

**NUTRITIONAL STATUS OF GERIATRIC POPULATION OF ITAHARI
SUB-METROPOLITAN CITY, SUNSARI,
NEPAL**

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**Nutritional Status Of Geriatric Population Of Itahari Sub-Metropolitan City,
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Approval Letter

This dissertation entitled “*Nutritional Status of Geriatric Population of Itahari Sub-Metropolitan City, Sunsari, Nepal*” presented by Chandrika Dangal has been accepted as the partial fulfillment of the requirements for the Bachelor Degree in Nutrition and Dietetics.

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Abstract

An analytical cross-section study was conducted on a sample of 151 geriatric population (77-females, 74-males) to assess the nutritional status of geriatric people of itahari sub-metropolitancity, sunsari, Nepal. The current study presents the nutritional status of geriatric population and factors associated with the nutritional status of the geriatric population in Itahari Sub-metropolitan city. The information was obtained using pre-tested questionnaire which included socio-demographic information, dietary intake of individuals and other risk factors like alcohol and tobacco use, physical activity etc. Anthropometric measurements were taken to identify the risk factors, Body Mass Index (BMI), Waist-Hip Ratio (WHR), Waist Circumference (Mozaffarian et al.) etc. Also diet and behavioral factors measurements were taken. Statistical Package for the Social Science (SPSS) version 20 and Microsoft Excel 2010 were used for analyzing the data. Descriptive analysis were used to identify the nutritional status of geriatric people. A cross sectional study was conducted. A total of 151 geriatric people (60 years and above) of both sexes living at Itahari Sub-metropolitan city were assessed for their nutritional status using Mini Nutritional Assessment (MNA) tool.

Out of total 151 participants, prevalence of malnutrition in geriatric population was found to be 15.2%, 52.3% were at risk of malnutrition and 32.5% were found to be normal. Gender was significantly associated with the nutritional status whereas various factors such as age, ethnicity, duration of sleep etc. were not significantly associated with the nutritional status of geriatric people. The result of this study concluded that malnutrition is a major problem in geriatric people living in Itahari Sub-metropolitan city. The problems that the geriatric people are facing must be identified and appropriate policies and programs targeted at such issues should be developed by concerned authority.

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List of Abbreviations

Abbreviations	Full form
ADL	Activity of Daily Living
BMI	Body Mass Index
CAD	Chronic Airway Disease
CBS	Central Bureau of Statistics
CC	Calf Circumference
CI	Confidence Interval
CVD	Cardio Vascular Disease
DM	Diabetes Mellitus
DNA	De – oxyribose Nucleic Acid
ESPEN	European Society for Clinical Nutrition and Metabolism
TFR	Total Fertility Rate
GI	Gastro Intestinal
GIT	Gastro Intestinal Tract
MNA	Mini Nutritional Assessment
MNA – SF	Mini Nutritional Assessment - Short Form
MoH	Ministry of Health
MoHP	Ministry of Health and Population
NDHS	Nepal Demographic Health Survey
NEPAN	Nepal Participatory Action Network
NHRC	Nepal Health Research Council
NPC	National Planning Commission
SAARC	South Asian Association for Regional Cooperation

SES	Socio-Economic Status
SPSS	Statistical Package of Social Sciences
UNICEF	United Nations International Children's Education Fund
WC	Waist Circumference
WHO	World Health Organization
WHR	Waist Hip Ratio

Part-I

Introduction

1.1 Background

Ageing is a natural phenomenon and an inevitable process. Population ageing is pervasive since it is creating humanitarian, social and economic problems in many countries of the world including Nepal (Shrestha, 2012). Geriatric populations are uniquely susceptible to malnutrition due to the association of aging with factors that influence nutritional status: decreased appetite, decreased energy expenditure, weight loss, taste and smell changes, feelings of loneliness and depression, difficulty chewing, fatigue and co-existing morbidities (Ghimire, *et al.*, 2017).

Over the next four decades, the population aged 60 and over in the developing world is projected to triple from 473 million in 2009 to 1.6 billion in 2050. The geriatric population itself is ageing at an accelerated rate with the population aged 80 and over projected to increase four-fold, to reach 395 million in 2050 (Adhikari, 2013). Geriatric population is expanding throughout the globe with estimates that people age over 60 years and older constitute 12% of global population. The proportion of this age group is expected to double (22%) by 2050 (Singh and Shrestha, 2016).

According to the 2011 census of Nepal, there were 2.1 million geriatric inhabitants, which constitute 8.1 percent of the total population in the country. Percent of geriatric inhabitants during the years 1951, 1991, 2001, and in 2011 are 5.0%, 5.8%, 6.5% and 8.1% respectively which shows that there has been a sharp increase in the number of elderly persons between 2001 and 2011 (Shrestha, 2012).

In less developed countries, the problems associated with geriatric people are poor diet, ill-health and inadequate housing, which are all exacerbated by poverty. Furthermore, due to changes in lifestyles in the developing world, chronic illness is becoming endemic among many older people, because of technical advances in medicine that allows for relatively disease-free living in developed countries (Acharya, 2011). Nutritional assessment of geriatric people is aimed to identify not only the presence of deficiency states, but also states of nutrient excess and chronic diet related diseases (Rowe and Khan, 1999).

Malnutrition is known as a common disorder, which is probably under-recognized in geriatric people. It is defined as a state of nutrition in which a deficiency or excess of energy, protein and other nutrients affects shape, size, composition and function of body and may lead to clinical disease. Malnutrition in geriatric may occur due to such different causes as dietary deficiencies, chewing or swallowing problems, gastrointestinal or endocrine disorders, loss of taste or smell, decreased appetite, consuming different kinds of drugs, immobility, social isolation, inflammatory diseases, chronic diseases, alcoholism, malignancies and cognitive disorder especially depression (Vafaei *et al.*, 2013).

Nutrition is an important determinant of health in geriatric patients. Although there is no uniformly accepted definition of malnutrition in the elderly, some common indicators include involuntary weight loss, abnormal body mass index (BMI), specific vitamin deficiencies, and decreased dietary intake (Wells and Dumbrell, 2006). Most nutritional intervention programs are directed toward infants, young children, adolescents, and pregnant and lactating mothers. However, nutritional interventions could play a part in the prevention of degenerative conditions of the elderly and helps in the improvement of their quality of life. A timely intervention can stop weight loss in those at risk of malnutrition (Agarwalla *et al.*, 2015). In Nepal the proportion of the population over 60 years is rapidly increasing and there are few policies or services in place to address this. In fact, free healthcare is not yet widely available for elderly people, and the current provision is negligible in terms of coverage (Lyons, 2012).

1.2 Statement of problem

Studies in developed countries point out that multiple chronic illness, nutritional deficiency, and functional disabilities are common features of geriatric people which can cause malnutrition (Khalesi and Bokaie, 2015). Malnutrition is inadequate amount of one or more nutrients (Barker, 1996). In elderly people malnutrition or weight loss is frequently underestimated. However, malnutrition can be controlled and managed by early nutrition intervention in them (Sampson, 2009). Malnutrition is associated with significantly increased morbidity and mortality in independently living geriatric people. The risk of malnutrition and protein energy malnutrition is higher in geriatric people who are living in hospitals and institutionalizations (Vellas *et al.*, 1999). The current statistics for the geriatric people in Nepal shows chances for a new set of medical, social, and economic problems that could arise if a timely initiative in this direction is not taken by the policy makers. There is urgent necessity to highlight the problems that are being

faced by the geriatric people and explored the ideas for bringing about an improvement in their quality of life (Shrestha, 2012).

In the past research various factors such as age, gender, medications, sedentary lifestyle, lifestyle related factors such as smoking and alcohol consumption, health condition such as presence of co-morbidities, etc. were studied in geriatric people. The factors such as older age, lower income of family, low literacy, decreased food intake, were independently associated with the lower MNA scores in the research in the West Bengal (Lahiri *et al.*, 2015).

1.3 Objectives of the study

1.3.1 General objectives

The primary objective of this study is to assess the nutritional status of geriatric people of Itahari sub-metropolitancy, Sunsari.

1.3.2 Specific Objectives

- i. To conduct survey to find out socio-economic status, physical activity level, family history, dietary intake, behavioral factors and health factors with the help of semistructured questionnaire.
- ii. To carryout anthropometric measurements of geriatric people of Itahari sub-metropolitan city to assess the nutritional status.
- iii. To find out association between nutritional status and various factors such as lifestyle related factors, sleep duration, health status, etc.

1.4 Research questions

The study has investigated the following research questions:

- i. What is the nutritional status of geriatric people in Itahari sub-metropolitancy, Sunsari?
- ii. What are the factors associated with the nutritional status of geriatric people in Itahari sub-metropolitancy, Sunsari?

1.5 Significance of the study

The findings of my study will have following implications:

- i. Provide relevant knowledge regarding the nutritional status and dietary pattern of particular age group of geriatric population.
- ii. Useful in informing the health sector and the public health planners in the mobilization and allocation of resources for the better nutritional approaches.
- iii. It will help to identify individual or group of people who are at risk of being malnourished and who need special care and attention.
- iv. Support the formulation of guidelines and messages which could be used for counseling of geriatric people.
- v. Provides the academic knowledge regarding food, nutrition and health.

1.6 Limitations

- i. The design of the study was cross-sectional; so cause-effect relationship could not be drawn.
- ii. Salt intake through different packaged foods was not calculated.
- iii. Non-quantitative food frequency questionnaire was used.

Part II

Literature Review

2.1 Concept of ageing

Ageing may be regarded as the beginning when the forces of growth bring the organism to a relative equilibrium. The terms like 'maturation' and 'ageing' imply direction to events, direction that is controlled by psychological, social and physical environmental forces as well as by genetic forces common to the species and unique to a particular individual (Knodell, 1999). Ageing is a complex, continuous, biological phenomenon which affects all living organisms and is related to the passage of time. At any point in time, it is resultant of two antagonistic and compensating process of growth and antrophy or involution (Tibbits and Donahue, 1960).

Ageing is a developmental process of the cycle, beginning from conception and ending with death. Geriatric age is defined as the age of retirement, for it is at that time the combined effects of ageing, social changes and diseases are likely to cause a breakdown in health. An increase in longevity and a decline in fertility have contributed to people living much 10 longer today than ever before in the last 50 years. Among the numerous environmental factors that modulate ageing, nutrition plays a significant role. The inseparable triad of nutrition, ageing and health is the logical basis for appropriate management of the problems that arise at the interface of these interdependent factors (Rowe and Khan, 1998).

The definition of ageing is different in each country. The criteria of the definition according to Eborsole and Hess also cited in the Chandrawati Ghimire's thesis is described as follows (Ghimire, 2013).

- Chronological ageing is defined by an increasing of age considering the calendar year since year at birth.
- Biological ageing is a changing of physical health and body process. Some such changes are white hair, wrinkle, freckle, degeneration of joint, bone and nerve cell and hearing loss and others. These degeneration are the causes of chronic disease and increasing of burden.
- Psychological ageing is a mental changing including intelligent changing such as perception, thinking, memory, learning, intelligence, and personality.
- Sociological ageing is a social changing including social role, social status in family or

the organization.

