents of the earth with respect to the COVID-19 pandemic. Results revealed that info demiology and Google Trends RSV are effective to monitor trends of COVID-19 pandemic. Sequel to the literatures, the evaluation of the prevention interest of Nigerians against COVID-19 pandemic using Google Trends data had not been documented. Hence, this study aims to cover this identified gap.

Materials and Methods

This study investigated into the Nigerians interest on COVID-19 preventive measures and symptoms for four periods. Those periods were between January 30 and February 27, 2020 (between the day WHO declared COVID-19 as Public Health Emergency of International Concern (PHEIC) and the day Nigeria documented her COVID-19 index case), between February 28 and May 3, 2020 (between the index case and the end of lockdown order in Nigeria), between May 4 and May 31, 2020 (first phase of the lifting national lockdown in Nigeria), between June 1 and June 30, 2020 (the second phase of the lifting national lockdown in Nigeria) and between July 1and July 17, 2020 (the extension day of second phase of lifting the national lockdown in Nigeria till the day these data were collected).Google search data, based on Nigeria search

activities on Google search engine, were mined with Google Trends between the aforementioned four specified periods using four non-pharmaceutical terms as the search terms. These terms were face mask, social distancing, hand washing and hand sanitizer. Similarly, data were mined using the four symptoms of COVID-19 (NCDC, 2020b). Those symptoms were fever, dry cough, tiredness, and difficulty in breathing. This study will test to know which among these symptoms is/are significantly considered by Nigerians against the spread of COVID-19. Figure 1 shows the screen shot of the search result on Google Trends. The search was done with Intel(R) Core (TM) i3 CPU, 4GB, 2.27GHz Laptop technology on July 22, 2020. Similarly, the Nigeria COVID-19 daily new cases data were downloaded from WHO website (WHO, 2020d) on July 22, 2020. SPSS version 23 was used for the statistical analyses. Statistical tests showed that the mined data violated the normality and homogeneity assumptions at5% significant level. This violation could be associated with the presence of extreme values (outliers) in the online data(Ahmed, 2008). Hence, Kruskal-Wallis test and Mann-Whitney U test (non-parametric tests) were used to test for the statistical significant difference of means among the data for the four non-pharmaceutical search terms within each of the four aforementioned periods at 5% significant level.

Fig. 1: Screenshot of Google Trends repository search for the non -pharmaceutical preventive measures against the spread of COVID-19



Review of Kruskal-Wall is test

Kruskal-Wall is test is a non-parametric test that does not require the satisfaction of normality distribution assumption, as the case is in parametric model. The test uses a raking system to ascertain if there exists statistically significant difference among more than two independent variables with one ordinal or continuous dependent variable. The null hypothesis states that there is no evidence of statistically significant difference among the three means of the independent variables.

According to Chan and Walmsley (1997), Kruskal-Wallis test statistic is giving as

$$H = (N-1)\frac{\Sigma_{i=1}^{g} n_i(\bar{r}_i - \bar{r})^2}{\Sigma_{i=1}^{g}\Sigma_{j=1}^{n_i}(r_{ij} - \bar{r})^2}. \quad (1)$$

Then$_i$ is the number of observation in group i, r_i is the rank (among all observations) of observation *j* from group *i*, *N* is the total number of observations across all groups

$$\bar{r}_i = \left(\sum_{j=1}^{n_i} r_{ij}/n_j\right)$$

is the average rank of all observations in group *i* and $\bar{r} = \frac{(N+1)}{2}$ is the average of all the r_{ij} . If the data contain no ties, the denominator of the equation for $\frac{(N-1)(N+1)}{12}$ and $\bar{r} = \frac{?N+1?}{2}$. Hence,

$$H = \frac{12}{N(N+1)}\sum_{i=1}^{g}\frac{1}{n_i}\left(\bar{r}_{i.} - \frac{(N+1)}{2}\right)^2.$$

This can, further, be simplified as

$$H = \frac{12}{N(N+1)}\sum_{i=1}^{g}\frac{\bar{r}_{i.}^{\,2}}{n_i} 3(N+1), \quad (2)$$

where $\bar{r}_{i.}^{\,2}$ is the square of the average of ranks.

