Indira Gandhi National Open University School of Continuing Education – New Delhi

Nutritional assessment of Geriatric hospitalized patients

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For Master of Science Degree in Dietetics and Food and Science Management

Nutritional assessment of Geriatric hospitalized patients

A dissertation submitted to the Indira Gandhi National Open University in partial fulfilment of the requirement for the degree of **Master of Science** in **Dietetics and Food and Science Management**

by

Bhoomi H. VED

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CERTIFICATE OF AUTHENTICITY

STUDENT CERTIFICATE

The work embodied in this dissertation titled "**Nutritional assessment in elderly hospitalized geriatric patients in Thane rural**" has been carried out by me **Bhoomi Harsh VED** under the supervision of **Dr. Vidushi Agrawal**. This work is original and has not been submitted by me for the award of any other degree to this or any other University
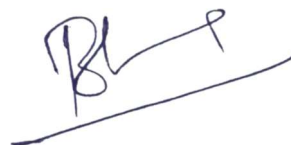
Date: 12/06/2020

Place: Mumbai

Signature and Name of   Bhoomi Harsh Ved
candidate:

CERTIFICATE OF DISSERTATION

COUNSELLOR

I / We certify that the candidate **Bhoomi Harsh VED** has planned and conducted the research study entitled "**Nutritional assessment in elderly hospitalized geriatric patients in Thane rural**" under my /our guidance & supervision and that the report submitted herewith is a bonafide work done by the candidate in Mumbai.

Date: 12/06/2020

Place: Mumbai

(Dr. Vidushi Agrawal)
Signature and Name

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TABLE OF CONTENT

1 ABSTRACT

Background: Geriatric population is a potentially vulnerable group for malnutrition as per 2002 census of the World Health Organization.

Objectives: To estimate the prevalence of malnutrition and risk of malnutrition among hospitalized elderly population in Thane rural area (Mira Road East)

Materials and Methods: This study was carried out in WOCKHARDT Hospital and Research institute. Mira Road (East), Thane 401107. Elderly patients aged ≥ 60 years during March 2019 to Jan 2020 were part of the study which was carried out by applying Mini Nutritional Assessment (MNA) and Subjective Global Assessment (SGA) questionnaire. Elderly individuals were interviewed after obtaining informed verbal consent.

Conclusion: Nutritional status of elderly subjects is poor as detected in this study. There is need and scope for geriatric nutritional interventions in hospitalized geriatric population.

Keywords: Nutritional assessment, Geriatric, MINI NUTRITIONAL ASSESSMENT, SUBJECTIVE GLOBAL ASSESSMENT, hospitalized elderly, malnutrition, aging, Body mass index, Thane

2 INTRODUCTION

The health of the elderly is an important issue defining the health status of a population. In India, geriatric age group (aged 60 years and above) constitute 8.6% of the total population as per 2011 census. Majority of them live in rural India. The magnitude of malnutrition among the elderly in India is underreported. Studies have shown that more than 50% of the older population is underweight and more than 90% has an energy intake below the recommended allowance.

The prevalence of malnutrition is increasing in this population and is associated with a decline in functional status, impaired muscle function, decreased bone mass, immune dysfunction, anemia, reduced cognitive function, poor wound healing, delayed recovery from surgery, higher hospital readmission rates, and mortality. Older people often have reduced appetite and energy expenditure, which, coupled with a decline in biological and physiological functions such as reduced lean body mass, changes in cytokine and hormonal level, and changes in fluid electrolyte regulation, delay gastric emptying and diminish senses of smell and taste. In addition, pathologic changes of aging such as chronic diseases and psychological illness all play a role in the complex etiology of malnutrition in older people.

The aim of this study is to assess the nutritional status, dietary habits and lifestyle patterns of elderly hospitalized patients in Thane Rural. There is a need for special attention to this group by health care centres.

2.1   EFFECT OF AGEING

Dementia becomes more common with age. The spectrum ranges from mild cognitive impairment to the neurodegenerative diseases of Alzheimer's disease, cerebrovascular disease, Parkinson's disease and Lou Gehrig's disease.

 Intelligence declines with age, though the rate varies depending on the type and may in fact remain steady throughout most of the lifespan, dropping suddenly only as people near the end of their lives.

Age can result in visual impairment; whereby non-verbal communication is reduced which can lead to isolation and possible depression. Macular degeneration causes vision loss and increases with age. This degeneration is caused by systemic changes in the circulation of waste products and by growth of abnormal vessels around the retina.

The most common ailments our elderly patients experience include:
1. **Heart conditions**: This includes hypertension, congestive heart failure, high blood pressure, and coronary artery disease. Side effects include fatigue and lack of physical strength.
2. **Dementia**: In addition to memory loss, dementia patients experience paranoia, aggression, agitation, and lack of self-care.
3. **Delirium:** Symptoms include shaking, a shortened attention span, and extreme mood swings.
4. **Depression:** Depression is very common among the elderly. Sadness, irritability, fatigue, and feelings of worthlessness are all symptoms.
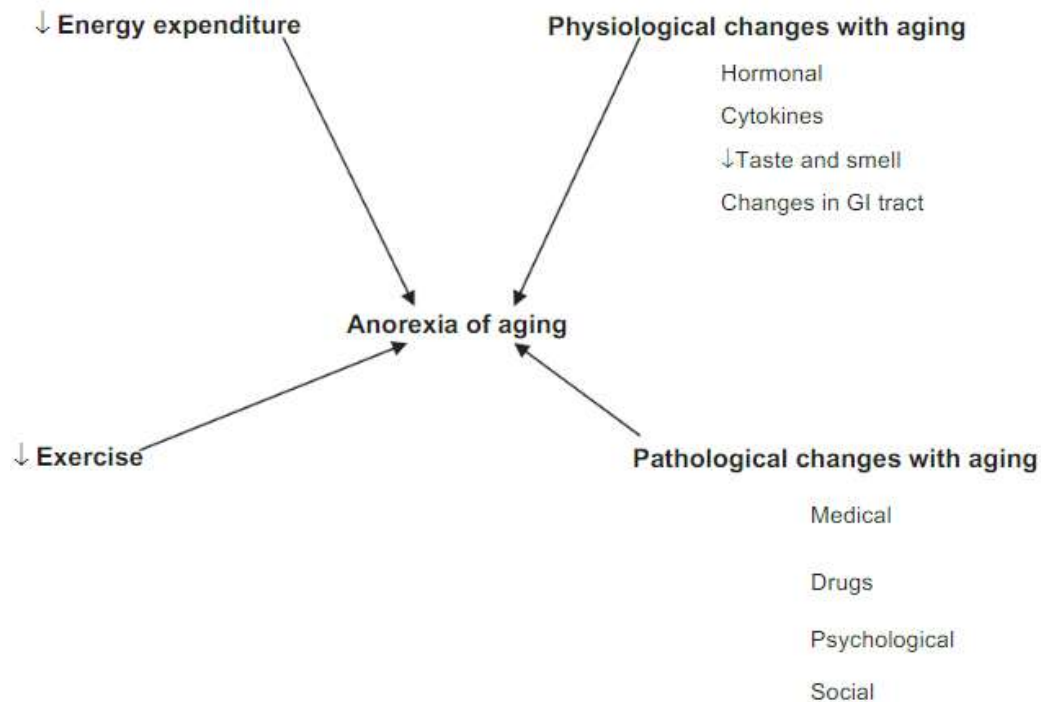

Figure 1 – anorexia of aging

2.2   HEALTH RELATED PROBLEMS DUE TO AGEING

Following are examples of how aging affects some of our major body systems.

1.   Cells, organs and tissues:

   a) Cells become less able to divide.
   b) The telomeres - the ends of the chromosomes inside every cell - gradually get shorter until, finally, they get so short that the cell dies.
   c) Waste products accumulate.
   d) Connective tissue between the cells becomes stiffer.
   e) The maximum functional capacity of many organs decreases.

2.   Heart and blood vessels:

   a) The wall of the heart gets thicker.
   b) Heart muscle become less efficient (working harder to pump the same amount of blood)
   c) The aorta (the body's main artery) becomes thicker, stiffer, and less flexible.
   d) Many of the body's arteries, including arteries supplying blood to the heart and brain, slowly develop atherosclerosis, although the condition never becomes severe in some people.

3.   Vital signs:

   a) It is harder for the body to control its temperature.
   b) Heart rate takes longer to return to normal after exercise.

4.   Bones, muscles, joints:

   a) Bones become thinner and less strong.
   b) Joints become stiffer and less flexible.
   c) The cartilage and bone in joints start to weaken.
   d) Muscle tissue becomes less bulky and less strong.

5.   Digestive system:

   a) The movement of food through the digestive system becomes slower.
   b) The stomach, liver, pancreas, and small intestine make smaller amounts of digestive juices.

6.   Brain and nervous system:

   a) The number of nerve cells in the brain and spinal cord decreases.
   b) The number of connections between nerve cells decreases.
   c) Abnormal structures, known as plaques and tangles, may form in the brain.

7.   Eyes and Ears:

   a) The retinas get thinner, the irises get stiffer.
   b) The lenses become less clear.
   c) The walls of the ear canal get thinner.
   d) The eardrums get thicker.

8.   Skin, nails, and hair:

    a) Skin gets thinner and becomes less elastic
    b) Sweat glands produce less sweat
    c) Nails grow more slowly
    d) Hairs get gray and some no longer grow

2.3   MALNUTRITION

Malnutrition is defined as a state in which a deficiency, excess, or imbalance of energy, protein, or other nutrients causes adverse effects on body form, function, and clinical outcomes. Two major markers of malnutrition in older people are sarcopenia and cachexia.

Sarcopenia is defined as a syndrome of progressive and generalized loss of skeletal muscle mass and strength, which increases the risk of adverse outcomes, such as physical disability, poor quality of life, and even death. Diagnosis is made based on findings of decreased muscle mass and either decreased muscle strength or decreased physical performance.

Cachexia is defined as complex metabolic processes associated with an underlying illness (e.g., cancer, end-stage renal disease, congestive heart failure) and is characterized by loss of muscle mass with or without loss of fat mass. In elders, cachexia is generally characterized by severe wasting, and it is frequently associated with inflammation, insulin resistance, and breakdown of muscle protein.

The terms undernutrition and malnutrition are often used synonymously, but undernutrition is a form of malnutrition. Undernutrition is defined as inadequate nutrition resulting from lack of food or failure of the body to properly absorb or assimilate nutrients. It is often characterized by a low body weight and low body mass index.