2.2 Ageing scenario in the world, Asia and Nepal

Every society has mechanisms to provide for its geriatric population. But the rapidity with which the older segment (60+ years and above) is growing is unprecedented. It took France 115 years to increase the percentage of elderly from 7 % to 14% (1865-1980). In Japan this demographic transition occurred in just 26 years (1970-1996). Developing countries are still taking still shorter time to increase their share of the elderly. For example, Jamaica will take 18 years (2015-3033) to double its ageing population from 7% to 14%. In Tunisia it will be just 15 years (2020-2035). The trend in the number of older persons in the world is dominated by the fast growth of the older population in the less developed regions, where the size of the older population is 554 million in 2013, which is five times greater than in 1950 (108 million). The number of older people in these regions will further triple by 2050 to attain 1.6 billion. The speed of change in the more developed regions has been significantly slower than in the less developed regions. The geriatric population of the more developed regions tripled between 1950 and 2013, from 94 million to 287 million, and it will increase further in coming decades, reaching 417 million in 2050 (GoN and MoPE, 2016).

In 2000, the number of countries with more than 10 million people aged 60 or over increased to 12, including 5 with more than 20 million geriatric people are China (129 million), India (77 million), the United States of America (46 million), Japan (30 million) and the Russian Federation (27 million). By 2050, 33 countries are expected to have more than 10 million people 60 or over, including 5 countries with more than 50 million older people: China (437 million), India (324 million), the United States of America (107 million), Indonesia (70 million) and Brazil (58 million). By 2050 geriatric population are expected to be 19 percent of Latin America's population and 18 percent of Asia's. Among SAARC countries, India has the highest ageing population i.e. 62.1 million followed by Bangladesh i.e. 7.54 million. In Nepal, the older population accounts for about 7 percent of the total population and a majority (over 6 out of 10) of them are in their sixties. About one fifth of the older population is aged 75 and over. This pattern holds for both men and women. The extent of ageing varies though modestly, by gender, rural/urban residence and development regions (Yadav, 2012). Japan has the highest proportion of older adults in the world (GoN and MoPE, 2016). The Great East Japan Earthquake, tsunami, and nuclear power plant disaster of March 2011 has highlighted current and emerging issues of a super-ageing society in Japan (Muramatsu and Akiyama, 2011).

2.3 Malnutrition

Nutrition has been defined as the food at work in the body. Nutrition includes everything that happens to food from the time it is eaten until it is used for various functions in the body (Srilakshmi, 2002). Malnutrition is the state of being poorly nourished. It may be due to the lack of one or more nutrients i.e. under nutrition, or an excess of nutrients i.e. over nutrition (Hickson, 2006). Malnutrition is a frequent and serious problem in the geriatric people (Ribeiro *et al.*, 2011) and caused by loss or imbalance in energy, protein, vitamins and minerals intake and leads to consequences such as loss of function, disability, decreased quality of life and mortality (Raynaud-Simon *et al.*, 2011). Ageing may progress with incidence of diseases and impairments, including cognitive and physical decline, depressive symptoms and emotional changes, all of which may directly affect the balance between nutritional needs and intake. Poor nutrition among elderly is not only the result of old age and ageing process. Various physiological, psychological, social, dietary, and environmental risk factors are equally responsible for poor nutritional outcomes among geriatric people (Singh and Shrestha, 2016).

2.3.1 Forms of malnutrition

According to (WHO, 1996) there are four forms of malnutrition. They are as follows:-

- 1) Undernutrition: - This is a condition which results when the insufficient food is eaten over an extended period of time. In the extreme cases, it is called starvation.
- 2) Overnutrition: - This is a pathological state resulting from the consumption of excessive quantity of food over an extended period of time. The high incidence of obesity, atheroma and diabetes in western societies is attributed to overnutrition.
- 3) Imbalance: - It is the pathological state resulting from a disproportion among essential nutrients with or without absolute deficiency of any nutrients (Jelliffe, 1996).

2.4 Undernutrition in geriatric people

Undernutrition can be due to either protein energy wasting (classically called kwashiorkor and marasmus) or due to individual nutrient deficiencies. In older persons, weight loss is the first sign of protein energy malnutrition (Morley, 2012). As the human body ages there is a gradual decrease in muscle mass accompanied by increase in fat mass and abdominal circumference. This age-related loss of muscle mass and strength is often referred to as sarcopenia. Weight loss due to an underlying disease is called cachexia and it usually involves a loss of fat and muscle mass (Ali and

Garcia, 2014). Weight loss, a low BMI, and other indicators of lean and fat mass depletion increase risk for adverse outcomes in patients independent of illness severity (Sullivan *et al.*, 2002).

2.5 Micronutrient deficiency disorder

Ageing may be due to the oxidation that damages DNA, protein, carbohydrates and lipids. This leads to disruption of cellular homeostasis and increase an incidence of degenerative diseases. Intake of inadequate diet due to a lack of appetite or difficulty in preparing food, depression, isolation, low income and reduced sense of smell, taste, drug- nutrient interaction and reduction in nutrient absorption contribute to malnourishment among the elderly (Das *et al.*, 2012). The main focus of malnutrition in the elderly is on protein–energy undernutrition, especially in the very old (75+ years) but the elderly people as a whole are also frequently micronutrient deficient. The initial effects of micronutrient deficiencies may be relatively mild, diffuse and subclinical and hence difficult to recognise. For example, deficiencies in B vitamins may result in mild cognitive decline, decreased thiamine intake increases levels of advanced glycation end- products which are linked to the development of type 2 diabetes, deficiencies of vitamin B12 and folate raise homocysteine levels which leads to CVD, and a lack of vitamin D alters immune function (Hoffman, 2017).

There are various causes of micronutrient deficiencies in elderly. Older adults may not consume certain foods or may consume them in insufficient amounts. Smoking tobacco, malabsorption disorders, gastrointestinal surgery, *Helicobacter pylori* infection of the GI tract, alcohol overconsumption, drug adverse effects, and drug-nutrient interactions may also contribute to the micronutrient deficiency in elderly. Age-related changes may cause seniors to eat less (i.e., satiety with less food) due to the presence of more hormones that decrease appetite and fewer neurotransmitters that stimulate appetite (Zagaria, 2010).

2.6 Obesity

Obesity is associated with a range of health problems and affects an increasing number of people of almost all ages. The incidence of diseases associated with obesity such as hypertension, type 2 diabetes, atherosclerosis, arthritis and disability increases with age (Gariballa, 2004). One of the many threats to independent life is the age-related loss of muscle mass and muscle function commonly referred to as sarcopenia (Goisser *et al.*, 2015). Ageing induces changes in body composition, such as an increase in visceral fat and reduced muscle mass. Recently, the new

concept of sarcopenic obesity has emerged, reflecting a combination of sarcopenia and obesity (Kyung, 2016).

2.7 Nutritional status

As stated by the American Dietetic Association (1969), nutrition is the state of health as influenced by the intake of essential food and nutrients. Nutritional Status is the condition of health as influenced by the intake of food. It is also a condition of health related to the use of food by the body (Robinson, 1957). Nutritional status is the condition of health of the individual as influenced by the utilization of nutrient. Nutritional Status is the state of health enjoyed as a result of nutrition (Karnath 1986). The principal aim of nutritional assessment is to determine the type, magnitude and distribution of malnutrition in different geographic areas, to identify the 'at risk' groups and to determine the contributory factors as explained by Rao and Vijayaraghavan (1996). Nutrition has been defined as the food at work in the body. Nutritional status has been defined as the condition of the body resulting from the intake, absorption and utilization of food. It can be measured directly (Burk, 1984).

2.8 Causes of malnutrition in Geriatric people

Nutrition is an important element of health among the elderly, and it affects the whole process of aging (Amarya *et al.*, 2015). Malnutrition is often due to one or more of the following factors: inadequate food intake; food choices that lead to dietary deficiencies; and illness that causes increased nutrient requirements, increased nutrient loss, poor nutrient absorption, or a combination of these factors. Nutritional inadequacy in the elderly can be the result of one or more factors such as physiologic, pathologic, sociologic, and psychologic (Evans, 2005).

2.8.1 Pathologic factors

The ageing process can also be viewed as the cumulative effect of chronic diseases namely, hypertension, diabetes, hyperlipidemia, and atherosclerosis on individual functioning (Drewnowski and Evans, 2001). The immune defence system is adversely affected by the ageing process. There is a strong evidence that a poorly functioning immune system can decrease disease resistance and reduced life expectancy in the elderly (Amarya *et al.*, 2015).

Natural changes in the status of the body with ageing, such as the changes associated with the immune, cardiovascular and endocrine systems, overlap with disease processes, such as those seen in musculoskeletal and skin wear and tear or cardiovascular disease (Martin and Sheaff, 2007).

2.8.2 Diabetes

Increasing life expectancy in conjunction with increasing rate of obesity and sedentary lifestyle will lead to a higher prevalence of diabetes among old persons. DM is frequently unnoticed in old patients as it is either asymptomatic or symptoms are nonspecific (Chentli *et al.*, 2015). Of all the diseases, type 2 diabetes mellitus (T2DM) is the single most disease affecting a large number of elderly populations along with hypertension. Diabetes and its complications take a major toll on the quality of life of the elderly and the healthcare costs of the society. Diabetes further increases the risk of cardiovascular mortality in elderly people. The management of diabetes in elderly requires special care and attention (Jain and Paranjape, 2013).

2.8.3 Marital status

It is found that married have lower rates of mortality, morbidity and mental disorders in comparison to single. Also, divorced and separated have the highest rate of poor self- rated health status, followed by the widow. Furthermore, married people experience less psychological distress than those who are single and also report greater life satisfaction (Pandey, 2008).

2.8.4 Hypertension

Hypertension stands out as the major risk factor for cardiovascular morbidity and mortality in the elderly population. The risk from hypertension has been demonstrated for stroke, left ventricular hypertrophy, congestive heart failure, coronary and peripheral artery diseases, vision impairment, end-stage renal disease, cognitive impairment, and dementia (Rigaud and Forette, 2001).

2.8.5 Psychological factors

Psychological well-being is closely related to old age (Tandon, 2017). Research studies reveal that there is a prevalence of depression, lower life satisfaction and more adjustment problems among elderly well-being individuals and societies (Dhara and Jogsan, 2013). Many people experience loneliness and depression in old age, either as a result of living alone or due to lack of close family ties and reduced connections with their culture of origin, which results in an inability to actively participate in the community activities. With advancing age, it is inevitable that people lose connection with their friendship networks and that they find it more difficult to initiate new friendships and to belong to new networks (Singh and Misra, 2009).

2.8.6 Socioeconomic factors

Socioeconomic status is the root cause of health issues among the elderly: there are obvious differences between income and economic status and health (Chen *et al.*, 2014). Older persons have different socio-economic needs that should be considered; for example accessibility of healthcare, needs regarding nutrition, shelter, clothing, transportation, community amenities and various types of abuses (Rabie *et al.*, 2015). There is considerable evidence that targeted social pensions are effective in reducing poverty among older people and their households. As with other cash transfers, it is sometimes claimed that pensions can generate other positive wellbeing outcomes, including improved health status (Sherlock and Agrawal, 2015).