A decision to the acceptance or rejection of the null hypothesis is done by comparing the values of *H* with the critical value (H_a) either from the associated statistical table or the statistical software significant value. If ($H > H_a$) then the null hypothesis will be rejected, else the null hypothesis will be accepted. However, the Dunn's multiple comparison post-hoc test (as in SPSS version 23) will be necessary if the null hypothesis is rejected. The post-hoc test was used to ascertain the significant difference among the four non-pharmaceutical preventive measures and the four COVID-19 symptoms at 5% significant level.

Multiple Linear Regression (MLR)

MLR is a statistical method that models a linear model between one continuous dependent (response) variable and more than one independent (explanatory) variable. MLR can, also, be used to determine significant independent variables in the linear regression model. Gujarati (2014) presented MLR as

$$y = \beta_0 + \sum_{i=1}^{k}\beta_i x_i + \varepsilon. \quad (3)$$

The *y* is the dependent variable, β_0 is the intercept on y axis, β_i is the regression coefficient of regressing x_i on *y*, x_i is the independent variable and ε is the model's residual. The assumptions associated with the use of MLR are linearity assumption, absence of collinearity or multi-collinearity among the independent variables and the dependent variable must be randomly and independently selected.

Functional Framework for Google Trends Relative Search Volume (TRSV)

The Nigeria COVID-19 daily infected case data were downloaded from the World Health Organization website (WHO, 2020b). The data ranged from February 27 (Nigeria index case day) to the July 17, 2020. This set of data had different unit of measurement from the data downloaded with Google Trends. Hence, there was need to standardize the Nigeria COVID-19 daily infected case data. The functional framework that is used by Google to produce the Google Trends relative search volume data was used for the standardization of the Nigeria COVID-19 daily infected case data.

Google Trends (www.trends.google.com) queries the Google search engine database for search activities data. However, these data are not the raw quantitative representation of the search activities on Google server. Aguilera *et al.* (2019) reported that Google Trends converts the raw search activity data into Relative Search Volume (RSV) using the equation.

$$RSV_{(K,g,t)} = \frac{S_{(k,g,t)}}{\sum_{k\in Q(g,t)} S_{(k,g,t)}}. \quad (4)$$

From equation (4), *k* represents the search queries, *g* represents the geographical region and *t* represents the particular time of the search.

It is expected that $\sum_{k\in Q(g,t)} S(k,g,t) > 0$. However, if $\sum_{k\in Q(g,t)} S_{(k,g,t)} = 0$, this implies that $S_{(k,g,t)} = 0$ and $RSV_{(K,g,t)} = 0$, automatically. The RS V is, further, normalized by dividing each RSV_t by the maximum RSV within the stipulated range Max $_{t\in T} RSV_{(K,g,t)}$. Aguilera et al. (2019) presented the Google Trends Relative Search Volume (TRSV) as

$$TRSV_{(K,g,t)} = \frac{RSV_{(k,g,t)}}{Max_{t\in T} RSV_{(K,g,t)}} * 100\%, \quad (5)$$

such that $TRSV_{(K,g,t)} \in [0,100]$. t is the particular search time while T is the range of considered search time.

Results

This study mined Nigeria COVID-19 data on the Google repository using Google Trends for aforementioned six periods. Data collected included Nigerians Google search on the four non-pharmaceutical preventive measures (face mask, social distancing, hand washing and hand sanitizer) over the six periods. The data, also, included Nigerians Google search on COVID-19 and coronavirus terms. It, also, included Nigerians Google search on four major symptoms (Fever, dry cough, tiredness and difficulty in breathing) of COVID-19 for the 37 states in Nigeria. Federal Capital Territory (FCT) was considered as a state in Nigeria. These four symptoms were considered as independent variables on the Nigeria COVID-19 daily newly infected cases (as dependent variable) between February 27 and July 17, 2020. The data on Nigeria COVID-19 daily newly infected cases

were downloaded on the World Health Organization (WHO) COVID-19 world data repository (WHO, 2020b). The data were standardized using equations (4 and 5) and further analysed using Kruskal-Wallis analysis test, Mann-Whitney U test, correlation test and Multiple Linear Regression (MLR) model.

