APPLICATION OF LEAN SIX SIGMA FOR WEIGHT LOSS: A PILOT STUDY

Dissertation Submitted to

The IIHMR University, Jaipur
for the partial fulfillment for the award of the degree of
Master of Business Administration (MBA)

in

Hospital and Health Management

by

Balaji Naik Bukke

Under the Supervision and Guidance of

Dr.Piyusha Majumdar
Assistant Professor

2021

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DECLARATION BY STUDENT

I hereby declare that this dissertation title "Application of Lean Six Sigma for Weigh Loss: A Pilot Study" is the bonafide record of my original researchwork. I declare that it has not been submitted to any other university or institution for the award of any degree or diploma. Information derived from the published or unpublished work of others has been duly acknowledged in the text.

Dr.Balaji Naik Bukke

CERTIFICATE

This is to certify that **Balaji Naik Bukke** in partial fulfillment of the requirements for the award of the degree of MBA (Hospital and Health Management) from the IIHMR University, Jaipur has been working with **Figmd, Pune in the CDA department** from **April 1, 2021, till date** and has completed his internship as a part of his on-job training. His internship report has been reviewed and the details mentioned therein are found to be accurate.

Place: Pune

Date: 30 June 2021

Preceptor/Head of the Department: Narendra

ShaligramName of the organization: Figmd

Pvt. Ltd., Pune

FIGmd (India) Pvt. Ltd.

CIN: U72900PN2016FTC165476 | Board line: 020 67585700 | website : www.figmd.com

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CERTIFICATE

This is to certify that dissertation titled **Application of Lean Six Sigma for Weight Loss: A Pilot Study** is a record of the research work undertaken by Balaji Naik Bukke in partial fulfillment of the requirements for the award of the degree of MBA Hospital and Health Management from the IIHMR University, Jaipur under my guidance and supervision and his approach to the research study has been sincere, scientific, and analytical.

Guide:	Dean :
Dr. Piyusha Majumdar	Dr. Dhirendra Kumar
Assistant Professor	Professor
IIHMR University, Jaipur	IIHMR University, Jaipur

ABSTRACT

Background-

Obesity is a global epidemic, and the prevalence rate is increasing rapidly with the association of non-communicable diseases like coronary heart disease(CHD), asthma, stroke, Type 2 diabetes, hypertension, and several cancers. Many approaches are framed by many researchers. But still, there are some challenges in controlling and maintaining BMI. To overcome those challenges LSS gaining attention towards the adherence of the weight control process which helps to maintain a normal healthy weight with sustainability. in addition Lean Six Sigma is a systematic budding innovation in health care to remain competitive, cost-efficient, and up to date.

Objectives-

The study was conducted to implement lean six sigma to reduce weight gain and to present a thorough knowledge and propose future directions consistent with the needs of professionals and academics and maintain a healthy community.

Methodology-

The study is prospective -interventional with a DMAIC approach. In the Define phase problem was identified through a Questionnaire-based survey. In the Measure phase data was collected and baseline data was framed. In the Analysis phase, the root cause was analyzed, and the solution was identified in Improve phase. Based on the solution the stability of the respondent was observed in the Control phase. Minitab was used for statistical analysis.

Results-

The results show that the majority of the respondents are aware of Tracking and documentation of regular diet and weight, and more than half of the respondents have improper physical activity. The major reasons that the respondents raised for weight gain were lack of guidance in food habits and lifestyle. A combination of diet and physical activity chart was framed in improve phase. The study has proven that there is a significant difference in Old & New BMI. Each respondent showed a mean difference of 0.0869 and stability when compared to baseline and end data.

Conclusion-

The findings of this study would empower every individual, researcher, and practitioner to include the results of the study in LSS application within the healthcare domain to enhance the possibility of effective implementation which reflects a healthy community.

ACKNOWLEDGEMENT

The successful completion of the internship and outcome of this project required a lot of guidance from different people, and I consider myself fortunate to have so many people around to guide me.

I express my deepest gratitude and special thanks to Mr. Narendra Shaligram, Head of Operations(FIGMD) for his inspiring guidance, outstanding cooperation, and constant encouragement.

I feel highly elated to keep on records of my sincere gratitude to my mentor guide Piyusha Majumdar, Assistant Professor, IIHMR University, Jaipur for her constant encouragement, support, sagacious guidance, and inspiration.

I am extremely indebted to all members of the business development divisions of FIGMD for their continuous support during my internship.

I express my sincere gratitude to all respondents who trusted and given their consent for participating in my study. Lastly, I would like to thank my parents for their caring love and help.

Thanks to one and all.

Balaji naik Bukke

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LIST OF ABBREVIATIONS

BMI	Body Mass Index
CHD	Coronary Heart **Disease**
lSS	Lean Six Sigam
DMAIC	Define,Measure,Analysis,Improve,Control
CTQ	Critical To Quality
FMEA	Failure Modes And Effects Analysis
SIPOC	Supply,Input,Process,Output,Customer
IMR	Indicidual And Maximum Range
ED	Emergency Department
OP	Out Patient
MRD	Medical Records Department
ANOVA	Analysis Of Variance

1.INTRODUCTION

Obesity is a global epidemic. AT Present >135 million Indians are affected with Overweight and Obesity (i.e., BMI ≥ 25 kg/$m^{2)}$and the prevalence rate is increasing rapidly with the association of non-communicable diseases like coronary heart **disease**, asthma, stroke, Type 2 diabetes, hypertension, and several cancers. [1,2,3]

The degrees of normal healthy weight, obesity, overweight and underweight are classified based on the Body Mass Index. BMI is used to broadly define different weight groups in adults 20 years old or older. The same groups apply to both men and women. The actual formula to determine BMI uses metric system measurements: weight in kilograms (kg) divided by height in meters, squared (m2). When using pounds and inches, the formula needs to be altered slightly. Multiply weight in pounds by 703. Divide that by height in inches, squared. [4]

BMI = (your weight in pounds x 703) ÷ (your height in inches x your Height in inches)

BMI	WEIGHT STATUS
BELOW 18.5	**UNDERWEIGHT**
18.5 – 24.9	**NORMAL OR HEALTHY WEIGHT**
25.0 – 29.9	**OVERWEIGHT**
30.0 AND ABOVE	**OBESE**

Table 1.1: Range of Body Mass Index

The main causes of obesity and overweight are complex and multi-factorial. However, in simple words Primary cause of obesity positive energy balance i.e., more consumption of calories than consumed. Behavioral, genetic, and environmental are secondary causes. [5,6]

To overcome the situation many approaches were identified by many researchers.in that, Traditional weight loss is much familiar in treating obesity and overweight. This approach focused on dietary plans and exercises by educating the patients in lowering daily intake of food and increase in regular physical activities. However, this approach is

unsuccessful because of Weight regain due to lack of guidance and planning on sustainability. Various factors are contributing to weight regain. But some studies recommended that adherence to weight control strategies, metabolic rate, and efficiency, the psychological effect of food, stress management, hormonal response, depression, obesogenic environment, accountability are more common influencers in regaining weight. In addition, some studies also recommend that combined intervention of diet and physical activities have significant weight loss in short term but in long run, there is a drastic increase in weight regain due to the maintenance.[7,8,9,10]

Lean Six Sigma is the budding approach towards the adherence of weight control process which helps to maintain a normal healthy weight with sustainability.

