Statistical analysis on Preventive measures taken during the pandemic COVID-19 in Virudhunagar District for smart health care

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Abstract

COVID-19 is a global challenge due to its contagious behavior and frequently changing characteristic features. The World Health Organization announced the COVID-19 outbreak as a "Pandemic" on 11 March 2020. In India, the prevention of the spread of infectious COVID-19 is the basic requirement of every individual across the world. Thus, there is a need for a model to define the dynamics and prevent the continuous spread of COVID-19 in order to cater smart health care amenities. In order to predict the growth of the epidemic and its potential end, the control measures are considered in the cases of "no remedial action taken", "Quarantine of infected people", "implementation of full lockdown" and "invention of new medicines for treatment".

Introduction

The quick evolution of COVID-19 has enforced the technologists to develop serious control measures to terminate the outbreak. Several researchers executed various tools to shrink the adverse consequences of the pandemic and to fasten the recovery level [1]. These technologies were comprised of machine learning (ML), artificial intelligence (AI), deep learning (DL) and so on. There are many possibilities for these tools to make a huge change in the healthcare industry. Statistical analysis has progressively converted as an essential portion of smart healthcare services. [2-4].

On the other hand, the mathematical modeling provides the basic analysis of the transmission trend of novel corona virus COVID-19 under various assumptions. Statistical analysis will be suitable for the future prediction of peak and termination of epidemic disease. Further it can predict the number of people that would be affected under the existing circumstances and this study helps to quicken the recovery segment.

Review of work already done relevance to international and national background

A discrete-time stochastic section model was suggested in [5] to know thedynamic diffusion of the pandemic COVID-19 second wave. In an additional study, AI predictions and a improved SEIR (Susceptible-Exposed-Infectious-Recovered) model were used to analyze the COVID-19 communication trends in China. It was supportive in accepting the public health mediations everyday [6]. Many Researchers reviewed various methods and given the case studies, efficient mapping surveys in a specific field of facing COVID-19 pandemic. Comparatively, a general idea is hidden to examine the virus's approach and resolve its harms in special methods [7]. Therefore, an overall review can help evaluate the issue from different angles and give more information to people about self-caring and facing COVID-19.

The pandemic is an immense setback and unsafe for people with conditional diseases due to rising the possibility of receiving a severe infection, leading to death. Bansal endowed with a literature investigation about the impact of fundamental cardiovascular (CV) disease on getting infected COVID-19 and the patient's worsening. This work utilized PubMed and Google search engines for collecting information and dataset to analyze the issue [8]. Parveen et al. studied the association among the possibility of getting acute the disease for patients with diabetes and hypertension and people without background diseases using two databases of PubMed and Cochrane. The experimental results and observations confirmed a straight dependence among rigorousness, ICU care necessity, death, and patients with hypertension contaminated to COVID-19 [9].

More attentiveness about the corona virus disease and its disease snag can help people for self-caring and healthcare rules. Ortiz-Prado et al. conducted a complete literature review of clinical, molecular, and epidemiological classification of the SARS-CoV2 virus and COVID-19 to present more information on the virus capability in generating a risk for life all over the world. The case study reported the dimension of the concentration and the number of cells in blood cells before and after getting the disease, such as plasma, erythrocytes, leukocytes, and thrombocytes [10].

Methodology

For the real time data set this work relied on the responses collected through the online survey on COVID-19. The levels of the COVID-19 outbreaks under fourcategories namely "no remedial action taken," "Quarantine of infected people", "implementation of full lockdown" and "invention of new medicines for treatment". To recommend the society to follow the containment strategies to reduce the widespread of the pandemic COVID-19.

Statistical analysis of the Virudhunagar District data on preventive measures taken during the pandemic COVID-19 based on the basic assumptions made in this study. The epidemic is sufficiently short so that it doesn't last long. Thus we can assume that the total population remains constant throughout the District in a particular period of time. The statistical model relates to the way in which the disease is transmitted.

An epidemic is supposed to get stopped not only when all has been diseased but also when no one is newly infected. Future prediction with the final parameters of "no remedial action taken", "Quarantine of infected people", "implementation of full lockdown" and "invention of new medicines for treatment" is made. This leads to some group of the population will really avoid the infection. To avoid physical contact with our participants, a convenience sampling method was utilized to recruit the study participants. This study used Google forms to get source information via an online-based survey. Only adults (age 18 years and above) were selected for the study. The minimum sample size was calculated. A 95% confidence level was used for the sample size estimation. The study was carried out in and around Virudhunagar District, one of the busiest Districts in Tamil Nadu. QGIS 3.16 DIVA-GIS is used for bringing out the Virudhunagar district map.