2.4   SCREENING METHODS FOR MALNUTRITION

Malnutrition is a condition of poor nutritional status resulting from reduced food intake or impaired metabolism and evaluation of nutritional status is necessary to determine the severity of undernutrition. As there is no objective test to measure nutritional status, therefore numerous screening methods have been developed to determine the nutritional status of individual: (i) assessing clinical signs and symptoms, (ii) biochemical indicators (iii) dietary survey and (iv) anthropometric measurements. Assessment of clinical signs and symptoms need proper knowledge for evaluation, whereas biochemical indicators are relatively expensive and time consuming to perform in community level. On the other, dietary survey can give an idea of daily energy intake but there may have chances of misreporting and need food consumption data of several days to obtain the estimate of usual diet.

2.4.1 Anthropoemetry

It has a long tradition of assessing nutritional and health status of adults as this is an inexpensive, non-invasive method that provides detailed information on different components of body structure, especially muscular and fat components Moreover, anthropometric measurements are highly sensitive to the broad spectrum of nutritional status, whereas biochemical and clinical indicators are useful only at extremes of malnutrition.

Among the widely used anthropometric measurements, body mass index (BMI) and mid-upper-arm-circumference (MUAC) are most significant and reliable.

2.4.1.1 BMI (Body mass index)

i.   It is generally considered as a good indicator and used for the assessment of chronic energy deficiency of adults, especially in developing countries.

ii. It is highly correlated with fat and fat-free mass and so the protein and fat reserves of body can be estimated. In normal adults the ratio is approximately constant, and a person with a low BMI is underweight for his/her height.

iii. However, it must be considered that many inpatients cannot be weighed and measured. Consequently, there is a need for markers easier to measure to detect malnutrition in habitual clinical practice. Currently, a BMI of 18.5 kg/m2 is considered a marker of malnutrition when associated with other risk factors, although, per se, this is not of much predictive value as it does not exclude patients with constitutional underweight

iv. Age is another factor that may alter the functional significance of BMI at different ages; because adults tend to lose fat free mass and increase fat mass with increasing age. Oedema can also affect the significance of BMI. Adults may develop oedema when severely undernourished, which artificially increases an individual's weight resulting in BMI appearing more normal than the actual value.

v.   Moreover, the universal cut-off of the BMI cannot be applicable across different populations. So, these inabilities limit the usefulness of BMI as an accurate screening tool to assess adult undernutrition.

2.4.1.2 MUAC (Mid-upper arm circumference)

i.   It is another important indicator for simple screening of adult nutritional status, specifically in developing countries. The measurement requires fewer apparatus and easy to perform even on the most debilitated individuals.

ii. It is independent of height and indicates the arm muscle and sub-cutaneous fat; both being important determinants of survival in starvation.

iii. Though classification of undernutrition according to the MUAC category is more appropriate than BMI category, but is not completely error free. Insufficient data are available correlating MUAC with undernutrition and other functional measures in adults, across different ethnic and population groups.

iv. Furthermore, the use of MUAC in adults may be affected by the redistribution of subcutaneous fat towards central areas of the body during aging. Therefore, age-specific cut-off points of MUAC may be required. MUAC is also very sensitive towards intra- and inter- observer errors.

2.4.1.3 CC (CALF-CIRCUMFERENCE)

Calf circumference (CC) measurements, which are simple to obtain and noninvasive, have been used as a basic tool for assessing nutritional status.

Calf circumference also provides information about normal muscle mass. It can reflect a decrease in muscle mass with limited physical activity. A result of more than 31 cm is considered normal

Anthropometries were measured using an inelastic tape by investigators trained in standardized measurement methods. To measure the upper arm circumference (UAC), the subject raised the arm at shoulder level with the elbow bent at 90° angle. In this position, the subject flexes the bicep, which can be measured at its greatest girth. To measure CC, the subject stood upright with feet apart shoulder width and body weight evenly distributed between both legs. In this position, CC can be measured at the calf's greatest girth using an inelastic tape measure.

Measuring CC is a simple and noninvasive assessment method that is easily accessible in communities and primary care settings. World Health Organization (WHO) has suggested the use of CC as a marker of muscle mass in elderly people.

2.5   FACTORS INFLUENCING NUTRITIONAL STATUS

Many factors contribute to malnutrition and undernutrition in elders, including social, psychological, and biological issues (figure 1).

Social
- Isolation
- Poverty
- Dependency

Psychological
- Depression
- Dementia

Biological
- Dentition
- Taste
- Gastrointestinal disorders
- Muscle weakness
- Dry mouth
- Olfaction
- Renal disease

Figure 1 – factors influencing nutrition risk in elders

In India, the elderly people suffer from both communicable as well as non–communicable diseases. This is further compounded by hearing and/ or visual impairment, obesity and its related complications due to a sedentary lifestyle and decreased physical activity. Socio-economic factors such as breakdown of the family support systems, social isolation, elderly abuse and decrease in economic independence also are major contributing factors. The mental disorders that are frequently encountered include dementia and mood disorders. Other disorders include neurotic and personality disorders, drug and alcohol abuse, delirium, and mental psychosis.

With the rise in geriatric population in India, it is important that we investigate various health issues encountered by them. Nutrition, anemia and physical disability of the aged are neglected aspects despite being vital health problems.

3   REVIEW OF LITERATURE

As part of this study, an exhaustive set of research documents were reviewed in-order to understand what kind of research has been done in this field so that we can improve on the same. Nutritional status pertaining to geriatric hospitalized patients are not available as such. The literature pertaining to this age group has been reviewed in this section which includes symptoms of malnutrition, association of nutritional parameters viz., dietary, anthropometry, effect of supplementation etc.

Studies have been conducted through a structured questionnaire of 100 elderly patients aged >=60 years to examine the relationships between dietary intake, diseases, medical history and socio-demographic variables. The symptoms which showed strongest association with malnutrition status were **BMI, dietary intake, weight loss, current diseases and medical history** along with social security. Geriatrics most likely to face malnutrition did not report a good BMI score, had morbidities, less or nil physical activities, irregular or insufficient dietary intakes.

To study the relationship of different variables with nutritional status, a significant relationship was observed between **age groups and MNA status.** The association between MNA status and gender was found to be statistically significant. This could be attributed to factors such as the role of women in the society and financial dependency which eventually affects nutritional status. No significant association was found between living status and nutritional status; However, studies have shown that malnutrition was more prevalent among the elderly who lived alone.

An analysis of the relationship between **financial dependency and nutritional status** also revealed an association. The **intake of food is determined by the purchasing power**, and moreover a person can be decisive about food intake if he or she is financially independent. Some studies similarly found that not having an income and not receiving regular financial support were associated with poor nutritional status.

The **functional status** of the elderly determines their ability to perform basic self-care tasks and live independently, which also includes food intake. The association between functional and nutritional status was found to be significant. There was significant association between calorie intake and nutritional status. The most common reasons cited for inadequate calorie intake were difficulty in chewing and swallowing (59.5%), and loss of appetite (54.2%). The inability of elderly to take decisions about food intake (47.8%), lack of funds (48.4%) lack of awareness (38.4%) were other reasons cited. Physical and financial dependency thus definitely influenced nutritional status.

Thus, the main causes of malnutrition can be broadly classified as **biological, behavioral and sociological factors**. The biological causes may be infectious diseases like HIV/AIDS, TB etc. and helminthes infestation which decreases intestinal nutrient absorption and thus developing poor nutrition. Behavioral factors include insufficient access to food, inadequate or inappropriate knowledge, practice and sanitation. The major social risk factors are political situation, lack of education and economic inequality. Cultural influences on food habits along with several religious taboos and social customs may also cause nutritional deficiency.

Malnutrition being a condition of poor nutritional status resulting from reduced food intake or impaired metabolism, its evaluation of nutritional status is necessary to determine the severity. As there is no objective test to measure nutritional status, therefore numerous screening methods have been developed to determine the nutritional status of individual: (i) assessing clinical signs

and symptoms, (ii) biochemical indicators (iii) dietary survey and (iv) anthropometric measurements. Assessment of clinical signs and symptoms need proper knowledge for evaluation, whereas biochemical indicators are relatively expensive and time consuming to perform in community level. On the other, dietary survey can give an idea of daily energy intake but there may have chances of misreporting and also need food consumption data of several days to obtain the estimate of usual diet.

Anthropometry has a long tradition of assessing nutritional and health status of adults as this is an inexpensive, non-invasive method that provides detailed information on different components of body structure, especially muscular and fat components. Moreover, anthropometric measurements are highly sensitive to the broad spectrum of nutritional status, whereas biochemical and clinical indicators are useful only at extremes of malnutrition. Among the widely used anthropometric measurements, body mass index (BMI) and mid-upper-arm-circumference (MUAC) are most significant and reliable.

BMI (Body mass index) is generally considered as a good indicator and used for the assessment of chronic energy deficiency of adults, especially in developing countries. It is highly correlated with fat and fat-free mass and so the protein and fat reserves of body can be estimated. In normal adults the ratio is approximately constant, and a person with a low BMI is underweight for his/her height.

However, there are some difficulties associated with the sole use of BMI, for example the ratio of sitting height to standing height or cormic index can influence BMI. Cormic index varies both between populations and within populations . So, without the correction by cormic index as a correction factor, the sensitivity and specificity of BMI as an indicator of nutrition may be low. Age is another factor that may alter the functional significance of BMI at different ages; because adults tend to lose fat free mass and increase fat mass with increasing age. Oedema can also affect the significance of BMI. Adults may develop oedema when severely undernourished, which artificially increases an individual's weight resulting in BMI appearing more normal than the actual value. Moreover, the universal cut-off of the BMI cannot be applicable across different populations. So, these inabilities limit the usefulness of BMI as an accurate screening tool to assess adult undernutrition.

On the other, MUAC (Mid-upper arm circumference) is another important indicator for simple screening of adult nutritional status, specifically in developing countries. The measurement requires fewer apparatus and easy to perform even on the most debilitated individuals. It is independent of height and indicates the arm muscle and sub-cutaneous fat; both being important determinants of survival in starvation. Though classification of undernutrition according to the MUAC category is more appropriate than BMI category, but is not completely error free. Insufficient data are available correlating MUAC with undernutrition and other functional measures in adults, across different ethnic and population groups. Furthermore, the use of MUAC in adults may be affected by the redistribution of subcutaneous fat towards central areas of the body during aging. Therefore, age-specific cut-off points of MUAC may be required. MUAC is also very sensitive towards intra- and inter- observer errors.

