ASSESSMENT OF NUTRITIONAL STATUS, DIETARY INTAKE PATTERN AND ASSOCIATED RISK FACTOR OF ELDERLY PEOPLE LIVING IN OLD AGE HOME IN KOSHI PROVINCE, NEPAL

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Assessment of Nutritional Status, Dietary Intake Pattern and Risk Factors of Elderly People Living in Old Age Home in Koshi Province, Nepal

A dissertation submitted to the Department of Nutrition & Dietetics, Central Campus of Technology, Tribhuvan University, in partial fulfilment of the requirements for the degree of B.Sc. in Nutrition & Dietetics

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Approval Letter

This **dissertation** entitled ***Assessment of Nutritional Status, Dietary Intake Pattern and Risk Factors of Elderly People Living in Old Age Home in Koshi Province, Nepal*** by **Luna Rai** has been accepted as the partial fulfilment of the requirements for the degree of Bachelor of Science in Nutrition and Dietetics.

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Abstract

A cross-sectional study was carried out among 91 elderly (female = 52 and male = 39) people from three different old age home from three different locations of Koshi Province, Nepal. Namely Birshratni Bridhha Ashram, Mulghat, Dhankuta, Birateshowr Bridhha Ashram, Biratnagar-13, Morang and Maya Ghar, Itahari-2, Sunsari. The elderly people were selected by purposive sampling technique. A well prepared and tested questionnaire was used to gather details about their socio-demographic information, Anthropometric indices, behavioral characteristics, physical activities, dietary intake and medical history. Their weight and height were measured using a digital weighing scale and stadiometer. Information about their food intake was collected through a 24-hour food recall and a food frequency questionnaire. The data was analyzed using SPSS ver. 27 and Microsoft excel. Chi-square and Fisher's test exact tests were used to find out what factors were linked to their nutritional status.

The study found that according to BMI 7.6% elderly people were underweight, 31.8% were normal and 60.6% were overweight. Similarly, according to MNA score 36.3% were malnourished, 42.8% were at risk of malnutrition and 20.9% were well nourished. Those aged 60–69 consumed the least energy 1225.36 kcal and carbohydrates 241.01 g, along with 33.83 g protein, 26.23 g fat, 10.36 g fiber, and 146.16 mg calcium. Participants aged 70–79 had higher averages—1408.66 kcal energy, 248.89 g carbohydrates, 40.41 g protein, 22.95 g fat, 45.89 g fiber, and 123.98 mg calcium. The ≥80 years group recorded the highest energy 1521.37 kcal and carbohydrate 267.98 g intake, with 40.28 g protein, 25.77 g fat, 12.36 g fiber, and 154.84 mg calcium. Age, gender, past occupation, unhealthy lifestyle, physical activity, duration of sleep were statistically significantly associated with nutritional status of elderly people.

Contents

Approval letter ..... **iii**

Acknowledgement ..... **iv**

Abstract ..... **v**

List of tables ..... **x**

List of figures ..... **xii**

List of abbreviation ..... **xiii**

1. Introduction **1-4**

1.1 Background 1

1.2 Statement of the problem 2

1.3 Objectives of the study 3

1.3.1 General objective 3

1.3.2 Specific objectives 4

1.4 Significance of the study 4

2. Literature review **5-14**

2.1 Particularities of geriatric population 5

2.2. Nutritional challenges in geriatric population 5

2.3 Malnutrition in the elderly 6

2.4 Physiological changes impacting nutrition in the elderly 6

2.5 Nutritional status of elderly in Nepal 7

2.6 Nutritional requirements for elderly 7

2.7 Factors associated with nutritional status of elderly people 9

2.7.1 Chronic diseases 10

2.7.2 Polypharmacy 10

2.7.3 Functional dependence 10

2.7.4 Anthropometric indices 10
2.7.5 Dietary habit 11
2.7.6 Physical activity 12
2.7.7 Mental health 12
2.7.8 Social factors 13
2.7.9 Institutional food quality 13
2.8 Interventions and management 13
2.9 Mealtime behaviors and dietary patterns 13
3. Materials and methods 15-19
3.1 Research instruments 15
3.1.1 Weighing machine 15
3.1.2 Stadiometer 15
3.1.3 Measuring 15
3.1.4 Mini nutritional assessment (MNA) tool 15
3.1.5 Structured and pretested questionnaire 15
3.2 Research design 15
3.3 Study area 16
3.4 Sampling techniques 16
3.5 Sample size technique 16
3.6 Study population 17
3.7 Selection criteria 17
3.7.1 Exclusion criteria 17
3.8 Study variables 17
3.8.1 Dependent variable 17
3.8.2 Independent variables 17

3.9 Validity and reliability 18
3.10 Data collection technique 18
3.10.1 Height 18
3.10.2 Weight 19
3.10.3 Food frequency and dietary recall 19
3.11 Data analysis 19
3.12 Logistical and Ethical considerations 19
4. Results and discussions 20-43
4.1 Demographic and socioeconomic characteristics 20
4.1.1 Age distribution of the study population 20
4.1.2 Gender wise distribution of study population 20
4.1.3 Marital status of the study population 21
4.1.4 Socioeconomic factors 21
4.1.5 Type of family 24
4.2 Anthropometric indices 25
4.2.1 BMI of participants 25
4.2.2 BMI of participants of different age group and gender 26
4.3 Behavioral characteristics 27
4.3.1 Exposure to sunlight 27
4.3.2 Unhealthy lifestyle habit 28
4.4 Physical activities 28
4.5 Dietary intake 29
4.5.1 Dietary preference 29
4.5.2 Dietary information 30
4.5.3 Food frequency questionnaire 32

4.5.4 Dietary intake in a preceding day 34
4.5.5 Consumption of snacks and dry fruits 35
4.5.6 Consumption of milk 36
4.6 Medical history 36
4.7 Mini nutritional assessment 37
4.8 Comparison of nutritional status using MNA score and BMI 38
4.9 Factors associated with the nutritional status of geriatric participants 40
4.9.1 Demographic factors and nutritional status 40
4.9.2 Nutritional status of participants based on their lifestyle 42
5. Conclusions and recommendations 45
5.1 Conclusions 45
5.2 Recommendations 45
6. Summary 47
Reference 49
Appendices 54

List of Tables

Table No	Title	Page No
2.1	RDA for male	8
2.2	RDA for female	9
2.3	Classification of obesity according to 'Asian Criteria' value of BMI	11
4.1	Distribution of age of surveyed population (n=91)	20
4.2	Distribution of study population according to gender (n=91)	21
4.3	Distribution of marital status (n=91)	21
4.4	Distribution of employment (n=91)	22
4.5	Distribution of education level(n=91)	23
4.6	Distribution of monthly income (n=91)	23
4.7	Distribution of reasons for staying at old age home (n=91)	24
4.8	Distribution of family type and number of children (n=91)	25
4.9	Distribution of elderly according to their BMI (n=91)	26
4.10	BMI of different age group and gender (n=91)	26
4.11	Distribution of behavioral characteristics(n=91)	27
4.12	Distribution of physical activities in an average day (n=91)	29
4.13	Distribution of dietary preference (n=91)	30
4.14	Distribution of dietary information (n=91)	31
4.15	Distribution of food consumption (n=91)	33
4.16	Distribution of mean energy and nutrient intake of old age	35
4.17	Distribution of consumption of snacks and Dry fruits (n=91)	35
4.18	Distribution of health condition (n=91)	37
4.19	Distribution of Mini Nutritional Assessment (MNA) score (n=91)	38

4.20	Comparison of Mini Nutritional Assessment (MNA) score (n=91)	39
4.21	Demographic factors and nutritional status of participants (n=91)	40
4.22	Demographic factors and nutritional status of participants (n=91)	41
4.23	Demographic factors and nutritional status of participants (n=91)	44