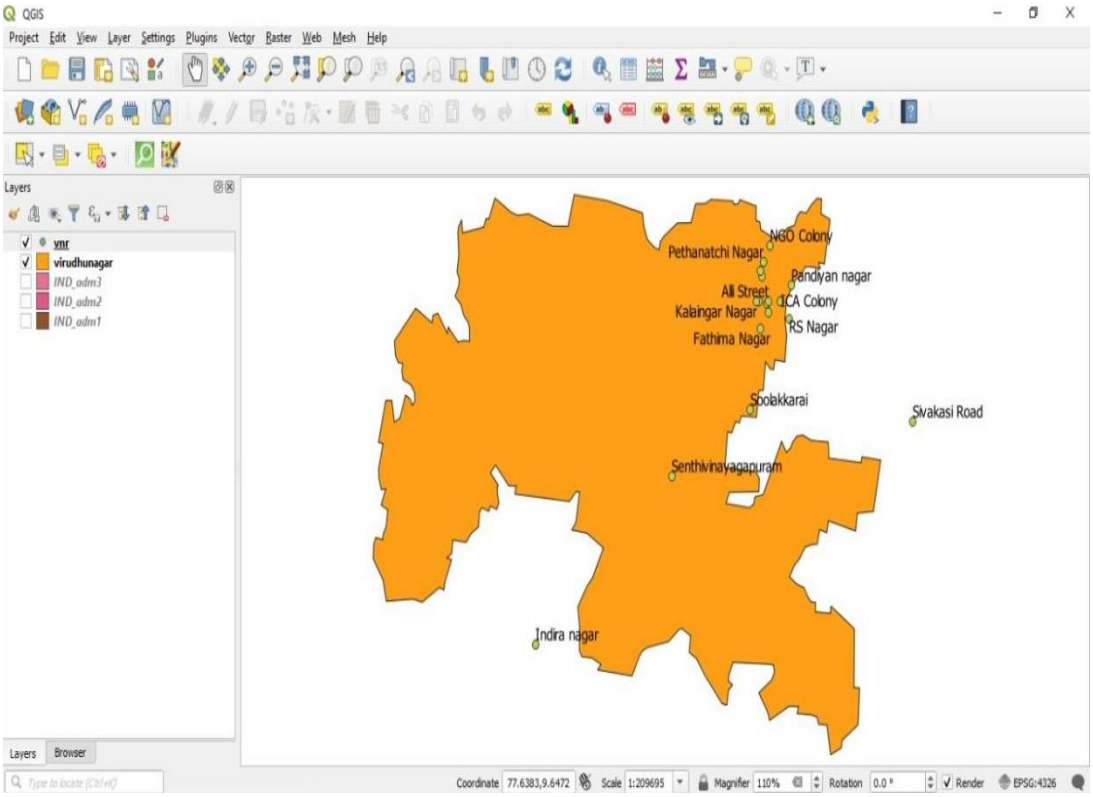
An online survey questionnaire was prepared based on the following factors.

- Access (to buy or receive) for face mask, hand Sanitizer etc.
- Quarantine of infected people helped to stop the spread of Covid-19.
- The idea of implementation of full lock down helped to stop the spread of Covid-19.
- The invention of new medicines for treatment helped the infected people.
- Covid-19 preventive measures were protective.
- Government regulations reduced covid-19 transmission.
- No remedial action was taken to overcome the Covid-19.
- After the Lock down due to Pandemic, mood swings in life were able to manage.
- Online learning Platforms are increased after Covid-19.
- Technology adoption was made mandatory after Covid-19.
- All the preventive measures taken during Covid-19 were followed.

One of the ways to manage the current corona virus disease 2019 (COVID-19) pandemic is to monitor the public knowledge, risk perceptions, adherence to preventive measures, and level of preparedness behaviors. This is important in resource-limited districts. A survey was conducted in and around Virudhunagar district about the preventive measures taken during the Pandemic. This study determined the knowledge and perception regarding COVID-19; adherence to COVID-19 preventive measures; as well as predictors of self-perceived risk of contracting COVID-19 among the people in Virudhunagar district. A cross-sectional study

was conducted among people using an online survey. Data were analyzed using descriptive and inferential statistics at a 5% level of statistical significance.

The questionnaire comprised with the questions on the socio-demographic characteristics of the participants. Information such as age, gender, educational level, was obtained in this section. Along with that 11 questions related to knowledge about transmission, risk factors, symptoms, disease progression, treatment, and prevention of COVID-19 which were related to the perception of the respondents about COVID-19 the questions are adherence to preventive measures against COVID-19. Confidentiality of the information provided was assured. Data generated were checked for accuracy and coded. Descriptive statistics such as frequency counts, percentages, and means were used to present responses that emanated from the survey. Chi-square test was used to determine bivariate associations between the dependent variable and selected socio-demographic features such as age, gender, of respondents; knowledge; perception; and preventive measures on COVID-19. Logistic regression analysis was used to determine the predictors of self-perceived risk of contracting COVID-19 among subjects recruited for the study. Variables on socio-demographic characteristics, knowledge, perception, and preventive measures on COVID-19 were included in the model. The statistical level of significance was set at $P < 0.05$.



