

SUMMER ENGAGEMENTS

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PART 1 RESEARCH PAPER

COVID-19 IN BACKGROUND OF THE MAJOR PANDEMICS OF THE WORLD

1. Abstract

- Coronavirus Disease 2019 (COVID-19) which causes severe acute respiratory syndrome caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) represents the largest current health challenge for the society. The present study is designed to understand the tracing of other such deadly pandemics of the world till corona virus and to trace their etiology, virology, diagnosis, prevention as well as treatment. The findings revealed that the increased risk of a pandemic occurrence can be sorted out by global surveillance capabilities of animals and humans, and a combination of local, national, and international efforts to improve both mitigation and containment of future pandemics. Another effective way is to do contact tracing (once the disease has spread internationally) by lessening the gap and lag time between the physician's report and the national and international evaluation.

- **Keywords-** Coronavirus, etiology, virology,

INTRODUCTION

1. Humans are fighting against COVID-19 all over the world, representing the largest acute health challenge for the society in the modern history of mankind. The disease was first identified in the Wuhan, Hubei province of China on December 2019, and later owing to its very high contagiousity has quickly spread globally. World Health Organization (WHO) has recognized it as pandemic on March 11, 2020. COVID-19 is the third-known zoonotic disease from coronavirus after severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS) [1]. Coronaviruses, enveloped viruses with a positive sense single-stranded RNA genome and a nucleocapsid of helical symmetry, constitute the subfamily Orthocoronavirinae, within the family Coronaviridae [2].

2. The novel corona virus SARS Cov-2 is being seen as by far, one of the deadliest pandemics of all times.
3. Strict lockdowns in countries, cancellation of domestic international flights and visas.
4. India has a huge population which accounts to about 464 people/sq² compared with that of Iran's 52 and United States 36 and hygiene is absent.
5. Only 36% of Indians wash their hands with soap and water properly before any meal (NSSO) and 160 million don't have access to clean water to wash their hands from. Causing high rates of TB and Pneumonia.
6. The awareness about disease dynamics as well as the testing rates are very poor in India as compared to other countries like UK, USA.
7. All the disease widespread occurrences, emergence and the widespread transmission occurring due to accelerated rate of travelling, globalization, changes in human behavior.

Some of the major pandemics of the world in the past 150 years are-

1. The Third Cholera (1852-60):

Total death toll being 1 million. It devastated Asia, Africa, North America, Europe and many other places. The major cause of the third cholera was vibrio cholerae bacteria. The means of transmission included contaminated water. It was an extremely deadly pandemic which claimed over a million lives worldwide. It was an acute diarrheal infection. The diagnosis for the same was identification of the bacteria in a stool sample. The treatment given to those who got infected was rehydration, ORS solutions, intravenous fluids, zinc supplements. The symptoms for the same were diarrhea, nausea and vomiting, dehydration, low BP extreme thirst, fatigue.

Causes of the third cholera were-contaminated food and water, seafood, unwashed raw fruits and vegetables, poor sanitation. Prevention methods were washing hands thoroughly, eat warm hot food and drink clean boiled water, avoiding sea food, maintaining hygiene.

2. Flu Pandemic (1889-90)

Total deaths- 1 million. It spread in various places, first seen in Russia then Saint Petersburg and in the next 4 months, it spread throughout the northern hemisphere.

Cause- a subtype H3 virus. First case was found in Asia. The symptoms included fever, sore throat, headache, fatigue, muscle aches.

As far as treatment for the same was concerned, at that time, there were no vaccines/antiviral drugs so people were asked to stay indoors and wear masks to avoid the spread of the disease. For Prevention- the following was put forward- social distancing, washing of hands, covering face while coughing or sneezing, using a mask while going out.



3. Sixth Cholera (1910-1911)

Total deaths- 8 lakh people worldwide. Its origin was Asia and it later spread to Middle East, North Africa, Eastern Europe and Russia. The cause of this pandemic was the bacterium *Vibrio cholerae*. The symptoms included diarrhea, nausea and vomiting, dizziness, dehydration, fatigue. The treatment that was provided to people who suffered it was- rehydration, ORS solution, intravenous fluids, zinc supplements and antibiotics. For prevention- washing hands thoroughly, eating hot and cooked food, drinking clean boiled water, practicing hygiene, avoiding raw uncooked sea food.