Lean Six Sigma is a systematic budding innovation in health care to remain competitive, cost-efficient, and up to date. Generally, lean six sigma will be implemented, when the complexity is **High** and the solution is **Unknown**[11,12,13]

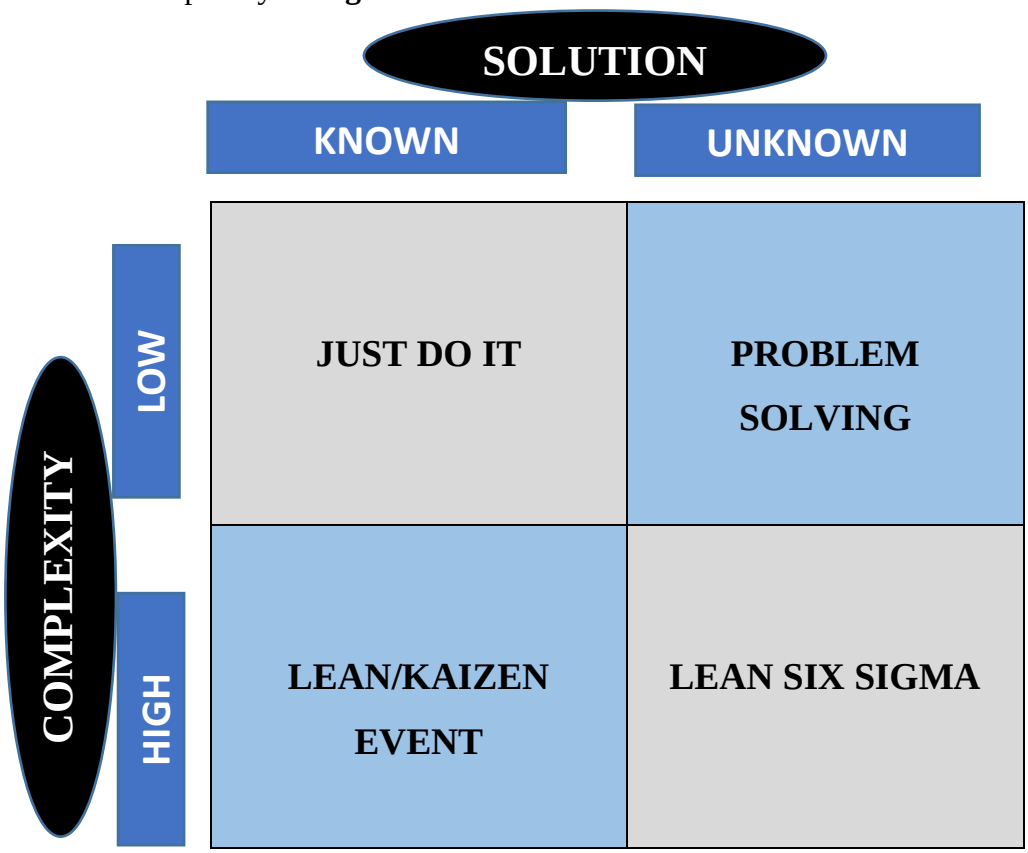

Figure 1.1: lean six sigma matrix

The Lean Six Sigma DMAIC is a quality improvement methodology used for the strategies in business management. This methodology is applied in healthcare which includes patient satisfaction improvement, reducing waiting times in the emergency department, reduction in prescription error, and monetary recovery by reducing waste. [14]

DMAIC five-step method for improving existing process problems with the unknown cause through the root cause analysis methodology from the Lean Six Sigma toolkit. DMAIC is an acronym that stands for: [15]

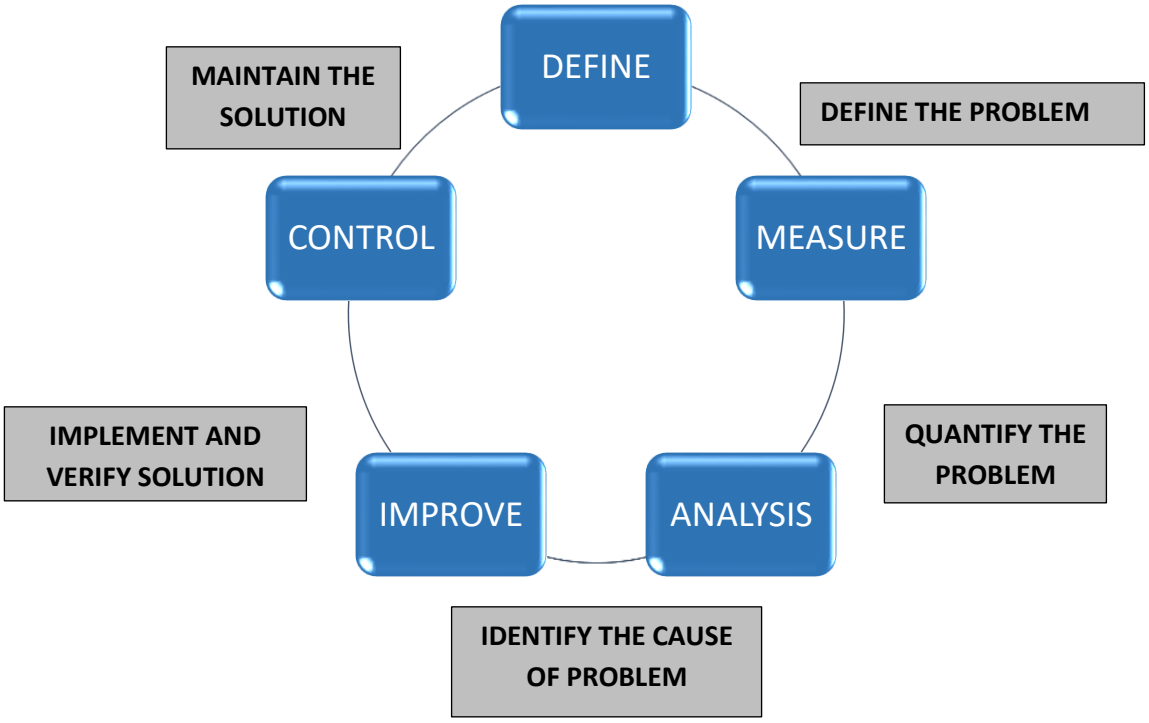

Figure 1.2: a cycle of DMAIC Methodology

The common LSS tools used in the healthcare system were shown in below table:

DEFINE	MEASURE	ANALYSIS	IMPROVE	CONTROL
Project Charter	Critical to Quality (CTQ)	Histograms and Graphical Analysis	Improvement Plan	FMEA
SIPOC	Data collection	Fish bone diagram	Action Plan	Control
Process map	Cost of Poor Quality	Process Analysis	Cost/benefit Analysis	Process Capability
Project Plan	Pareto Chart	Kaizen diagram	Dashboards	
		7 Wastes	Scorecards	

Table 1.2: Tools Used in DMAIC

In this context, to the best of our knowledge, there is not much work that studied the Lean Six Sigma approach in maintaining weight loss. This study outlines a methodology of Lean Six Sigma which provides an effective framework for maintaining weight loss and improving quality of life. The main goal of the present research study is to present a thorough knowledge and propose future directions consistent with the needs of professionals and academics and maintain a healthy community. [16]

2. REVIEW OF LITERATURE

In this chapter, we have organized the literature into two main sections.

1. Lean Six Sigma for the healthcare sector.
2. Importance of the LSS Methodology

Section one will discuss the complications and risks and section two will discuss the importance of lean six sigma in healthcare with the usage of different tools and strategies.

The objective of this review is to provide the backdrop on obesity and weight loss management strategies in long run with the help of applicable strategies used in different scenarios in the health care domain.

Summary:

In the health care sector lean six sigma is a modern approach to reduce the variation in process and eliminate the waste or defects.in addition, LSS is a service-oriented methodology that improves efficiency and Effectiveness.

Nowadays in health care, LSS is using in different conditions like **Elimination**(To Eliminate the Non-value added activities in CT scanning - Remove Wasteful processes and implement a more robust process) **Reduction(**To reduce the length of stay at the hospital – Turnaround time for the emergency department (ED) specimens - Work-related injuries in the hospital) and **Improvement(**To improve Operating room throughput - OP-MRD waiting time and Efficiency nursing - Process of nursing shift directors department - Insulin medication safety and delivery - Allocation of resources).

Major tools used in these studies are process mapping, ANOVA, and cause and effect diagram, waste reduction, control charts.

implementation of LSS has some challenges or barriers to endure in healthcare services such as –lack of knowledge and awareness, lack of financial resources, lack of leadership, lack of training facilities(poor training), lack of time, lack of human resources.

The current research i.e., **Application of Lean Six Sigma for Weigh Loss** would build a hope towards reduction and control on weight management through the help of evidence of literature review on Lean Six Sigma for the healthcare sector and Importance of the LSS Methodology

It is ascertained there are many studies done on the application of Lean six sigma in different conditions but on the condition of weight loss there are limited research and reviews., this study would become guidance for forthcoming studies and research works.