Kruskal-Wallis analysis result revealed that there is no statistically significant difference among the days, within each of the six considered periods, on the cumulative use of the four non-pharmaceutical preventive measures against COVID-19 among Nigerians at $p>0.000$ Table 3.1 shows the means of the TRSV (in percentage), standard error and the p-value of face mask, social distancing, hand washing and hand sanitizer obtained for each of the six periods. Between January 30 and Feb 27, Table 3.1 confirms that face mask had statistically significant TRSV of 44.69% which is high over the average usage interest of social distancing, hand washing and hand sanitizer at $p>0.000$ Similarly, the usage interest on hand sanitizer (12.48%) is statistically significantly higher than Social distancing at $p>0.000$ while there is no significant difference between the usage interest of Social distancing and hand washing and the usage interest of hand washing and hand sanitizer among Nigerians at $p>0.05$. This result is similar to other five considered periods.

Table 3.1: Comparison result of the means of non-pharmaceutical preventive measures across the days using Kruskal Wallis test

N	Period	No of days	Face mask (%) Mean±SE	Social distancing(%) Mean±SE	Hand washing(%) Mean±SE	Hand sanitizer(%) Mean±SE	*p-value*
	Jan 30 - Feb 27	29	44.69±2.91	0±0	10.59±2.63	12.48±2.6	0.000*
	Feb 28 - May 3	66	14.47+1.45	2.5+0.24	1.79+0.125	12.79+2.207	0.000*
	May 4 - May 31	28	39.32+3.226	5.36+0.361	4.5+0.541	10.14+0.79	0.000*
	June 1 - June 30	30	61.2+3.742	14.27+1.155	7.63+1.326	21.67+1.541	0.000*
	July 1 - July 17	17	64.24+4.037	8+2.234	8.06+2.397	16.71+3.137	0.000*
	Jan 30 - July 17	170	11.89+0.876	1.31+0.162	0.66+0.081	6.22+0.941	0.000*

Table 3.2 presents the cumulative usage intention of the four non-pharmaceutical preventive measures against the spread of COVID-19 in Nigeria. These results are presented in percentage. The results for the cumulative period (between January 30 and July 17) were used for the ranking of the 37 states in Nigeria. The rankingwas done based on the decision of this study presented in table 3.3.Google Trends gives the access to related search terms that are associated with the search keyword. Table 3.4 depicts the associated search terms to face mask used by Nigerians.

Table 3.2: Comparison result of the means of 37 states across the four non -pharmaceutical preventive measures using Kruskal Wallis test

N	States	Jan 30 - Feb 27	Feb 28 - May 3	May 4 - May 31	June 1 - June 30	July 1 - July 17	Jan 30 - July 17	Rank	Rank Class
1	Ogun	3.75	43.25	49.25	28.5	14.5	69	1	High
2	Oyo	29.5	71.5	31.25	61.5	39.25	65	2	High
3	Plateau	33.25	23.25	16.25	14.5	12.25	42.5	3	Low
4	Abia	17.75	20	27	24	5	41.5	4	Low
5	Akwa Ibom	14.5	37.25	25	32.5	4.5	38.25	5	Low
6	Cross River	0	30.75	15.25	13.5	6.25	36.75	6	Low
7	Lagos	7.25	32.25	24.25	13.5	8	34.25	7	Low
8	Delta	16.25	38	17.5	21	3.5	31.75	8	Low
9	Enugu	11.75	28	43	6	26.5	31.25	9	Low
10	Abuja	9	27.5	21.75	12.5	7	30	10	Low
11	Rivers	23.25	32.75	20.25	14.75	5.75	29.75	11	Very Low
12	Bayelsa	0	18	36.75	14	10.25	29.25	12	Very Low
13	Imo	11.75	25	7.25	24.25	9.5	29	13	Very Low
14	Benue	25	17.75	47	23.75	25	27.25	14	Very Low
15	Osun	0	11.75	20	13.25	5.25	27.25	14	Very Low
16	Bauchi	12.25	43.25	22	20.5	0	27	16	Very Low