4. Spanish Flu (1918)

Total deaths- 50 million people. First case was seen in Kansas after which it spread to Asia, America and almost every other part of the world. The cause of it was H1N1 influenza A virus. The symptoms included fever, cough, sore throat, fatigue, muscle ache. Cause- H1N1 influenza A virus. Treatment for the same was, as there were no effective vaccines or antivirals, drugs that treat the flu. The first licensed flu vaccine was developed in America in the 1940s. Prevention- public libraries were closed down, social distancing was asked to follow, regulations regarding banning of spitting were passed.

The pandemic is believed to have come in three different waves: the spring of 1918, the fall of 1918 and the winter of 1918-1919.⁶ The economic brunt was severe, the claims against life insurance policies went high as much as 745%.⁷

5. Asian Flu (1956-58)

Total deaths- 2 million. Origin- spread from the Chinese province of Guizhou to Singapore, Hongkong and USA. It originated from the mutation in wild ducks combining with a pre- existing human strain. It was caused by Influenza A virus subtype, H2N2. The symptoms included fever, body aches, chills, coughs, weakness and loss of appetite. The treatment for the same was - no specific treatment but dosage of antivirals were given to the patients. For prevention of the flu, social distancing, hygiene practices, hand washing methods were suggested. The economic impact was that the GDP of USA fell down by 1%, industrial production in Canada fell by 1.2%.⁸

6. Flu Pandemic (1968)

Total deaths- 4 million. Its origin was China. The cause being the H3N2 strain of Influenza A virus. Symptoms included fever, body ache, muscle ache, chills, weakness and fatigue. For the treatment part, increased public health communication and treatment. Improved antibiotics to fight secondary infections. Development of a vaccine was also seen. Prevention- social distancing, hygiene practices. There was social as well as economic brunt particularly in North America but there was a rapid recovery after the infection declined.⁸

7. Swine Flu (2009-2010)

Total deaths- 18,500. Origin- Mexico. Cause- H1N1 strain which resulted from a previous triple reassortment of bird, swine, and human flu viruses. Symptoms- fever, cough, sore throat, chills, weakness and body ache. Symptoms- fever, cough, sore throat, chills, weakness and body ache. Prevention- hygiene, maintaining cleanliness in and around yourself.

The economic loss was a drop in 0.5-1% decline in the GDP of affected countries. Although actual costs were difficult to calculate but global tourism and airlines reported tens of millions of losses.⁹

8. HIV AIDS (2005-12)

Total deaths- 36 million. The first case was identified in the Democratic Republic of Congo. The cause for it being human immunodeficiency virus. The symptoms included

flu like symptoms such as sore throat, fever and fatigue can occur including weight loss and recurrent infections. There is abdominal pain, pain while swallowing and dry cough. Swollen lymph nodes, skin rashes, ulcers, vomiting and diarrhea.

9. COVID-19 (2019)

Total deaths (till 22nd June 2020)- more than 4.55 lakhs across the globe.

Origin- Wuhan, China. Cause- SARS Cov-2 (COVID-19). Symptoms- fever, dry cough, tiredness, sore throat, body ache, headache and flu like symptoms, shortness of breath. Mode of transmission- through droplet transmission, fecal oral route, conjunctiva and fomites. Treatment- to date there are no specific vaccines or medicines for it but treatments are under investigation, and will be tested through clinical trials. Prevention- social distancing, containment of community by closing the educational institute businesses sports events, wearing of a mask while going out, hand washing for 20 seconds, using an Alcohol based sanitizer, eating healthy and immunity boosting food items. The economic impact is that according to the IMF, the global economy might shrink up to 3% by the end of this pandemic.

10. Influenza Pandemic

Influenza pandemics, different from general epidemics have time and again caused several deaths, disturbances and illness for many years now. Influenza is derived from the Latin word “influential”⁴ There are different strains separated into types A, B, and C. the types A and B are responsible for major mortality as well as morbidity and type A has a great potential to spread a pandemic.⁵ the strain A type is the only strain which has an animal reservoir.

Rationale

The study was designed to understand the patterns, causes, reasons, origin, preventions as well as the economic brunt of the various pandemics that have occurred in history and the current pandemic that is COVID-19.

Research Questions

1. What is the reason and cause behind the occurrences of the various deadly pandemics?
2. Is there any relationship with the increased occurrence of pandemics and growing technology and globalization?

Objectives

1. To trace the outcomes of the previous pandemics with respect to the novel coronavirus to trace their effect on morbidity, mortality and economic brunt.
2. To gain insights on various pandemics that have occurred in the past such as Spanish flu, swine flu, the risk factors, impacts, mitigation strategies as well as gaps and final solution to the problem.