Author	Objective	Methodology/Tools	Findings	Conclusions/Challenges
Bahensky et al. (2005) [17]	To eliminate nonvalue adding activities in radiology CT scanning	Faxing patient information, early contrast administration, transfer of patient information, insertion coverage, CT room escorts, and exam procedure scheduling	Command center experienced 30% reduction in calls Patient throughput increased by 31% Total takt time reduced by 30% Patient experience time decreased by 33% Travel time for technicians declined by 91%	LSS can be combined with the kaizen approach for better results Team dynamics enable the project to draw solutions through a free exchange of ideas The cross-functional team, cultural change, and top management support are crucial for the success of an LSS project
Fairbanks (2007) [18]	To improve operating room throughput	Process measurement, process mapping, education, and staging area for first cases of the day	Increase in on-time start from 12% to 89% Decrease in mean TAT from 23.8 to 17.9 min Increase in perception of employee teamwork and overall facility rating	The project has improved patient flow, and teamwork, and pride among perioperative staff members Research culminated that LSS has a positive implication for both staff members and facility
Yu and Yang (2008) [19]	To improve the OP-MRD average waiting time	Simulation, regression, time series plot, and Gemba	Decrease in average waiting time from 42.3 to 6.55 min	LSS has the potential to tackle high healthcare cost and low efficiency, which are of major concern for consumers, business leaders, the insurance industry, and governments The research concluded that developing an effective approach to reduce healthcare cost and increase healthcare efficiency without compromising healthcare quality is the need of the hour
Wijma et al. (2009) [20]	To improve the efficiency of the nursing department	Pie chart, Pareto chart, and waste elimination	A substantial decrease in the annual cost of the nursing department after deployment	LSS is a structured methodology to solve complex operational problems LSS stimulates organizational innovations To be effective, LSS demands an organizational framework, with specific roles and responsibilities for MBBs, BBs, GBs, and methods from project management to monitor progress and schedules LSS works better through the DMAIC roadmap LSS draws effective solutions based on data, and not just hypothesis and deliberate analysis

Author	**Objective**	**Methodology/Tools**	**Findings**	**Conclusions/Challenges**
Bisgaard and Does (2009) [21]	To reduce the length of stay at the hospital	The dot plot, Pareto chart, scatter plot, control charts, ANOVA, and box plot	Decrease in the average length of stay by 2.4 days for a patient volume of approximately 30 patients per year with annual savings of $36,000	LSS is a results-oriented approach, which ensures improved quality while reducing costs on both the clinical and operational side of healthcare The strategy not only aids the patients, but also healthcare providers and the bottom line
Yamamoto et al. (2010) [22]	To improve profit by increasing insulin medication safety and delivery	Flow charts, failure mode and effects analysis, ANOVA, and cause and effect diagram	Overall cost savings estimated to be $75,000	The LSS methodology demonstrates positive, validated outcomes in improving patient safety and patient care Commitment of the hospital administration and staff are critical to the success of the project
Schoonhoven et al. (2011) [23]	To improve the allocation of resources	VSM and statistical tools	About 95% of patients had an appointment for the first consultation within 10 days Throughput times within 14 days resulting in increased revenue amounting to $70,000 About 95% of patients had an appointment for first consultation within 10 days Throughput times within 14 days resulting in increased revenue amounting to $70,000	LSS together with the conceptual framework developed by de Mast et al. (2011) can help to diagnose and resolve workflow and efficiency problems
Mozammel and Mapa (2012) [24]	To improve the process of nursing shift directors	Cause and effect diagram, process flow chart, and statistical charts	Free time of nursing shift directors increased to 17 from 2.8%, which is used for patient care Reduction in overall documentation from 39 to 26%	The DMAIC approach is a consistent and standardized way of problem-solving for the LSS methodology
Lokkerbol et al. (2012) [25]	To reduce work-related injuries in the hospital	Control charts and frequency table	The average number of incidents dropped from 12 to 7.2	The challenge of LSS project deployment is in changing the behavior of the organization and its employees Focussing on implementation and developing a creative and recognizable system are critical elements for an LSS project

Author	**Objective**	**Methodology/Tools**	**Findings**	**Conclusions/Challenges**
Sanders and Karr (2015) [26]	To reduce the TAT for the emergency department (ED) specimens	Statistical tools and waste reduction	Vials used for testing and in extra specimens decreased by 50% ED specimens without orders declined by 90% Complete blood count analysis TAT reduced by 30% Troponin TAT variation cut by 10% ED registered nurses rainbow draw time decreased from 5 to 2 min	The LSS methodology, which extracts a project-focused approach from Six Sigma and relies less on the speed of Lean, can also give rapid improvement results in the hospitals
Nayar et al. (2016) [27]	To remove wasteful processes and implement a more robust process	Value stream mapping and process redesign	The barrier to smooth process flow was identified as the receipt of the nonVeterans Health Administration medical record, which resulted in delays in filling prescriptions. The crucial factors determined during the work were veteran education, process redesign, and outreach to community providers	LSS can apply even to simple processes, where Lean dominates under the DMAIC umbrella of the SS

Table 2.1: literature review

NEED OF THE STUDY

It is critical to control weight gain for the reduction of long-term health risks. Over the past year controlling weight gain attempted with medications and changing diet, also by avoiding high glycemic calorie foods. These have been unsuccessful in controlling weight gain. It is highly desirable to develop a long-term alternative to increase medications. To maintain the BMI, it is necessary to reduce the long-term health risks. These can include heart disease, kidney damage, nerve problems, and loss of vision. In this case, the need of the study was to evaluate the impact of the Lean Six Sigma approach on the maintenance of weight loss in obese and overweight adults following a prospective observational study. This study will address the need by maintaining the weight loss for 3 months with the completion of the intervention.

The study addresses two main research questions:

1.What is the impact of Lean Six Sigma?

This question will be answered by examining the Lean Six Sigma approach in maintenance of weight loss in the 2-month follow-up by comparing baseline data of 1 month. The hypothesis is that the Lean Six-Sigma approach is used to reduce weight gain.

2. What is the impact of root cause analysis in the maintenance of weight loss?

This question will be answered by collecting the voice of respondents about the daily activities through the questionnaire-based survey. The hypothesis is that root cause analysis is the specific tool that helps in better weight maintenance (i.e., less regain) in the 3-month follow-up.

The study results will help to determine if the Lean Six Sigma application helped individuals to maintain or continue the weight loss following guided and self-monitoring interventions. The information will help to determine the steps to enhance the long-term efficacy of the weight loss studies.

FUTURE SCOPE : The goal to continue the effort to maintain the **Body Mass Index** (BMI) and control weight gain.

AIM

Implementation of lean six sigma approach in long term weight loss management

OBJECTIVES

To understand the problem and analyze the root cause of weight gain.

To control and maintain the BMI in long run.

3 METHODOLOGY

Study Design: Prospective observational study

Study Site: ANDHRA PRADESH (Telecommunication)

Study Duration: 3months

Sample Size: 20(based on current situation and availability)

INCLUSION CRITERIA:

Working women age (25- 45)

Women who have more than 24 and less than 35 BMI

volunteers who are healthy individuals

EXCLUSION CRITERIA

volunteers who showed their unwillingness towards the daily recommendations and continuity of recommendations and hesitated to give the informed concern form.

volunteers who have diseases like Diabetic and Thyroid

and other comorbidities

a volunteer who has past medication and surgical (like cesarean) history

STUDY REQUIREMENTS

Documents:

Questionnaires(annexure 1)

BMI Chart((Annexure 2)

Diet Chart(Annexure 3)

Baseline and End data((Annexure 4)