17	Anambra	5	27.5	12.25	11.5	2.75	26.25	17	Very Low
18	Taraba	0	12.25	0	0	0	25	18	Very Low
19	Kogi	0	14.25	32.25	27	0	24.75	19	Very Low
20	Borno	25	12.25	0	13.5	35	24.25	20	Very Low
21	Edo	11.5	24.75	24.75	19	33.5	22.75	21	Very Low
22	Ondo	0	15.25	17.5	14.75	10.25	21.75	22	Very Low
23	Kwara	6.25	23	21	17.75	5.75	21.25	23	Very Low
24	Nasarawa	0	24.5	43.5	15.5	20.25	21.25	23	Very Low
25	Niger	0	17.25	12	10.75	26.5	20	25	Very Low
26	Kano	6	20.5	20.75	5.25	4	19.75	26	Very Low
27	Kaduna	5.5	16	15.75	5.75	10.25	18	27	Very Low
28	Adamawa	0	16.5	16.75	37.75	0	15.75	28	Very Low
29	Gombe	0	24.5	0	0	0	12.75	29	Very Low
30	Ekiti	38.5	24.5	26.5	0	7.5	11.75	30	Very Low
31	Ebonyi	0	17.5	0	25	0	8.5	31	Very Low
32	Jigawa	0	0	0	0	0	0	32	Poor
33	Katsina	0	0	0	0	0	0	32	Poor
34	Kebbi	0	0	0	0	0	0	32	Poor
35	Sokoto	0	0	0	0	0	0	32	Poor
36	Yobe	0	0	0	0	0	0	32	Poor
37	Zamfara	0	0	0	0	0	0	32	Poor
	P-value	0.147	0.158	0.06	0.088	0.091	0.173		

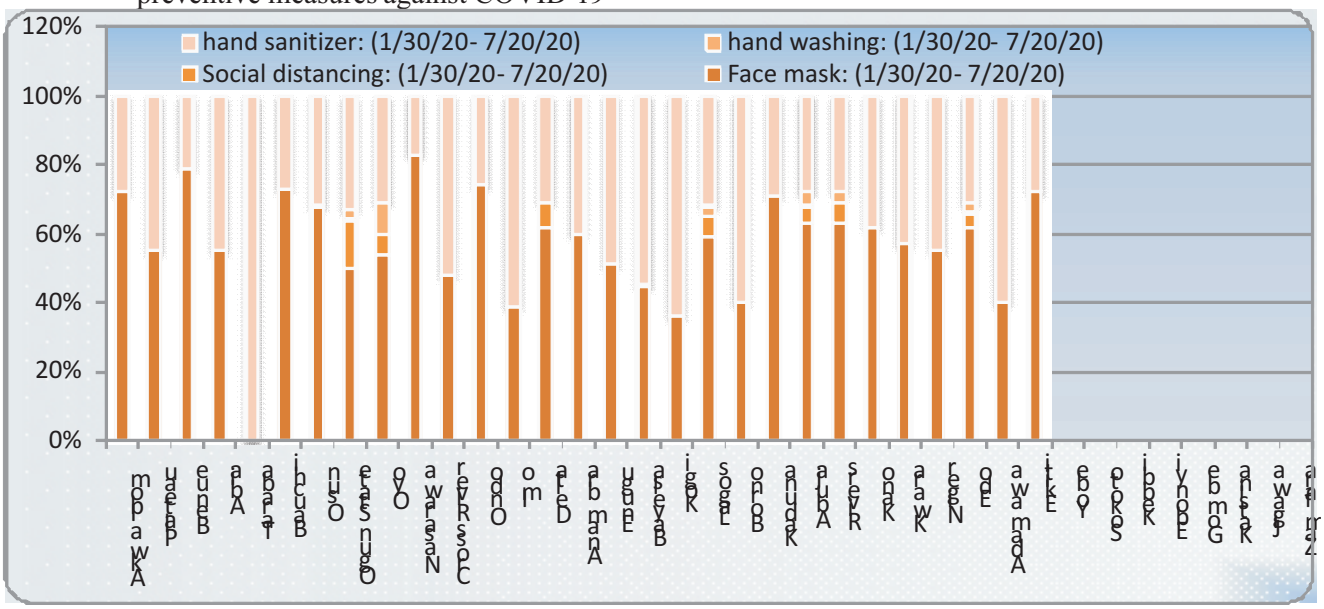
Table 3.3: Yardstick for rating of the states' TRSV in Nigeria

SN	TRSV Range	Rating
1	80% - 100%	Very High
2	60% – 79%	High
3	50% – 59%	Moderate
4	30% – 49%	Low
5	6% – 29%	Very low
6	0% - 5%	Poor