Methodology

Various articles and research papers were reviewed to collect information on the pandemics and their behaviors. Certain systematic reviews as well as reports were consulted from various knowledge platforms such as Lancet, PubMed, google scholar as well as various everyday newspapers like the Times of India and Rajasthan Patrika. This entire study is based on literature review.

DISCUSSIONS

- **Challenges in Indian Perspectives During Covid Times-**

- 1. Huge population load (130 crores)**

- The population density is approx. 464 people per sq. km as compared to USA which has 36 people per sq. km.

- 2. Poor hygiene standards-**

- Less than 36% Indians wash their hands with soap and water. Around 16 crore Indians do not have access to clean water to wash their hands.
- India has 0.8 doctor per 1000 population as compared to USA which has 2.6 and China 1.8, Italy 4.1. India has 0.7 hospital beds per 1000 population as against USA which has 2.9, Italy 3.4. The country currently has 20,000 ventilators and expects to make it 40,000 by the end of June 2020.

- 3. The lockdown blues**

- India is currently facing the situation of joblessness and economic decline. The retail industry is expecting a 10 million job loss, restaurant industry is facing 1.5 million job loss, transport industry 5 million job loss. The falling incomes in major population group will increase the health expenditure burden and might push the people below poverty line.

DISCUSSIONS(CONTINUE)

4. Present bank loan disbursement fallen from 50% to 6% and out of Rs 1200 crore, only Rs 150 crore loan amount has been lended so far. (SBI)

5. Significant morbidity and mortality from non Covid diseases like cancers, heart, kidney diseases etc due to postponement of elective surgeries, closure of OPD out of fear of Covid.

The quarter 4 growth of fiscal year 2020 went down by 3.1% in India.

6. Pharma and Telecom industry have reported a profit of 23% and 12% respectively, while, the other sectors saw a dip of 50-55% (IIM Ahmedabad, Kozhikode)

Silver Lining-

- 1. The overall fatality rate in India is 2.82% as compared to the global which is 6.13% (silver lining).**
- 2. The agriculture sector is still acting as a ray of hope during such a slump in the economy.**
- 3. Agriculture related fields contribute to around 17% of GDP in India which is a big figure as the country's 65% population is rural and 50% of the entire population is dependent upon it.**



RESULTS AND CONCLUSIONS

- Although a lot of progress has been made in the field of infectious disease prevention, control and treatment, our ability and capacity as a nation to respond to such outbreaks has also improved manifolds. But, the process of globalization, mobility and demographics have increased the threat and occurrence of various disease outbreaks at an accelerated speed. Earlier, there were occurrences of various sorts of Pandemics but not as frequently as they are happening in today's era and majority of this can be attributed to the development in technology leading to increment in human mobility, both within and outside the boundaries of one's own countries.
- Any influenza outbreak in a particular area lasts between six and ten weeks and in previous years, were contained because till then the concept of industrial revolution was not in full swing or even if it existed, was in the initial stages and not so well developed. Various scholars suggest that any Pandemic occurs within an irregular gap of 10-50 years and this is a very big hinderance in predicting their emergence accurately.
- Another school of thought suggests that population growth and greater proximity to animal reservoirs pose as a threat in terms of both Pandemic emergence as well as the rate at which it spreads.
- The increased risk of a pandemic occurrence can only be sorted out by global surveillance capabilities of animals and humans, and a combination of local, national, and international efforts to improve both mitigation and containment of future pandemics. Another important and effective way is to do contact tracing once the disease has spread internationally and this can be done by lessening the gap and lag time between the physician's report and the national and international evaluation.

SUMMARY SHEET OF THE MAJOR PANDEMICS-



Name of pandemic	year	cause	Place of origin	No. of deaths	Economic brunt
Third cholera	1852-60	Bacterium vibrio cholerae	Asia	1 million	Many countries faced a loss from the lost productivity of the caregivers, sharp drops in the food exports and tourism sector.
Flu pandemic	1889-90	A subtype H3 virus	Asia	1 million	A lot of soldiers died, the entire travelling and tourism industry shut down, all schools and colleges were shut down, many people became unemployed.
Sixth cholera	1910-11	Bacterium vibrio cholerae	Asia	8 lakh people worldwide	Sharp drop in food production, tourism industry and many businesses
Spanish flu	1918	H1N1 influenza A virus	Kansas	50 million people	Life insurance policies soared by 745%, In 2007, the health advocacy group trust for America's Health estimated that US economy would have shrunk by 5.5%.
Asian flu	1956-58	Influenza A virus subtype H2N2	China	2 million	it was a moderate pandemic. could have reduced the global GDP by 2%, as per reports by Bloomberg
Flu pandemic	1968	H3N2 strain of influenza A virus	China	4 million	Sectors such as transport, tourism, retail sales were severely affected. The GDP was estimated to be reduced by 0.7% in the first year, according to Bloomberg
Swine flu	2009	H1N1 virus	Mexico	18,500	Fall in equity markets, tourism industry.
HIV AIDS	2005	Human immune deficiency virus	Democratic republic of Congo	36 million	Reduced avg national economic growth in Africa by 2-4% per year, reduced labor supply,
Covid 19	2019	SARS Cov2	China	4.5 lakhs approx. (till 22june 2020)	According to IMF, the global economy is expected to shrink by 3%, worst since great depression.