2.8.7 Anthropometric Indices

Obesity has reached epidemic levels in developed countries. Overweight and obesity are known to have significant impact on both physical and psychological health. The mechanism of obesity development is not fully understood and it is believed to be a disorder with multiple causes. The environmental factors, lifestyle preferences, and cultural environment play pivotal roles in the rising prevalence of obesity worldwide. Anthropometry is an easy, economical, effective, and reliable method that is useful as an initial screening tool of nutritional status. Various anthropometric indices that describe obesity and body fat distribution have been developed; these include the body mass index (BMI), waist circumference (Mozaffarian *et al.* 2011) and the waist-to-hip ratio (WHR) (Lee and Kim 2014). Waist circumference above or equal to 80 cm and 90 cm for females and males respectively is known as abdominal obesity (Brussels 2006). Abdominal obesity is defined as WHR greater than 0.9 for male and WHR greater than 0.85 for female. The hip circumference is measured at a level parallel to the floor, at the largest circumference of the buttocks (WHO 2008).

The height and weight measures are used to calculate the persons body mass index. BMI is expressed as the ratio of weight in kg to the height in m². This is used as a good parameter to grade chronic energy deficiencies. BMI is regarded as a good indicator of nutritional status (Alpers and Klain, 2003).

Table 2.1 Classification of obesity according to ‘Asian Criteria’ value of BMI

Class	“Asian criteria” BMI cut- off
Underweight	<18.5
Normal	18.5-23
Overweight	23-27.5
Obese	≥27.5

Source: (WHO 2004)

2.8.8 Dietary Habit

The vegan or total vegetarian diet includes only food from plants like fruits, vegetables, legumes (dried beans and peas), grains, seeds and nuts while non-vegetarian diet include meat and meat products. There are different types of vegetarian such as:

- Lacto-ovo-vegetarians: Eating both dairy products and eggs. This is the most common type of vegetarian diet.
- Lacto-vegetarians: Eating dairy products but avoid eggs.
- Ovo-vegetarian: Eating eggs but not dairy products.
- Vegans do not eat dairy products, eggs, or any other products which are derived from animals (Society).

Most vegetarian diets are low or devoid of animal products. They are also lower in total fats, saturated fats cholesterol and high in fibers and other minerals, phyto-chemicals (Association 2015). India is the only country in the world with highest number of vegetarian people i.e. 20%-40% of its total population (VTM 2008).

Though the actual population of vegetarian is not known in Nepal there are some ethnic groups, religions etc that avoid non-vegetarian diets. Older adults are predisposed to nutrient deficiency due to a decline in total and resting energy requirements (physical inactivity, loss of lean muscle mass and increased adiposity) that gradually reduces food intake while vitamin and mineral needs remain

unchanged or increased (Kathryn *et al.*, 2015). Reductions in energy requirements impact on the quantities or volumes of food consumed, people tend to naturally eat less. The physiologic changes in their body also make them to eat less when they grow older. This can lead to shortfalls in micronutrients intakes (Leslie and Hankey, 2015). Inadequate food intake contributes to many health conditions including malnutrition, sarcopenia, osteoporosis, and cognitive decline (Baugreet *et al.*, 2017).

2.8.9 Physical activity

It doesn't take a lot of effort to become physically active. All we need is 30 minutes of moderate-level physical activity on most days of the week. Examples of such activities are brisk walking, bicycling, raking leaves, and gardening (SERVICES, Health, and institute 2003). Moreover, cycling, hiking, swimming and aerobics are also equally supportive for burning out the calories and getting rid of obesity, a precursor to high blood pressure and diabetes like chronic disorders. However, sedentary lifestyle, lack of interest in outdoor activities, use of passive mode of transportation and increased urbanization have played a substantial role for reducing the physical activity level in people. More than 14 percent of Nepalese are now living the insufficiently physically active life. In last three decades, Nepalese mean body mass index is also gradually shifting upward with proportional increment in non-communicable diseases (Chataut J, Adhikari RK, and NP 2011).

The functional limitations and disabilities are conditions prevalent in the elderly, with implications for increased use of health services and institutionalization, creating a serious public health problem. Nutritional status is an indicator of health and an important factor associated with motor performance limitations (Danielewicz *et al.*, 2014).

2.8.10 Smoking, drinking and tobacco habits

The connection between smoking and dietary intake is extremely complex. Nicotine, the most characteristic of tobacco components, a highly toxic alkaloid, is both a ganglionic stimulant and a depressant. Recent studies have demonstrated that tobacco smoke exposure is associated with a marked reduction in monoamine oxidase, an enzyme that is associated with mood function. It is found that such effects result in dysregulation of appetite or attitudes towards food (Dallongeville *et al.*, 1998), Health complications associated with smoking tobacco and alcohol dependence include lipid, carbohydrate and protein metabolises disturbance, may affect the state of the dependent person's nutrition (Rosinska *et al.*, 2014).

2.9 Assessment of nutritional status

The nutritional status of an individual is usually a result of multiple factors that interact with each other at different levels. Recognizing the role of diet at the onset of many diseases and assessing the nutritional status of an individual, family and community are important for public health. Assessment of nutritional status of community is one of the first steps in the formulation of any public health strategy to combat malnutrition. The principle aim of such an assessment is to determine the type, magnitude and distribution of malnutrition in different geographic areas to identify at risk groups and to determine the contributory factors. In addition, factual evidence of the exact magnitude of malnutrition is essential to sensitize administrators and politicians to obtain allocation of materials and human resources and to plan appropriately (Srilakshmi, 2002).

The assessment of nutritional status can be done using the following information (WHO, 1996).

- a) Direct method: Deals with the individual and measures objective criteria e.g. anthropometric, clinical examination, biochemical and bio-physical parameters.
- b) Indirect method: Use community indices that reflect the community nutritional status or need e.g. dietary intake, morbidity and mortality rates, as specific mortality and vital statistics.
- c) Ecological factors: e.g. socio-economic status, housing and environmental hygiene, health and education services, conditioning infection.

2.9.1 Mini nutritional assessment in geriatric people

The Mini Nutritional Assessment is an effective, easily administered tool designed to identify geriatric people who have or are at risk for developing malnutrition. The MNA contains geriatric-specific assessment questions related to nutritional and health conditions, independence, quality of life, cognition, mobility and subjective health. The MNA is recommended for routine geriatric assessments by the European Society for Clinical Nutrition and Metabolism (ESPEN). The MNA is easily completed within 10 to 15 minutes time, but the MNA is infrequent in use in some acute care settings due to the time needed to complete it. To reduce this problem, Rubenstein and colleagues developed a six question MNA short-form (MNA-SF) by identifying a subset of

questions from the full MNA that had high sensitivity, specificity and correlation to the full MNA (Kaiser *et al.*, 2009).

MNA consists of 18 items, including measurements of body size and weight, questions about food, beverages and known risk factors for malnutrition, as well as self- assessment questions. Each item gives points, which are then added together to produce a final sum (maximum 30 points). Final MNA scores classify the tested person to have either as-normal nutritional status (> 23.5 points), being -at risk of malnutrition (17–23.5 points) or-malnourished (< 17 points). The MNA-SF uses only the first six questionnaires from the full MNA format. Here the maximum score is 14 points. A total of 12–14 points is taken as -normal nutritional status, and if the patient has less than or equal to 11 points, the manual for the MNA test recommends the examiner to do a complete assessment with all 18 MNA items (Lundin *et al.*, 2012). The questionnaire for Short-Form MNA is shown in Appendices B.

2.10 Indicators of nutritional status in geriatric people

2.10.1 Body mass index (BMI)

Body mass index (weight (kg) / height (m²)) predicts disease risk both in those termed underweight and in those who are obese. The World Health Organization categorizes underweight as BMI < 18.5, normal 18.5-24.9, over-weight 25-29.9, obese 30-39.9 and extreme obesity 40 (Harris and Haboubi, 2005).

2.10.2 Underweight

At a BMI < 22 there is a steady increase in mortality and the combined effect of being underweight and increasing age has a deleterious effect on mortality (Ahmed and Haboubi, 2010).

2.10.3 Body circumference (waist and hip)

Waist and hip circumferences can be measured using a flexible non- elastic measuring tape. The hip circumference is measured from the maximum perimeter of the buttocks. The waist circumference was taken as the plane between the umbilical scar and the inferior rib border. The waist circumference was used to identify individuals with possible health risks based upon threshold values of ≥ 88 cm for women and ≥ 102 cm for men (Lean *et al.*, 1995). CC has been proposed, together with arm circumference, to be a valid nutritional screening instrument for malnutrition in the elderly (Bonneyfoya *et al.*, 2002).

2.10.4 Waist to hip ratio (WHR)

The ratio of waist circumference and hip circumference, or WHR, is used more and more frequently in estimating a possible increase regarding abdominal fat, with the purpose of identifying those individuals at risk of incurring non-insulin-dependent diabetes mellitus, dyslipidemias, arterial hyper-tension, and/or coronary problems. WHR values of <1.00 for men and <0.85 for women are considered desirable (Molarius *et al.*, 1999).

Part-III

Material and Methods

3.1 Research Design

A community based cross-sectional survey was conducted from 27th May to 12th of June, 2018 in Itahari Sub-Metropolitan city to assess the nutritional status of geriatric people of Itahari Sub-Metropolitan city, Sunsari using semi- structured questionnaire on formal interview basis. Measurement of height, weight, waist circumference and hip circumference were taken.

3.2 Study Site

This study was conducted in Itahari Sub-metropolitan city of Sunsari district. It comprises of 20 wards. According to National Population and Housing census:

Fig: 3.1 Distribution of different wards, households and total population in Itahari

Ward No.	No. of Households	Total Population
1	1023	4348
2	2661	11561
3	923	4086
4	4169	15914
5	3667	14339
6	1895	7903
7	779	3687
8	1723	6973
9	1969	7558
10	937	3907
11	999	4121
12	1638	5506
13	1556	6789

14	1019	4964
15	578	2679
16	1447	6232
17	1727	8001
18	913	4133
19	1564	6835
20	2607	10981

Thus newly formed Itahari Sub-metropolitan city altogether constituted of 33794 households with 140517 total populations.

3.3 Materials

The materials required for the survey are as follows:

- Weighing machine: A weighing scale with capacity of 100 kg were used.
- Stadiometer: A stadiometer with capacity of measuring 6 ft was used.
- Measuring tape : Anon stretchable measuring tape was used to measure waist and hip circumference.
- Measuring utensils: Standardised utensils were used for taking 24 hour dietary recall.
- Questionnaire: A well designed, semi structured and pretested set of questionnaire was used to collect information on socio-demographic and economic data such as age, sex, ethnicity, marital status, education, income, education, caste, religion.

3.4 Research variables

3.4.1 Dependent Variables

3.4.1.1 Nutritional status

3.4.2 Independent variables

The independent variables under this study were defined as :

3.4.2.1 Body mass index

People with a BMI of 18.5-24.9 kg/m² were classified as normal , with BMI of 25.0 to 29.9 kg/m² were classified as overweight; while those with a BMI greater or equal to 30.0 kg/m² were classified as obese based on WHO standards of classification (WHO 2016).

3.4.2.2 Waist circumference in cm

Men and women with waist circumference above 90 cm and 80 cm respectively were identified as being abdominally obese (IDF 2006).

3.4.2.3 Waist to Hip ratio

Men and women with waist to hip ratio greater than 0.90 and 0.85 were considered as abdominally obese respectively (WHO 2011).

3.4.2.4 Socio-economic and demographic variables

Age, caste, religion, marital status, income, occupation, education, parity, family size.