METHOD: DMAIC approach

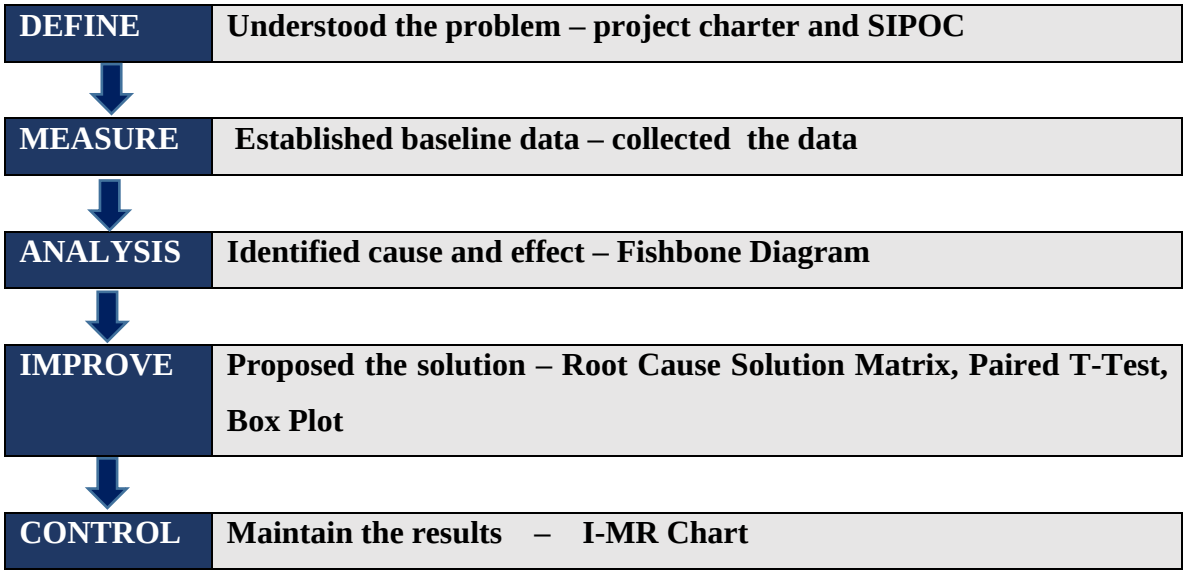

Figure 3.1: DMAIC Methodology

4 RESULTS:

Define:

In the define phase, the problem was understood by reviewing the voice of the respondents(Annexure 1 & 4)and goal was established which was defined in a project charter and identified the process was measured by using SIPOC

a) Project Charter

Project Title: Application of Lean Six Sigma for Weigh Loss: A Pilot Study
Business Case Since lockdown, most people have started complaining about weight gain. There is a constant increase in weight because of that some people delaying taking vaccine. If this is not resolved within a couple of months, then there is a potential threat of increasing health risks which will result in mass morbidity.
Problem Statement in the past 1 month, the weight gain is too high. it is ranging between 25.5—30.9 against the ideal BMI range of 18.5—24. 9. This leads to an overweight that in turn increases the risk for obesity. this also affects the overall life expectancy rate
Project Objective Improve physical activity and lifestyle modification by maintaining a diet chart and controlling weight which reflects reduce the weight by June 15. **Goal Statement** Measure the BMI pre(Weekly Once Per Month) and post-intervention (15 Days Once Per Two Months), incorporate healthy foods, and consider exercise for the next 45 days
Scope Good scope in weight loss and fit the body within few months

Project Schedule			
Define Phase	22/3/2021 TO 31/3/2021	Improve Phase	3/5/2021 TO 25/6/2021
Measure Phase	1/ 4 /2021 TO 30/4/2021	Control Phase	16/6/2021+
Analyze Phase	1/5/2021 TO 2/5/2021	Presentation	5/7/2021

Expected Benefits Weight loss would decrease many long-term health risks, increase energy levels, and improve my overall wellness/appearance.
Team

Sponsor:	NO	Leader:	BALAJI NAIK BUKKE	Members:	NO

Charter Prepared by: Balaji Naik Bukke	**Charter Approved by: Piyusha Majumdar**

Table 4.1: project charter

b) SIPOC

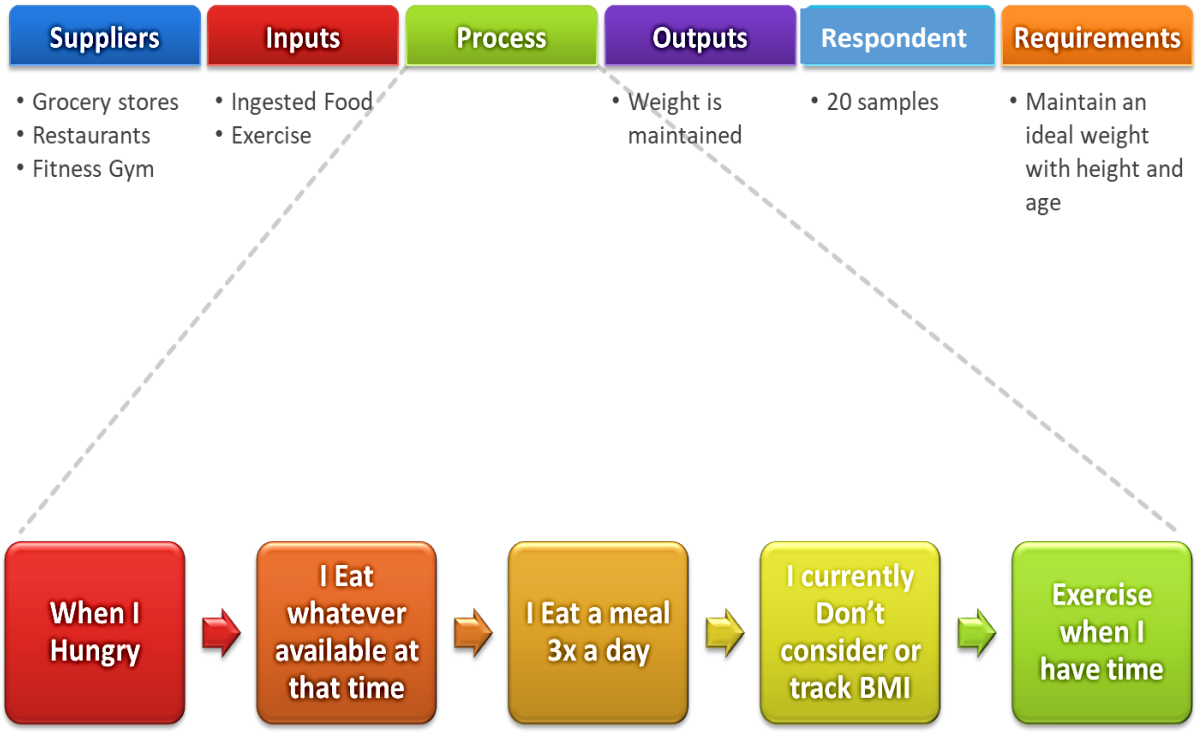

Figure 4.1: SIPOC analysis

Measure:

A baseline was established by collecting BMI for 1 month for future comparison. (Annexure 3&4)

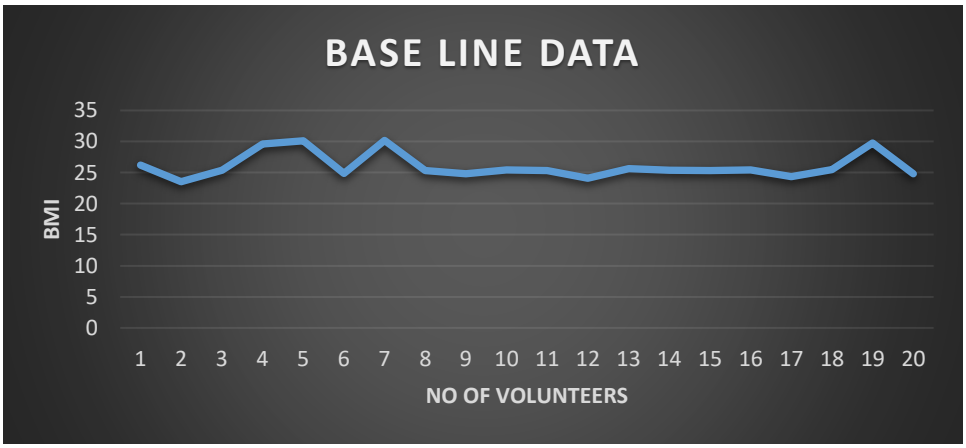

Figure 4.2: Baseline data

Analyze:

A root cause analysis was done based on the verified evidence from the survey and identified diet and exercise as the key contributors in gaining weight and it was drawn on a fishbone diagram. (Annexure 1)