4   SIGNIFICANCE

Although the incidence of malnutrition in the community-dwelling elderly is estimated between 2%–16%, up to 55% of elderly people admitted to hospital have pre-existing evidence of malnutrition. In the geriatric rehabilitation setting, the incidence of protein undernutrition, not including patients with micronutrient deficiencies, is estimated at 57%. In addition to pre-existing malnutrition, hospitalized patients often develop further nutritional problems during their hospital stay. Nausea, vomiting, "nothing by mouth" orders, medication side-effects, difficulty with vision and opening containers, the placement of food out of patients' reach, limited access to snacks, and ethnic or religious food preferences may all contribute to low nutritional intake in hospital.

Malnutrition during hospitalization is also associated with an increased length of stay, readmission, mortality, skin breakdown, and infection. Compromised nutritional status has also been linked to impaired immunity, respiratory and muscle function, and delays in wound healing.

Considering the above rationale, an investigation on the "Nutritional assessment of hospitalized Geriatric assessment' was carried out. the details of material used, and the methodology employed in carrying out the study are described in following sections.

5   OBJECTIVE:

To investigate the relationships between nutritional status measured by a comprehensive nutritional assessment including anthropometric measurements, nutritional biological markers, evaluation of dietary intake, and the Mini-Nutritional Assessment (MNA) as well as Subjective Global Assessment (SGA) nutrition screening tool. To identify individuals or population groups at risk of becoming malnourished. and analyze the ecological factors that are directly or indirectly responsible.

6   METHODOLOGY

6.1   SAMPLE

The investigation was performed on 100 hospitalized elderly aged >=60 years, of which 68 males and 32 females' details were taken from WOCKHARDT Hospital and Research Institute, Mira Road (East). Thane 401107.

6.2   TESTS AND TOOLS

6.2.1   QUESTIONNAIRE

A detailed questionnaire was structured to collect necessary information of the subjects through **selected random sampling technique**. The details of various aspects of questionnaire are as given below :

- **General information**: General information such as name, age, gender, contact details, food preference, income, were collected by self-structured questionnaire through personal interview method.

- **Dietary History**: Questions regarding dietary history of the patients were included as part of the questionnaire. This included their food habits viz.; existing food frequency and food

consumption patterns were assessed.

- **Medical history:** Diseases, existing, if any and duration of the same was captured.

- **Anthropometric measurements**: Anthropometry is the measurement of gross composition of the body. In current study, it included height, weight and BMI.

> **BMI**: The body mass index (BMI) or Quetelet Index is a value derived from the mass (weight) and height of an individual. The BMI is defined is as the body mass divided by the square of the body height and is universally expressed in unit of kg/m^2, resulting from mass in Kilograms and height in meters respectively. According to Asian criteria, BMI categories are as follows:

$$BMI = \frac{Weight(kg)}{Height\,(m)^2}$$

WEIGHT STATUS	BODY MASS INDEX (BMI), kg/m^2
Underweight	<18.5
Normal range	18.5 – 22.9
Overweight	23-24.9
Obese	>=25

[Vasuden D & et al, 2011]

- **Bio-chemical parameters**: List of parameters along with reading, as applicable were captured.

- **24-hour dietary recall**: A diet recall is a dietary assessment tool that consists of a structured interview in which the participants are asked to recall all food and drink they have consumed in the stated period. The specific details like time of consumption of meals, number of meals, method of preparation, portion sizes etc. were included in the record with help of which nutrient values were calculated. Nutritive values of Indian foods as provided by the "Indian Institute of Nutrition" by C.Goplan (2010) was used for calculations of total energy along with macronutrients.

6.2.2 INCLUSION CRITERIA

All the elderly defined as those above the 60 years of age admitted in the hospital during study period and who consented to participate in the study were enrolled.

6.2.3 EXCLUSION CRITERIA

Those not found at 3 attempts or whose bio-chemical lab values could not be obtained were excluded from the study. Subjects whose height or weight could not be obtained due to deformities or any other valid reason that prevented the measurements were also excluded. Subjects who were critically ill for example cancer, end-stage renal disease or receiving artificial enteral or parenteral nutrition.

6.2.4 DETAILS ABOUT THE MINI NUTRITIONAL ASSESSMENT.

The **MINI NUTRITIONAL ASSESSMENT** (MNA) is a simple and highly sensitive tool for nutritional screening and assessment. The large mass of data collected and the diffusion among healthcare professionals clearly support its use. However, the cost-effectiveness of interventions based on its scoring deserves investigation. It is highly recommended that a screening tool fits best to the population object of evaluation Due to the potentially multifactorial origin of nutritional risk in the elderly it appears that the MNA properly addresses this requirement. Structured in 18 questions grouped in four rubrics (anthropometry, general status,

dietary habits, and self-perceived health and nutrition states), the MNA provides a multidimensional assessment of the patient.

It was initially developed as a one-step evaluation procedure, using as principal reference criteria, the physician-rated nutritional status and a full nutritional assessment including anthropometric measures, biochemical parameters, dietary intake and functional variables such as cognition (by Mini-Mental State Examination) and activities of daily living (general and instrumental). After its completion, the final score (a maximum of 30 points) allows grading the nutritional status according to clearly defined thresholds: scores above 24, good status; scores 23.5–17, risk of malnutrition; scores below 17, malnutrition. The main features targeted during this phase of design and validation were the reliability, the simplicity, the speed of execution and the acceptability by the patient.

Below one can find the sample questionnaire for MNA method.

Mini Nutritional Assessment
MNA®

Last name:		First name:	
Sex:	Age:	Weight, kg:	Height, cm:	Date:

Complete the screen by filling in the boxes with the appropriate numbers.
Add the numbers for the screen. If score is 11 or less, continue with the assessment to gain a Malnutrition Indicator Score.

Screening

A Has food intake declined over the past 3 months due to loss of appetite, digestive problems, chewing or swallowing difficulties?
0 = severe decrease in food intake
1 = moderate decrease in food intake
2 = no decrease in food intake ☐

B Weight loss during the last 3 months
0 = weight loss greater than 3kg (6.6lbs)
1 = does not know
2 = weight loss between 1 and 3kg (2.2 and 6.6 lbs)
3 = no weight loss ☐

C Mobility
0 = bed or chair bound
1 = able to get out of bed / chair but does not go out
2 = goes out ☐

D Has suffered psychological stress or acute disease in the past 3 months?
0 = yes   2 = no ☐

E Neuropsychological problems
0 = severe dementia or depression
1 = mild dementia
2 = no psychological problems ☐

F Body Mass Index (BMI) = weight in kg / (height in m)^2
0 = BMI less than 19
1 = BMI 19 to less than 21
2 = BMI 21 to less than 23
3 = BMI 23 or greater ☐

Screening score (subtotal max. 14 points) ☐☐
12-14 points: Normal nutritional status
8-11 points: At risk of malnutrition
0-7 points: Malnourished
For a more in-depth assessment, continue with questions G-R

Assessment

G Lives independently (not in nursing home or hospital)
1 = yes   0 = no ☐

H Takes more than 3 prescription drugs per day
0 = yes   1 = no ☐

I Pressure sores or skin ulcers
0 = yes   1 = no ☐

J How many full meals does the patient eat daily?
0 = 1 meal
1 = 2 meals
2 = 3 meals ☐

K Selected consumption markers for protein intake
• At least one serving of dairy products (milk, cheese, yoghurt) per day   yes ☐ no ☐
• Two or more servings of legumes or eggs per week   yes ☐ no ☐
• Meat, fish or poultry every day   yes ☐ no ☐
0.0 = if 0 or 1 yes
0.5 = if 2 yes
1.0 = if 3 yes ☐.☐

L Consumes two or more servings of fruit or vegetables per day?
0 = no   1 = yes ☐

M How much fluid (water, juice, coffee, tea, milk...) is consumed per day?
0.0 = less than 3 cups
0.5 = 3 to 5 cups
1.0 = more than 5 cups ☐.☐

N Mode of feeding
0 = unable to eat without assistance
1 = self-fed with some difficulty
2 = self-fed without any problem ☐

O Self view of nutritional status
0 = views self as being malnourished
1 = is uncertain of nutritional state
2 = views self as having no nutritional problem ☐

P In comparison with other people of the same age, how does the patient consider his / her health status?
0.0 = not as good
0.5 = does not know
1.0 = as good
2.0 = better ☐.☐

Q Mid-arm circumference (MAC) in cm
0.0 = MAC less than 21
0.5 = MAC 21 to 22
1.0 = MAC greater than 22 ☐.☐

R Calf circumference (CC) in cm
0 = CC less than 31
1 = CC 31 or greater ☐

Assessment (max. 16 points) ☐☐.☐
Screening score ☐☐.☐
Total Assessment (max. 30 points) ☐☐.☐

Malnutrition Indicator Score
24 to 30 points ☐   Normal nutritional status
17 to 23.5 points ☐   At risk of malnutrition
Less than 17 points ☐   Malnourished

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6.2.5 DETAILS ABOUT SUBJECTIVE GLOBAL ASSESSMENT.

Subjective Global Assessment (SGA) is a method for evaluating nutritional status based on a practitioner's clinical judgment rather than objective, quantitative measurements. Encompassing historical, symptomatic, and physical parameters, SGA aims to identify an individual's initial nutrition state and consider the interplay of factors influencing the progression or regression of nutrition abnormalities. SGA has been widely used for more than 25 years to assess the nutritional status of adults in both clinical and research settings.

Below one can find the sample questionnaire for SGA.

Patient Name:_____ Patient ID:_____ Date:_____

Part 1: Medical History

SGA Score — A, B, C

1. Weight Change
- A. Overall change in past 6 months: _____ kgs.
- B. Percent change: _____
  - gain - < 5% loss
  - _____ 5-10% loss
  - _____ > 10% loss
- C. Change in past 2 weeks: increase _____
  - no change _____
  - decrease _____

2. Dietary Intake
- A. Overall change: _____ no change
  - _____ change
- B. Duration: _____ weeks
- C. Type of change:
  - _____ suboptimal solid diet   _____ full liquid diet
  - _____ hypocaloric liquid   _____ starvation

3. Gastrointestinal Symptoms   (persisting for >2 weeks)
- _____ none   _____ nausea   diarrhea _____   anorexia
- _____ vomiting _____

4. Functional Impairment   (nutritionally related)
- A. Overall impairment: _____ none
  - _____ moderate
  - _____ severe
- B. Change in past 2 weeks: _____ improved
  - _____ no change
  - _____ regressed

Part 2: Physical Examination

	SGA Score		
	Normal	Mild	Moderate	Severe
5. Evidence of: Loss of subcutaneous fat				
Muscle wasting				
Edema				
Ascites (hemo only)				

Part 3: SGA Rating (check one)
A. Well-Nourished   B. Mildly-Moderately Malnourished   C. Severely Malnourished

6.2.6 LIFESTYLE

Questions regarding physical activity of the patients were included as part of the questionnaire. This included whether patients were bed bound or able to get of bed but not go out of house or able to go out of house.