List of Figures

Fig No.	Title	Page No.
2.1	Age-related changes relevant to nutrition	10
4.1	Distribution of elderly according to their unhealthy lifestyle habit	28
4.2	Distribution of consumption of milk	36
4.3	Comparison of nutritional status of elderly using MNA score and BMI.	39

List of Abbreviation

Abbreviations	Full form
MNA	Mini Nutritional Assessment
BMI	Body Mass Index
BP	Blood Pressure
CBS	Central Bureau of Statistics
MoH	Ministry of Health
MoHP	Ministry of Health and Population
GLV	Green Leafy Vegetables
NDHS	Nepal Demographic Health Survey
HTN	Hypertension
NHRC	Nepal Health Research Council
DM	Diabetes Mellitus
RDA	Recommended Daily Allowances
Kcal	Kilo calorie
gm	Gram
ESPEN	European Society for Clinical Nutrition and Metabolism
SPSS	Statistical Package of Social Sciences
NHRC	Nepal Health Research Council

ICMR	Indian Council of Medical Research
WHO	World Health Organization

Part I

Introduction

1.1 Background

Old age is generally understood as the final phase of life, following youth and middle adulthood, often associated with a gradual decline in physical or mental abilities. However, there's no universal agreement on when old age officially begins, as this can vary depending on cultural, social, and individual factors. Reaching the age of 50 is frequently used as an indicator to categorize someone as an older adult or senior in many nations (Zareen and Vasundhara, 2018). Population aging is a worldwide phenomenon, with the number and percentage of older people in almost every nation increasing. According to The United Nations in 2019, there were 703 million people worldwide who were 65 years of age or older. According to projections, the population of elderly people will double to 1.5 billion by 2050. Latin America and the Caribbean, as well as Eastern and South-Eastern Asia, have seen the fastest rates of population aging. The percentage of people 65 and older in Eastern and South-Eastern Asia almost doubled between 1990 and 2019, going from 6% to 11%. In the Caribbean and Latin America, this age group increased from 5% to 9% within the same time period (Division, 2019).

Proper nutrition is essential for supporting overall health and well-being at every stage of life and it becomes even more vital in older age. Malnutrition can appear as insufficient nutrient intake or as excessive weight gain, including overweight and obesity (Cristina and Lucia, 2021; Lucia, 2021). In 2016, global figures showed a concerning rise in chronic undernourishment, reaching 815 million people, an increase from 777 million the previous year. Older individuals are particularly vulnerable to malnutrition, especially those living alone in the community or in residential care settings. Based on data from the Mini Nutritional Assessment short form (MNA-SF), malnutrition affects between 0–8% of seniors living the community and up to 74% of those who are hospitalized or in long-term care institutions(Bhatta *et al*., 2023).

Malnutrition affects one in every six populations globally, increasing with aging. People with cognitive decline, hospitalized, or institutionalized are more susceptible. It increases long-term mortality, infection risk, and hospitalization duration, leading to higher healthcare costs. Older

adults also experience a 30% increase in hospital remissions, putting significant financial burdens on governments and individuals. Despite this, malnutrition is underreported due to inadequate screening(Abdu Oumer Abdu, 2020). Older individuals often spend more time at home and are more dependent on others, leading to loneliness, isolation from society, and neglect of parents by children. This isolation affects their functional capacity, social status, family structure, family contacts, and access to organized social services(Enisa Ramic1, 2011). A cross-sectional study of 237 elderly residents in Kathmandu Metropolitan City's assisted living facilities revealed that 15.5% of them were malnourished and, according to MNA scores, 61.0% at danger of malnutrition. Similarly, in rural areas of Nepal, revealed 38.7% had normal nutritional status, 49.7 were at risk of malnutrition, and 11.6% were malnourished. This has shown that the higher proportion of malnourished elderly individuals found among those who stayed in the old age homes as compared to people who live in their own houses (Singh and Shrestha, 2016).

1.2 Statement of the problem

Ageing in Nepal is not yet understood as a demographic or socio-economic issue, but challenges include declining fertility, increasing technological diffusion, and controlling mortality. Internal conflicts, poor socioeconomic conditions, unemployment, and inadequate resources also pose challenges. Transitions in social status, economic motives, family attitudes, and family structures also pose challenges. Coherent and aggressive policy measures are needed to address elderly issues and welfare for all in Nepal. Nepal has concerned ageing as a global issue, with a declining fertility rate and increasing life expectancy. However, understanding the ageing issue in the proper demographic and national context is crucial. In a country like Nepal, a marginal increase in older citizens poses problems due to spatial inequalities, poverty, overused land resources, stagnant economy, high illiteracy, and poor health. The increasing number of elderly citizens is a major concern in developing countries(Subedi, 1999). Nepal's government has implemented a national policy on ageing and addressed the issues of the elderly through various acts and regulations. The Civil Code 1963 includes provisions for elderly people in property rights distribution, stating that if parents want to live with a specific son or daughter, the son or daughter must take care of the parents. If the parents cannot survive on their own income, the son or daughter should care for them. Nepal has introduced a non-contributory social pension

scheme since 1994/95 to provide social security to elderly citizens, promoting family support for their well-being. This unique system is the primary universal pension scheme in Asia and a model for other developing countries. In developing countries, few have access to retirement pensions, and schemes that do not provide adequate income or coverage may need expansion (Nepal, 2010).

With increasing age, their health and functional status deteriorate, as do their physical and cognitive abilities, and the number of chronic diseases and the extent of disability in performing daily activities increases. Maintaining a good functional capacity is a crucial component of successful ageing (Chalise, 2012) . The main objective of the study is to assess the nutritional status and quality of life in the geriatric population. 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 (Hays and Roberts, 2006). Many social, psychological, and medical factors associated with aging have been suggested to impair food intake and contribute to weight loss and the potential consequences of malnutrition include a decline in functional status, impaired muscle function, decreased bone mass, immune dysfunction, anemia, reduced cognitive function, increased susceptibility to infection, and poor wound healing (Chapman, 2006). Global evaluation of physical, mental, and social states before treatment and preadaptation is fundamental to the care of the elderly to assess health problems and restore their autonomy. Management after geriatric assessment is helping to improve the survival and functional status of the elderly(Guigoz *et al*., 1996).

1.3 Objectives of the study

1.3.1 General objective

The general objective of the study is to assess the nutritional status and its associated factors of elderly population living in old age homes of the Koshi Province, Nepal.

1.3.2 Specific objectives

1. To assess the nutritional status of elderly individuals residing in old age homes using standardized tools such as the Mini Nutritional Assessment (MNA) and anthropometric measurements.
2. To find out the dietary patterns of the old age homes and selected participants.
3. To assess the relationship of nutritional status among the elderly people and socio-demographic, anthropometric indices, behavioral characteristics, physical activities, dietary intake and medical history factors.
4. To compare the nutritional status using MNA tool and BMI.

1.4 Significance of the study

1. The purpose of the study to assess physical and functional status (e.g., mobility, ability to perform daily activities) and its correlation with malnutrition or risk of malnutrition.
2. This investigation will help to find out socio-economic status, family history, dietary intake, behavior and factors using semi structured questions.
3. To explore psychological and emotional factors such as depression, loneliness, or cognitive decline that may influence nutritional status.

Part II

Literature review

2.1 Particularities of geriatric population

The geriatric population is growing globally, with increasing attention on their health, nutritional status, and quality of life. In particular, older adults residing in old age homes often face distinct health challenges compared to those living with families or in community settings. Factors such as isolation, limited mobility, chronic diseases and dependency on institutional meals may adversely affect their nutritional intake and disease profile (Zareen and Vasundhara, 2018).