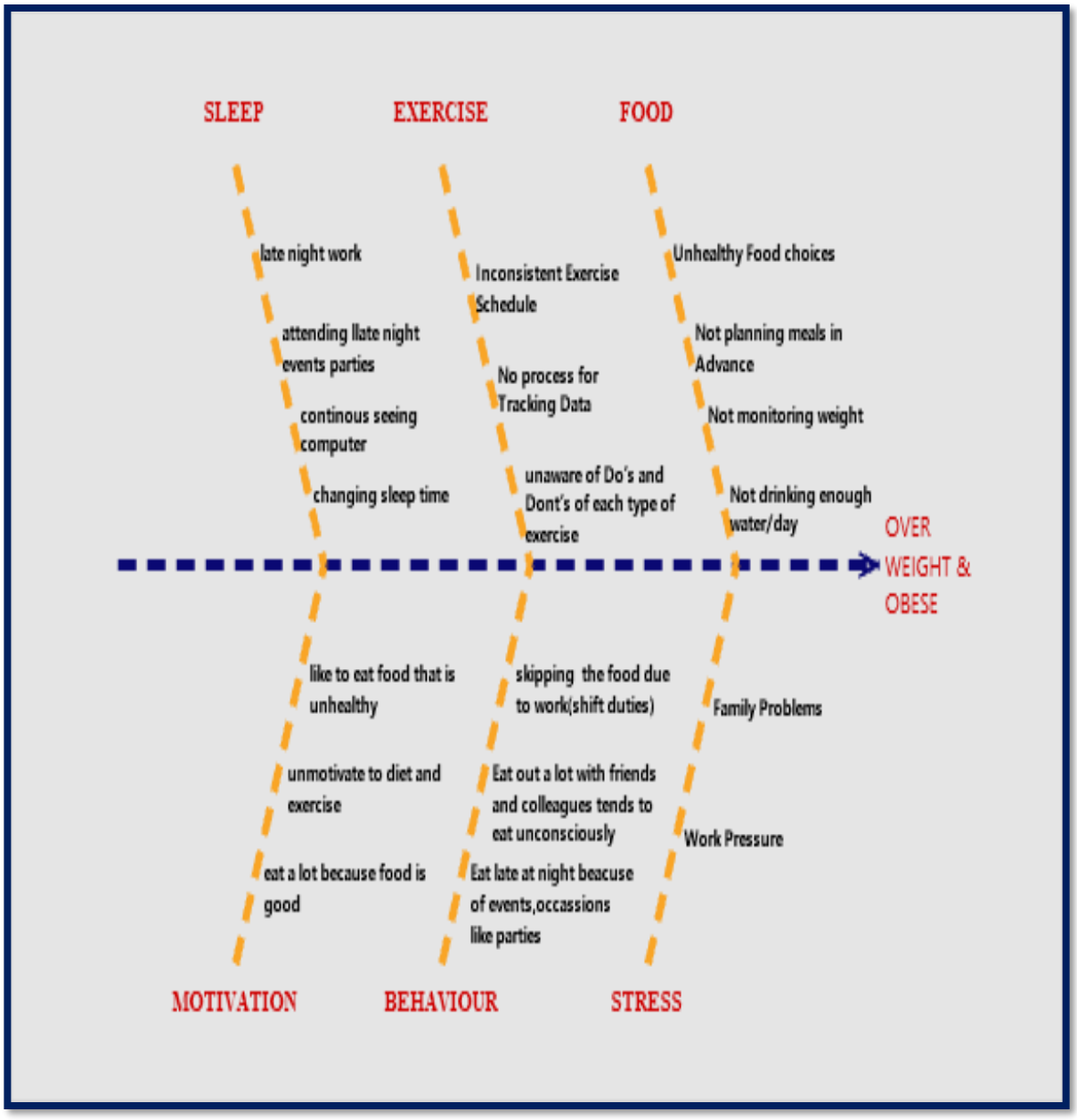

Figure 4.3: root cause analysis

Improve

Based upon the analysis, the intervention was done by using a Diet chart, which would be the best method for controlling weight gain. The proposed solution was to increase physical activity and reduced overweight by employing lifestyle modifications and weekly counseling. A box plot was drawn to show the significant difference which was observed between previous and current data. (Annexure 3)

a.)Solution Matrix

	Solution 1	Solution 2	Solution 3	Solution 4	Solution 5
	Stick To Diet Guidelines	**Walk After Meals**	**Stabilizing Exercise Schedule**	**Document Data**	**Preplan Meals**
Unhealthy Food Choices	X				X
Inconsistent Exercise Schedule		X	X		
Data Not Documented				X	

Table 4.2: Solution Matrix

b.)Boxplot

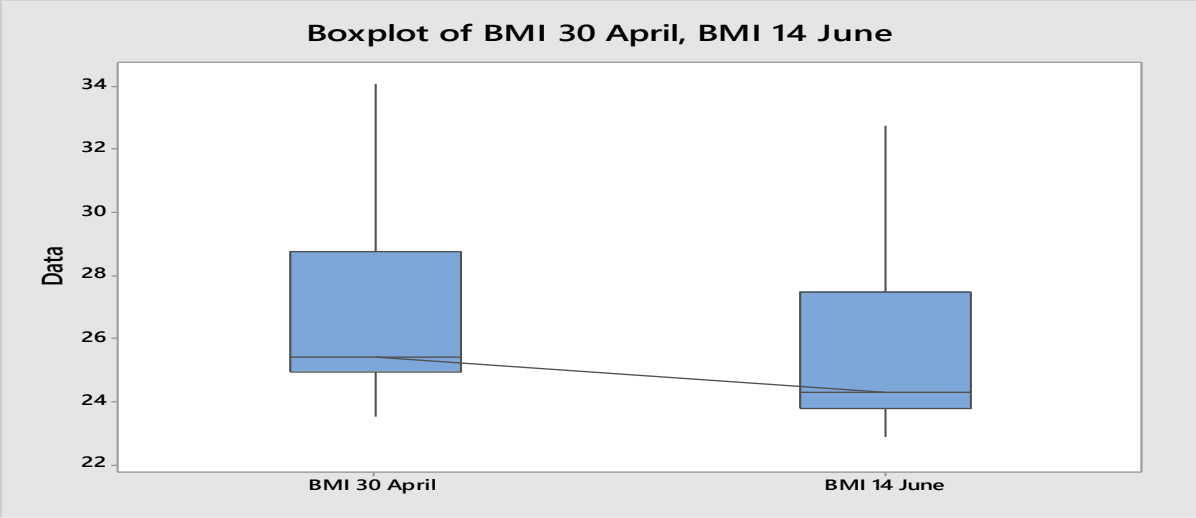

Figure 4.4: Box plot on baseline and end data

Control

The goal was achieved and it was drawn on the control chart i.e., IMR Chart. Anticipating that there is a need of continuing the same process i.e., maintaining a regular diet chart and physical activities by recording in a logbook for getting good results and to sustain the weight loss, "It's not a diet, it's a lifestyle change!" (Annexure 4)