6.2.7 STATISTICAL ANALYSIS

Analysis were performed using statistical package – R (v4.0). All descriptive data of numerical types were analyzed for mean, trimmed mean (10%), standard deviation, standard error, median (25% -- 50% --75%), mean absolute deviation, minimum, maximum, range, skew, kurtoises, iqr (inter-quartel range), standard error, count, missing, outliers, number of outliers were calculated and histogram are plotted.

For alphanumeric variables, count, missing, frequency table, frequency table percentage and pie-charts were plotted.

As an outcome of the analysis, it was found that the patients can be classified into three categories – at risk, malnourished and well-nourished. The results were compared using standard statistical t-test and CHI-SQAURE test which showed significant difference between the two methods. The MNA using scientific parameters while SGA uses personal judgement. However, in case of time-constraints, SGA can be used.

Using data mining methods – classification tree and random forest, we found, in both cases parameters such as BMI, dietary intakes and age are the significant factors affecting nutritional status of geriatric patients.

6.2.8 RESEARCH PROPOSAL FLOW CHART
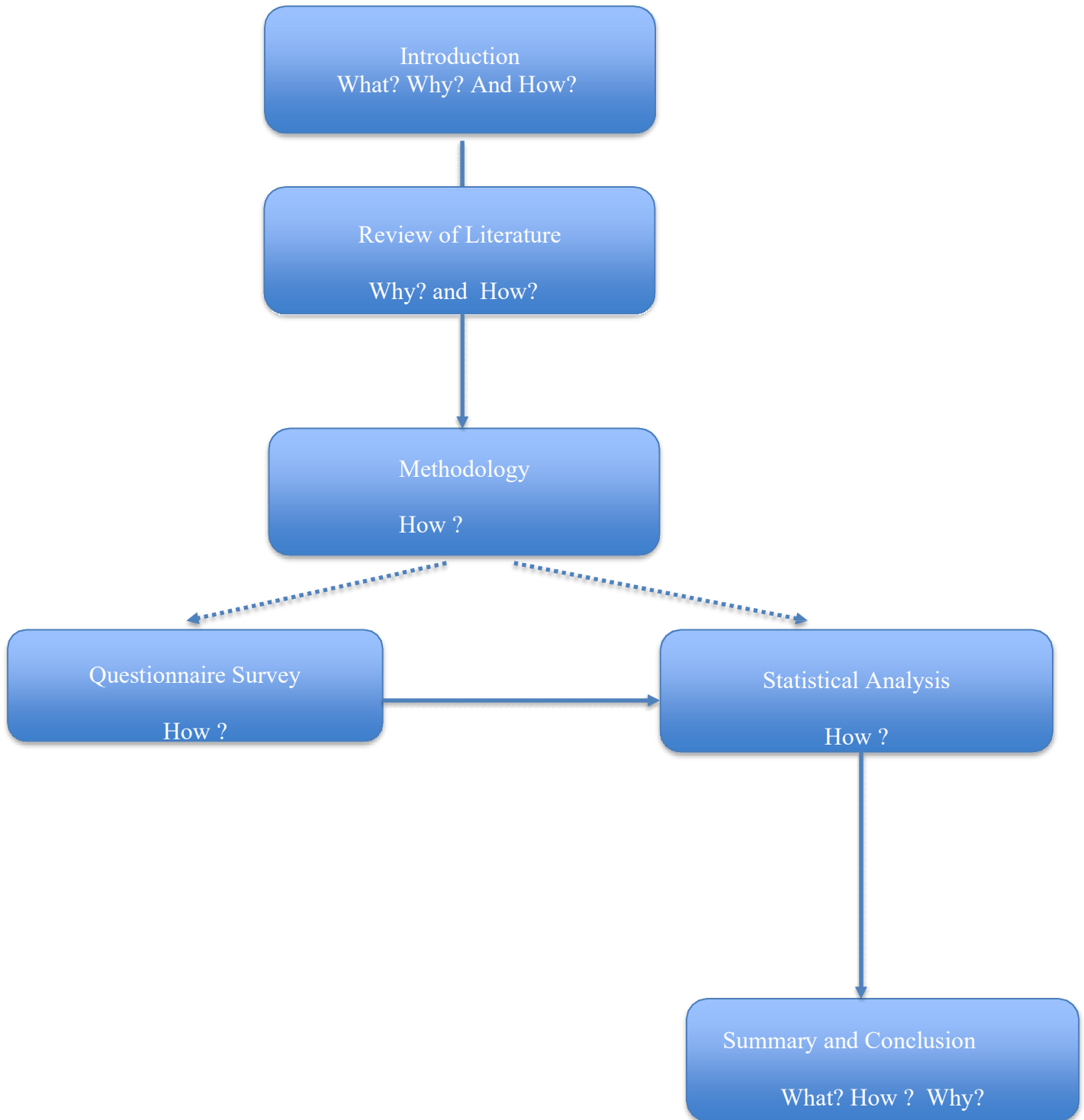
7 RESULTS

The results of the present study are presented in this chapter. The results related to demographic profile, anthropometry, dietary history, nutrient adequacy is included in this section.

7.1 GENERAL INFORMATION

SAMPLE PROFILE

The data collected of 100 elderly patients consisting of 32 females and 68 males are presented in Table 2

Note: as our sample size is 100, our count and % frequency distribution will remain the same. So, we are showing only count in below table.

Particulars		Particulars		Particulars	
Gender	Frequency	**Blood-pressure**	Frequency	**BMI**	Frequency
male	68	yes	87	underweight	0
female	32	no	13	normal	43
Economic Status		**Prominent diseases**		overweight	21
earning	56	kidney disease	35	obese	31
retired	44	CVD	10	severely obese	5
Food Preference		Thyroid	18	**Supplements**	
non-veg	56	Liver disease	29	Valleysure	12
ovo-veg	9	None	8	Mitspro peptide	37
Lacto-veg	2	**Other diseases 1**		None	51
lacto-ovo-veg	4	GI problems	28	**Items included in daily meal**	
vegan	1	Allergies	11	egg	15
veg	28	Osteoporosis	27	curd	14
Age (years)		Ophthalmic	26	sweet	10
65-75	9	None	8	salad	6
70-75	54	**Other diseases 2**		nothing specific	55
75-80	28	anemia	29	**Allergy to any food**	
80-85	7	respiratory	34	Milk	9
85-90	2	dental	24	No	91
Diabetic		none	13		
yes	78				
no	22				

TABLE 1 - General information of Geriatric patients

histogram of age_in_years
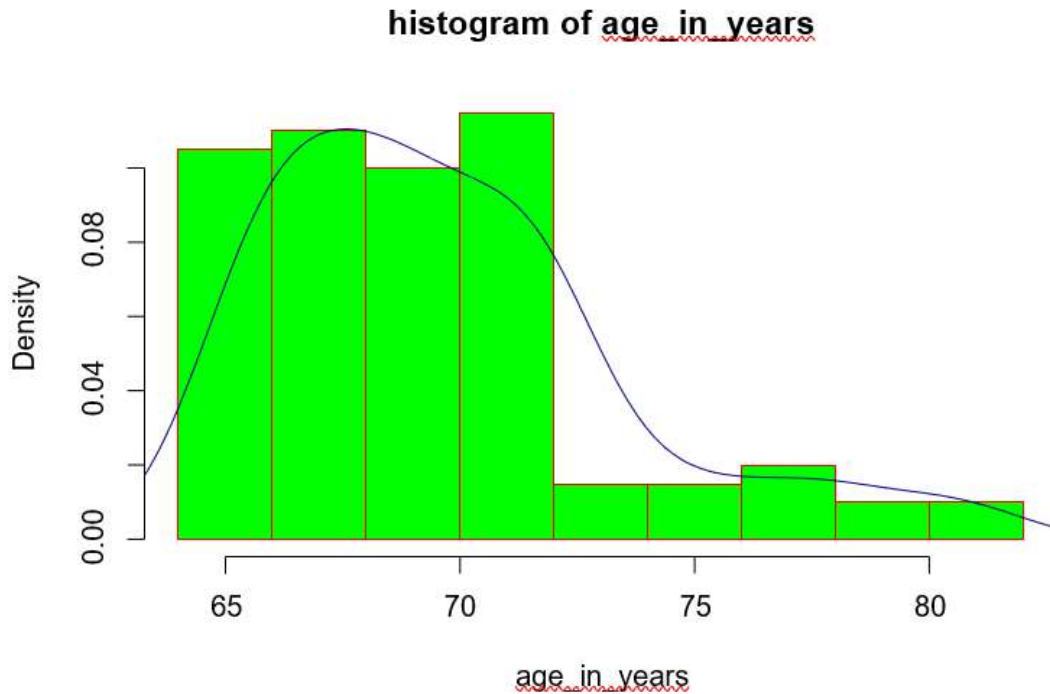
The histogram of age seen above reveals the mean age to be 69.72 years with minimum 65 and maximum 81. The standard deviation recorded was 3.77 with 3 outliers. The outliers recorded was two patients of 81 years and one of 80 years.