3.5 Target Population

The target populations of this study were the geriatric people aged above 60 years of Itahari Sub-Metropolitan city, Sunsari.

3.5.1 Inclusion criteria

- People aged above 60 years of Itahari Sub-Metropolitan city.

3.5.2 Exclusion Criteria

- People who were not available at house at the time of survey.
- Participants who did not consent to participate in the study.
- People who were not from Itahari Sub-Metropolitan city.
- People who were guest in their relatives in Itahari.

3.6 Sampling Technique

There are altogether twenty wards in Itahari Sub-Metropolitan city. All twenty wards were chosen for sample selection and equal numbers of samples were taken from each ward using simple random sampling

3.7 Sample size

The sample size was determined using Sample size formula from creative research system, $N=Z^2P(1-P)/d^2$, by assuming 31% of prevalence of malnutrition in Itahari Sub-metropolitan city of Sunsari district, 95% confidence interval, 8% desired precision, some people may refuse or are unavailable so 10% non-response rate was added to the total sample size. A Z-value 1.96 is used at 95% CI and d of 8%. (N= sample size, P= prevalence, d= margin of error) (Lyons, 2012).

$$Z^2 P (1-P)/d^2$$

$$= (1.96)^2 * 0.31 * (1-0.31) / (0.08)^2$$

$$= 128.34$$

$$= 129 \text{ (minimum sample size)}$$

From the office of Itahari Sub-Metropolitan city, we found that the total number of geriatric population is 7195. Thus we apply finite population sample formula to obtain new sample size to conduct survey in this particular village.

Therefore,

$$\text{New SS} = n_0 / [1 + \{(n_0 - 1) / \text{POP}\}]$$

Where,

New SS = New sample size for finite population

n_0 = Sample size in infinite population

POP = Total number of population

New sample size obtain as

$$= n_0 / [1 + \{(n_0 - 1) / \text{POP}\}]$$

$$= 129 / [1 + \{(129 - 1) / 7195\}]$$

$$= 126.75$$

i.e., 127

Thus calculated sample size was adjusted for non-response. Considering non-response rate as 10%, the adjusted sample size was calculated to be 140. Extra 11 participants were added to increase the precision. Thus the total number of sample size was 151.

3.8 Pretesting

Pretesting was done in 10 people for the feasibility and practicability of the tool. The questionnaire was prepared in Nepali and reviewed by supervisor of this study. The prepared sets of questionnaire and anthropometric instruments were pre-tested among few people who were from study site. Pre-testing of the questionnaire was performed to gather information about understanding ability, time required for each person, acceptability and to check the interpretation of the variables. After pre-testing all the ambiguous, misleading and wrongly interpreted questions were omitted and questionnaires were revised in accordance with the findings of pre-testing.

3.9 Validity and reliability

To ascertain the degree to which the data collection instruments will measure what they purposed to measure, the instruments were validated by comparing with standard known measurements. Reliability refers to quality control measure of data collected. Validity of instrument was ascertained by comparing the data provided by our weighing balance with standard weights. Likewise validity of stadiometer was ascertained by comparing the measurement from our stadiometre and UNICEF stadiometre. Measuring tape was calibrated against standard stadiometre. For 24 hours recall, different foods were standardized in utensils for data collection. The instruments were checked and reset daily to validate the data. The questionnaire was validated by reviewing different literature designed to assess the dietary habit, physical activity and other behavioral factors of geriatric population. The questionnaire was also pre-tested prior to data collection to ascertain content and face validity. Questionnaire was checked for completeness,

consistency and clarity. Validity and reliability of the study was ensured by pre-testing of the tools, using standardized instruments. The test re-test method was used to test consistency in producing the same results.

3.10 Data collection techniques

Data were collected in three phases viz, initial direct contact with participants and filling structured questionnaires, and at last anthropometric measurements of participants.

3.10.1 Data collection for dependent variable-

Nutritional status of the geriatric participants.

3.10.2 Data collection for independent variables-

Data was collected using semi structured questionnaire. Each subject underwent anthropometry measurement. Interview was conducted with geriatric people, or caretaker with the help of questionnaire.

Two tools were used to gather the information. The first part contained structured questionnaire. The second part of assessment was done by using MNA which covered all the anthropometry of the elderly.

3.10.2.1 Anthropometric measurement

Anthropometric measurements were taken by measuring height with stadiometre, weight with digital weighing balance and waist circumference and hip circumference by non-stretching tape.

- a. **Weight:** Weight was measured to the nearest 100 grams (0.1kg) using a weighing scale, after calibrating it to zero, and after removal of shoes and excess clothing. Both weight and height were taken twice. In order to ensure quality data, the weighing scale was calibrated before measuring of weight every day and after every five measurements during the data collection time (CDC 2007).
- b. **Height:** Height was measured using stadiometre to the nearest 0.1cm. The subject was told to stand (without shoes) on a horizontal platform with his/her heels together and with the Frankfurter plain horizontal. The subject draws himself/herself to full height without raising the shoulders with arms and hands relaxed and with the feet flat on the ground (CDC 2007).

- c. Body mass index (BMI): BMI was calculated using the formula weight in kilograms divided by the square of the height in meters $\text{weight (kg)}/ \text{height (m}^2\text{)}$.
- d. Waist circumference: It was measured at the mid-point between the lower border of the rib cage and the iliac crest. Waist circumference was measured using a non-stretchable tape halfway between the lower border of ribs and the iliac crest on a horizontal plane, while ensuring that the tape was level around the body and parallel to the floor. The tape was tightened around the body without depressing the skin (CDC 2007). Two measurements to the nearest 0.1cm were taken and the mean recorded.
- e. Hip circumference: It was measured around the highest point of hip. Hip circumference was measured using a non-stretchable tape (CDC 2007). Two measurements to the nearest 0.1cm were taken and the mean was recorded.

3.10.2.2 Dietary Intake

Food frequency questionnaire and 24 Hour dietary recall were used for the assessment of dietary intake. The food frequency questionnaire was used to obtain information on the type of foods consumed by the respondents in the preceding days and the frequency of consumption of those foods. All the types of foods listed were read out and asked the participants to point out the foods they eat and the frequency of consumption of those foods within a week or fortnightly.

For 24 hour dietary recall, the respondents were asked to recall the foods they had taken in past 24 hour. Respondents were also asked about the left overs of the food items they had taken. Prompts were given to make them easy to remember the time and amount of the food item they had eaten. Portion size of the food was estimated as per the utensils that were calibrated prior to the study. A record form was created and all the information was recorded in the form for further analysis.

With the help of information obtained from dietary assessment nutrients like fat, energy, calorie, carbohydrates were calculated. Nutrients like fat, protein, carbohydrate, potassium as well as total calorie were calculated and classified according to WHO recommendations. It is recommended that 15-30 % of total calories should be included from fat (WHO 2017b). Similarly, it is recommended that 55-75% of total calories should be included from carbohydrate (Mann et al. 2007). Protein intake should be 0.83gm/kg (WHO 2002) Recommendation for total calories is

based on the energy requirement of an individual. Total energy requirement is calculated as follows:

Recommended energy for women

$$\geq 60 \text{ years} = (9.082 \times \text{weight} + 658.5) \times \text{PA factor}$$

Recommended energy for men

$$\geq 60 \text{ years} = (11.711 \times \text{weight} + 587.7) \times \text{PA factor}$$

(FAO 2011)

Table 3.1 Physical activity factor to calculate total energy

Physical activity level	Factors
Low	1.53
Moderate	1.76
Heavy	2.25

(FAO 2011)

3.10.2.3 Physical Activity

Short (IPAQ) International Physical Activity Questionnaire was used for classifying physical activity of study participants. Physical activity part was used to collect data on type, frequency, duration and intensity of physical activity during work, transportation and leisure time in a typical week. The purpose of the questionnaires is to provide common instruments that can be used to obtain internationally comparable data on health-related physical activity.

Physical activity was categorized as low, moderate and high according to the score of each individual calculated following the short IPAQ questionnaire. For this total MET-minutes/week was calculated and physical activity level was determined as shown below:

$$\text{Total MET-minutes/week} = \text{Walk (METs} \times \text{min} \times \text{days)} + \text{Moderate (METs} \times \text{min} \times \text{days)} + \text{vigorous (METs} \times \text{min} \times \text{days)}.$$

Where, MET factors for walk, moderate activity and vigorous activity are 3.3, 4 and 8 respectively.

IPAQ categorical score is as follows:

- a) Low : No physical activity is performed or physical activity with MET values less than 600 MET per week activity (IPAQ 2002).
- b) Moderate: Physical activity with MET value 600 or greater than 600 per week or 3 or more day of vigorous activity of at least 20 minutes per day activity (IPAQ 2002).
- c) Vigorous: Vigorous-intensity activity on at least 3 days and accumulating at least 1500 minutes or 7 days or more days more days of any combination of walking, moderate or vigorous intensity activities accumulating at least 3000 MET-minutes/week activity (IPAQ 2002).

Adequacy of physical activity for each individual was also determined according to WHO recommendation. WHO has recommended that older adults should do at least 150 minutes of moderate-intensity aerobic physical activity throughout the week or do at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week or an equivalent combination of moderate- and vigorous-intensity activity (WHO 2017a).

Data collection regarding other variables such as caste, religion, age, gender, marital status, family type, family size, income, education level, occupation, history of disease etc were done using structured questionnaire.

3.11 Data Analysis

The collected data were checked and rechecked for completeness and consistency at the end of each day of data collection. The collected data were first edited, organized, categorized and entered into Microsoft Excel 2010 and then into statistical package of social science (SPSS) version 20.0.

The collected data were analyzed by using descriptive statistics. Descriptive analysis was used to describe the percentages and number distributions of the respondents by socio-demographic characteristics and other relevant variables such as physical activity, dietary patterns, medical characteristics and behavioral characteristics in the study. Likewise, qualitative data were

transcribed and coded by assigning labels to various categories. Verified test parameters were used to establish the relationships between the variables and indicators of malnutrition.

3.12 Logistic and ethical consideration

Prior to survey, permission to conduct survey was obtained from Nutrition and Dietetics Department, Central Campus of Technology. Also permission to conduct survey in Itahari Sub-metropolitan city was obtained from Itahari Sub-metropolitan city office. An informed written and verbal consent was obtained from the respondents at the time of survey. The objective of the survey was explained clearly in simple language. Privacy and confidentiality of collected information was ensured at all levels.

Part IV

Results and Discussions

A cross-sectional study to assess the nutritional status of geriatric people was conducted in 151 people (females-77, males-74) of Itahari Sub-Metropolitan city, Sunsari. The results obtained from this study are explained in the following headings.

4.1 Demographic and socioeconomic characteristics

The information's on demographic and socioeconomic characteristics are given below.

4.1.1 Age distribution of the study population

There were relatively more people of age group 70-79 i.e. 50.4% (76). The age group ≥ 80 consisted 14.5% of total people i.e. 22. This results shows that increasing age also gradually increases the blood pressure. Age distribution of the study population is shown in table 4.1.

Table 4.1 Distribution of age of surveyed population (n=151)

Age	Frequency	Percent
60-69	53	35.1
70-79	76	50.4
≥ 80	22	14.5
Total	151	100

4.1.2 Caste distribution of the study population

There were relatively more janajati i.e 45.7% (69). Madhesi were much less i.e 2.3% (40. 23.8% (36) were from brahmin and 11.3% (17) were chhetri. And also dalit were 13.2% (20) and muslim were found 3.4% (5). Caste distribution of the study population is shown in table 4.2.