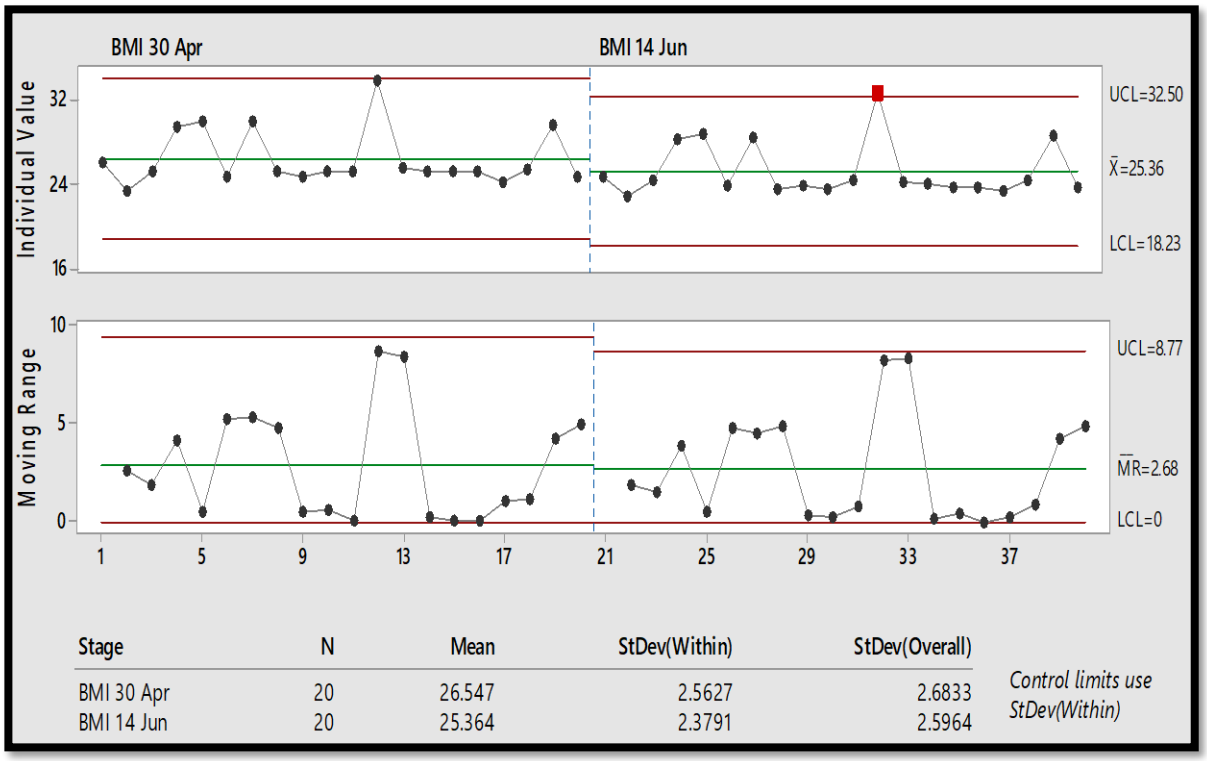

Figure 4.5: I MR Chart on control and stability of Baseline and End data

5.DISCUSSION

Everyone has known how to reduce weight by taking special cautions on diet and physical fitness like exercise and yoga. But still, there is a gap where weight is regained and the cause is unknown.

Several studies recommended that a combination of diet and physical fitness is not a permanent solution for weight loss. Many weight programs were conducted in different populations in different countries by applying different strategies. eventually, the solution for weight loss is to maintain and control ourselves.it means self-regulation and self-perception are the two key factors in maintaining and controlling BMI with the help of applicable strategies based on individual daily activities.

In this case, lean six sigma is the better option or solution to resolve and sustain weight loss on daily basis. It is crucial to support and encourage the appropriate preventive mechanisms and control strategies like lean six sigma, especially among overweight working women.

This study aimed to implement lean six sigma for weight loss. This study is focused on overweight in working women's attempts to lose weight by the intervention of a combination of diet and physical activities based on daily tracking and documenting. According to the results, all 20 volunteers felt they needed to lose weight, followed diet charts and instructions related to daily activities from morning to night.

The results confirmed that working on the root cause and identifying specific solutions with daily tracking and changing the lifestyle had a greater impact on the control phase. In this study analysis and improve phase has a crucial role in sustaining a healthier weight. In addition, Maintaining or controlling a healthier weight is not easy and on the other side isn’t painful because it depends on the approach and strategy based on individual needs and daily lifestyle.

The strengths and weaknesses of the study were considered and the presented results reflect it. The weights and heights were derived from self-reports and that itself is the primary limitation of the study. Although this raises some questions about the BMI value accuracy, as previous studies have shown that the rates of overweight derived through self-reporting measures are fairly reliable and classification as normal and overweight can be done quite accurately. A second limitation was the duration of the study which is very less for interpret

the concepts of being on a diet and weight by using the LSS approach. The acquired results with a limited sample size not sufficient to give a 100% confirmation whether this approach will give a good outcome or not which can be considered as a third limitation. A fourth limitation was Lean six sigma methodology is a promising approach in the healthcare domain, resolving many problems by creating and applying different processes but the awareness and knowledge are very little.in addition to this availability of research work and kinds of literature are less in the count.

6.CONCLUSION

The study will help many researchers and policymakers to conduct further research in this field. root cause analysis and lifestyle modifications in the control phase are the primary approaches in the DMAIC methodology of lean six sigma to resolve overweight and obesity. eventually, there will be a decline in the rate of new emerging problems or risk factors associated with non-communicable diseases like overweight and obesity. Moreover, the findings will empower individuals, researchers, and practitioners to include the results of the study in LSS application within the healthcare domain to enhance the possibility of effective implementation. Additionally, the study will support greater motivation across the field of various departments in the hospital for a larger and clearer application of LSS for establishing and maintaining process improvements.

ANNEXURE: 1 QUESTIONARY WITH RESPONSE

DEMOGRAPHICS

1.What is your gender?

A. Female
B. Male
C. Prefer not to say

2.Your Age

A. 18 to 24
B. 25 to 34
C. 35 to 44
D. 45 to 54
E. 55 to 64
F. Above 65

3.Occupation

A. Employed
B. Unemployed

4.Marital status

A. Married
B. Un Married
C. widow
D. Divorced

5.Your Height (in cm)

A. 147
B. 150
C. 157
D. 163
E. 165
F. 166
G. 168
H. 173
I. 178

6.Your Weight (in Kg)

A. 55
B. 58
C. 62
D. 65
E. 67
F. 67.5
G. 69
H. 75
I. 77
J. 79
K. 80
L. 83

DIET

7.Do any of your blood relatives (parents, grandparents, siblings, uncles, aunts, children) have/had any of the following health challenges?

A. Heart Problems
B. Blood Pressure
C. Diabetes
D. Thyroid
E. Cancer
F. Arthritis
G. Others
H. No known health challenges

8.Approximately how many glasses of water do you drink every day?

A. 4 or less
B. 5 to 8
C. 9 to 12
D. 13 to 16
E. More than 16

9.How many times in a week do you eat outside (including office cafeteria)

A. Daily
B. 3 times a week
C. 2 times or lesser
D. Rarely/Never

10.How often do you use preserved food (Jam, Frozen vegetables, instant noodles, frozen fries, ready to eat curries/Rotis, etc)

A. Daily
B. 3 times a week
C. 2 times or lesser
D. Rarely/Never

11.How many cups of tea/coffee do you drink on a typical day?

A. 1
B. 2
C. 3
D. 4

12.Do you eat food that was cooked the previous day or earlier?

A. Yes
B. No

DAILY ACTIVITIES

13.What kind of exercises do you do regularly?

A. Walking/Jogging/Running (10,000 steps or more)
B. Household Chores only
C. Work out in a Gym, Swim
D. Play sports (Tennis, Football, Badminton, etc)
E. Yoga, Aerobics, Pilates
F. Others
G. None
H. Other:

14.On a typical day, how many hours do you sleep continuously without any interruptions

A. Less than two hours
B. 2 to 4 hours
C. 4 to 6 hours
D. 6 to 8 hours
E. More than 8 hours

15.How would you rate the intensity of your exercise?

A. 1
B. 2
C. 3
D. 4
E. 5

16.Rate the quality of your sleep during the past one week20 responses

A. Light sleep, woke up several times, disturbed
B. Slept well, woke up in-between, went back to sleep
C. Deep sleep, wouldn't know if anything happened around

17.How would you rate your work-life balance?

A. 1
B. 2
C. 3
D. 4
E. 5

18.What is your daily mode of transport within your city?

A. Self Drive (2 wheeler)
B. Self Drive (4 wheeler)
C. Pillion rider (2 wheeler)
D. Pillion rider (4 wheeler)
E. Public transport (bus, Metro, Cab, Auto, etc)
F. Cycling
G. Walking (more than 20 minutes)
H. I work from home

19.Your work involves sitting continuously

A. 30 minutes or less
B. More than 30 minutes, but less than 2 hours
C. More than 2 hours

20.Please indicate if you have/had any of the ailments related

A. Nerves (Weakness, Anxiety & Sleep disorders, etc)
B. Brain (Parkinsons, Seizures, Alzheimer's, etc)
C. Eye (Cataract, Macular degeneration, etc)

D. Respiratory (Asthma, Bronchitis, TB, etc)
E. Heart (BP, Heart Attack, etc)
F. Liver & Kidney (Dialysis, Sclerosis, Kidney stones, Gall bladder stones, Hepatitis, etc)
G. Hormonal (Diabetes, Thyroid, PCOD, etc)
H. Digestion (Gastritis, Piles, Constipation, Ulcers, etc)
I. Hair/Skin (Psoriasis, Pimples, Allergies, Eczema, Hair loss, etc)
J. Cancer
K. Vitamin/Mineral deficiencies (Anemia, Vitamin D, Vitamin B, Calcium, etc)
L. Immunity (Frequent Cough, Cold, Fever, Allergies, Auto immune diseases, etc)
M. Bones & Joints (Spondylitis, Back pain, Arthritis, Slipped disc, Fractures, etc)
N. No known health challenges
O. Other:

21.Are you under any ongoing medical treatment or medication?