histogram of weight_in_kgs
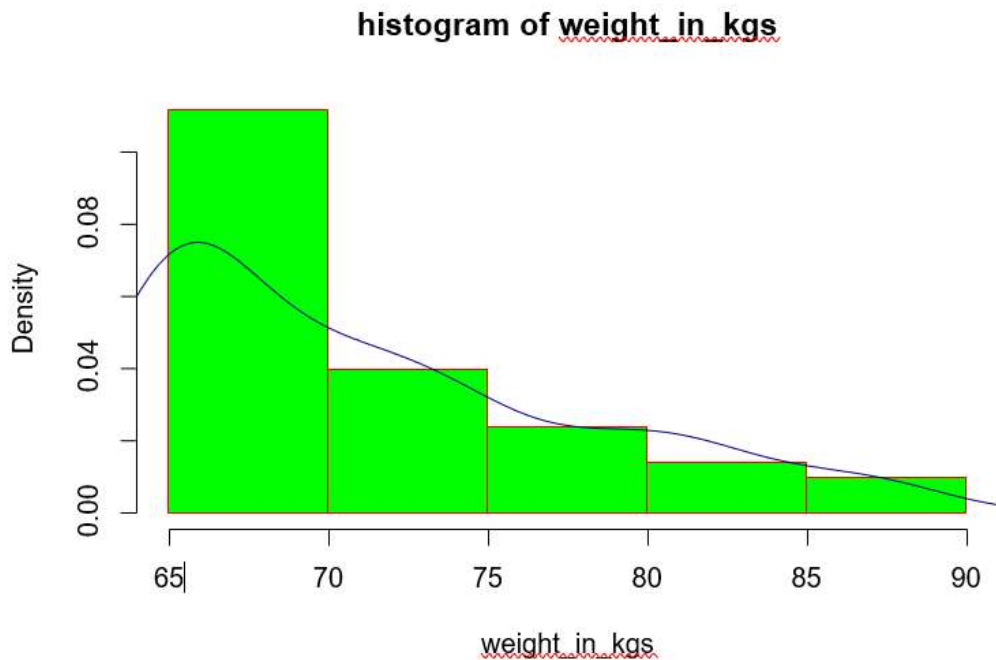
Out of 100 patients, majority of them fall into 65 to 70 Kgs category. As observed, the weight decreases with age. The mean weight of the sample size was 71.28Kg with no outliers observed. Minimum weight recorded was 65 Kgs and maximum were 88 Kgs.

histogram of height_in_cms
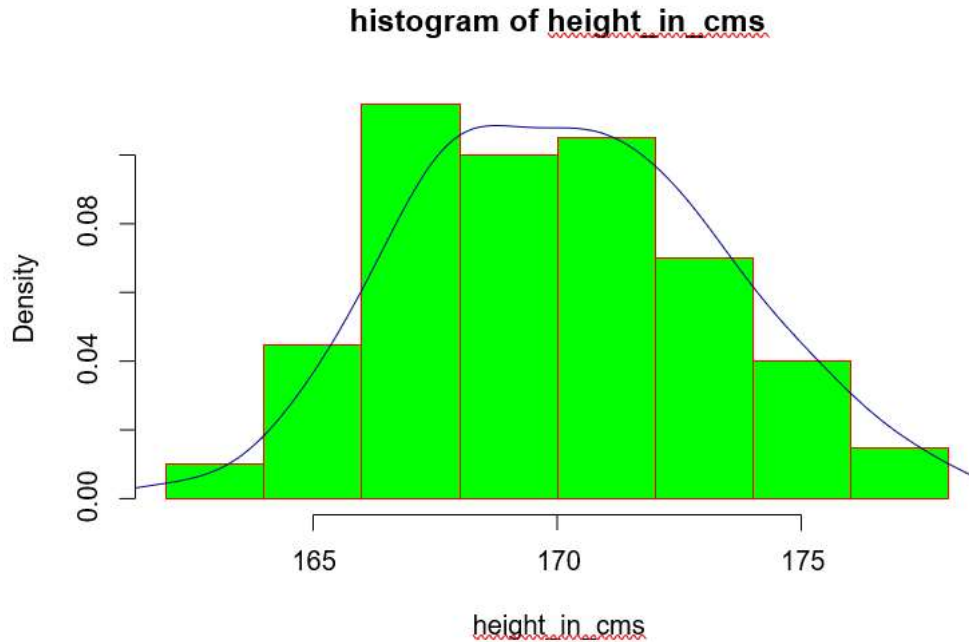
The mean height recorded for the sample was 170.22 cms with maximum 178 cms and minimum 162 cms.
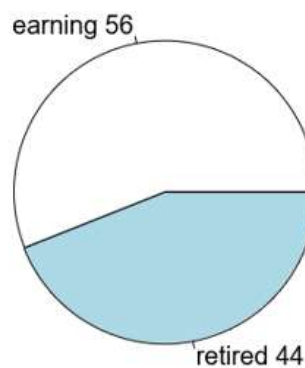
histogram of bmi
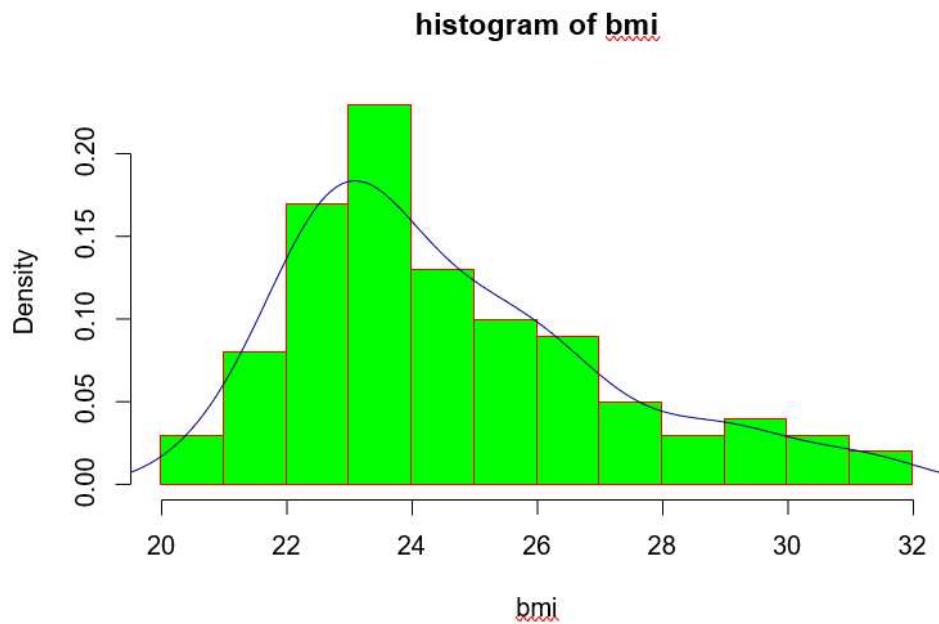
From the sample size of 100, mean BMI recorded was 24.63 Kg/m^2. Minimum recorded value was 20.52 while maximum was 31.63. The standard deviation of the group was observed to be 2.55 with 2 outliers. The outliers recorded were 31.57 and 31.63.

pie chart of food_intake_category
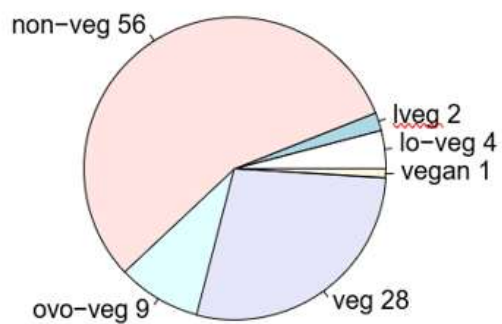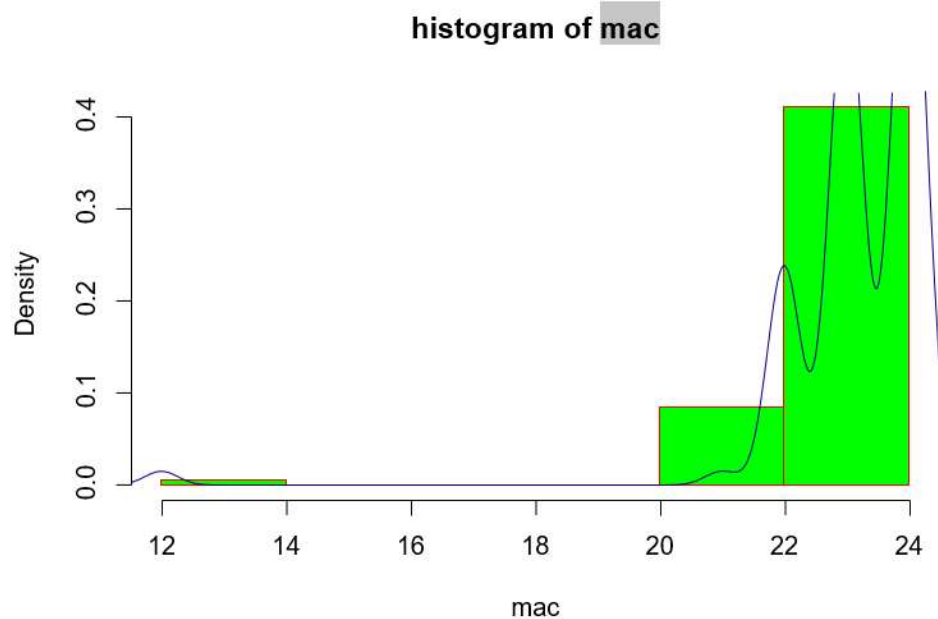
pie chart of economical status

To complete the analysis of general information collected, the food preferences and economical status were analyzed as well. Summary of the same was detailed in table 1.

7.2   NUTRITIONAL ASSESSMENT

7.2.1   PARAMETERS CONSIDERED IN MNA NUTRITIONAL ASSESSMENT.

a.   Mid-upper arm circumference (MUAC)

histogram of mac

Using the MAC method, 2 patients reported value <21, 16 were between 21 to 22 and 82 reported value >22. Two outliers reported with MAC value as 12 and 21. Average was calculated as 23.16 with standard deviation 1.36.