Table 4.2 Distribution of caste of surveyed population (n=151)

Caste	Frequency	Percent
Brahmin	36	23.8
Chhetri	17	11.3
Janajati	69	45.7
Dalit	20	13.2
Madhesi	4	2.6
Muslim	5	3.4
Total	151	100

4.1.3 Religion wise distribution of study population

There were relatively more hindu i.e 91.4% (138) among the surveyed population. Buddhist were found less i.e 2.0% (3) only. The distribution of religion of participants is shown in Table no. 4.3.

Table 4.3 Distribution of religion of surveyed population (n=151)

Religion	Frequency	Percent
Hindu	138	91.4
Buddhist	3	2.0
Christain	5	3.3
Muslim	5	3.3
Total	151	100

4.1.4 Gender wise distribution of study population

Among 151 participants, 51% (77) were females and 49% (74) were males. There were more female participants involved in this study. The distribution is shown in the following table no.4.4.

Table 4.4 Distribution of study population according to gender (n=151)

Gender	Frequency	Percent
Male	74	49.0
Female	77	51.0
Total	151	100

4.1.5 Marital status of the study population

Majority of the study population were married 60.3% (91), 28.5% (43) were widow and 11.2% (17) were widower. The distribution of marital status of participants is shown in Table no. 4.5.

Table 4.5 Distribution of marital status (n=151)

Factors	Frequency	Percent
Married	91	60.3
Widow	43	28.5
Widower	17	11.2
Total	151	100

4.1.6 Socioeconomic factors

Socioeconomic factors include education level, occupation and income level of family. Socioeconomic Status (Vasan et al.) can be assessed by measuring these factors. Modified Kuppuswamy scale is used for assessing the SES of family in Nepal (Ghosh and Ghosh 2009). Here, in this study, this kuppuswamy scale was used for assessing socioeconomic status of family as many study had found SES as a risk factor for hypertension.

4.1.6.1 Distribution of occupation

The study showed that 59 (39.1%) participants were semiskilled. A least percent i.e. 3.3% were unemployed, 10.6% were skilled, 17.2% were farmer, clerks or shop owners and 21.2% were reported to be unskilled. The distribution of different occupation of family heads is shown in Table no. 4.6.

Table 4.6 Distribution of occupation (n=151)

Occupation	Frequency	Percent
Skilled	16	10.6
Semiskilled	59	39.1
Clerical/ shop-owner/farmer	26	17.2
Unskilled	32	21.2
Unemployed	5	3.3
Profession	6	4.0
Semiprofession	7	4.6
Total	151	100

4.1.6.2 Education level

35.1% (53) of participants had education level up to middle school, 27.1% (41) were illiterate, 19.2% (29) had education level up to primary school, graduated 9.3 % (14) were high school graduated. Very few 4.0% (6) had education level of intermediate or diploma and remaining and 5.3% were graduated or post graduate. The distribution of education level of participants is shown in Table 4.7.

Table.4.7 Distribution of education level (n=151)

Education level	Frequency	Percent
Graduate or post graduate	8	5.3
Intermediate or diploma	6	4.0
High school graduate	14	9.3
Middle school	53	35.1
Primary school	29	19.2
Illiterate	41	27.1
Total	151	100

4.1.6.3 Socioeconomic status

After assessing all the SES factors, socioeconomic status score had been calculated where only 3.3% (5) belonged to upper class, 42.4% (64) belonged to upper middle class, 23.2 % (35) belonged to lower middle class, 26.5% (40) belonged to upper lower class and 4.6% (7) belonged to lower class. The distribution of SES score is shown in Table no. 4.8

Table 4.8 Distribution of socio-economic status (n=151)

Socio-economic status	Frequency	Percent
Upperclass	5	3.3
upper middle class	64	42.4
lower middle class	35	23.2
upper lower class	40	26.5
lower class	7	4.6
Total	151	100

4.1.6.4 Family income per month (Rs)

The study showed that 27 (17.9%) participants had monthly income greater than Rs.45,751. Similarly, 52 (34.5%) participants had monthly income between Rs.(22,851-45,750), 6 (3.9%) participants had monthly income less than Rs.2,300. The distribution of monthly income is showed in Table no 4.9.

Table 4.9 Distribution of monthly income (n=151)

Income	Frequency	Percent
≥45,751	27	17.9
22,851-45,750	52	34.5
17,151-22,850	21	13.9
11,451-17,150	24	15.9
6,851-11,450	8	5.3
2,301-6,850	13	8.6
≤2,300	6	3.9
Total	151	100

4.1.7 Type of Family

The study showed that 85.4% (129) of the participants were from joint family and rest of 14.6% (22) were from singlefamily. The study also showed that 80.1 % (121) of families had family size greater than 5 and rest 19.9% (30) of families had size smaller than 5. The distribution of size and type of family is shown in Table no 4.10.

Table 4.10 Distribution of family type and size (n=151)

Factors	Frequency	Percent
Family Type		
Single	22	14.6
Joint	129	85.4
Total	151	100
Family Size		
<5	30	19.9
≥5	121	80.1
Total	151	100

4.2 Anthropometric indices

4.2.1 BMI

The study showed that 17.2% (26) participants were underweight, followed by normal- 39.7% (60), overweight were 33.1% (50) and 9.9% (15) were found as obese. The distribution of participants according to Asian BMI criteria is shown in the table 4.11.

Table 4.11 Distribution of participants according to Asian BMI criteria (n=151)

Category	Frequency	Percent
Underweight	26	17.2
Normal	60	39.7
Overweight	50	33.1
Obese	15	9.9
Total	151	100

4.2.2 WHR and WC

According to WC, 70.2% (106) were found to be normal and remaining 29.8% (45) were found to be abdominal obese and according to WHR, 17.2% (26) were normal and 82.8% (125) were abdominal obese, which is shown in Table 4.12.

Table 4.12 Distribution of participants according to Waist circumference and WHR

Category	Frequency	Percent
Waist circumference(Mozaffarian et al.)		
Normal	106	70.2
Abdominal obese	45	29.8
Total	151	100
WHR		
Normal or underweight	26	17.2
Abdominal obese	125	82.8
Total	151	100

4.3 Behavioral characteristics

In this study, few percent of participants were found to take psychological stress on daily basis. 79.5 % of people were found to have psychological stress 2-3 times a week. According to the participants, Only 5.3 % had no psychological stress. More than half of the participants (76.8%) used to sleep less than 7 hours daily, 20.5% of participants were found to sleep between 7-8 hours daily and only 2.7% were reported to sleep more than 9 hours daily. The distribution of behavioral characteristics is shown in Table no. 4.13.

Table 4.13 Distribution of behavioral characteristics (n=151)

Factors	Frequency	Percent
Stress		
Daily	23	15.2
2-3 times a week	120	79.5
Never	8	5.3
Total	151	100
Sleeping Hours		
<7 hrs	116	76.8
7-8 hrs	31	20.5
≥9 hrs	4	2.7
Total	151	100

4.4 Physical activities

Short IPAQ questionnaire was used in order to assess the physical activity level. Subjects were categorized to do low, moderate and vigorous physical activity. Most of the participants were found to do moderate physical activity i.e. 73.5% (111). Only 9.3% (14) participants were found to do high physical activity. 17.2 % of participants were found involving in low physical activities in my survey area. The distribution of physical activities is shown in Table no.4.14.

Table 4.14 Distribution of physical activities (n=151)

Factors	Frequency	Percent
Physical activity		
High	14	9.3
Moderate	111	73.5
Low	26	17.2
Total	151	100

4.4 History of Hypertension and Diabetes diagnosed

Majority 108 (71.5%) participants were reported to have no any history of hypertension and 43 (28.5%) of participants were reported to have history of hypertension in their families. Only 19 (12.6%) participants were reported to have diabetes and rest 132 (87.4%) participants were not diagnosed with diabetes. The distribution of history of hypertension and diabetes is shown in Table no 4.15.

Table 4.15 Distribution of history of hypertension and diabetes (n=151)

Factors	Frequency	Percent
Family member (Hypertensive)		
Yes	43	28.5
No	108	71.5
Total	151	100
Diabetes diagnosed		
Yes	19	12.6
No	132	87.4
Total	151	100

4.5 Dietary intake

4.5.1 Dietary intake in a preceding day

It was found that majority of participants 90.7% (137) consumed inadequate calories and only 9.3% (14) participants consumed adequate calories in their diet. The mean calorie intake was 2487 ± 751 kcal, mean carbohydrate intake was found to be 431 ± 105 gm, mean fat intake 91 ± 11 gm, protein intake 89 ± 18 gm.

12.6% (19) participants were found to consume low carbohydrate, 80.1% (121) were found to consume adequate carbohydrate and 7.3% (11) were found to consume high carbohydrate. Likewise for fat consumption, majority of participants i.e. 113 (77.5%) were reported to consume normal fat followed by low fat and high fat. Majority of the participants i.e. 86 (57.0%) had adequate protein and 65 (43.0%) participants were found to consume inadequate protein.

All study participants were found to consume potassium in much lesser amount than the recommended level. This might be because of inadequate consumption of green leafy vegetables, fruits and other vegetables in a daily diet. The RDA of potassium is 3510mg per day (WHO 2012a) but the mean consumption was found to be 2901 ± 1102 mg. 90.1% of participants were reported to consume sodium more than the upper safe limit i.e. 2,000 mg (WHO 2012b). Similarly, the mean sodium intake was found to be 3915 ± 1551 mg which was very much higher than the upper safe limit and this might be caused due to excess consumption of salt and sodium rich foods. Similarly, The distribution of nutrient intake is shown in Table no 4.16.

Table 4.16 Distribution of nutrients intake (n=151)

Factors	Frequency	Percent
Calories		
Adequate	14	9.3
Inadequate	137	90.7
Total	151	100
Carbohydrates		

Low	19	12.6
Adequate	121	80.1
High	11	7.3
Total	151	100

Protein

Adequate	86	57.0
Inadequate	65	43.0
Total	151	100

Fat

Normal	117	77.5
Low	13	8.6
High	21	13.9
Total	151	100

Sodium

<2000	15	9.9
≥2000	136	90.1
Total	151	100

Potassium

<3510	151	100
≥3510	0	0
Total	151	100

4.5.2 Distribution of dietary factors

The study revealed that all the participants had salt intake greater than 5gm daily. This might be because of lack of knowledge on appropriate use of salt. Majority of participants 112 (74.2%) were found to be non-vegetarian, 12 (7.9 %) pure vegetarian, 26 (17.2%) lacto vegetarian and only 1 (0.7%) lacto-ovo- vegetarian. 59 (39.1%) of study participants were found non-smoker, 31 (20.5%) were past smokers and 61 (40.4%) of participants were found to smoke. The study also revealed that 43 (28.5%) participants used to drink alcohol and rest all 108 (71.5%) participants did not use to drink alcohol. The distribution of dietary factors is shown in Table no 4.17.