Table 3.4: List of associated search terms to face mask

SN	Related search terms	Percentage	classification
1	how to make face mask	100	Production
2	nose mask	38	Production
4	face mask jumia	28	Production
5	face mask pattern	26	Production
6	how to wear face mask	24	Correct use
7	Do It Yourself face mask	22	Production
8	how to use face mask	20	Correct use
9	how to sew face mask	15	Production
10	how to cut face mask	13	Production
11	how to make face mask at home	13	Production
12	3m face mask	9	Production
13	surgical face mask	9	Production
14	how to wear a face mask	7	Correct use
15	how to cut and sew face mask	4	Production
16	Ankara face mask	4	Production
17	kn95 face mask	4	Production
18	how to wear a face mask properly	2	Correct use

Figure 2: Bar chart of the distribution of Nigeria states' usage interest in the four non-pharmaceutical preventive measures against COVID-19



Mann-Whitney U test revealed that, among the 37 states in Nigeria, there is statistically significant difference between the mean of CORONAVIRUS (65.84%) and the mean of COVID-19 (44.73%) at p =0.000. The term CORONAVIRUS had smaller search standard error (2.05) over the search term COVID-19 with higher search standard error (2.78). Similarly, Mann-Whitney U test, also, revealed that, between January 30 and July 17 2020 (170 days), there is statistically significant difference between the mean of CORONAVIRUS (23.0176%) and the mean of COVID-19 (2.9693%) at p =0.000. Figure 3 shows the search distribution of the two terms, COVID-19 and CORONAVIRUS within each state in Nigeria. CORONAVIRUS shows higher search result percentage over COVID-19 search term.

Fig. 3 Bar chart of the distribution of Nigeria states' interest in COVID 19 and Coronavirus