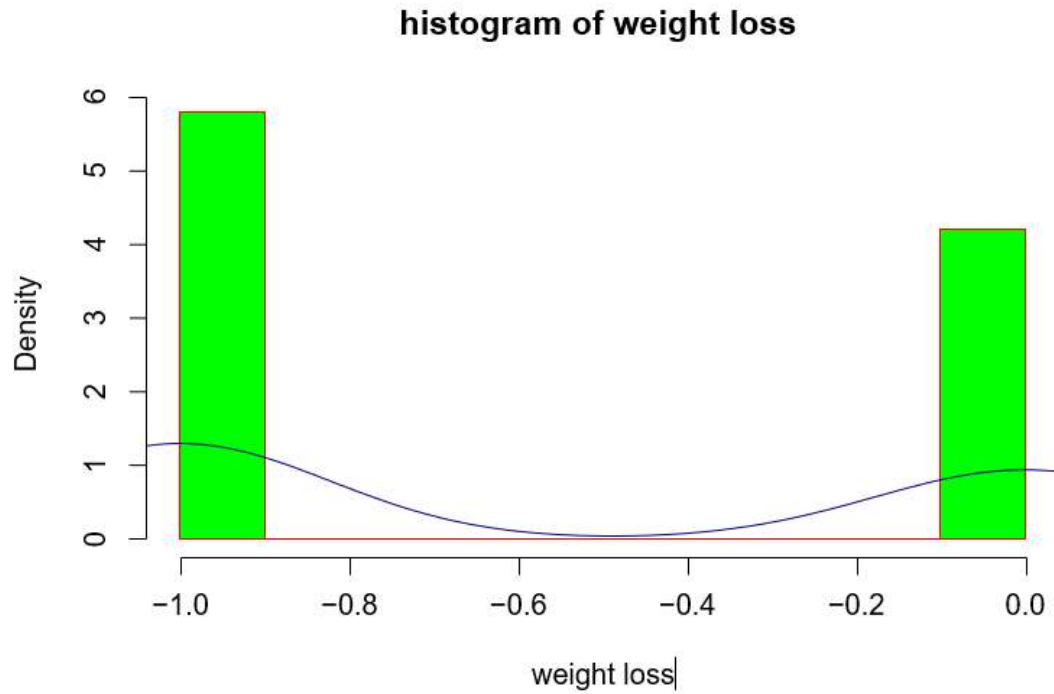**b.   Calf circumference (CC)**

histogram of cc
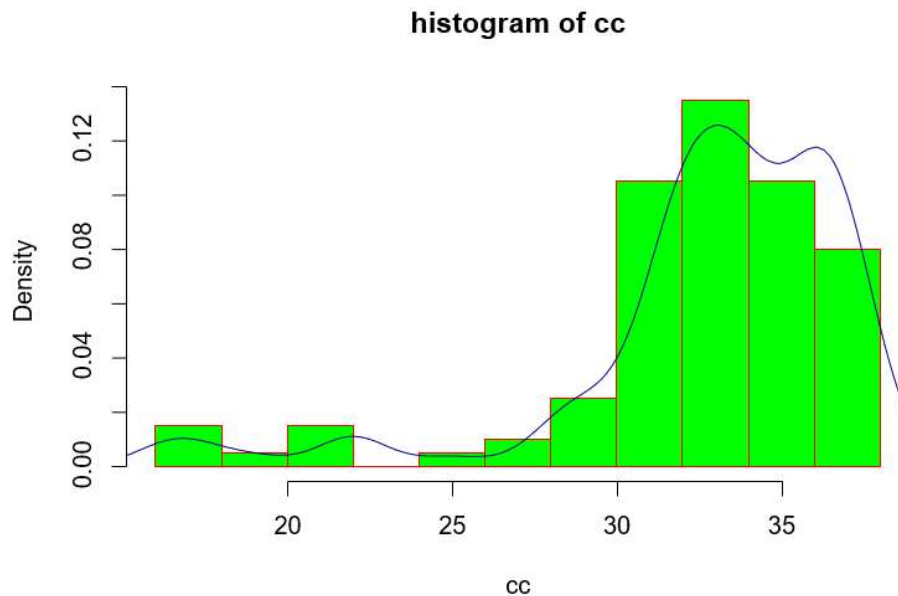
The analysis conducted for Calf circumference (CC) revealed 8 outliers having values 25,22, 22,19,16,17,17,22. Average is calculated as 32.79 with standard deviation as 4.53. The calculations

also revealed that 21 patients have CC < 31 while rest 79 >=31.

c.   Weight loss during last 3 months

histogram of weight loss

58 patients were found to have weight less between 1 to 3 kgs and 42 reported weight less between 0 to 1 kg. There were no outliers with average weight loss of -0.58kgs and standard deviation of 0.50. Minimum weight loss reported was 1kg while maximum was zero.

d.   Other parameters calculated are documented below.

Particular	Frequency
Lives independently	
Yes	85
No	15
Takes more than 3 prescribed drugs	
Yes	100
No	0
Psychological stress or acute disease	
Yes	10
No	90
Mobility	
bed bound	11
move out of bed but not home	3
move out of home	86
Neuropsychological problems	
depression	7
mild depression	5
no depression	88
Skin ulcer	
Yes	15
No	85
Number of full meals	
one meal	12
two meals	3
more than 2 meals	85
Health status	
not so good	23
does not know	52
good	14
better than others of same age	11

Particular	Frequency
Dairy product consumption	
Yes	86
No	14
Protein consumption	
Yes	90
No	10
Meat, fish, poultry consumption	
Yes	90
No	10
Fruit and Vegetable consumption	
Yes	86
No	14
Reduction in food intake	
severe loss	4
moderate loss	18
none	78
Fluid intake	
less than 3 cups	7
3-5 cups	15
more than 5 cups	78
Mode of feeding	
need assistance	8
self-fed with some difficulty	31
self-fed without any problems	61
Nutritional problems	
major malnutrition	6
moderate malnutrition	39
no malnutrition	55

7.2.2   NUTRITIONAL ASSESSMENT USING MNA

Pie chart of MNA Score
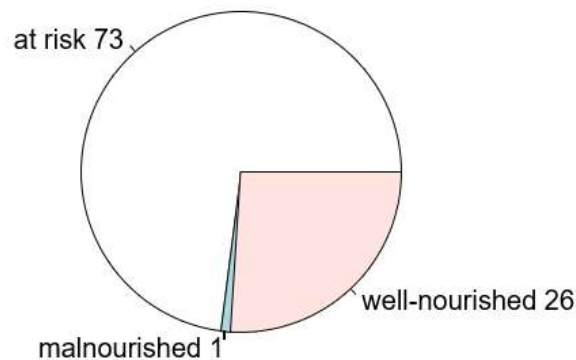
Using the Mini Nutritional Assessment method, it was found that out of 100 geriatric patients, 73 were at risk of malnutrition, 1 was already malnourished and rest 26 were well-nourished. Using variable importance method of data mining, we found following parameters have significant impact in decreasing order on final classification.

1. Weight loss
2. Diseased conditions such as: allergy, GI problem, ophthalmic, osteoporosis.
3. Height
4. Calf circumference.
5. Weight
6. Age
7. Diseased conditions such as: anemia, dental and / or respiratory problems.
8. Diseased conditions such as: CVD, Kidney and / or Liver disease, Thyroid.
9. Reduction in food intake.
10. Food preferences.
11. Nutritional problem
12. Mode of feeding
13. Mid-upper arm circumferences.
14. Mobility.
15. Consumption of foods and vegetables.
16. Neuro-psychological problems.
17. Fluid consumption.
18. Stress or medical history.
19. Gender
20. Skin ulcer.
21. Consumption of dairy products.
22. Life dependency
23. Total mean count.
24. Economic status
25. Diabetic
26. Blood pressure
27. Intake of meat, fish and poultry.
28. Intake of proteins.
29. Medication consumption of more than 3 types.

Variables one to thirteen has significant impact in classification while from variable fourteen till twenty-nine, the study showed that they have less impact.

7.2.3   PARAMETERS CONSIDERED IN SGA NUTRITIONAL ASSESSMENT.

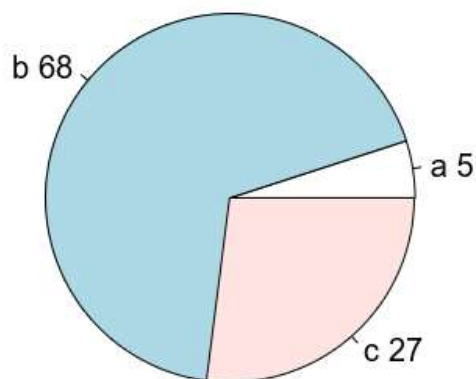#### a. Gastro-intestinal problems.

pie chart of GI symptoms
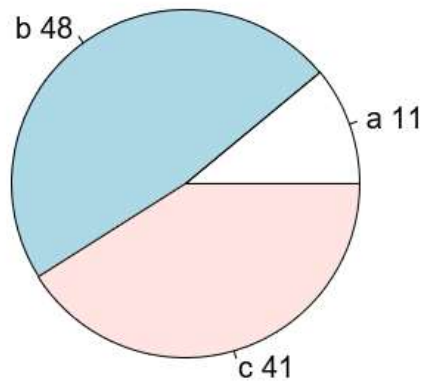
11 patients did not show symptoms for Gastro- intestinal problem persisting for more than 2 weeks. 48 patients exhibited nausea and vomiting like symptoms while rest 41 exhibited severe symptoms like diarrhea and anorexia.
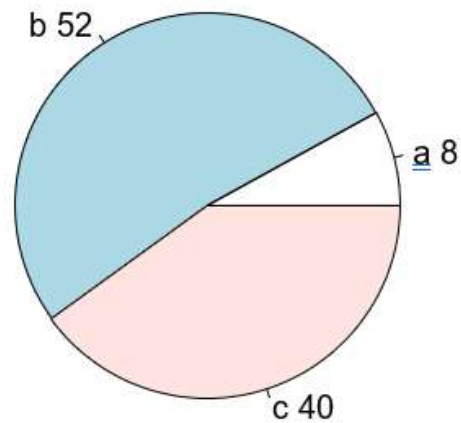
b. Food intake

pie chart of dietary intake

5 patients reported no change in dietary intake while 68 moderate changes while remaining 27 reported suboptimal solid diet intake or only liquid diet intake.

c. Functional impairment.

pie chart of functional impairment

8 patients did not exhibit any functional impairment, 52 exhibited moderate symptoms and rest 40 exhibited severe symptoms of nutritional related functional impairment.

pie chart of functional impairment – past two weeks
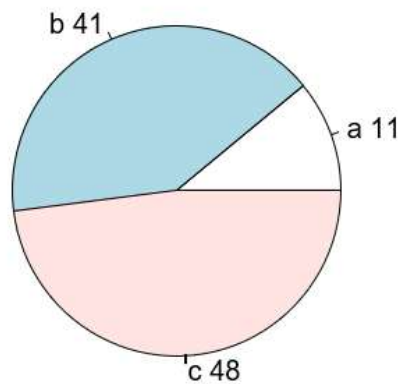
When the same patients were consulted after 2 weeks, 11 reported improvement in functional impairment while 41 did not have any changes and rest 68 informed about situation worsening.