Table 4.17 Distribution of dietary factors (n=151)

Factors	Frequency	Percent
salt consumption per day		
<5 gm/day	15	11.3
≥5 gm/day	134	88.7
Total	151	100
Vegetarianism		
Vegan	12	7.9
Lacto vegetarian	26	17.2
Lacto- ovo vegetarian	1	0.7
Non-vegetarian	112	74.2
Total	151	100
Smoking		
current smoker	61	40.4
Past smoker	31	20.5
No	59	39.1

Total	151	100
Alcoholism		
Yes	43	28.5
No	108	71.5
Total	151	100

4.5.3 Food frequency questionnaire

From the food frequency questionnaire, we came to know that majority 78 (51.7%) of participants consumed green leafy vegetables (GLVs) frequently, 61 (40.4%) consumed regularly and only 12 (7.9%) participants consumed rarely. There were no any participants who did not use to eat potatoes. 133 (88.1%) of participants used to consume potatoes frequently and 18 (11.9%) used to consume regularly. Very few participants 13 (8.6%) consumed fruits frequently, 81 (53.7%) participants consumed regularly and 57 (37.7%) participants consumed on rare basis. Majority of participants 107 (70.9)% consumed red meat rarely, and other 44 (29.1%) consumed on regular basis. There were no participants consuming red meat and fish frequently. Majority of participants 70.9% (107) were reported to consume fish rarely and rest 29.1% (44) were reported to consume fish on regular basis. Major percent 74.2% (112) were reported to consume papad on rarely, 2% (3) consumed frequently and rest of 23.8% (36) consumed papad on regular basis. 70.9% (107) consumed pickles regularly. No participants consumed noodles/chips frequently. 76.8% (116) rarely consumed noodles/chips respectively. The distribution of foods intake is shown in Table 4.18.

Table4.18 Distribution of foods/food intake

Foods	Frequency of consumption					
	Number			Percentage		
	Frequent	Regular	Rare	Frequent	Regular	Rare
GLV	78	61	12	51.7	40.4	7.9
Potatoes	133	18	0	88.1	11.9	0
Fruits	13	81	57	8.6	53.7	37.7
Red meat	0	44	107	0	29.1	70.9
Fish	0	44	107	0	29.1	70.9
Papad	3	36	112	2.0	23.8	74.2
Pickles	4	107	40	2.6	70.9	26.5
Noodles/Chips	0	35	116	0	23.2	76.8

4.6 BMI of participants

The figure 4.1 shows the BMI categorization of elderly participants according to the Asian BMI criteria. 17.2% (26) of elderly participants were underweight, 39.7% (60) were normal, 33.1% (50) were overweight and 9.9% (15) were found to be obese respectively.

■ Underweight ■ Normal ■ Overweight ■ Obese

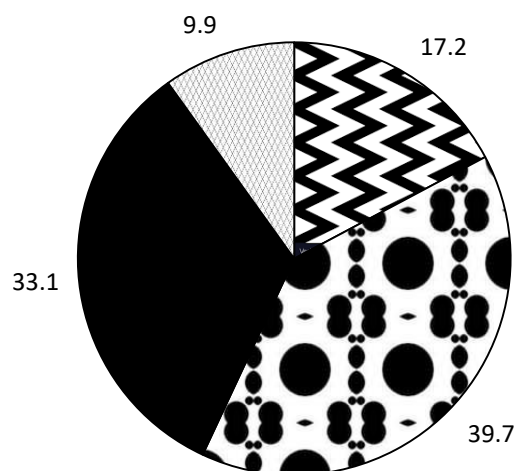


Fig. 4.1 BMI status of study population

4.6.1 BMI of participants of different age group and gender

As age advances i.e. 80 and above, the percentage of total underweight participants were more (27.3%). The percentage of older people who were overweight was comparatively greater in the age group of (60-69) i.e. 39.6%. Females were found more underweight than females (20.8%) and males were more overweight than females (33.8%). 39.0% of female participants had normal BMI and 40.5% of male participants had normal BMI. The age group of 80 and above had comparatively normal BMI i.e. 45.5% than the age group of 60-69 i.e. 35.8% and age group 70-79 i.e. 40.8% respectively.

Table 4.19 BMI of different age group and gender (n=151)

Variables	BMI			
	Underweight	Normal	Overweight	Obese
Gender				
Female	16 (20.8)	30 (39.0)	25 (32.4)	6 (7.8)
Male	10 (13.5)	30 (40.5)	25 (33.8)	9 (12.2)
Age				
60-69 yrs	7 (13.2)	19 (35.8)	21 (39.6)	6 (11.3)
70-79 yrs	13 (17.1)	31 (40.8)	24 (31.6)	8 (10.5)
80 yrs and above	6 (27.3)	10 (45.5)	5 (22.7)	1 (4.5)

4.7 Prevalence of malnutrition in geriatric Population

The diagram 4.2 shows the nutritional status of participants as guided by MNA. 52.3% (79) of participants were normal, 15.2% (23) were malnourished and 32.5% (49) were found to be at risk of malnutrition. In the similar study carried out in Pharping in 2012, 31% of the elderly were malnourished and 51% were at risk of malnutrition (Lyons, 2012). The study done in elderly people in Nuwakot district showed that 24% were malnourished and 65% were at risk of malnutrition which is comparable to this study (Ghimire *et al.*, 2017).

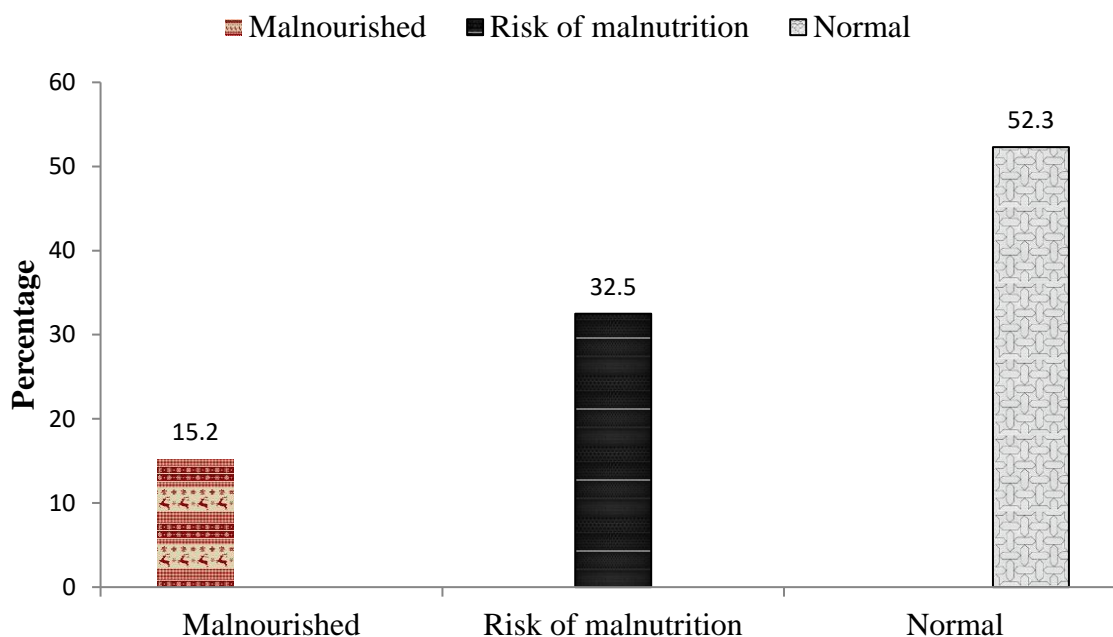


Fig. 4.2 Prevalence of malnutrition among elderly population in this study

4.8 Factors associated with the nutritional status of geriatric participants

4.8.1 Demographic factors and nutritional status

4.8.1.1 Age categorization and nutritional status

Prevalence of malnutrition was higher in the age group of 80 years and above (27.3%) than age group of 60-69 (11.3%) and 70-79 (14.5%). The risk of malnutrition was more than half i.e. 64.2% in age group of 60-69. In the study by Devendra Singh the advanced age group (77 and above) were more malnourished than the others which was 20% and risk of malnutrition was 59% which are comparable to this study. The result of the study showed that malnutrition worsened with the advancing age. Age categorization and nutritional status were not statistically associated in this study but in the research by Devendra Singh, a significant association was shown between the age and nutritional status (Singh and Shrestha, 2016). In the study done in Okharpauwa, Nuwakot district, no association was shown between age and nutritional status (Ghimire *et al.*, 2017).

4.8.1.2 Gender and nutritional status

Malnutrition was (15.6%) in females and (14.9%) in males. The risk of malnutrition was also high in females (57.1%). A significant association was shown between gender and nutritional status in

this study. In the study done in Nuwakot district malnutrition was more prevalent in females (29%) than males (18%) which was comparable findings to this study (Ghimire *et al.*, 2017).

4.8.1.3 Religion and nutritional status

Malnutrition was prominent in people who followed muslim religion (40.0%). Risk of malnutrition was more than half i.e. 60.0% in people following Christain religion. In the study done in Okharpauwa in community dwelling elderly, people following Hindu religion were malnourished i.e. 13.3% which is not similar to the finding of this study. Risk of malnutrition was found in higher proportions in Buddhist and Christians i.e. 75.9% and 66.7% respectively in the Okharpauwa study (Ghimire *et al.*; 2017).

Table 4.20 Demographic factors and nutritional status of participants (n=151)

Variables	Nutritional status			p-value
	Malnourished	Risk of malnutrition	Normal	
Age				
60-69 yrs	6 (11.3)	34 (64.2)	13 (24.5)	0.028
70-79 yrs	11 (14.5)	40 (52.6)	25 (32.9)	
80 yrs and above	6 (27.3)	5 (22.7)	11 (50.0)	
Gender				
Male	11 (14.9)	35 (47.3)	28 (37.8)	0.006*
Female	12 (15.6)	44 (57.1)	21 (27.3)	
Religion				
Hindu	20 (14.5)	75 (54.3)	43 (31.2)	0.274
Buddhist	1 (33.3)	0 (0.0)	2 (66.7)	
Muslim	2 (40.0)	1 (20.0)	2 (40.0)	
Christain	0 (0.0)	3 (60.0)	2 (40.0)	

4.8.1.4 Ethnicity and nutritional status of participants

A significant association was not found between ethnicity and nutritional status in this study. Muslims were more malnourished i.e. 40.0% than other ethnic groups. Risk of malnutrition was

more than half (82.4%) in chhetri i.e. Dalit and Janajati. Bound with the spiritual and religious beliefs many were found to restrict meat, skip evening meals and deprived themselves from their morning sleep for their prayers and religious activities. This might be reason that malnutrition was prevalent in them. An association found between the nutritional status and ethnicity in the past study in which malnutrition was 20.1% and risk of malnutrition was 64.1%. This was not similar findings to this study (Singh and Shrestha, 2016).

4.8.1.5 Past occupation and nutritional status of participants

Geriatric people who were semiprofessional in the past were more malnourished (28.6%) than the people who were in other occupation. Risk of malnutrition was shown high in unemployed people i.e. (60.0%). In the current study, unemployed elderly population were at 3.23 times more risk of malnutrition compared to those who were employed. This can be explained by the fact that the employed elderly possibly could have good financial status, resulting in good access to nutritional foods (Ghimire *et al.*, 2017).