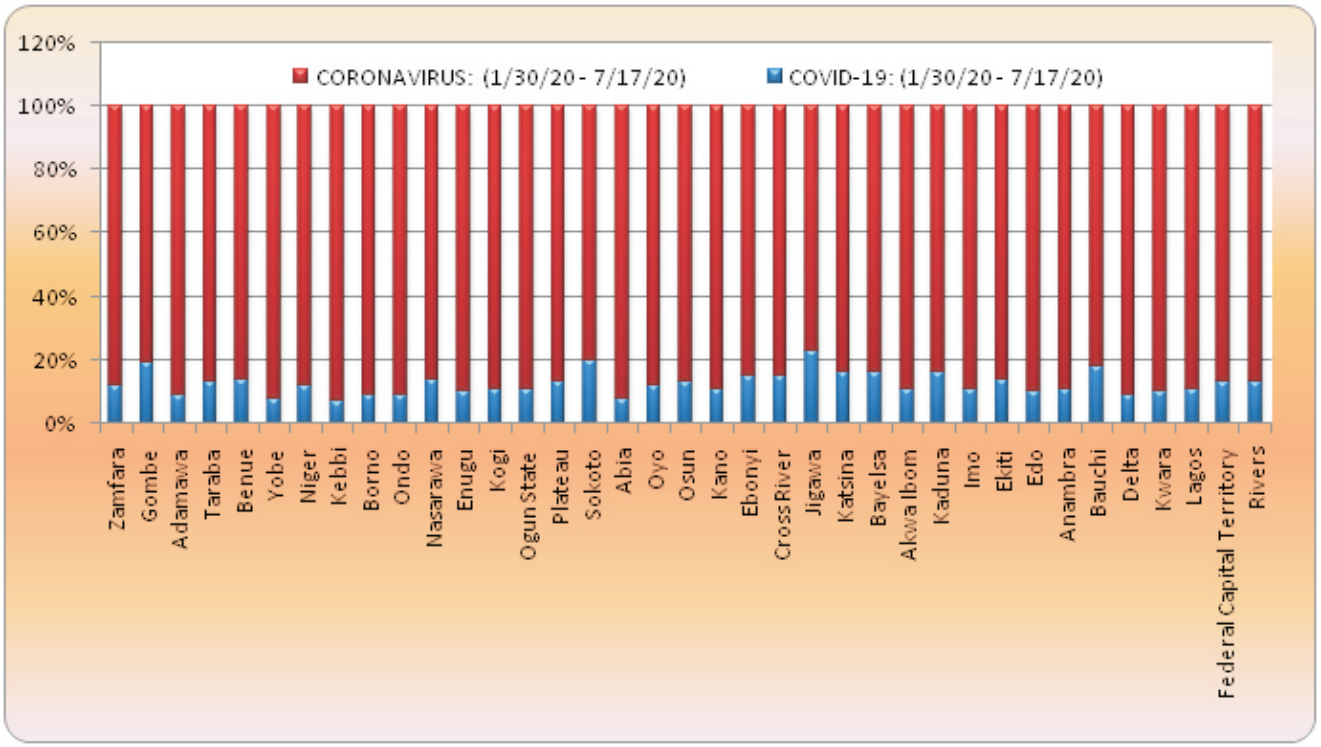


Table 3.5: The means and standard error of the Nigerians' interest in the four major symptoms

	Number of states	**Mean (%)**	**Std. Error**	***p-value***
Fever	37	51.54	3.499	0.000
dry cough	37	12.86	4.116	
tiredness	37	6.22	3.111	
difficulty in breathing	37	7.54	4.238	
Total	**148**	**19.54**	**2.417**	

Within the 37 states in Nigeria, post-hoc test revealed that there is no statistically significant difference among the means of Nigerians' interest in dry cough (12.86%), tiredness (6.22%) and difficulty in breathing (7.54%) while the mean (51.54%) of fever is significantly higher than others at P = 0.000. (see table 3.5). However, Kruskal-Wallis test result revealed that there is no statistically significant difference in the Nigerians' interest in these four symptoms among the 37 states at P = 0.937 This means that the result in table 3.5 was significantly practiced in all the 37 states in Nigeria.

Spearman's rank (of the non-parametric model) correlation coefficient was considered for the correlation analysis since the distributions violated the normality assumption at 5% significant level. Table 3.6 depicts the result of the correlation coefficient test. There is statistically significant negative and moderate negative (see table 3.8 for classification) correlation coefficient (-59.9%) between the COVID-19 daily

infected cases and the Nigerians interest for fever at p = 0.000 However, Nigerians' interest (to know more) about dry cough had a non-significant negative correlation coefficient (-4.1%) with the daily infected COVID-19 cases in Nigeria at 5% significant level. Similarly, Nigerians' interest (to know more) about tiredness and difficulty in breathing had a non-significant and negligible (see table 3.8 for classification) positive correlation coefficient of 8.1% and 7.6% with the daily infected COVID-19 cases in Nigeria, respectively, at 5% significant level.

Table 3.6: Spearman's rank correlation coefficient results

		Fever	Dry cough	Tiredness	Difficulty in breathing
Nigeria daily new cases (in TRSV unit)	Correlation Coefficient	-.599**	-.041	.081	.076
	Sig. (2-tailed)	.000	.630	.337	.369

**: Correlation is significant at the 0.01 level (2-tailed).

Multiple linear regression analysis test for the significance of the coefficient of the four independent variables (fever, dry cough, tiredness and difficulty in breathing) on the dependent variables (the daily infected COVID-19 cases in Nigeria) at 5% significant level. Statistical investigation revealed that only fever is statistically significantly related to the daily infected COVID-19 cases in Nigeria at P=0.000 while the remaining three COVID-19 symptoms (dry cough, tiredness and difficulty in breathing) are not statistically significantly related to the daily infected COVID-19 cases in Nigeria at P > 0.05 (see Table 3.7). This analysis reports low VIF or high tolerance level (Agunbiade and Ogunyinka, 2014) among the four independent variables (Fever, dry cough, tiredness and difficulty in breathing).The regression model is presented as

$$\text{Nigeria daily new cases (in TRSV unit)} = 58.729 - 1.028\text{Fever} + e \quad (6)$$

Table 3.7: Multiple linear regression coefficient test

		B	Std. Error	Beta	Tolerance	VIF
1	(Constant)	58.729	5.002			
	Fever	-1.028	.141	-.525	.965	1.036
	Dry Cough	-.798	.442	-.131	.942	1.062
	Tiredness	1.149	.921	.090	.950	1.052
	Difficulty in breathing	1.006	1.137	.063	.985	1.015

Table 3.8: Correlation Coefficient interpretation developed by Agunbiade and Ogunyinka (2013)

Size of Correlation	Interpretation
0.90 to 1.0	Very high Positive (Negative) Correlation
0.70 to <0.90	High Positive (Negative) Correlation
0.50 to <0.70	Moderate Positive (Negative) Correlation
0.30 to <0.50	Low Positive (Negative) Correlation
0.00 to <0.30	Negligible Correlation

4.0 Discussion

Generally, Nigerians had statistically equal daily usage interest of the four non-pharmaceutical preventive measures within each of the six periods considered in this study at 5% significant level. The daily usage of the face mask, social distancing, hand washing and hand sanitizer were statistically approximately equal in each of the six periods.