The above picture shows the Virudhunagar district map and the area where the people were COVID-19 survey were conducted which was obtained using QGIS.

Results and Discussion

The distribution of a categorical variable in a sample often needs to be compared with the distribution of a categorical variable in another sample. Descriptive statistical methods were used to summarize data on socio-demographic characteristics and responses to questions concerning knowledge, perceptions and attitude towards COVID-19. Data were summarized as frequencies (n) and percentages (%) for categorical variables. Knowledge concerning COVID-19 was assessed by analyzing 11 multiple-choice questions followed by the calculation of a total cumulative knowledge score for each participant.

ANOVA tests were carried out to determine the relation between mean knowledge score and age as a socio-demographic variable. In the case of a significant ANOVA test, post hoc analysis (LSD) was performed for multiple comparisons between each two categories. All data analyses were performed using Statistical Package for the Social Sciences (SPSS) software. A value of $P < 0.05$ was considered statistically significant.

Table 1: Analysis of Variance

		Sum of Squares	df	Mean Square	F	Sig.
Access (to buy or receive) for face mask, hand Sanitizer etc.	Between Groups	12.181	3	4.060	2.653	.052
	Within Groups	165.310	108	1.531		
	Total	177.491	111			
Quarantine of infected people helped to stop the spread of Covid-19.	Between Groups	.667	3	.222	.479	.698
	Within Groups	50.190	108	.465		
	Total	50.857	111			
The idea of implementation of full lock down helped to stop the spread of Covid-19.	Between Groups	3.340	3	1.113	1.294	.280
	Within Groups	92.910	108	.860		
	Total	96.250	111			
The invention of new medicines for treatment helped the infected people.	Between Groups	4.973	3	1.658	2.221	.090
	Within Groups	80.590	108	.746		
	Total	85.563	111			
Covid-19 preventive measures were protective.	Between Groups	2.587	3	.862	1.600	.194
	Within Groups	58.190	108	.539		
	Total	60.777	111			
Government regulations reduced covid-19 transmission.	Between Groups	1.167	3	.389	.776	.510
	Within Groups	54.110	108	.501		
	Total	55.277	111			
No remedial action was taken to overcome the Covid-19.	Between Groups	.004	3	.001	.009	.999
	Within Groups	17.960	108	.166		
	Total	17.964	111			
After the Lock down due to Pandemic, mood swings in life were able to manage.	Between Groups	10.369	3	3.456	2.979	.035
	Within Groups	125.310	108	1.160		
	Total	135.679	111			
Online learning Platforms are increased after Covid-19.	Between Groups	4.141	3	1.380	1.089	.357
	Within Groups	136.850	108	1.267		
	Total	140.991	111			
Technology adoption was made mandatory after Covid-19	Between Groups	1.389	3	.463	.694	.558
	Within Groups	72.040	108	.667		
	Total	73.429	111			
All the preventive measures taken during Covid-19 were followed.	Between Groups	1.054	3	.351	.809	.492
	Within Groups	46.910	108	.434		
	Total	47.964	111			

Generally, a high proportion of respondents had correct knowledge about COVID-19.

To the best of our knowledge, this is the comprehensive report in Virudhunagar District that considered the knowledge about the spread, disease progression, risk factors, treatment, and preventive measures against COVID-19 in post pandemic situation. Also, the study assessed perceptions about COVID-19 and adherence to preventive measures among the Virudhunagar population. Attitudes towards the preventive measures of COVID-19 have a statistically significant difference between groups as demonstrated by one-way ANOVA as follows:

- F (3,108) = 2.63, p = 0.052, for having access for face mask, hand Sanitizer etc.
- F (3,108) = 0.479, p = 0.698, the quarantine of infected people helped to stop the spread of Covid-19.
- F (3,108) = 1.294, p = 0.280, that the idea of implementation of full lock down helped to stop the spread of Covid-19.
- F (3,108) = 2.221, p = .090, the invention of new medicines for treatment helped the infected people.
- F (3,108) = 1.600, p= 0 .194, Covid-19 preventive measures were protective.
- F (3,108) = 0.776, p = 0.510, Government regulations reduced covid-19 transmission.
- F (3,108) = 0.009, p= 0.999, No remedial action was taken to overcome the Covid-19.
- F (3,108) = 2.979, p = 0.035, After the Lock down due to Pandemic, mood swings in life were able to manage.
- F (3,108) = 1.089, p = 0.357, Online learning Platforms are increased after Covid-19.
- F (3,108) = 0.694, p = 0.558, Technology adoption was made mandatory after Covid-19
- F (3,108) = 0.809, p = 0.492, All the preventive measures taken during Covid-19 were followed.