4.8.1.6 Literacy and nutritional status of participants

Literacy and nutritional status were not statistically associated in this study. The illiterate people were found malnourished in greater percentage i.e. 26.8% in comparison to other ones. Risk of malnutrition was also seen in higher proportion in graduate or post graduate older people (75.0%). In the study done in Kathmandu by Devendra Singh and Soniya Shrestha, nutritional status was poorer among the respondents who were illiterate (at risk of malnutrition (62.3%) and malnourished (16.8%). This finding was similar to this study. No statistically significant association was observed between educational status and nutritional status of the respondents in the study by Devendra Singh (Singh and Shrestha, 2016).

Table 4.21 Demographic factors and nutritional status of participants (n=151)

Variables	Nutritional Status			P-value
	Malnourished	Risk of malnutrition	Normal	
Ethnicity				
Brahmin	6 (16.7)	20 (55.6)	10 (27.8)	
Chhetri	1 (5.9)	14 (82.4)	2 (11.8)	

Dalit	7 (35.0)	9 (45.0)	4 (20.0)	0.027
Janajati	7 (10.1)	33 (47.8)	29 (42.0)	
Madhesi	0 (0.0)	2 (50.0)	2 (50.0)	
Muslim	2 (40.0)	1 (20.0)	2 (40.0)	
Past Occupation				
Farmer/ shop owner	7 (26.9)	12 (46.2)	7 (26.9)	
Profession	0 (0.0)	5 (83.3)	1 (16.7)	
Semiprofession	2 (28.6)	3 (43.9)	2 (28.6)	0.511
Semiskilled	6 (10.2)	33 (55.9)	20 (33.9)	
Skilled	4 (25.0)	8 (50.0)	4 (25.0)	
Unemployed	1 (20.0)	3 (60.0)	1 (20.0)	
Unskilled	3 (9.4)	15 (46.9)	14 (43.8)	
Educational level				
Graduate	1 (12.5)	6 (75.0)	1 (12.5)	
High school graduate	1 (7.1)	6 (42.9)	7 (50.0)	
Illiterate	11 (26.8)	19 (46.3)	11 (26.8)	0.391
Intermediate	1 (16.7)	2 (33.3)	3 (50.0)	
Middle school	6 (11.3)	29 (54.7)	18 (34.0)	
Primary school	3 (10.3)	17 (58.6)	9 (31.0)	

4.8.2 Nutritional status of participants based on their lifestyle

The table 4.22 shows the nutritional status of people according to the social status and lifestyle. The lifestyle factors such as smoking and drinking consumption were less contributing to the state of malnutrition in elderly which was 19.4%, and 14.4% respectively. In that case various other factors might have contributed to higher prevalence of malnutrition in people who did not smoked and drank alcohol which was 61.0% and 53.7% respectively. In the case of physical activity, older people having high physical activity were more malnourished i.e. 28.6% than those having low

and moderate activities. The risk of malnutrition was found to be higher in people having low physical activity i.e. 57.7% respectively. In the study by Devendra Singh and Soniya Shrestha the greater percentage of malnourished people were those who had habit of smoking i.e. 26.2% (Singh and Shrestha, 2016).

Table 4.22 Nutritional status of participants based on their lifestyle (n=151)

Variables	Nutritional status			P- value
	Malnourished	Risk	Normal	
Lifestyle				
Smoking status				
No	7 (11.9)	36 (61.0)	16 (27.1)	0.509
Past smoker	6 (19.4)	15 (48.4)	10 (32.3)	
Current smoker	10 (16.4)	28 (45.9)	23 (37.7)	
Alcohol consumption				
Yes	6 (14.4)	21 (48.8)	16 (37.2)	0.732
No	17 (15.7)	58 (53.7)	33 (30.6)	
Physical activity				
High	4 (28.6)	4 (28.6)	6 (42.9)	0.369
Low	4 (15.4)	15 (57.7)	7 (26.9)	
Moderate	15 (13.5)	60 (54.1)	36 (32.4)	

4.8.3 Nutritional status and physical health status of participants

The table 4.23 shows the nutritional status of geriatric people according to the health status. It was found that malnutrition was dominant in elderly who had no family history of hypertension i.e. 15.7% followed by who had diabetes (15.8%) respectively. Similarly, the risk of malnutrition was notable in the geriatric people having family history of hypertension (53.5%) which was superseded by people having no diabetes (56.1%). In the study by Devendra Singh, hypertension and diabetes were the most prevalent co - morbidities in the elderly which were 18.8% and 19% respectively (Singh and Shrestha, 2016).

Table 4.23 Nutritional status and health status of participants (n=151)

Variables	<u>Nutritional status</u>			p- value
	Malnourished	Risk	Normal	
Family history of Hypertension				
Yes	6 (14.0)	23 (53.5)	14 (32.6)	0.961
No	17 (15.7)	56 (51.9)	35 (32.4)	
Diabetes				
Yes	3 (15.8)	5 (26.3)	11 (57.9)	0.028
No	20 (15.2)	74 (56.1)	38 (28.8)	

4.8.4 Other factors and nutritional status of participants

4.8.4.1 Duration of sleep and nutritional status

An association was not shown between the nutritional status and duration of sleep. It was found that those who slept for lesser than 7 hours were more malnourished i.e. 17.2%. Risk of malnutrition was greater in elderly who slept for more than or equal to nine hours (75.0%). National Sleep Foundation recommended 7-8 hours as appropriate sleep hours for elderly people. Research further said that the short duration sleep i.e. less than six or seven hours and long duration sleep i.e. more than eight or nine hours were associated with CVD, DM, obesity and poor self-rated health outcomes (Silva *et al.*, 2016).

4.8.4.2 Duration of stress and nutritional status

An association was not shown between the nutritional status and duration of stress. It was found that those had no stress were found to be slightly more malnourished i.e. 25.0% than who had daily stress i.e. 21.7%. This may be due to lesser number of people present had no stress. Risk of malnutrition was greater in elderly who had stress two to three times a week i.e. 53.3%.

Table 4.24 Association between nutritional status and other various factors (n=151)

Variables	Nutritional Status			p- value
	Malnourished	Risk	Normal	
Duration of sleep				
<7 hours	20 (17.2)	59 (50.9)	37 (31.9)	0.701
7-8 hours	3 (9.7)	17 (54.8)	11 (35.5)	
9 hours and more	0 (0.0)	3 (75.0)	1 (25.0)	
Duration of stress				
2-3 times a week	16 (13.3)	64 (53.3)	40 (33.3)	0.784
Daily	5 (21.7)	11 (47.8)	7 (30.4)	
Never	2 (25.0)	4 (50.0)	2 (25.0)	

Part-V

Conclusions and Recommendations

5.1 Conclusions

Following conclusions can be drawn from the results of the study:

- i. In this study the prevalence of malnutrition in geriatric people was found to be 15.2%, 52.3% were at risk of malnutrition and 32.5% were normal.
- ii. The result of this study concludes that the malnutrition is the major nutritional problem in the geriatric people.
- iii. The prevalence of malnutrition was high in females (15.6%) than males (14.9%).
- iv. The study conducted consist of more janajati people participating (45.7%), most of the people followed hindu religion (91.4%), majority of people at survey were married (60.3%), most of them were semiskilled (39.1%), most of them had their education level upto middle school only (35.1%).
- v. Most of the family had moderate source of income i.e 22,851-45,750 (34.5%), most were from upper middle class level (42.4%), most of the participants were from joint family (85.4%), most of them had normal Body Mass Index (39.7%), they were going through stress time (79.5%) respectively
- vi. In this study a significant association was found between nutritional status and gender ($p=0.006$).

5.2 Recommendations

The result of this study suggests the following recommendations;

1. A timely intervention should be done in by health and nutritional professionals regarding undernutrition, food consumption habits and co-morbidities.
2. Those who are malnourished should be treated by appropriate nutrition program such as diet enhancement and supplementation and their weight loss and other health conditions should be closely monitored.
3. Community based approaches and awareness for reduction of malnutrition and its cofactors.

4. This study can provide a background for a population based intervention in attempts to prevent rising problems of malnutrition in the country.
5. The need is to increase awareness at community and clinical settings regarding malnutrition.

Part VI

Summary

Ageing is the global problem to the world. Due to decreased fertility and increased life expectancy, the ageing population is outnumbering the normal population in many nations. With rise in geriatric population, their problems are also on rise. Malnutrition is the major cause of mortality in many geriatric people.

An analytical cross-section study was conducted on a sample of 151 geriatric population (77-females, 74-males) of Itahari sub-metropolitan city. The information was obtained using pre-tested questionnaire which included socio-demographic information, dietary intake of individuals and other risk factors like alcohol and tobacco use, physical activity etc. Anthropometric measurements were taken to identify the risk factors, BMI, WHR, WC etc..Also diet and behavioral factors measurements were taken to identify the factors associated with malnutrition. Stastical Package for the Social Science (SPSS) version 20 and Microsoft Excel 2010 were used for analyzing the data. Descriptive analysis were used to identify the prevalence of malnutrition and risk factors associated with it.

Findings showed that overall the prevalence of malnutrition in geriatric people was found to be 15.2%, 52.3% were at risk of malnutrition and 32.5% were found to be normal. The result of this study concludes that the malnutrition is the major nutritional problem in the geriatric people. The prevalence of malnutrition was high in females (15.6%) than males (14.9%). It consist of more janajati people participating (45.7%), most of the people followed hindu religion (91.4%), majority of people at survey were married (60.3%), most of them were semiskilled (39.1%), most of them had their education level upto middle school only (35.1%), most of the family had moderate source of income i.e 22,851-45,750 (34.5%), most were from upper middle class level (42.4%), most of the participants were from joint family (85.4%), most of them had normal Body Mass Index (39.7%), they were going through stress time (79.5%) respectively. A significant association was found between nutritional status and gender ($p=0.006$).

The study concluded that the geriatric people who are malnourished and at risk of malnutrition required regular monitoring, support and education to sustain, revive and to achieve better health and nutritional outcomes in the future.

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Appendices

Appendix-A

Questionnaire

Nutritional assessment form
Department of nutrition and dietetics
Central campus of technology
Tribhuvan University
Dharan, Nepal

प्रश्नउत्तरहरु.

फारम नं

अन्तर्वार्ताको मिति.....

सामान्य जानकारीहरु :

१. नाम.....महिला /पुरुष
२. जन्ममिति.....
३. उमेर.....वर्ष.....
४. ठेगाना.....
५. तपाईंको जात के हो?
क. ब्रामण ख.क्षत्रि ग.जनजाती घ. दलितङ .मधेसी च.अन्य.....
६. तपाईं कुन धर्म मान्नुहुन्छ?
क. हिन्दु ख.बौध ग.क्रिस्चियन घ.अन्य.....
७. बैबाहिक अवस्ता :विवाहित /अविवाहित /अन्य.....

पारिवारिक जानकारी

८. जम्मा परिवार सदस्य संख्या.....
९. महिला संख्या.....
१०. पुरुष संख्या.....
११. परिवारको प्रकार?

क. एकल ख.संयुक्त

अन्ध्रोपोमेट्रिक नापतौल:

नापतौल	मापन
तौल (के.जी)	
उचाई (से.मी)	
कम्मरको परिधि (सि.मी)	
हिप् परिधि (सि.मी)	

समाजिकआर्थिक स्थितिः

१२. तपाईको घरको मुख्य आम्दानीको श्रोत के हो?

क. कृषि ख.सेवा ग.श्रमिक घ.व्यापार ङ.अन्य.....