It was observed that there was very low usage interest(14.47%) of face mask between the COVID-19 index case (February 27) in Nigeria and at the end of the lock down order by the federal government of Nigeria. Low usage interest (39.32%) of using face mask was observed during the first phase of lifting lockdown in Nigeria. Perhaps, this had contributed to the consistent increase in the infected cases in the Nigeria between May 5 and July 17. However, there was significant increase in the usage interest of face mask during the second phase of lifting lockdown in Nigeria (61.20%) and the extension of the second phase of lifting lockdown in Nigeria (64.24%). There were low usage interest of social distancing, hand washing and hand sanitizer among Nigerians for the spread control of the COVID-19 in Nigeria before and after the index case of COVID-19. This low usage interest is also associated with the consistent increase in the Nigeria COVID-19

infected cases between May 5 and July 17.In total, between January 30 and July 17, there was very low usage interest in the use of face mask (11.89%), social distancing (1.31%), hand washing (0.66%) and hand sanitizer (6.22%) among Nigerians for the spread control of COVID-19 in country. This study suspects that this low usage interest might have contributed to the consistent increase in the COVID-19 infected cases in the Nigeria between May 5 and July 17, 2020.This study recommends the public sensitization program on the use of these four non-pharmaceutical measures against the spread of COVID-19 in Nigeria.

Table 3.2 reveals that only Ogun and Oyo states had at least average of 65% in the usage interest of the four non-pharmaceutical preventive measures among the 37 states in Nigeria. It was observed that 21 states (Rivers, Bayelsa, Imo, Benue, Osun, Bauchi, Anambra, Taraba, Kogi, Borno, Edo, Ondo, Kwara, Nasarawa, Niger, Kano, Kaduna, Adamawa, Gombe, Ekiti and Ebonyi) had very low (less than 30%) usage interest on the four non-pharmaceutical COVID-19 preventive measures in Nigeria. There were 8 states (Plateau, Abia, Akwa Ibom, Cross River, Lagos, Delta, Enugu and Abuja) that had low (between 30% and 49% TRSV) usage interest on the four non-pharmaceutical COVID-19 preventive measures in Nigeria. There were 6 states (Jigawa, Katsina, Kebbi, Sokoto, Yobe and Zamfara) that had (0%) usage interest on the four non-pharmaceutical COVID-19 preventive measures in Nigeria between January 30 and July 17. In general, 95% states (out of the 37 states) in Nigeria had percentage usage interest less than high rating (that is, less than 43% of TRSV) in using the four non-pharmaceutical COVID-19 preventive measures in Nigeria. See table (3.3) forthe yardstick used in the rating of the states' TRSV. This study recommends that government in the aforementioned states should strategize COVID-19 sensitization program on the use of these four non-pharmaceutical COVID-19 preventive measures in Nigeria.

Generally in Nigeria, it was observed that after the lockdown (that is, after May 3), the usage intention on these four preventive measures decreased rapidly. This reduction in usage intention could increase the spread of COVID-19 in the country. Hence, this study recommends that all the 37 states should sustain and increase strategic COVID-19 sensitization programs.

It was observed that most Nigerians were interested in the making or production of face mask while some were interested in the correct use of face mask (see Table 3.4). Most Nigerians usage intention of face mask is associated with the production purpose rather than correct use of the face mask. This observation was, also, associated with the usage interest on hand sanitizer. While this study could not identify the justification for this observation, it is recommended that government should include face mask and hand sanitizers as part of palliative measures to Nigerians. This study also recommends that Nigeria government should provide support to Small and Medium scale Enterprise (SME) to produce face mask and hand sanitizers at the World Health Organization (WHO) recommended standard and at cheap price. Some Nigerians were interested in the meaning of social distancing (100%). This study recommends that demonstration of social distancing should be included in every sensitization program organized in the country.