Statistical analysis makes the drawing of reliable inferences from observational data. The above data are collected and analyzed in order to make inferences about situations that have not been measured in full during the pandemic. The chi-square test used for analysis is a non-parametric test of significance in social sciences research. It is used to make comparisons between two or more independent samples measured at a nominal level. Here the relationship between the parameters given in questionnaire is well tested.

Table 1

	Access (to buy or receive) for face mask, hand Sanitizer etc.* Quarantine of infected people helped to stop the spread of Covid-19.			Access (to buy or receive) for face mask, hand Sanitizer etc.* The idea of implementation of full lock down helped to stop the spread of Covid-19.			Age * Online learning Platforms are increased after Covid-19.			Age * Technology adoption was made mandatory after Covid-19		
	Value	df	Asymp. Sig. (2-sided)	Value	df	Asymp. Sig. (2-sided)	Value	df	Asymp. Sig. (2-sided)	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.901[a]	8	.547	12.139[a]	16	.734	11.345[a]	12	.500	2.271[a]	6	.893
Likelihood Ratio	7.576	8	.476	13.218	16	.657	14.116	12	.293	3.882	6	.693
Linear-by-Linear Association	1.856	1	.173	1.586	1	.208	2.812	1	.094	.967	1	.325
N of Valid Cases	112			112			112			112		
	a. 10 cells (66.7%) have expected count less than 5. The minimum expected count is .11.			a. 17 cells (68.0%) have expected count less than 5. The minimum expected count is .03.			a. 16 cells (80.0%) have expected count less than 5. The minimum expected count is .07.			a. 10 cells (83.3%) have expected count less than 5. The minimum expected count is .04.		

From Table 2, it was observed that the Access (to buy or receive) for face mask, hand Sanitizer etc. was readily available during the Quarantine of infected people and the idea of implementation of full lock down helped to stop the spread of Covid-19. Almost the age group of 18-24 has welcomed the increase of online learning platforms and they agreed to make technology adoption to a mandatory one. Covid-19 fetched out an extreme transform in the learning system in Virudhunagar district. Schools and Colleges across India as well as around the globe moved to the online classes instead of physical classrooms. Learning at this stage was found to be situation-specific due to the pandemic.

Table 2

	Online learning Platforms are increased after Covid-19. * Technology adoption was made mandatory after Covid-19.			The invention of new medicines for treatment helped the infected people. * After the Lock down due to Pandemic, mood swings in life were able to manage.			All the preventive measures taken during Covid-19 were followed. * The invention of new medicines for treatment helped the infected people.		
	Value	df	Asymp. Sig. (2-sided)	Value	df	Asymp. Sig. (2-sided)	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	29.563[a]	8	.000	13.151[a]	8	.107	1.943[a]	4	.746
Likelihood Ratio	26.245	8	.001	13.766	8	.088	2.597	4	.627
Linear-by-Linear Association	2.552	1	.110	.556	1	.456	.710	1	.399
N of Valid Cases	112			112			112		
	a. 9 cells (60.0%) have expected count less than 5. The minimum expected count is .07.			a. 10 cells (66.7%) have expected count less than 5. The minimum expected count is .31.			a. 6 cells (66.7%) have expected count less than 5. The minimum expected count is .18.		

From Table 2, it was observed that the due to the increase in the online learning Platforms after Covid-19 the technology adoption was made mandatory. The invention of new medicines for treatment helped the infected people and this readily helped people to manage the mood swings in life. Also all the preventive measures taken along with the new medicines for treatment helped the infected people to overcome the pandemic.

Our study recommends more rigorous public health education aimed at improving COVID-19 outbreak response in Virudhunagar District. In addition, physical and social distancing should be emphasized across all age groups with additional focus on the older population. The limitation of this study was that the untrained people and those living in rural areas that are likely to be more vulnerable due to poor knowledge and poor preventive measures practices were not represented in this study. It is therefore very important to conduct a similar study among the uneducated and rural dwellers in Virudhunagar. Also, the online nature of the study did not permit us to conduct a focus group discussion and in-depth interviews, which could have further provided us with more details on the participants' responses. Despite these limitations, this study was able to add to the existing level of knowledge on COVID-19 in Virudhunagar district.

Conclusion

This paper depicts the knowledge level about perception and preventive measures on COVID-19 during the pandemic situation in Virudhunagar district of Tamil Nadu. Hence the society would be made aware of the dynamic transmission of COVID-19 in order to face the future consequences and to cater smart health care amenities. Based on the results and

discussions carried out, a strong recommendation is provided to the people to follow the control strategies to overcome the pandemic situation in future.

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