A. Yes
B. No
C. Other:

.

ANNEXURE: 2 BODY MASS INDEX CHART

Obese (>30) | Overweight (25-30) | Normal (18.5-25) | Underweight (<18.5)

HEIGHT in feet/inches and centimeters

WEIGHT		4'8"	4'9"	4'10"	4'11"	5'0"	5'1"	5'2"	5'3"	5'4"	5'5"	5'6"	5'7"	5'8"	5'9"	5'10"	5'11"	6'0"	6'1"	6'2"	6'3"	6'4"	6'5"
lbs	(kg)	142cm		147	150	152	155	157	160	163	165	168	170	173	175	178	180	183	185	188	191	193	196
260	**(117.9)**	**58**	**56**	**54**	**53**	**51**	**49**	**48**	**46**	**45**	**43**	**42**	**41**	**40**	**38**	**37**	**36**	**35**	**34**	**33**	**32**	**32**	**31**
255	(115.7)	57	55	53	51	50	48	47	45	44	42	41	40	39	38	37	36	35	34	33	32	31	30
250	**(113.4)**	**56**	**54**	**52**	**50**	**49**	**47**	**46**	**44**	**43**	**42**	**40**	**39**	**38**	**37**	**36**	**35**	**34**	**33**	**32**	**31**	**30**	**30**
245	(111.1)	55	53	51	49	48	46	45	43	42	41	40	38	37	36	35	34	33	32	31	31	30	29
240	**(108.9)**	**54**	**52**	**50**	**48**	**47**	**45**	**44**	**43**	**41**	**40**	**39**	**38**	**36**	**35**	**34**	**33**	**33**	**32**	**31**	**30**	**29**	**28**
235	(106.6)	53	51	49	47	46	44	43	42	40	39	38	37	36	35	34	33	32	31	30	29	29	28
230	**(104.3)**	**52**	**50**	**48**	**46**	**45**	**43**	**42**	**41**	**39**	**38**	**37**	**36**	**35**	**34**	**33**	**32**	**31**	**30**	**30**	**29**	**28**	**27**
225	(102.1)	50	49	47	45	44	43	41	40	39	37	36	35	34	33	32	31	31	30	29	28	27	27
220	**(99.8)**	**49**	**48**	**46**	**44**	**43**	**42**	**40**	**39**	**38**	**37**	**36**	**34**	**33**	**32**	**32**	**31**	**30**	**29**	**28**	**27**	**27**	**26**
215	(97.5)	48	47	45	43	42	41	39	38	37	36	35	34	33	32	31	30	29	28	28	27	26	25
210	**(95.3)**	**47**	**45**	**44**	**42**	**41**	**40**	**38**	**37**	**36**	**35**	**34**	**33**	**32**	**31**	**30**	**29**	**28**	**28**	**27**	**26**	**26**	**25**
205	(93.0)	46	44	43	41	40	39	37	36	35	34	33	32	31	30	29	29	28	27	26	26	25	24
200	**(90.7)**	**45**	**43**	**42**	**40**	**39**	**38**	**37**	**35**	**34**	**33**	**32**	**31**	**30**	**30**	**29**	**28**	**27**	**26**	**26**	**25**	**24**	**24**
195	(88.5)	44	42	41	39	38	37	36	35	33	32	31	31	30	29	28	27	26	26	25	24	24	23
190	**(86.2)**	**43**	**41**	**40**	**38**	**37**	**36**	**35**	**34**	**33**	**32**	**31**	**30**	**29**	**28**	**27**	**26**	**26**	**25**	**24**	**24**	**23**	**23**
185	(83.9)	41	40	39	37	36	35	34	33	32	31	30	29	28	27	27	26	25	24	24	23	23	22
180	**(81.6)**	**40**	**39**	**38**	**36**	**35**	**34**	**33**	**32**	**31**	**30**	**29**	**28**	**27**	**27**	**26**	**25**	**24**	**24**	**23**	**22**	**22**	**21**
175	(79.4)	39	38	37	35	34	33	32	31	30	29	28	27	27	26	25	24	24	23	22	22	21	21
170	**(77.1)**	**38**	**37**	**36**	**34**	**33**	**32**	**31**	**30**	**29**	**28**	**27**	**27**	**26**	**25**	**24**	**24**	**23**	**22**	**22**	**21**	**21**	**20**
165	(74.8)	37	36	34	33	32	31	30	29	28	27	27	26	25	24	24	23	22	22	21	21	20	20
160	**(72.6)**	**36**	**35**	**33**	**32**	**31**	**30**	**29**	**28**	**27**	**27**	**26**	**25**	**24**	**24**	**23**	**22**	**22**	**21**	**21**	**20**	**19**	**19**
155	(70.3)	35	34	32	31	30	29	28	27	27	26	25	24	24	23	22	22	21	20	20	19	19	18
150	**(68.0)**	**34**	**32**	**31**	**30**	**29**	**28**	**27**	**27**	**26**	**25**	**24**	**23**	**23**	**22**	**22**	**21**	**20**	**20**	**19**	**19**	**18**	**18**
145	(65.8)	33	31	30	29	28	27	27	26	25	24	23	23	22	21	21	20	20	19	19	18	18	17
140	**(63.5)**	**31**	**30**	**29**	**28**	**27**	**26**	**26**	**25**	**24**	**23**	**23**	**22**	**21**	**21**	**20**	**20**	**19**	**18**	**18**	**17**	**17**	**17**
135	(61.2)	30	29	28	27	26	26	25	24	23	22	22	21	21	20	19	19	18	18	17	17	16	16
130	**(59.0)**	**29**	**28**	**27**	**26**	**25**	**25**	**24**	**23**	**22**	**22**	**21**	**20**	**20**	**19**	**19**	**18**	**18**	**17**	**17**	**16**	**16**	**15**
125	(56.7)	28	27	26	25	24	24	23	22	21	21	20	20	19	18	18	17	17	16	16	16	15	15
120	**(54.4)**	**27**	**26**	**25**	**24**	**23**	**23**	**22**	**21**	**21**	**20**	**19**	**19**	**18**	**18**	**17**	**17**	**16**	**16**	**15**	**15**	**15**	**14**
115	(52.2)	26	25	24	23	22	22	21	20	20	19	19	18	17	17	16	16	16	15	15	14	14	14
110	**(49.9)**	**25**	**24**	**23**	**22**	**21**	**21**	**20**	**19**	**19**	**18**	**18**	**17**	**17**	**16**	**16**	**15**	**15**	**15**	**14**	**14**	**13**	**13**
105	(47.6)	24	23	22	21	21	20	19	19	18	17	17	16	16	16	15	15	14	14	13	13	13	12
100	**(45.4)**	**22**	**22**	**21**	**20**	**20**	**19**	**18**	**18**	**17**	**17**	**16**	**16**	**15**	**15**	**14**	**14**	**14**	**13**	**13**	**12**	**12**	**12**
95	(43.1)	21	21	20	19	19	18	17	17	16	16	15	15	14	14	14	13	13	13	12	12	12	11
90	**(40.8)**	**20**	**19**	**19**	**18**	**18**	**17**	**16**	**16**	**15**	**15**	**15**	**14**	**14**	**13**	**13**	**13**	**12**	**12**	**12**	**11**	**11**	**11**
85	(38.6)	19	18	18	17	17	16	16	15	15	14	14	13	13	13	12	12	12	11	11	11	10	10
80	**(36.3)**	**18**	**17**	**17**	**16**	**16**	**15**	**15**	**14**	**14**	**13**	**13**	**13**	**12**	**12**	**11**	**11**	**11**	**11**	**10**	**10**	**10**	**9**

Note: BMI values rounded to the nearest whole number. BMI categories based on CDC (Centers for Disease Control and Prevention) criteria.