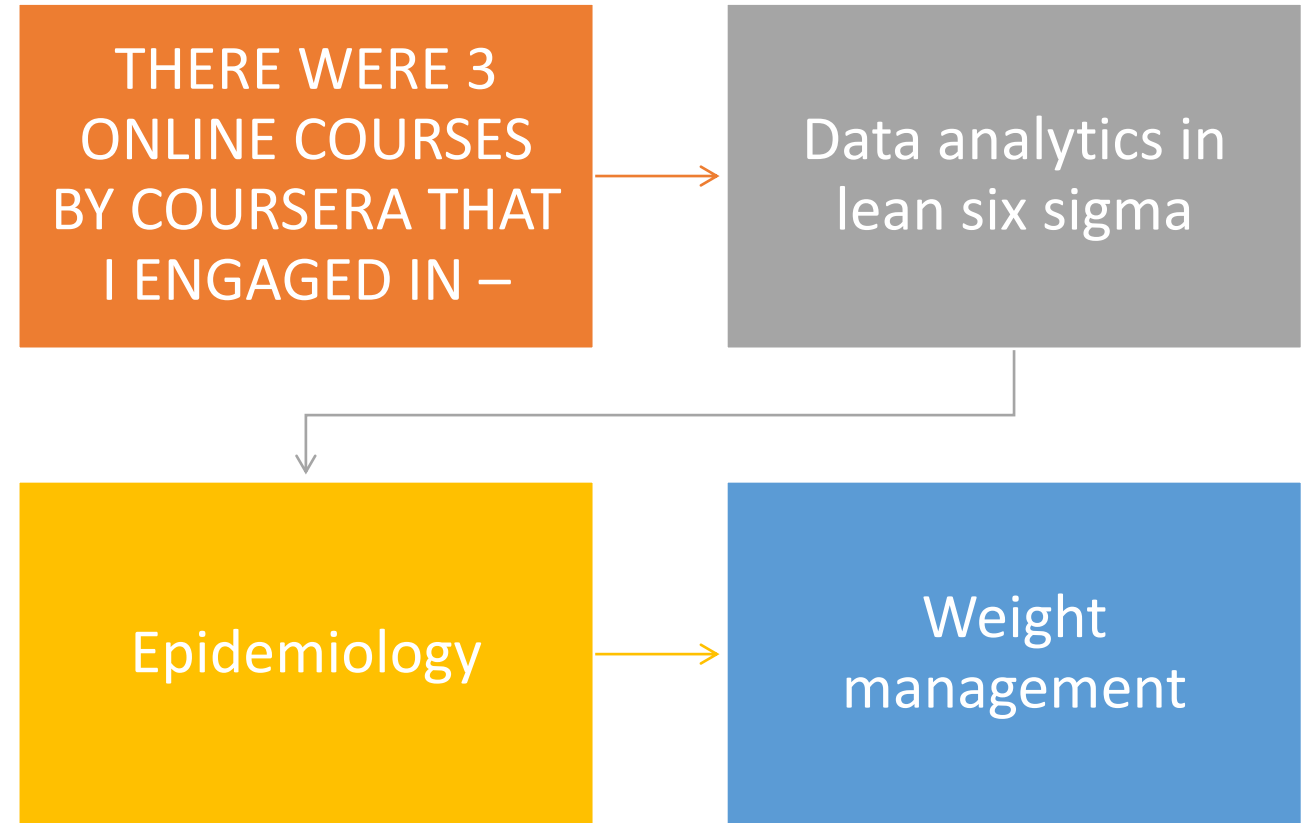
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PART 2 ONLINE COURSES



1. Data analytics in lean six sigma

1. Course description-

- Data analytics for lean six sigma is a data driven course where a lot of answers and analysis is conducted with the use of statistics. It introduces the software package called Minitab which we have used throughout in the entire course. There are certain modules in this course which are divided week wise and have an assignment and test questions at the end of each week. One needs to cover all the tests and assignments in order to go on to the next level. The course teaches us how to use probability distributions and quantify uncertainty. The week 4 module teaches us how to model the CTQ influence factor and use a decision tree to select the right tool for testing.