The United Nations (UN) General Assembly declared 2021–2030 the UN Decade of Healthy Ageing and asked WHO to lead the implementation. The UN Decade of Healthy Ageing is a global collaboration bringing together governments, civil society, international agencies, professionals, academia, the media and the private sector for 10 years of concerted, catalytic and collaborative action to foster longer and healthier lives. The UN Decade of Healthy Ageing (2021–2030) seeks to reduce health inequities and improve the lives of older people, their families and communities through collective action in four areas: changing how we think, feel and act towards age and ageism; developing communities in ways that foster the abilities of older people; delivering person-centered integrated care and primary health services responsive to older people; and providing older people who need it with access to quality long-term care (Organization, 2024).

2.2. Nutritional challenges in geriatric population

Nutrition is an important modulator of health and well-being in older people. Inadequate nutrition contributes to the progression of many diseases and is also regarded as one important contributing factor in the complex etiology of sarcopenia and frailty (Volkert *et al*., 2019).

Nutritional intake in older people is often compromised, increasing the risk of malnutrition. Anorexia of aging is crucial in this context, especially in cases of acute and chronic illness. Reduced dietary intake combined with catabolic disease effects leads to malnutrition, which is

closely related to poor outcomes such as increased infections, pressure ulcers, hospital stays, and mortality (Morley, 2017). The definition of malnutrition is based on the ESPEN consensus, which considers the presence of unintended body mass loss, markedly reduced body mass, or muscle mass as serious signs of malnutrition. The global consensus approach (GLIM) advocates combining at least one phenotype criterion (non-volitional weight loss, low BMI, or reduced muscle mass) and one etiology criterion (reduced food intake/malabsorption or severe disease with inflammation). Older persons are at risk of malnutrition if oral intake is markedly reduced or if risk factors such as acute disease, neuropsychological problems, immobility, chewing problems, and swallowing problems are present. Malnutrition prevalence generally increases with deteriorating functional and health status, with reported rates varying depending on the definition used (Cederholm *et al*., 2015).

2.3 Malnutrition in the elderly

Poor nutritional status in the elderly is closely linked to a broad range of health complications, including reduced physical function, loss of bone density, weakened immune response, slower recovery following surgery and higher chances of hospitalization, readmission and death. Despite being a key indicator for predicting adverse health outcomes and increased healthcare costs, malnutrition in older adults is frequently overlooked. One-fourth of the patients who are nutritionally at risk do not receive nutritional support or counseling, despite having been in contact with health care professionals (Bartwal *et al*., 2016).

Every elderly individual has distinct nutritional requirements, so dietary recommendation should be individualized. The current dietary reference intake, establish to optimize health for individuals and groups, provide a guideline for assessing intake and estimating needs and reflect the latest understanding about nutrient requirement (Zareen and Vasundhara, 2018).

2.4 Physiological changes impacting nutrition in the elderly

Aging brings about several physiological changes that can negatively affect nutritional intake. These changes contribute to the increased risk of malnutrition and health complications in older adults. As the body ages, it undergoes various changes, such as a reduction in bone density, a significant slowing of nerve signal transmission, and a decline in muscle strength. This section

focuses primarily on the age-related changes in the digestive system, which can affect the digestion and absorption of nutrients in the elderly (Guo *et al*., 2025)

2.5 Nutritional status of elderly in Nepal

Age is significantly associated with nutritional status, which states that nutritional status decreases with increasing age. Similarly, educational status and past occupation were associated with nutritional status. In case of quality of life of geriatric population, 48.2% had good quality of life while 51.8% had poor quality of life. Factors such as age, ethnicity, religion, educational status, and past occupation showed a positive association with quality of life. Nutritional status was associated with overall QOL (WHO, 2015).

In a study conducted at rural eastern Nepal 24.8% of people are malnourished and 49.6% are risk of malnutrition. It has also concluded that malnutrition is higher among elderly at rural area. The study also concluded that malnutrition is more among female than male in rural area (Sharma *et al*., 2022). Regarding policies related to elderly nutrition in Nepal, there are no provisions but elderly is provided with NRs. 2000 as a social security. As elderly is a neglected topic here, government is still planning for health and nutrition policies (Singh, 2016). Likewise, study by aging Nepal in 2012 showed that, nutritional problems are more in Dalit group and people are in depression (Lyons, 2012).

The government of Nepal has formulated a national policy, act and regulations on ageing and the problems of elderly; however, this has not been operationalized because of limited resources (Shrestha, 2012). Although Nepal is moving towards elderly friendly country, some sort of hindrance is still there to negotiate with those problems. The high nutritional need blinded with financial aspect is one major concern for developing countries like Nepal. Thorough assessment and diagnosis of malnutrition among older age people are seen to be limited. Research study shows that considerable proportions of older people are affected by malnutrition worldwide. The main aim of the research is to identify the nutritional status of elderly in the community and identify factors associated with them (Sharma *et al*., 2022).

2.6 Nutritional requirements for elderly

The age and sex of an individual determine their nutritional needs. While newborns, kids, adolescents and elderly need nutrients for both development and maintenance, adults need them

for maintenance. The amount of nutrients a child needs during childhood is correlated with their rate of growth. Even people of the same age, sex, and body weight have distinct variances in their nutritional needs (Srilakshmi, 2006).

Table 2.1 RDA for male

Nutrient	**Age in year**
	51-70 year
Carbohydrate	130 mg
Protein	56 g
Fat	15.6 g
Fiber	30 g
Calcium	1200 mg
Iron	8 mg
Vitamin A	900 µg
Thiamine	1.2 mg
Riboflavin	1.3 mg
Niacin	16 mg
Ascorbic acid	90 mg
Vitamin B_{12}	2.4 µg
Magnesium	420 mg
Zinc	11 mg

Source: Stephenson (2021)

Table 2.2 RDA for female

Nutrient	Age in year
	51-70 year
Carbohydrate	130 mg
Protein	46 g
Fat	12.1 g
Fiber	21 g
Calcium	1200 mg
Iron	8 mg
Vitamin A	700 µg
Thiamine	1.1 mg
Riboflavin	1.3 mg
Niacin	14 mg
Ascorbic acid	75 mg
Vitamin B_{12}	2.4 µg
Magnesium	320 mg
Zinc	8 mg

Source: Stephenson (2021)

2.7 Factors associated with nutritional status of elderly people

Sex, gender, educational status, ethnicity, occupation, the income level, smoking status, the experience of any mistreatment, daily physical activity, having concentration problems and poly-pharmacy are the studied independent variables. Independent factors associates among the elderly population after controlling for confounders on bivariate analysis, performing a backward elimination procedure (Tamang *et al*., 2019).

As a population, older adults are more prone to age-related diseases, functional impairment, and physical inability that may interfere with the maintenance of a good nutritional status (Fig. 2.1) Aging refers to a multidimensional process in humans, the process of physical, psychological, and social changes.

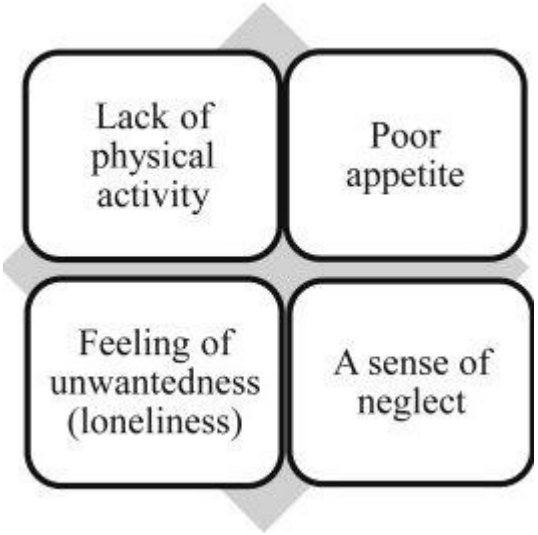

Fig. 2.1 Age-related changes relevant to nutrition

2.7.1 Chronic diseases

Chronic illnesses such as diabetes, hypertension, cardiovascular diseases, and dementia are prevalent in the elderly and often impact appetite and nutrient metabolism (WHO, 2015).