ANNEXURE: 3 DIET CHART

DIET CHART

Time	Daily Activities
06:30 AM	Wake up with prayer and take 500 ml of water on empty stomach (start with 1 glass and extend up to 500 ml over a period of one week)
06:45 AM – Detox Water	1 glass of water – 200 ml + 1 spoon chia seeds (5 grams)
07:00-08:00 AM	Exercise (If not possible, do in the evening times)
08:30 AM	Salad one plate (Carrot-3 + Tomato-1 + Onion + Beetroot) and 1 cup sprout bowl (green gram or channa or Kabul or black-eyed beans or toor dhal or rajma (red kidney beans)
09:00 AM	Breakfast: Dosa -2 or Idly -3 or Chapati – 2 (wheat, no maida) or 1 cup of upma
11:30 AM	Any 1 seasonal fruit (Apple must) with 1 spoon of flax seeds.
01:00 AM	Salad one plate (Carrot-3 + Tomato-1 + Onion-1)
01:30 PM	Rice + curry + curd + rasam; 1 ½ cup rice, dhal/vegetable curries (if possible, replace rice with roti for 40 days)
04:30 PM	Green tea plus pumpkin or sesame seeds or flax seeds plus one fist size dry fruits with protein shake.
07:00 PM Before dinner	Fiber powder – 1 scoop in 250 ml water to be stirred till it gets dissolved. (at 7 PM)
Before meal - 1 cup salad bowl – boiled broccoli, cauliflower, cabbage or repeat same morning salad bowl (onion/tomato/carrot/radish) or any vegetable salad of choice	
08:00 PM	Dinner: Body key sachet
NOTE: 1) In case, exercise not possible (only could not be able to do because of heavy work), 10-20 minutes of walk after 20 mins of every meal (three times a day) or 10,000 steps per day. 2) No fried food and non-vegetarian food also only boiled stuff. 3) No mobile and TV before one hour going to sleep, before going to bed have a good prayer and read a good book to have sound sleep with positive thoughts. 4) Please use HealthifyMe application and include daily food intake to check total protein intake 5) Please track all the recommended suggestions diligently. 6) Please do not take fruits after 4 PM	
Foods To Avoid	Processed foods, soft drinks, sugar, white bread, chocolates, cakes, biscuits, tea/coffee, fried items, excess Butter, whole milk and heavy cream.
Belly Fat	12 sets of Suryanamakaras (6 sets in initial days; can be included in routine exercise), Plank (30 secs for first week, 1 min for next two weeks, followed by 2 ½ mins)

ANNEXURE: 4 BASELINE AND END DATA

PRE TEST/BASE LINE DATA-APRIL (30 DAYS)										STATUS
	1/4/2021-15/4/2021					16/4/2021-30/4/2021				
SL.NO	height /ft	height /cm	weight/kg	wt /pounds	BMI	height /cm	weight/kg	wt /pounds	BMI	
1	4'10	147	55	121.254244	25.45236	147	56.6	124.78164	26.19279	OVERWEIGHT
2	5'2	157	58	126.78	23.53037	157	58	126.78	23.53037	NORMAL
3	5'2	157	62	136.686603	25.15315	157	62.6	138.009376	25.39657	OVERWEIGHT
4	5'4	163	77	169.755942	28.98114	163	78.6	173.283338	29.58335	OBESITY
5	5'4	163	79	174.165187	29.7339	163	80	176.36981	30.11028	OBESITY
6	5'4	163	65	143.30047	24.4646	163	66	145.505093	24.84098	NORMAL
7	4'11	150	67	147.709716	29.77778	150	67.9	149.693876	30.17778	OBESITY
8	5'5	165	67	147.709716	24.60973	165	69	152.118961	25.34435	OVERWEIGHT
9	5'6	168	69	152.118961	24.44728	168	70	154.323584	24.80159	NORMAL
10	5'5	165	67.5	148.812027	24.79339	165	69.2	152.559885	25.41781	OVERWEIGHT
11	5'5	165	67	147.709716	24.60973	165	69	152.118961	25.34435	OVERWEIGHT
12	5'2	157	83	182.983678	33.67277	157	84	185.1883	34.07846	OBESITY
13	5'10	178	79	174.165187	24.93372	178	81.2	179.015357	25.62808	OVERWEIGHT
14	5'8	173	75	165.346697	25.05931	173	75.9	167.330857	25.36002	OVERWEIGHT
15	5'6	168	69	152.118961	24.44728	168	71.5	157.630517	25.33305	OVERWEIGHT
16	4'11	150	55	121.254244	24.44444	150	57.2	126.104414	25.42222	OVERWEIGHT
17	5'2	157	58	127.868112	23.53037	157	60	132.277357	24.34176	NORMAL
18	5'4	163	67	147.709716	25.21736	163	67.7	149.252951	25.48082	OVERWEIGHT
19	5'5	165	80	176.36981	29.38476	165	81	178.574432	29.75207	OBESITY
20	5'6	168	69	152.118961	24.44728	168	70	154.323584	24.80159	NORMAL

POST INTERVENTION-DIET CHART (45 DAYS)												STATUS
01-05-2021-15/05/2021				16/5/2021-30/05/2021				31/06/2021-14/06/2021				
height /cm	weight/kg	wt /pounds	BMI	height /cm	weight/kg	wt /pounds	BMI	height /cm	weight/kg	wt /pounds	BMI	
147	55.92204	123.287	25.87905	147	54.55809	120.28	25.24786	147	53.65091	118.28	24.82804	NORMAL
157	59.62472	131.45	24.18951	157	57.35676	126.45	23.2694	157	56.44957	124.45	22.90136	NORMAL
157	61.25765	135.05	24.85198	157	60.34842	133.0455	24.48311	157	60.32779	133	24.47474	NORMAL
163	76.29424	168.2	28.71551	163	75.38705	166.2	28.37406	163	75.29143	165.9892	28.33808	OVERWEIGHT
163	78.37486	172.787	29.49861	163	77.92127	171.787	29.32789	163	76.65752	169.0009	28.85224	OVERWEIGHT
163	64.54982	142.308	24.29516	163	64.12925	141.3808	24.13687	163	63.95652	141	24.07186	NORMAL
150	66.67245	146.9876	29.6322	150	65.71465	144.876	29.20651	150	64.35387	141.876	28.60172	OVERWEIGHT
165	66.66384	146.9686	24.48626	165	65.34842	144.0686	24.00309	165	64.44123	142.0686	23.66987	NORMAL
168	68.3468	150.6789	24.21584	168	68.14318	150.23	24.1437	168	67.68959	149.23	23.98299	NORMAL
165	66.63272	146.9	24.47483	165	65.42571	144.239	24.03148	165	64.51853	142.239	23.69826	NORMAL
165	67.49799	148.8076	24.79265	165	66.71255	147.076	24.50415	165	66.67173	146.986	24.48916	NORMAL
157	82.55354	181.9994	33.49164	157	82.09995	180.9994	33.30762	157	80.73917	177.9994	32.75556	OBESITY
178	78.55657	173.1876	24.79377	178	78.06268	172.0988	24.63789	178	77.1555	170.0988	24.35157	NORMAL
173	74.83399	164.9807	25.00384	173	73.89337	162.907	24.68956	173	72.5326	159.907	24.23489	NORMAL
168	68.48655	150.987	24.26536	168	68.03827	149.9987	24.10653	168	67.13108	147.9987	23.78511	NORMAL
150	54.87878	120.987	24.39057	150	54.42551	119.9877	24.18911	150	53.53297	118.02	23.79243	NORMAL
157	58.4725	128.9098	23.72206	157	58.10065	128.09	23.5712	157	58.05488	127.9891	23.55263	NORMAL
163	67.09026	147.9087	25.25133	163	66.26395	146.087	24.94032	163	64.90317	143.087	24.42816	NORMAL
165	79.83226	176	29.32314	165	79.41813	175.087	29.17103	165	78.05735	172.087	28.6712	OVERWEIGHT
168	68.71924	151.5	24.3478	168	68.06154	150.05	24.11477	168	67.15435	148.05	23.79335	NORMAL

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