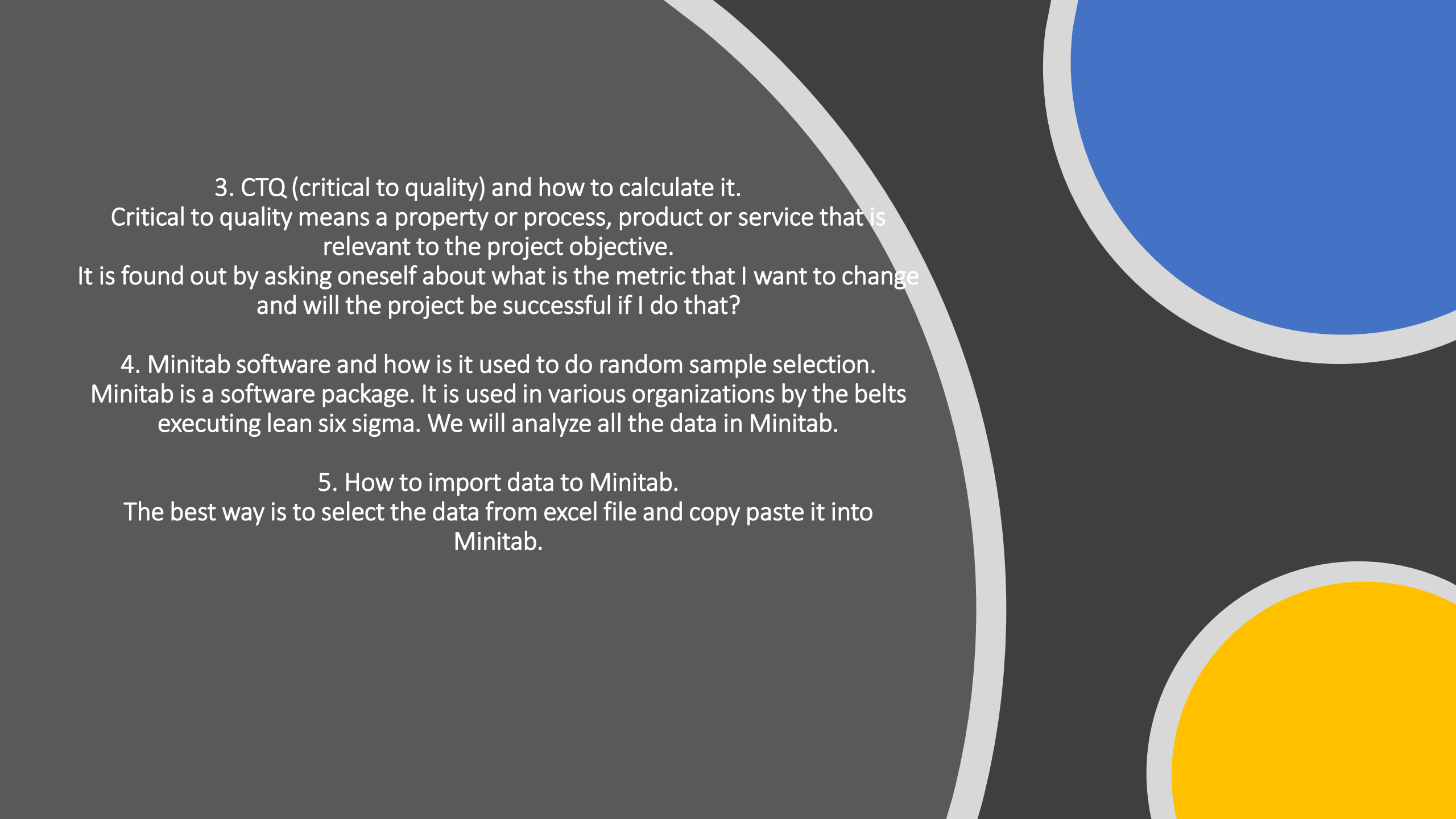
In this course my key learnings were-

1. The meaning and definition of lean six sigma and data analytics-

- Lean six sigma is a methodology and makes use of data and data analysis to answer certain questions.