2.7.2 Polypharmacy

The use of multiple medications is common in older populations and may interfere with appetite, digestion, and nutrient absorption, contributing to poor nutritional outcomes (Salazar, 2014).

2.7.3 Functional dependence

Limited mobility and functional impairments can affect the ability to feed oneself and access meals, leading to inadequate nutritional intake (Lee and Frongillo Jr, 2001).

2.7.4 Anthropometric indices

Obesity in developed countries is a major public health concern. Obesity has a severe influence on both physical and mental 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. Body mass index (BMI) is the most commonly used anthropometric measure that has been shown to be associated with several diseases, as well as mortality (Murat *et al.,* 2021).

The height and weight measurements are used to determine the person's body mass index. BMI is calculated as the ratio of weight (kg) to height (m2). This is a useful measure for grading chronic energy deficiencies. BMI is considered a good indicator of nutritional status(Khanna *et al.,* 2022).

Table 2.3 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: ("Appropriate body-mass index for Asian populations and its implication for," 2004)

2.7.5 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(Apovian & Aronne, 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 (Starr *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).

2.7.6 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, 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, 2011).

2.7.7 Mental health

Depression and cognitive impairment are known to influence eating behavior and are significant predictors of malnutrition among the elderly (Wang *et al*., 2024).

2.7.8 Social factors

Social isolation, lack of family support, and low social engagement are linked to poorer nutritional outcomes, especially among elderly individuals in long-term care facilities (Locher *et al*., 2005).

2.7.9 Institutional food quality

The nutritional content and palatability of food served in old age homes often do not meet recommended dietary guidelines, which negatively impacts nutritional status (Ahmed and Haboubi, 2010).

2.8 Interventions and management

The management of older people with or at risk of malnutrition should be multi-modal and multi-disciplinary (Volkert *et al*., 2019). Care staff have an important role in delivering appropriate nutritional advice and support and making timely referrals for specialist dietetic advice in line with local care pathways. For example, older people with tooth loss treated with dentures or dental implants demonstrated a greater improvement in fruit and vegetable consumption when combined with dietary counselling, compared to receiving dental treatment alone (Kossioni, 2018).

In primary care settings, community healthcare professionals, especially nurses, may be able to deliver opportunistic nutritional advice and education, and there is evidence that this can positively influence the functional outcomes and diet of older people living at home (Young *et al*., 2011). Group educational sessions can be effective but older people with frailty may find it difficult to access these (Marshall *et al.,* 2017). Telehealth methods such as telephone consultations, tele-monitoring devices and internet-enabled tablets have been reported to be effective among community dwelling older people in a recent systematic review and meta-analysis (Marx *et al.*, 2018).

2.9 Mealtime behaviors and dietary patterns

Nutrition is a modifiable factor affecting the quality of life and independence of older people. The physiological, psychological and social changes during aging affect their dietary choices. Many older adults have inadequate energy and protein intake. Carbohydrate intake and intake

of total lipids, in terms of contribution to total energy intake, generally are within the recommended levels, but a decline in overall energy intake as well as the limited variety of micronutrient-dense foods that older people tend to consume result in an inadequate intake of several micronutrients. Adherence to healthy dietary patterns has been described as only moderate among older adults. Health-care practitioners should educate older people and promote healthy diets, in particular adequate energy and protein intake (Yannakoulia *et al*., 2018).

Part-III

Materials and methods

3.1 Research instruments

The following tools were utilized for data collection in the study:

3.1.1 Weighing machine

A weighing scale with a maximum capacity of 180kg and a precision of 0.1 kg was employed to measure the body weight of participants, ensuring accurate and consistent reading.

3.1.2 Stadiometer

A stadiometer capable of measuring height up to 197 cm with a precision of 0.1 cm was used to determine the height of participants, which is crucial for calculating body mass index (BMI).

3.1.3 Measuring

A set of measuring cups with capacities of 250 ml, 125 ml, 80 ml, 60 ml and 30 ml was used to estimate portion sizes and quantify dietary consumption, ensuring standardized measurements.

3.1.4 Mini nutritional assessment (MNA) tool

It includes a structured questionnaire, which was divided into either a Short Form (MNA-SF) or a Full Form (18 items). These questionnaires contain both subjective and objective questions to assess the nutritional status of elderly individuals.

3.1.5 Structured and pretested questionnaire

A well-designed and pretested questionnaire was administered to gather information on dietary patterns, nutritional intake and other relevant factors. The questionnaire was validated to ensure reliability and accuracy in data collection.

3.2 Research design

Since this research was done for short period of time, the research design chosen for this study is cross-sectional descriptive study design. A community based cross-sectional study was conducted among elderly of Bishranti Briddha Ashram, Mulghat Dhankuta, Birateshwor

Briddha Ashram, Biratnagar-13 Morang and Maya Ghar, Itharai-2 Sunsari to know the nutritional status and associated factors with it.

3.3 Study area

The study was conducted three locations Bishranti Bridhha Ashram, Mulghat, Dhankuta, Birateshwor Bridhha Ashram, Biratnagar-13, Morang and Maya Ghar, Ithari-2 Sunsari of Koshi Province in Nepal.

3.4 Sampling techniques

The study employed a purposive sampling technique, also known as judgment sampling. This method involves the deliberate selection of participants based on specific qualities or characteristics they possess, which are relevant to the research objectives.

3.5 Sample size technique

The calculation of sample size was done by a single proportional statistical formula. Sample size (n) = $Z \times \frac{p(1-p)}{d^2}$

Where,

z =confidence interval at 95 %

P= estimated prevalence of underweight in the project area

d = margin of error

We have,

Confidence interval (z) = 1.96 (Standard value)

Margin of error (m) = 8%

Estimated prevalence of underweight (p) = 16.5%

Now, sample size will be calculated using formula for infinite population as:

Sample size (n) = $(1.96)^2 \times \frac{16.5\ (100-16.5)}{8^2}$

=82.69 ≈ 83

Now the new sample size is further calculated below;

Let us assume the non-response rate is 10%

Now the required sample size is = 83+8.3

=91.3

Hence the desired sample size for conducting this survey 91.

3.6 Study population

The study population consist of elderly individuals residing in selected old age care homes across various city of Koshi Provinces, Nepal. The participants were included men and women aged 60 years and above who were permanent residents of these facilities.

3.7 Selection criteria

3.7.1 Exclusion criteria

- ✓ Pregnant women and seriously ill people.
- ✓ People who do not want to participate in study.
- ✓ People who were absent at the time of survey.

3.8 Study variables

The study variables were divided into two categories: dependent variables and independent variables.

3.8.1 Dependent variable

The nutritional status of elderly individuals with associated factors.

3.8.2 Independent variables

The independent variables of this study are-

i. Anthropometric measurements- This includes measurements of waist, hip circumference and its ration along with BMI (body mass index).

ii. Mini Nutritional Assessment (MNA) tool- It evaluates several aspects of nutrition, including anthropometric measurements, dietary intake, general health, and self-perception of health and nutrition.
iii. Socio-economic and demographic variables- It includes age, sex, education, religion, income, occupation, marital status, family size, smoking, physical activity and dietary consumption.

3.9 Validity and reliability

To ascertain the degree to which the data collection instruments were measured what they purposed to measure, the instruments were validated by a group of professionals from Central Campus of Technology, Central department of Nutrition and Dietetics. In this study, the data collection tools were validated by comparing with standard known weights (for weighing balance). Similarly, the questionnaire was checked for consistency and clarity. The data collection tools were pretested using standardized instruments.

3.10 Data collection technique

Data obtained from the respondents was collected in the structured form of a questionnaire. Stadiometer, weighing balance, and measuring tape was used for the measurement of height, weight, and body circumference respectively for the calculation of BMI.