d.   Weight before 6 months
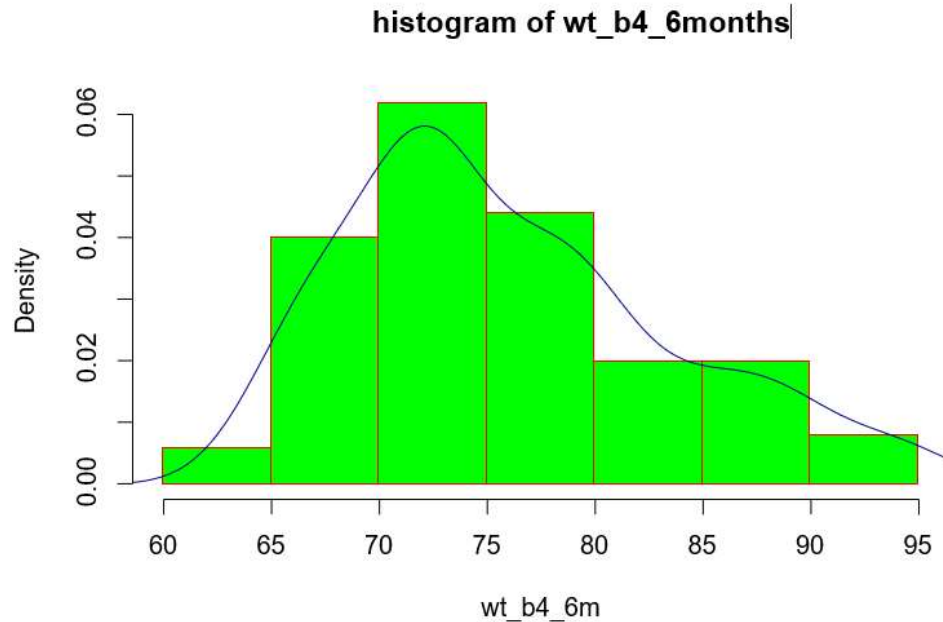
Out of 100 patients, two outliers were reported with value of 95 each; mean value as 76.05 with standard deviation of 7.52 and minimum / maximum values of 64 / 95Kg.

e.   Weight before 2 weeks
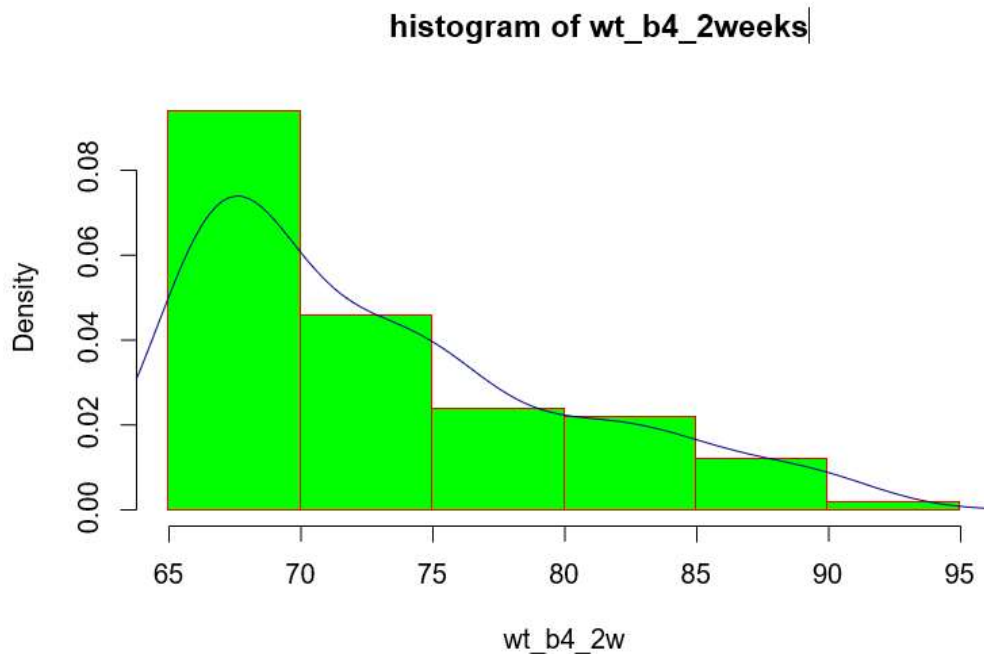
Two outliers were reported with values of 91 and 90. Mean weight was 72.99Kg with standard deviation of 6.86. Minimum / maximum values recorded were 65Kg / 91Kg.

7.2.4   NUTRITIONAL ASSESSMENT USING SGA

◢ Pie chart of SGA score

Using the Subjective Global Assessment method, it was found that out of 100 geriatric patients, 40 were at risk of malnutrition, 59 was already malnourished and rest 1 was well-nourished. Using variable importance method of data mining, we found following parameters have significant impact in decreasing order on final classification.
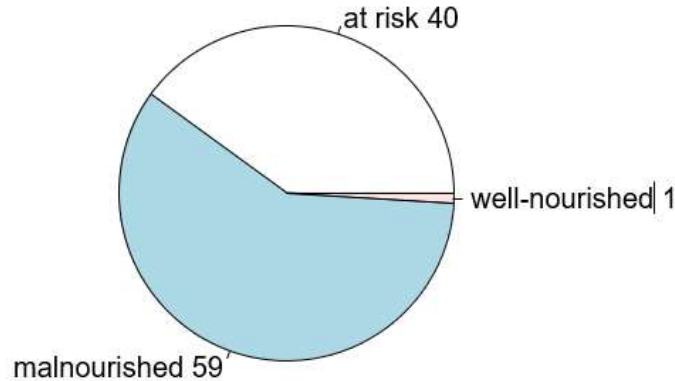
1. GI symptoms
2. Food intake during past 2 weeks.
3. Functional impairment
4. Weight before 6 months
5. Age
6. Weight before 2 weeks
7. Height
8. Diseased conditions such as: allergy, ophthalmic, osteoporosis.
9. Weight
10. Food preferences
11. Diseased conditions such as: anemia, dental and / or respiratory problems.
12. Daily food consumption of items
13. Diseased conditions such as: CVD, Kidney and / or Liver disease, Thyroid.
14. Dietary intake
15. Dependency on nutritional supplement
16. Health status
17. Blood pressure
18. Diabetic
19. Gender
20. Economic status
21. Allergy to any food
22. Food item never tried before

Variables one to seventeen has significant impact on the classification by SGA method. However, variables eighteen to twenty-two has less significant impact.

7.2.5 NUTRITIONAL ASSESSMENT USING 24 HOURS DIETARY RECALL.

As per assessment done using 24-hour dietary recall, the table 2 below lists the dietary intake which does not meet the recommended dietary allowance values for the patients.

Table 2 - Dietary intake								
Particulars	Energy (kcal)	Carbohydrate(g)	Protein (g)	Total Fat (g)	Calcium (mg)	Dietary Fibre (g)	Sodium (mg)	Iron (mg)
Average intake per day	1094	127.1	58	39.1	892.7	8.9	2587.6	4.8
Recommended dietary allowance (RDA)	1760	264	47.7	58.7	1000	17.6	1173	8
% of recommendation met	62	48	121	67	89	51	220	60

A brief dietary system can disclose inadequacies of nutrients from any of the above groups. This information can be the clue for possibility of the subject who may be at risk of developing nutritional deficiencies.

8 DISCUSSION

Anthropometry has long been used as indicator of nutritional status because it is non-invasive and less expensive. Anthropometric measurements help in calculating both BMI and MUAC, which provide a simple and convenient value for assessing nutritional status. Nutritional assessments in rural population usually rely on BMI and MUAC, as it does not require much instruments, time and efficiency; but have independent limitations. Again, human body has bilateral asymmetry; therefore, taking MUAC measurement on one side may provide erroneous assessment. On the other, variation of MUAC is very high depending on the physical activity and food intake of the individual. Moreover, both BMI and MUAC do not have population specific cut-off values. Therefore, there are every chances of misclassifying nutritional status of individuals.

The study shows that according to MNA score, 73% of geriatric were 'at risk', 1% were already malnourished and remaining 26% were well-nourished. Study using SGA conducted on the same patients showed 40% 'at risk', 59% malnourished and 1% well-nourished.

The MNA and SGA identify different individuals as malnourished or at risk for malnutrition. Because of its association with relevant prognostic parameters, the MNA is still the first choice for geriatric hospital patients.

To study the relationship of different variables with nutritional status, a significant relationship was observed between weight loss and MNA status. The association between MNA status and diseased conditions such as 1. allergy, GI problem, ophthalmic, osteoporosis was found to be statistically significant. No significant association was found between living status and nutritional status.

The functional status of the elderly determines their ability to perform basic self-care tasks and live independently, which also includes food intake. The association between functional and nutritional status was found to be significant.

9 CONCLUSION

The investigation entitled "**Nutritional assessment of hospitalized geriatric patients**" was carried out during 2019-20 at Thane with the objectives of studying the nutritional status in terms of anthropometry, dietary habits and lifestyle.

A total of 100 patients aged >=60 years were selected for the study which included 32 women and 68 men. Based on the symptoms they were categorized as '**at risk', 'malnourished' or 'well-nourished**'. General information regarding the subjects was collected using a **structured questionnaire** and **selected random sampling technique.** The information included the name, age, gender, height, weight, BMI, economic status, current medication, medical history and dietary habits.

The information on dietary habits like frequency of food consumption pattern was recorded using 24 hours recall method with standardized cups. The raw equivalents of the cooked foods and nutrients present in the diet were computed.

Calorie intake was found to be inadequate and therefore, it is necessary to raise awareness of the elderly and their caregivers about the quality, quantity and frequency of food intake of older persons. However, a multidimensional approach is required at this moment to deal with these issues. Efforts should be initiated to help the elderly to adopt healthy lifestyle practices to maintain or improve their functional status.

MNA and SGA assessment tools were used to assess the nutritional status of the hospitalized elderly. Using **statistical tool R**, the dataset was analyzed to arrive at classification of patients into above mentioned three categories.

SGA, and MNA are the common validated nutritional assessment tools used among the hospitalized elderly. SGA is, however, not recommended for use in geriatric population as it has low validity to be used among this group, and most studies suggest using nutritional assessment tools developed specifically for elderly. MNA has been shown as widely acceptable to be used in the hospital setting. Nonetheless, the results of the studies determining which tool is the best for assessing the nutritional status of this population remain contradictory.

MNA being a scientific method showed more promise in analyzing the nutritional status of the patients.