Nigerians significantly prefer to hear and to know about the term CORONAVIRUS instead of the term COVID-19 across the 37 states in the country between January 30 and July 17 2020 (170 days) in Nigeria. Hence, this study recommends the use of CORONAVIRUS (instead of COVID-19) terminology in any COVID-19 sensitization program organized in Nigeria. The following questions are recommended for any COVID-19 sensitization programme in Nigeria based on the search interest on Google. These are recommended to be answered in any COVID-19 sensitization program organized in Nigeria. They include *what is coronavirus?, coronavirus in Nigeria, coronavirus news in Nigeria, coronavirus cases in Nigeria, CBN coronavirus loan, coronavirus loan application, symptoms of coronavirus, coronavirus tips, coronavirus update Nigeria, Nigeria coronavirus cases, coronavirus vaccine, coronavirus in Lagos, coronavirus world update, coronavirus statistics and Madagascar coronavirus*.

Nigerians placed significant higher attention on fever as the symptom of COVID-19 than they considered dry cough, tiredness and difficulty in breathing. The percentage attention placed on dry cough, tiredness and difficulty in breathing, as symptoms of COVID-19, are significantly low and equal at $p>0.05$. This means that Nigerians significantly considered COVID-19 as fever related sickness than they associate other symptoms (dry cough, tiredness and difficulty in breathing) to COVID-19. This could indicate that many Nigerians might have been treating fever at home or reporting fever in the hospital while majority silently neglect their health when other three symptoms showed on them. This practice was observed to be statistically similar in all the 37 states in Nigeria. This study recommends that Nigeria government should sensitize Nigerians on the symptoms of COVID-19 in any sensitization program.

The negative and moderate correlationcoefficient signifies that increase in the Nigerian interest (to know more) about fever is statistically significantly associated with decrease in the daily infected COVID-19 cases in Nigeria. However, Nigerians' interest (to know more) about dry cough is statistically non-significantly associated with decrease in the daily infected COVID-19 cases in Nigeria. It was observed that Nigerians had no statistically significant interest (to know more) about

dry cough, tiredness and difficulty in breathing.
While correlation coefficient does not imply causation, however, it shows relationship. This study expects that significant increase of Nigerians interest in the symptoms of COVID-19 will help to flatten and reduce the curve of the COVID-19 infected cases in Nigeria. This study recommends a significant increase in the COVID-19 sensitization program in all the states, with special attention on the symptoms (Fever, dry cough, tiredness and difficulty in breathing) of COVID-19 among Nigerians in all states. It is expected that this recommended sensitization program will increase the knowledge level of COVID-19 symptoms among Nigerians and help in the control of the spread of COVID-19 in country. The multiple linear regression model confirms that only the Nigerians' interest in fever, among the four symptoms, is significant. It reveals that for every one percentage case of interest (by Nigerians) in fever as the symptom of COVID-19, there is, significantly one percent reduction in the daily infected COVID-19 cases in Nigeria. This reveals that Nigerians' low interest in the other symptoms of COVID-19 might have made some sick individuals with these symptoms not have reported to the hospital for medical attention.

Conclusion

This study examinedthe Nigerians prevention interest on the spread of COVID-19 in Nigeria using Google Trends data. The four non-pharmaceutical preventivemeasures (face mask, social distancing, hand washing and hand sanitizer) were considered over six periods that lie between January 30 and July 17, 2020. Similarly, statistical investigation was conductedto examine the Nigerians' interest on the four major symptoms (fever, dry cough, tiredness and difficulty in breathing) of COVID-19. Result revealed that Nigerians, generally,had low usage interest on the use of four non-pharmaceutical preventive methods towards the prevention of the spread of COVID-19 in Nigeria. It was, also, observed that Nigerians would significantly preferthe term **coronavirus** over **COVID-19** in any sensitization program.It was revealed that Nigerians' insignificant interest in the dry cough, tiredness and difficulty in breathing, as the symptoms of COVID-19, could have led to people with these symptoms not to have reported to the hospital for medical attention.COVID-19 sensitization questions of interest to Nigerians were recommended for strategic sensitization programs.

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