3.10.1 Height

To measure height subject was first asked to stand straight without shoes on horizontal platform with heels together and hanging the arms loose. Head was made at Frankfurt plane, buttocks and shoulder blades in contact with vertical surface of stadiometer. He was asked to take deep breaths and stand tall to aid the straightening of the spine and shoulders relaxed. Movable headboard was lowered until it touches crown of head. Height measurement was taken at maximum inspiration, with examiner's eyes in level with headboard to avoid parallax error. Reading was taken to nearest millimeter. For reading falling between two values, lower reading was recorded. The same process was repeated 3 times for more accurate observations (WHO, 2019).

3.10.2 Weight

After emptying the bladder and wearing very little clothing, the measurement was made. The scale was set to zero and the balance was set down on a firm, level surface. The subject was instructed to stand alone in the middle of the platform, look straight ahead while remaining calm and motionless. Weight was measured to the closest 0.1 kg. The same process was repeated 3 time for more accurate observations (WHO, 2019).

3.10.3 Food frequency and dietary recall

Data on dietary intake was gathered using the 24-hour recall method and a food frequency questionnaire. The types of foods and frequency of consumption of those foods by the respondents were ascertained using the food frequency questionnaire. In the 24-hour recall, participants were asked to list every meal and beverage they had had throughout the preceding 24 hours, or the day before, starting with their first meal of the day and ending with their last meal before bed. Pictures of standardized number of different food items and locally used equipment like bowl, spoon, glass etc. were used to obtain information about the number of foods.

3.11 Data analysis

Quantitative data was first cleaned, coded, and will be entered in SPSS ver. 27. Similarly, qualitative data will be transcribed and coded by assigning labels to various categories.

3.12 Logistical and Ethical considerations

Clearance to conduct the research was obtained from the administrative authorities of the identified old age care facilities for conducting the research. The study participants were provided with oral consent prior to the study. Respondents were assured that the data was collected for the study and it was treated with the uttermost confidentiality.

Part IV

Results and discussions

A cross-sectional study to assess the nutritional status and associated factors of elderly people living in old age home was conducted in 91 people (females-52, males-39) of Koshi province, Nepal. 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 60-69 i.e. 46.3% (42). The age group ≥80 consisted 14.2% of total people i.e. 13. Age distribution of the study population is shown in table 4.1.

Table 4.1 Distribution of age of surveyed population (n=91)

Age	Frequency	Percent (%)
60-69	42	46.3
70-79	36	39.5
≥80	13	14.2
Total	91	100

4.1.2 Gender wise distribution of study population

Among 91 participants, 57.3% (52) were females and 42.7% (39) were males. There were more female participants involved in this study.

Table 4.2 Distribution of study population according to gender (n=91)

Gender	Frequency	Percent (%)
Male	39	42.7
Female	52	57.3
Total	91	100

4.1.3 Marital status of the study population

Majority of the study population were widowed 41.8% (38) and only 2.1% (2) were married. The distribution of marital status of participants is shown in Table no. 4.3.

Table 4.3 Distribution of marital status (n=91)

Factors	Frequency	Percent (%)
Single	34	37.4
Married	2	2.1
Separated / divorced	17	18.7
Widowed	38	41.8
Total	91	100

4.1.4 Socioeconomic factors

Socioeconomic factors include education level, occupation and income level of family. SES 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.

4.1.4.1 Distribution of employment

The study showed that 45(49.5%) of participants were self-employed who were mostly involved in agriculture, livestock and business. A least percent, i.e. 6.5% were government employ, 18.6% were homemaker, 25.4% were other who were involved in abroad, transportation, construction. The distribution of occupation of family heads is shown in Table no. 4.4.

Table 4.4 Distribution of employment (n=91)

Employment	Frequency	Percent (%)
Homemaker	17	18.6
Self-employed	45	49.5
Government employ	6	6.5
Other	23	25.4
Total	91	100

4.1.4.2 Education level

Almost half, i.e. 46.2% (42) of participants had no formal education, 34.1% (31) had education level up to primary school, 17.6% (16) were graduated from primary/secondary school and 2.1% (2) were above who had done post graduated. The distribution of education level of family heads is shown in Table 4.5.

Table 4.5 Distribution of education level (n=91)

Education level	Frequency	Percent (%)
No formal education	42	46.2
Less than primary	31	34.1
Primary/secondary school completed	16	17.6
Above	2	2.1
Total	91	100

4.1.4.3 Earning range of monthly income

The study showed that 23(25.3%) participants had monthly income greater than Rs.15,0000. Similarly, 39(42.9%) participants had monthly income between Rs. (10,000 -15,000), 12.1% (11) of participants had monthly income between Rs. (5,000-10,000) and 19.7%(18) of participants had monthly income between Rs. (2,000-5,000). The distribution of monthly income is showed in Table no 4.6.

Table 4.6 Distribution of monthly income (n=91)

Income	Frequency	Percent (%)
2000-5000	18	19.7
5-10,000	11	12.1
10,000-15,000	39	42.9
Above 15,000	23	25.3
Total	91	100

4.1.4.4 Reasons for staying at old age home

The study showed the distribution of participants living at old age home according to their reasons for staying at old age home. It was observed that majority 40.7% (37) of participants stayed at old age home for potential isolation by themselves, 24.1% (22) of the participants have no financial support and 30.9% (28) participants were there because of loneliness, whereas 4.3% (4) of the subjects were stayed at old age because of their children settled abroad.

Table 4.7 Distribution of reasons for staying at old age home (n=91)

Reason	Frequency	Percent (%)
Self	37	40.7
No financial support	22	24.1
Loneliness	28	30.9
Children settled abroad	4	4.3
Total	91	100

4.1.5 Type of family

The study showed that 36.3% (33) of the participants were from single families, 13.2% (12) were from nuclear families and 50.5% (46) of the participants were from joint families. The study also showed that 41.8% (38) of participants had one or two children, 14.3% (13) of participants had three or four children and 6.5% (6) of participants had five or six childrens. The rest of .43 (37.4%) of participants had no children. The distribution of type of family and number of children is shown in Table no 4.8.

Table 4.8 Distribution of family type and number of children (n=91)

Factors	Frequency	Percent (%)
Family Type		
Single	33	36.3
Nuclear	12	13.2
Joint	46	50.5
Extended	-	-
Total	91	100
Number of children		
1-2	38	41.8
2-4	13	14.3
4-6	5	6.5
≥7	-	-
Total	91	100

4.2 Anthropometric indices

4.2.1 BMI of participants

The study showed that the distribution of participants living in the old age home according to their BMI. The study also showed that majority 60.6% (55) of the participants living at old age home fell under the overweight, 31.8% (29) of them were with normal BMI and 7.6% (7) amongst them were being underweight. It was observed that majority 60.6% of participants living at old age home were found to be obese. The distribution of elderly according to their BMI is shown in Table no. 4.9.

Table 4.9 Distribution of elderly according to their BMI (n=91)

Category	Frequency	Percent (%)
underweight	7	7.6
normal	29	31.8
overweight	55	60.6
Total	91	100

4.2.2 BMI of participants of different age group and gender

As age advances, i.e. 80 and above, the percentage of total overweight participants were more (10.9%). The percentage of older people who were overweight was comparatively greater in the age group of (60-69) i.e. 26.4%. In term of gender overweight prevalence was similar among females (30.7%) and males (29.8%). 20.8% of female participants had normal BMI and 10.9% of male participants had normal BMI. The age group of 80 and above had comparatively normal BMI i.e. 2.2% than the age group of 60-69 i.e. 14.3% and age group 70-79 i.e. 15.3% respectively. Most participants in the study were in the overweight category, followed by those with a normal BMI, while underweight individuals were the least represented.