१३. तपाईको घरको महिनावारी आम्दानी कति छ?

क. २३०० वा कम ख. २३०१ देखि ६८५० ग.६८५१ देखि ११४५० घ. ११४५१ देखि १७१५०

ङ. १७१५१ देखि २२८५० च. २२८५१ देखि ४५७५० छ. ४५७५१ भन्दा माथि

१४. घरमा खानको प्रमुख श्रोत के हो?

क. कृषि ख.बजारबाट किन्ने ग.अनुदान घ.अन्य.....

१५. तपाईको शैक्षिक योग्यता कति छ?

क. निरक्षर ख.प्राथमिक तह ग.माध्यमिक तह घ.उच्च माध्यमिक तथा सो भन्दा माथि

१६. तपाईको घरमा कसैलाई उच्चरक्तचाप छ /थियो?

क. छ/थियो ख. छैन/थिएन

१७. यदि थियो /छ ,उसंग तपाईको नाता के हो?

बानीव्यवहार तथा खानपानको जानकारी

१८. शाकाहारी मांसाहारी

१९. एकदिनमा विभिन्न थरीका फलफुलहरु कतिको खाने गर्नु हुन्छ?

क. एकचोटि ख.दुइचोटि ग.तीनचोटि घ.एकचोटि भन्दा कम

२०. एकदिनमा बिभिन्न थरीका तरकारीहरु कतिको खाने गर्नु हुन्छ?

क. एकचोटि ख.दुइचोटि ग.तीनचोटी घ.एकचोटि भन्दा कम

२१. तपाई धुम्रोपान /सुर्ती सेवान गर्नु हुन्छ या गर्नुहुन्न ?

- क. धुम्रोपान गर्छु /सुर्ती सेवान गर्छु ख.पहिले गर्थे ग.गर्दिन
२२. एकदिनमा कति वटा चुरोटको सेवान गर्नु हुन्छ?
- क. १ देखि १० वटा सम्म ख.११ देखि २० वटा सम्म ग.२० भन्दा बढी
२३. के तपाईं माधकपदार्थ सेवान गर्नु हुन्छ ? (गर्छु /गर्दिन)
२४. माधकपदार्थ कहिले कहिले सेवान गर्नु हुन्छ ?
- क. दैनिक ख.हप्तामा एकपटक ग.हप्तामा दुइपटक घ.महिनामा एकपटक
ङ.महिनामा दुइपटक च.अन्य
२५. एकपटकमा कति पिउनु हुन्छ ?
- क. एक प्याक् ख. दुइ प्याक् ग.सानो प्याक् घ. ठुलो प्याक्
२६. तपाईंलाई मानसिक थकान कतिको हुन्छ ?
- क. दैनिक ख.हप्तामा तीन या चार चोटि ग.कहिले हुदैन
२७. के तपाईं थकान मेटाउनकालागि खानाको प्रयोग गर्नुहुन्छ ?
- क. गर्छु ख.गर्दिन
२८. यदी गर्नु हुन्छ ,कस्तो प्रकारको खाना खानु हुन्छ ?
- क. फलफुल तथा सागसब्जी ख. गेडागुडी ग. मसलादार घ.अन्य
२९. एकमहिनामा खाना पकाउदा कति तेलको प्रयोग गर्नु हुन्छ? लिटर
३०. कस्तो खानेतेलको प्रयोग गर्नु हुन्छ ?
- क. घिऊ ख.तोरीको ग.अन्य
३१. के तपाईंको नुन थपेर खाने बानी छ? (छ /छैन)
३२. एकमहिनामा कति पाकेट नुनको प्रयोग गर्नु हुन्छ ?.....
३३. दही कहिले कहिले खानु हुन्छ?
३४. दुध दैनिक खानु हुन्छ ? (खान्छु /खादिन)
३५. माछामासु हप्तामा कति चोटि खानु हुन्छ ?
३६. घिऊ खानु हुन्छ ? (खान्छु /खादिन)

उच्चरक्तचाप बारे जानकारी:

३७. के तपाईंलाई उच्चरक्तचाप भएको छ ? (छ /छैन)
३८. उच्चरक्तचापको लागि औषधि लिदै हुनुहुन्छ? (छ /छैन)

३९. रक्तचापको जाँच अन्तिम पटक कहिले गराउनु भएको थियो ?

क. एकहप्ता अगाडि ख. एकमहिना अगाडि ग. दुइमहिना अगाडि घ. छ महिना अगाडि
ङ. थाहा छैन

४०. तपाईंलाई उच्चरक्तचाप भएको कति भयो ?

क. हालसालै देखि ख. एकबर्ष जति ग. एक देखि तीनबर्ष घ. तीन देखि पाँचवर्ष
ङ. पाँच देखि दसवर्ष च. दसवर्ष भन्दा बढी भयो

४१. तपाईंलाई मधुमेह भएको छ ? (यदी छ मेडिकल रिपोर्ट हेर्नु) छ/ छैन

शाररिक क्रियाकला

४२. तपाईं दिनमा कति समय शाररिक काम गरेर बिताउनु हुन्छ ?

क.घण्टा ख. थाहा छैन

४३. तपाईं दिनमा कति समय हिडडुल गरेर बिताउनु हुन्छ ?

क.मिनेट ख.घण्टा ग. थाहा छैन

४४. तपाईं कति समय बसेर बिताउन हुन्छ ?

क.मिनेट ख.घण्टा ग. थाहा छैन

खानाको आबृति बारे प्रश्नहरु

खानाको प्रकार	दैनिक	हप्ताभरिको खपत	रिमाक्स
चामल			
गहुँ			
मकै /कोदो/जौ			
पलिश गरिएको दाल			
पूर्ण दाल			
चना /सिमी/मटर (गेडागुडी)			

पालूङ्गो/तोरीकोसाग/लट्टेसाग/ निगुरो			
आलु/फर्सी/तरुल/गाजर/फुलकोपी/ बन्दाकोपि			
स्याउ/मेवा /कोला /नरिवल/आप /सुन्तला/किसमिस			
दुध			
दही			
पनिर			
घिऊ			
सेतो मासु (कुखुराको/सुगुर)			
रातो मासु (खसी/रागा)			
माछा			

२४ घण्टामा खाएका खानेकुराहरु

	समय	खानाको विवरण	खानकोमात्रा (सरभिंग)	जम्मा (अमाउन्ट)
नास्ता				
बिहानको खाना				
दिउसको खाजा				
खाना				
सुत्नेबेला				

APPENDIX-B

Mini Nutritional Assessment Score Table

A. Has food intake declined over the past three months due to loss of appetite, digestive problems, chewing or swallowing difficulties?

Score 0 = Severe decrease in food intake

1 = Moderate decrease in food intake

2 = No decrease in food intake

B. Involuntary weight loss during the last 3 months?

Score 0 = Weight loss greater than 3 kg

1 = Does not know

2 = Weight loss between 1 and 3 kg

3 = No weight loss

C. Mobility?

Score 0 = Bed or chair bound

1 = Able to get out of bed/chair, but does not go out

2 = Goes out

a. Has the patient suffered psychological stress or acute disease in the past three months?

Score 0 = Yes 2 = No

b. Neuropsychological problems?

Score 0 = Severe dementia or depression

1 = Mild dementia

2 = No psychological problems

D. Body mass index (BMI)? (Weight in kg / height in m²)

Score 0 = BMI less than 19

1 = BMI 19 to less than 21

2 = BMI 21 to less than 23

3 = BMI 23 or greater

E. Waist circumference (WC) in cm

Score 0 = WC less than 31 1 = CC 31 or greater

Total Score: a) 12 points or greater- Normal

b) 11 points or lesser- Risk of malnutrition

c) 7 points or lesser- Malnourished

Appendix-C

केन्द्रीय प्रविधि क्याम्पस

हात्तिसार, धरान

पोषण तथा आहार विज्ञान, चौथो वर्ष

मन्जुरिनामा

नमस्कार,

मेरो नाम चन्द्रिका दंगाल हो, म केन्द्रीय प्रविधि क्याम्पस, धरानमा पोषण तथा आहार (BND), चौथो वर्षमा अध्ययनरत विध्यार्थी हुँ। यस संकायको चौथो वर्षको पाठ्यक्रम अन्तर्गत म सोधपत्र गरिरहेको छु, मेरो सोधकार्यको बिषय रहेको छ इटहरी उपमहानगरपालिका भरि रहेका जेष्ठ नागरिकहरुमा पोषण मूल्यांकनका बारे जानकारी संकलन गर्नु रहेको छ। यो जानकारीले हाम्रो अध्ययनलाई सहज बनाई हामीलाई सहयोग गर्ने छ र यस उपमहानगरपालिकाको पोषण स्थितिलाई सुधार गर्नलाई केहि मदत गर्न सकिन्छ।

यस अध्ययनका लागि सहभागी हुन तपाईं छान्निनु भएको छ र म तपाईंलाई यस सर्भेक्षणका केहि प्रश्नहरु गर्ने छु साथै तपाईंको केहि नाप पनि लिनेछु। यस सर्भेक्षणले तपाईंको स्वास्थ्य स्थिति तथा पोषण स्थिति बारे थाहा हुन्छ र पोषण सम्बन्धि विशेष हेरचाह आवश्यक पर्ने वा नपर्ने पनि थाहा पाउना सक्नु हुनेछ। अध्ययनका केहि प्रश्नहरु नितान्त व्यक्तिगत पनि हुन सक्छन् र तपाईंले दिनुभएका सबै जानकारीहरु महत्वपूर्ण हुनेछन् र सो जानकारीहरु एकदमै गोप्य राखिनेछ साथै तपाईंले दिनुभएका सूचना तथा तथ्यांकको दुरुपयोग गरिने छैन। यो अध्ययनमा तपाईंको सहभागिता स्वेच्छाले हुनेछ, यदी तपाईंलाई कुनै प्रश्न व्यक्तिगत वा संवेदनसिल लागेमा उत्तर नदिन पनि सक्नु हुन्छ। तर म यो आशा गर्दछु कि तपाईं यस अध्ययनमा सहभागी हुनु हुनेछ।

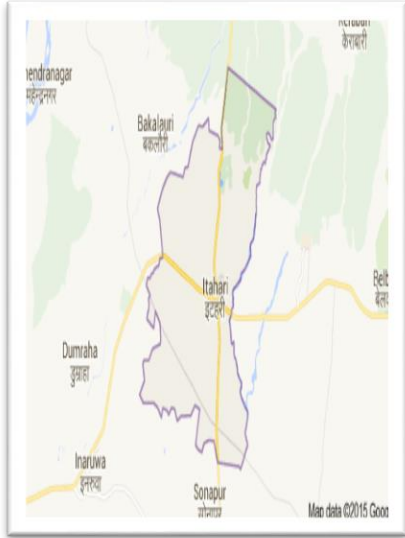
के तपाईं यस अध्ययनमा सहभागी हुन इच्छुक हुनुहुन्छ) ? इच्छुक भए मात्र प्रश्न गर्ने (म यस अध्ययनमा सहभागी हुन इच्छुक छु र यस अध्ययनका लागि आवश्यक पर्ने मेरो नापतौल लिन अनुमति दिन्छु।

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Appendix-D

Photo gallery



a) Map of Itahari



b) Measurement of height



c) Measurement of weight



d) Waist measurement