Above all, nutritional status of the hospitalized elderly cannot be determined by only referring to a single nutritional parameter. Thus, simple biochemical parameters such as albumin, hemoglobin, and TLC can be used in combination with nutritional screening and assessment tools to identify those who are malnourished.

10 DELIMITATION

Further study across different locations is a must to arrive at a firm conclusion. This will ensure that there is no sampling error. Some patients had to be excluded who were in acute intensive geriatric care. Language barrier for elders who did not understand English, Hindi or Marathi also acted to exclude them form the study.

11 SUGGESTIONS

For a much better study, the data could have been collected via forms printed in regional language and explaining the participants the right meaning of each column. As future line of work following points can be explored

1. To study the geriatric patient's nutritional status across multiple hospitals in the region.
2. To study the relationship between nutritional status and addiction to drugs.

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13   APPENDIX-I

THE QUESTIONNAIRE FORM

NOTE: this data is being collected for the purpose of research only and the personal details will not be disclosed to anyone except for examiner to examine for proof of authentication.

Following form was created to request information from the participants

I.   General information:

1. Name: -

2. Age: -

3. Gender: -

4. Contact Details: -

5. Food preference (put tick against applicable): -
    ➢ VEGETARIAN
    ➢ NON VEGETERIAN
    ➢ OVO VEGETERIAN
    ➢ LACTO OVO VEGETERIAN
    ➢ VEGAN

6. Economic status: -
    ➢ Retired
    ➢ Working

II.   Anthropometric measurements:

1. Height in cm: -

2. Weight in kgs: -

3. BMI: -

III. **Medical History:**

Condition	Put tick, if applicable	Duration
DIABETES		
BLOOD PRESSURE		
LIVER DISEASE		
KIDNEY DISEASE		
THYROID		
CVD		
OSTEOPOROSIS		
OPTHALMIC / CATARACT		
GASTERIC PROBLEM		
ALLERGIES		
RESPIRATORY		
ANAEMIA		
DENTAL		
MENTION ANY OTHER		

IV. **Medication:**

Sr. No.	Name	Frequency

V. **Dietary Pattern:**

Below open-ended questions were asked.

a) How many meals do you take in a day?

b) Any specific item you would like to have daily in your meal?

c) Any specific item you never tried before?

d) Allergy to any food?

e) Any dietary or nutritional supplements being consumed?

BIO-CHEMICAL PARAMETERS: -

Parameter name	Reading
FASTING BLOOD SUGAR	
POST PRANDIAL BLOOD SUGAR	
HBA1C	
BUN	
CREATININE	
SODIUM	
CHLORIDE	
URIC ACID	
CALCIUM	
ALBUMIN	
GLOBULIN	
A/G RATIO	
SGOT	
SGPT	
HDL	
LDL	
VLDL	
POTASSIUM	

24 HOUR DIETARY RECALL: -

MEAL AND TIME	MENU	INGREDIENT	Cooked amount	ENERGY (kcal)	CARBS (gm)	PROTIEN (gm)	FAT (gm)	FIBRE	Ca	Fe	Na
EARLY MORNING											
BREAKFAST											
MID MORNING											
LUNCH											
SNACKS											
MID EVENING											
DINNER											
BEDTIME											

14   APPENDIX – II

Approval letter from Hospital

NOTE: this data is being collected for the purpose of research only and the personal details will not be disclosed to anyone except for examiner to examine for proof of authentication.

Stationery for billing & reports only

WOCKHARDT | LIFE WINS
Mira Road

To Whomsoever this may concern

Date- 12/06/2020

This is to certify that Ms Bhoomi Harsh Ved, was working on subject – " Nutritional assessment in hospitalized elderly people". from March 2019 , to January 2020.

She was working under guidance of our dietician Shabana M.

Regards,

DR. Nilesh Singh

Medical Administrator

15   APPENDIX - III

Proposal

STUDY OF NUTRITIONAL STATUS OF HOSPITALIZED GERIATRIC POPULATION.

AIM: -

A comprehensive approach towards evaluating nutritional status of hospitalized geriatric patients.

OBJECTIVES: -

1. To assess the anthropometric parameters.
2. To assess the health status of elderly.
3. To assess the bio-chemical parameters of elderly.
4. To assess the dietary intake through one day dietary recall.
5. To impart the nutritional education.

PROJECT OVERVIEW: -

With the rise in aged population, there is a greater need to investigate their nutritional and physical disability aspects which is otherwise neglected. This study aims to have a comprehensive approach towards evaluating nutritional status of hospitalized Geriatric patients.

It covers the degenerative diseases, food intake, physical evaluation and bio-chemical parameters which are amongst some of the factors affecting our Geriatric hospitalized community.

The study has been done using SGA and MNA nutritional assessment methods whose data was analysed using statistical tools.

METHODOLOGY: -

The methodology will consider geriatric patients (>=65 years of age) with a sample size of 100. The sample will consist of both males and females from WOCKHARDT Hospitals and Research institute, Mira Road (E) Thane 401107.
Pre-tested structured questionnaire will be administered to study population which will consists of the following:

a) General information.
b) Anthropometric measurements.
c) Medical history and medication.
d) Bio-chemical parameters.
e) Dietary patterns.

f) 24-hour dietary recall.

Nutritional screening will be assessed by using standard tools such as SGA and MNA.

➔ SGA: - SUBJECTIVE GLOBAL ASSESSMENT

A validated tool consists of clinical history (weight loss, dietary intake changes, gastrointestinal symptoms persisting for more than 2 weeks, physical examination.

➢ SGA A=well nourished
➢ SGA B= moderate/suspected
➢ SGA C= severely undernourished

➔ MNA: - MINI NUTRITIONAL ASSESSMENT

This tool can identify multifactorial causes of nutritional risk specifically in elderly. A questionnaire consists of anthropometric data, general status, dietary habits, self-perceived health and nutrition states.

➢ 24 = well nourished
➢ 17 – 23.5 = at risk of malnutrition
➢ < 17 = malnourished

KEYWORDS: -

Nutritional assessment, Geriatric, MINI NUTRITIONAL ASSESSMENT, SUBJECTIVE GLOBAL ASSESSMENT, hospitalized elderly, malnutrition, aging, Body mass index.

INTRODUCTION: -

India is in a phase of demographic evolution. As per the 1991 census, the population of the elderly in India was 57 million as compared with 20 million in 1951. There has been a steady growth in the number of elderly persons across the decade from 1991 to 2001 and it has been projected that by the year 2050, the number of elderly people would rise to about 324 million. (1)

The United Nations has estimated that in between 2015 and 2030, the Geriatric population will grow worldwide by 56%. The department of statistics reported that 8.2% of the population were accounted as elderly in 2012. (2)

Thus, as this aging population grows from time to time, it is crucial to attend issues to this group. Health, independency and quality of life of elderly depend on their nutritional wellbeing. (3) Therefore, early prevention, identification of high-risk individuals and appropriate intervention should be addressed to this group. (4) In Asia, it was found that a range of 16%-18% of hospitalized elderly are malnourished in between 2005 to 2012. (5)

In India, the elderly people suffer from both communicable as well as non–communicable diseases. This is further compounded by hearing and/ or visual impairment, obesity and its related complications due to a sedentary lifestyle and decreased physical activity. Socio-economic factors such as breakdown of the family support systems, social isolation, elderly abuse and decrease in economic independence also are major contributing factors. The mental disorders that are frequently encountered include dementia and mood disorders. Other disorders include neurotic and personality disorders, drug and alcohol abuse, delirium, and mental psychosis.

With the rise in geriatric population in India, it is important that we investigate various health issues encountered by them. Nutrition, anaemia and physical disability of the aged are neglected aspects despite being vital health problems. This study investigates nutritional and physical disability aspects of hospitalized geriatric population.

STATISTICAL ANALYSIS:

The statistical data will be analysed using R – 3.6.2 version. Following parameters were calculated:
   a) Descriptive statistics including count, mean, mode, median, standard deviation and skew kurtosis.
   b) Table / count category wise for each patient and % of the same.
   c) Data mining model – random forest was used to develop the prediction model.
Rating of importance of dependent variables.

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Profile of Guide – Empanelment Letter By IGNOU

5/2/2020 IGNOU Online Counselor Empanelment Counselor Portal
http://rsd.ignou.ac.in/Role_AC/ACDownEmpnLetter.aspx 1/1

Regional Services Division
IGNOU HQ,Maidan Garhi,New Delhi110068
IG/RSD/Academic Counselor19/

Dated:02/05/2020

To,
Dr/Ms/Mr DR VIDUSHI AGRAWAL
20/403, Sanskruti, Thakur Complex,
Kandivli East, 90 feet road
Mumbai, MAHARASHTRA
Pin Code:400101
Mob:9969526918
Email:dr.vidushi.agrawal@gmail.com

Sub:Empanelment as an Academic Counselorreg

Dear Sir/Madam,

We are pleased to empanel you as an Academic counselor as per the following details:
Academic Counselor Code ADIPA2563M/002
Regional Center MUMBAI
Study Center Code 49045P
Study Center Name DR. B.M.N. COLLEGE OF HOME SCIENCE
Programme MSCDFSM
Approval for Course(s) MFNL4,MFNL3,MFN6,MFN4,MFN3,MFNP12
Your empanelment as Academic Counselor is subject to acceptance of the following terms and conditions by you:1.
Your empanelment commences from the date of your acceptance.
2. Your empanelment shall be valid up to 31December
2020, which is renewable on the basis of performance evaluation by
the Regional Centre. If your performance is not found satisfactory, your empanelment can be cancelled at any time without
assigning any reason thereof.
3. You will be paid honorarium for counselling as per rates decided by the University which may vary from time to time. This
amount is all inclusive sums for your functioning as part time Academic Counselor. In addition, you will be paid local
conveyance allowance as admissible under the rules.
4. You will be paid separately for evaluating Tutor Marked Assignment (TMA) as per the University norms.
5. Your empanelment is coursewise
and in case there is a change in the city of your residence for some reason, your services
could be utilized by any other Study Centre of IGNOU, if required.
6. Income earned by you in Counselling and Assignment Evaluation or any other activity of IGNOU is accounted for Income
Tax if applicable and TDS may be deducted accordingly and deposited against your PAN.
7. This empanelment doesn't guarantee assignment of academic services.
Wishing you all the best for your pleasant association with the university.

With regards,
Yours sincerely,
Director(RSD)

Note: This is an electronically generated empanelment letter and it doesn't require signature. However rendering/ hiring of services will be further
subject to verification with academic counselor code and QR.