Table 4.10 BMI of different age group and gender (n=91)

Variables	BMI		
	Underweight	Normal	Overweight
Gender			
Female	5 (5.5 %)	19 (20.8 %)	28 (30.7 %)
Male	2 (2.3 %)	10 (10.9 %)	27 (29.8 %)
Age			
60-69 yrs	5 (5.5 %)	13 (14.3 %)	24 (26.4 %)
70-79 yrs	1 (1.1 %)	14 (15.3 %)	21 (23.2 %)

80 yrs and above	1 (1.1 %)	2 (2.2 %)	10 (10.9 %)

4.3 Behavioral characteristics

4.3.1 Exposure to sunlight

The study showed that the distribution of participants living at old age home according to their behavioral characteristics. From the study, very few percent i.e. 18.7% (17) of participants were not exposed to sunlight on daily basis and 81.3% (74) of participants were found to have daily exposure to sunlight. Majority of the participants 39 (42.8%) used to sleep less than 5 hours daily, 51.6%(47) of participants used to sleep between 5-6 hours daily, 5.6%(5) of participants used to sleep between 6-7 hours and none of participants were reported to sleep more than 8 hours daily. The distribution of behavioral characteristics is shown in Table no. 4.10.

Table 4.11 Distribution of behavioral characteristics (n=91)

Factors	**Frequency**	**Percent**
Exposure to sunlight		
Yes	74	81.3
No	17	18.7
Total	91	100
Sleeping Hours		
≤ 5 hrs	39	42.8
5-6 hrs	47	51.6
6-7 hrs	5	5.6
≥8 hrs	-	-
Total	91	100

4.3.2 Unhealthy lifestyle habit

The study showed that the distribution of participants living at old age home according to their unhealthy lifestyle.

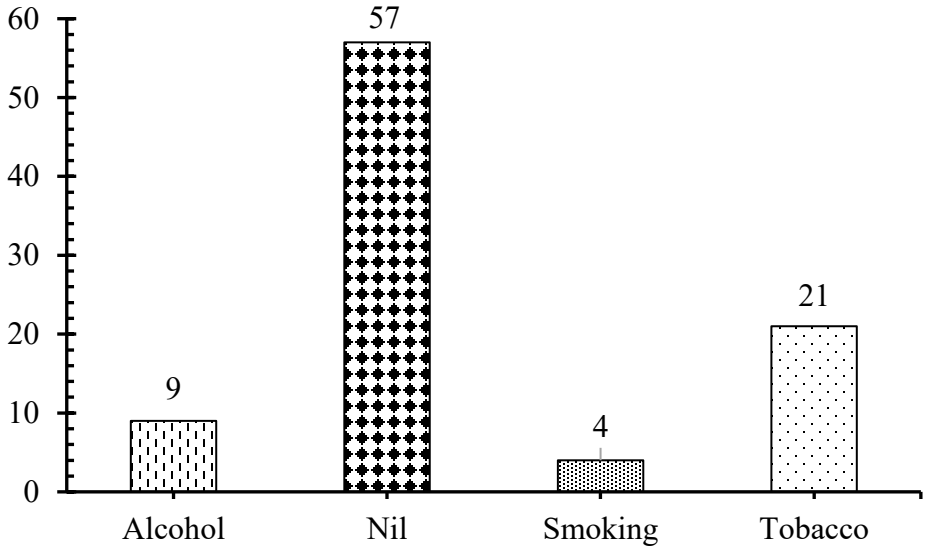

Fig. 4.1 Distribution of elderly according to their unhealthy lifestyle habit (n= 91)

4.4 Physical activities

The study showed that walking is the most common form of physical activity, with 56.1% (51) of participants and 29(31.8%) of participants practiced yoga in daily basis. The remaining participants, i.e. 11(12.1%) were not engaged in any physical activity at all. None of the participants were reported jogging as their physical activity, indicating either a lack of interest or potential barriers such as health limitations or environmental constraints. The distribution of physical activities is shown in Table no. 4.11.

Table 4.12 Distribution of physical activities in an average day (n=91)

Factors	Frequency	Percent
Physical activity		
Walking	51	56.1
Jogging	-	-
Yoga	29	31.8
Nil	11	12.1
Total	91	100

4.5 Dietary intake

4.5.1 Dietary preference

The study showed that the distribution of participants living at old age home according to their food preference. It was observed that majority 71.4% (65) of the participants were non vegetarian, followed by 28.6 % (26) of the participants were vegetarian. There were no participants who identified as ovo-vegetarian or vegan, indicating that these dietary patterns are either uncommon or not well recognized. The distribution of dietary preference is shown in Table no. 4.13.

Table 4.13 Distribution of dietary preference (n=91)

Food preference	Frequency	Percent (%)
Vegetarian	26	28.6
Non vegetarian	65	71.4
Ovo vegetarian	-	-
Vegan	-	-
Total	91	100

4.5.2 Dietary information

The study showed that the distribution of participants living at old age home according to their dietary information. The study showed that number of meals consumed per day for 3-4 meals were high 58.3% (53) amongst the participants, followed by 41.7%(38) of the participants consumed ≤ 3 meals per day. The study also showed the meal timings of participants where 70.3% (64) had regular and 29.7% (27) of the participants had irregular meal timing. The majority of participants 43(47.3%) never skipped meals, indicating a generally consistent eating pattern. The type diet consumed by majority 97.8% (89) were Normal diet, 2.2% (2) of the participants were on soft diet. Elderly practicing in religious fasting were 19.7% (18) weekly and 12.1% (11) monthly. It was observed that majority of the participants consumed 3-4 meals per day on a normal diet with no fasting. The distribution of dietary information is shown in Table no.4.13.

Table 4.14 Distribution of dietary information (n=91)

Characteristics	Frequency	Percent
Number of meals per Day		
≤ 3 meals	38	41.7
3-4 meals	53	58.3
4-5 meals	-	-
≥ 6meals	-	-
Total	91	100
Meal timings		
Regular	64	70.3
Irregular	27	29.7
Total	91	100
Skipping of meals		
Sometimes	9	9.9
Often	21	23.1
Rarely	18	19.7
Never	43	47.3
Total	91	100
Type of diet Consumed		
Normal diet	89	97.8
Soft diet	2	2.2
Semi solid diet	-	-

Liquid diet	-	-
Total	91	100
Fasting		
Weekly	18	19.7
Monthly	11	12.1
Yearly	-	-
None	62	68.2
Total	91	100

4.5.3 Food frequency questionnaire

The study showed that the distribution of participants living at old age home according to their food consumption. The study showed that root and tubers were consumed frequently by the participants, with 68.2 % (62) eating them twice a week. A small proportion i.e. 8.7 % (8) participants consumed them daily, while 23.1 % (21) participants had them once a week. This indicated that root and tubers had been a staple part of their diet. Other vegetables were consumed by 72.7 % (66) twice a week and 5.4 % (5) participants had them once a week. Non vegetarian participants were 71.4 % (65) in old age home where 36.4 % (33) participants consumed it once a week, 5 (5.4%) participants consumed twice a week and 27 (29.7%) once a month, while 28.5 % (26) of the participants were vegetarian. The consumption of fruits in old age home were low, as 36.2 % (33) of the participants reported eating fruits only once a week and 63.8 % (58) of the participants reported eating fruits only once a month, highlighting a significant gap in fruit intake and the potential need for nutritional awareness. It was observed that the numbers of participants living in old age home were non vegetarian and they consume green leafy vegetables in moderate quantity.