2. Questions that can be analyzed with the help of data analytics in lean six sigma.

- Examples of questions that we can analyze using lean six sigma are – what is the most important issue an organization faces, how to qualify a certain phenomenon, are the employees of taking more than allotted time to work on an issue, how to decrease the number of problems etc.



3. CTQ (critical to quality) and how to calculate it.

Critical to quality means a property or process, product or service that is relevant to the project objective.

It is found out by asking oneself about what is the metric that I want to change and will the project be successful if I do that?

4. Minitab software and how is it used to do random sample selection.

Minitab is a software package. It is used in various organizations by the belts executing lean six sigma. We will analyze all the data in Minitab.

5. How to import data to Minitab.

The best way is to select the data from excel file and copy paste it into Minitab.

6. Various types of graphs and how are they interpreted.

7. Pareto analysis and its principles.

8. Confidence interval and probability distribution, empirical CDF.

9. Data based testing of ideas and improvements.

10. Hypothesis testing, correlation and regression.
Calculations of various statistical values using mean median and mode in the software.



Course contents-

- Statistics
- Lean six Sigma
- Data analysis
- Minitab
- Pareto chart

Methodology of the course-



DATA AND LEAN SIX
SIGMA



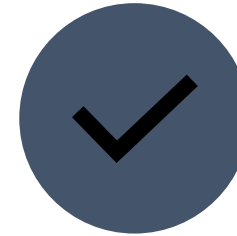
UNDERSTANDING AND
VISUALIZING DATA



USING PROBABILITY
DISTRIBUTION



INTRODUCTION TO
TESTING



TESTING: NUMERICAL
Y AND CATEGORICAL X



Duration of the course

6 WEEKS



Epidemiology: the basic science of public health by the university of North Carolina at Chapel Hill

1. Course description-

- Epidemiology is referred to as the “cornerstone” of public health and it studies the distribution and determinants of public health conditions, diseases, or events among population and the applications of that study to control the health problems and issues. This course explores the various public health issues such as cardiovascular and infectious diseases both locally and globally. There were various assessment tests given at the end of each week’s modules which had to be taken up and scored well on in order to move ahead. By applying the various concepts learned in this course to current public health problems and issues, we understood the practice of epidemiology and how closely it is related to the real life.



Key learnings-

1. Measures of disease occurrence in terms of who, what, when and where in the population with regards to different diseases and their health outcomes.
2. Difference between prevalence, risk, rates, odds.
3. Prevalence v/s incident cases.
4. Different types of epidemiological study designs which include both experimental and observational.

5. Randomized control trials and their applications.

6. Blinding technique.

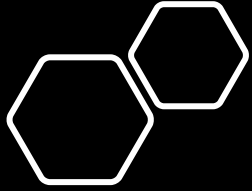
7. Measures of association and what they tell us.

8. Odds ratio, meaning and what it tells us.

9. Confidence intervals and its examples.

10. The meaning of causality and modern ways of determining it.





Course contents-

Measures of disease frequency



History and field of epidemiology



Study designs: cohort, experimental, cross sectional, ecologic, case control.



- 6 WEEKS

DURATION OF THE COURSE

-
**Weight management:
beyond balancing
calories by Emory
University**

1. Course description

Since the discovery of the first appetite hormone in the 1990s, the science of obesity has advanced dramatically. The growing understanding of how hunger and weight “set point” are regulated is changing the way we need to approach weight loss. Hence, this course puts a lot of focus on the various aspects related to one’s health, weight and other body related stuff.

Key learnings-



What is metabolism and how does it work in our body.



How metabolic rate is related to the weight loss, gain or stagnation.



Metabolic adaptation.



Hormonal imbalance and its relation to the weight fluctuations.



How the hypothalamus acts as the command central which helps in the coordination and sensing when we need to eat and when not.



Weight set points and genetics



How processed foods interact with our biology.

Benefits of whole foods and how they help in maintaining a healthy gut and body.

Importance of exercise and physical activity

Mindful eating and developing a better relationship with food.

Stress eating and emotional eating.

Course contents



WEIGHT SET POINT



DIETARY FACTORS



BARRIERS TO WEIGHT
LOSS



WEIGHT
MANAGEMENT PLAN

Methodology of the course-

1. Understanding obesity
2. Managing obesity: the role of diet
3. Beyond diet: the role of stress, exercise and sleep
4. Using habit and emotions to your advantage



Duration of course

5 weeks



THANK YOU