Table 4.15 Distribution of food consumption (n=91)

Characteristics	Frequency	Percent (%)
Root and tubers		
Everyday	8	8.7
Ones a week	21	32.1
Twice a week	62	68.2
Ones a month	-	-
Total	91	100
Other vegetable		
Everyday	17	18.7
Ones a week	5	5.4
Twice a week	66	72.7
Ones a month	3	3.2
Total	91	100
Non vegetarian		
Everyday	-	-
Ones a week	33	36.4
Twice a week	5	5.4
Ones a month	27	29.7
Never	26	28.5
Total	91	100
Fruit		

Everyday	-	-
Ones a week	33	36.2
Twice a week	-	-
Ones a month	58	63.8
Total	91	100

4.5.4 Dietary intake in a preceding day

Participants aged 60–69 years consumed an average of 1225.36±307.46 kcal of energy, 241.01±41.91 g of carbohydrates, 33.83±6.26 g of protein, 26.23±45.49 g of fat, 10.36±3.21 g of fiber, and 146.16±140.97 mg of calcium. Those aged 71–79 years had higher intakes, averaging 1408.66±288.12 kcal of energy, 248.89±65.73 g of carbohydrates, 40.41±13.91 g of protein, 22.95±8.87 g of fat, 45.89±164.56 g of fiber, and 123.98±146.23 mg of calcium. The ≥80 years group consumed the highest average energy (1521.37±344.05 kcal) and carbohydrates (267.98±47.78 g), along with 40.28±10.69 g of protein, 25.77±9.95 g of fat, 12.36±3.19 g of fiber, and 154.84±23.53 mg of calcium. Overall, energy and carbohydrate intake tended to increase with age, while protein, fat, fiber, and calcium intake fluctuated across age groups.

Table 4.16 Distribution of mean energy and nutrient intake of old age

Age group	Calories	Crabs.	Protein	Fat	Fiber	Calcium
60-69	1225.36±307.46	241.01±41.91	33.83±6.26	26.23±45.49	10.36±3.21	146.16±140.97
71-79	1408.66±288.12	248.89±65.73	40.41±13.91	22.95±8.87	45.89±164.56	123.98±146.23
Above 80	1521.37±344.05	267.98±47.78	40.28±10.69	25.77±9.95	12.36±3.19	154.84±232.53

4.5.5 Consumption of snacks and dry fruits

The study showed that the distribution of participants living at old age home according to their consumption of snacks and dry fruits. The study showed that majority of participants 70.3 % (64) consumed snacks. In contrast, none of the participants had consumed dry fruits, indicating a complete lack of dry fruit intake. The study showed that snacks were a common part of the participant's diet where as dry fruits were entirely absent from their consumption patterns.

Table 4.17 Distribution of consumption of snacks and Dry fruits (n=91)

Characteristics	**Frequency**	**Percent**
Snacks		
Yes	64	70.3
No	27	29.7
Total	91	100
Dry fruits		
Yes	-	-

No	91	100
Total	91	100

4.5.6 Consumption of milk

The study showed that the distribution of participants living at old age home according to their consumption of milk.

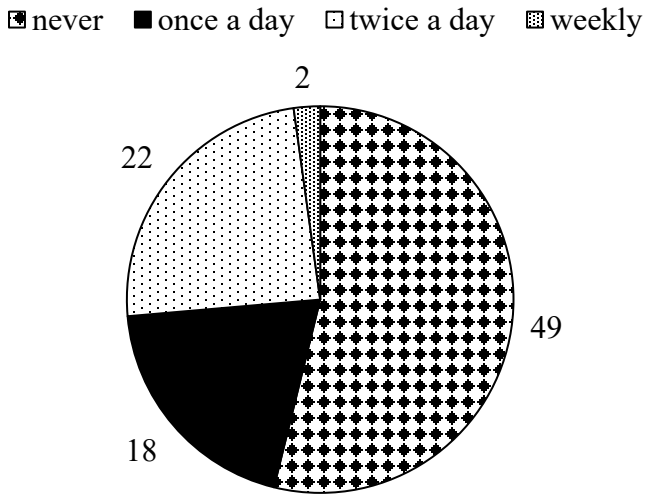

Fig. 4.2 Distribution of consumption of milk (n= 91)

4.6 Medical history

The study showed that the distribution of participants living at old age home according to their health condition. The study showed that 46.2 % of the participants were suffering with dizziness, followed by 39.6 % of them were suffering from insomnia, 48.3 % of diabetes, 57.8 % of hypertension, 35.2 % of arthritis, 16.5 % of osteoporosis, 31.9 % of heart problem and 2.1 % were with no medical history having none of the above dizziness, frequent infection. It was observed that participants residing in old age home were more prone to hypertension, diabetic, dizziness and insomnia but no one had asthma. Hence it was observed that the above conditions were seen more in all the participants living in old age home.

Table 4.18 Distribution of health condition (n=91)

Symptoms	Frequency	Percent
Dizziness	42	46.2
Insomnia	36	39.6
Diabetes	44	48.3
Hypertension	48	52.8
Arthritis	32	35.2
Osteoporosis	15	16.5
Asthma	-	-
Heart problem	29	31.9
Any other	33	36.2
None	2	2.1

4.7 Mini nutritional assessment

The study showed that the distribution of participants living at old age homes according to their Mini Nutritional Assessment (MNA) score. The study showed that the participants living in old age homes, 36.3% (33) of them were malnourished. Similarly, 42.8% (39) were at risk of malnutrition, while only 20.9% (19) among them were well nourished. Thus, it was observed that majority 42.8% (39) of the participants living at old age home were at risk of malnutrition when compared to the participants 36.3% (33) were malnourished living at old age home. The study showed that poor nutrition was common among the participants.

Table 4.19 Distribution of Mini Nutritional Assessment (MNA) score (n=91)

Malnutrition indicator score	MNA score	Frequency	Percent (%)
Malnourished	≤ 7	33	36.3
At risk of malnutrition	8-11	39	42.8
Well nourished	12-14	19	20.9
Total		91	100

4.8 Comparison of nutritional status using MNA score and BMI

The study showed that the distribution of participants living at old age home according to their nutritional status comparison using MNA score and BMI. It was observed that according to BMI 8.3 % of the participants were malnourished, whereas 56.2 % were well nourished and 35.5 % were at the risk of malnutrition. Thus, it was observed that according to BMI, 8.3 % of the participants living at old age home were malnutrition when compared with MNA score 36.9 % of participants were also seen to be malnourished, similarly according to BMI 35.5 % of the participants living at old age home were at risk of malnutrition when compared with MNA score 41.3 % of participants living at old age home were at risk of malnutrition and 56.2 % of participants were well nourished according to BMI when compared with MNA 21.8 % were well nourished. This indicated that the MNA identified more people at risk or already malnourished than BMI alone.

Table 4.20 Distribution of Mini Nutritional Assessment (MNA) score (n=91)

Residence	Frequency	Percent (%)
Well Nourished		
BMI	55	60.6
MNA	19	20.9
At risk of malnutrition		
BMI	29	31.8
MNA	39	42.8
Malnourished		
BMI	7	7.6
MNA	33	36.3

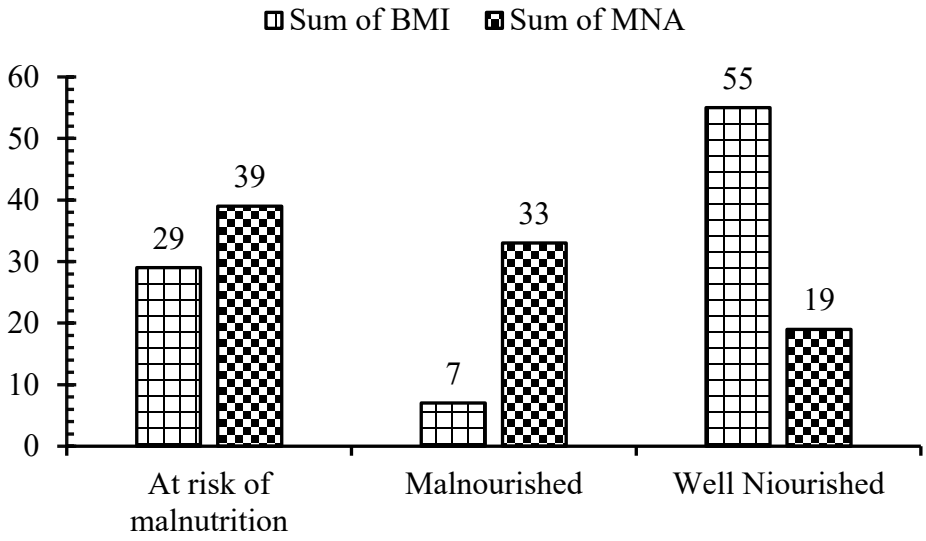

Fig. 4.3 Comparison of nutritional status of elderly using MNA score and BMI (n= 91).

4.9 Factors associated with the nutritional status of geriatric participants

4.9.1 Demographic factors and nutritional status

4.9.1.1 Age categorization and nutritional status

Prevalence of malnutrition was higher in the age group of 60-69 (40.5%) than age group of 80 years and above (23.1%) and 70-79 (33.4%). The risk of malnutrition was half i.e. 50% in age group of 60-69. The result of the study showed that the proportion of participants with normal nutritional status increased with age, from 9.5% in the 60–69 years group to 38.5% in the ≥80 years group. This study identified no statistically significant association between age classification and nutritional status, but Devendra Singh's research showed a significant association between the age and nutritional status(Singh, 2016).

4.9.1.2 Gender and nutritional status

Malnutrition was (42.3%) in females and (28.2%) in males. The risk of malnutrition was high in males (43.6%). A significant association was shown between gender and nutritional status. 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).

Table 4.21 Demographic factors and nutritional status of participants (n=91)

Variables	Nutritional Status			P-value
	Malnourished	Risk of malnutrition	Normal	
Age				
60-69 yrs	17 (40.5%)	21 (50%)	4 (9.5%)	
70-79 yrs	12 (33.4%)	14 (38.9%)	10 (27.7%)	0.141
80 yrs and above	3 (23.1%)	5 (38.5%)	5 (38.5%)	
Gender				
Male	11 (28.2%)	17 (43.6%)	11 (28.2%)	0.225
Female	22 (42.3%)	22 (42.3%)	8 (15.4%)	

4.9.1.3 Past occupation and nutritional status of participants

Geriatric people who were government employed in the past were more malnourished (66.8%) than the people who were in other occupation. Risk of malnutrition was shown high in homemaker people i.e. (64.8%). This can be explained by the possibility that elderly individuals in employment have high financial standing, which makes healthy food affordable(Ghimire *et al*., 2017).

4.9.1.4 Literacy and nutritional status of participants

The risk of malnutrition decreased with higher educational attainment. Participants with no formal education had the highest prevalence of malnutrition (38.1 %), while those with primary or secondary education had the lowest (6.25 %). The proportion of normal nutritional status increased with education level, from 7.2 % in the no formal education group to 56.3 % in the primary/secondary education group. The calculated relative risk indicated that participants with no formal education were approximately 6 times more likely to be malnourished compared to those who had completed primary or secondary education. No statistically significant association was observed between educational status and nutritional status of the respondents in the study by Devendra Singh (Singh, 2016).

Table 4.22 Demographic factors and nutritional status of participants (n=91)

Variables	**Malnourished**	**Nutritional Status**		**P-value**
		Risk of malnutrition	**Normal**	
Past Occupation				
Homemaker	2(11.7)	11(64.8)	4(23.5)	
Self employed	14(31.2)	19(42.1)	12(26.7)	0.031
Government employ	4(66.8)	2(33.2)	0(0)	

Other	7(30.4)	5(21.8)	11(47.8)	
Educational level				
No formal education	16(38.1)	23(54.7)	3(7.2)	
Less than primary	4(12.9)	19(61.3)	8(25.8)	<0.001
Primary/ Secondary completed	1(6.2)	6(37.5)	9(56.3)	
Above	2(100)	0(0)	0(0)	

4.9.2 Nutritional status of participants based on their lifestyle

4.9.2.1 Unhealthy lifestyle and nutritional status

Malnutrition prevalence was highest among participants who consumed alcohol (66.7 %) and lowest among smokers (0 %) and tobacco users (23.8 %). Tobacco users had a lower malnutrition prevalence (23.8 %) but the highest proportion at risk of malnutrition (61.9 %). The proportion of participants with normal nutritional status was highest among smokers (25%) and those with no history of alcohol or tobacco use (21.1 %). 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, 2016).

4.9.2.2 Physical activity and nutritional status

Walking was the most common form of physical activity and was associated with a relatively lower prevalence of malnutrition (23.5 %) compared to yoga (27.6 %) and no activity (36.4 %). The highest proportion of normal nutritional status was observed among yoga practitioners (31.1 %), followed by those who walked (11.8 %). Participants who reported no physical activity ("nil" group) had (36.4 %) malnourished, (63.6 %) at risk and none with normal nutritional status. The main reasons for physical inactivity among older people are the presence of diseases, fear of injury and falls, lack of energy and weakness, low motivation level, lack of partners or friends for joint activities (Bashkireva *et al*., 2019).

4.9.2.3 Duration of sleep and nutritional status

There was no correlation found between sleep duration and nutritional health. Malnutrition prevalence was highest among participants sleeping less than 5 hours (41.1 %) and those sleeping 5–6 hours (40.4 %). However, those with shorter sleep duration (<5 hours) had a much higher proportion of normal nutritional status (23.1 %) compared to the 5–6 hour group (2.1 %). For elderly people, the National Sleep Foundation suggested 7-8 hours of sleep every night. 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 outcome(Silva *et al.*, 2016).

Table 4.23 Demographic factors and nutritional status of participants (n=91)

Variables	**Nutritional Status**			**P-value**
	Malnourished	**Risk of malnutrition**	**Normal**	
Unhealthy lifestyle				
Alcohol	6(66.7)	3(33.3)	0(0)	
Tobacco	5(23.8)	13(61.9)	3(14.3)	0.173
Smoking	0(0)	3(75)	1(25)	
Nil	18(31.6)	27(47.3)	12(21.1)	
Physical activity				
Walking	12(23.5)	33(64.7)	6(11.8)	
Jogging	0(0)	0(0)	0(0)	0.070
Yoga	8(27.6)	12(41.3)	9(31.1)	
Nil	4(36.4)	7(63.6)	0(0)	
Duration of sleep				

≤ 5	16(41.1)	14(35.8)	9(23.1)	
5-6	19(40.4)	27(57.5)	1(2.1)	0.030
6-7	1(20)	3(60)	1(20)	
≥ 8	0(0)	0(0)	0(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 36.3%, 42.8% were at risk of malnutrition and 20.9% were normal.
ii. The result of this study concludes that the malnutrition is the major nutritional problem in the geriatric people.
iii. Gender differences existed, with 42.3% females more likely to be malnourished than 28.2% males.
iv. Lower education was strongly linked to malnutrition, with no formal education with 38.1%.
v. Physical inactivity and short sleep duration were linked to poorer nutrition.
vi. Dietary patterns revealed inadequate fruit and dairy intake, and reliance on carbohydrate-rich foods, with minimal dry fruit consumption.
vii. MNA identified more at-risk individuals than BMI alone, highlighting the need for functional assessment in addition to anthropometry.
viii. In this study a significant association was found between nutritional status and gender ($p= 0.225$).

5.2 Recommendations

The result of this study suggests the following recommendations:

i. A timely intervention should be done in by health and nutritional professionals regarding undernutrition, food consumption habits and co-morbidities.
ii. 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.

iii. The need is to increase awareness at community and clinical settings regarding malnutrition.

iv. Organize group activities, social events and mental health support sessions to reduce loneliness and depression, which indirectly affect appetite and nutrition.

v. In Policy and institutional support, government should advocate nutrition programs in old age homes including elderly nutrition in national health and social care policies.

vi. Integrate dietary therapy with disease-specific nutritional advice to establish routine medical check-ups for diabetes, hypertension and other chronic illnesses.

Summary

Aging has emerged as a global challenge, with declining fertility rates and increasing life expectancy contributing to a rapid growth in the elderly population, which is now surpassing the younger population in many countries. As the number of older adults rises, so do the issues they face. Among these, malnutrition stands out as a leading contributor to mortality in the geriatric community.

An analytical cross-section study was conducted on a sample of 91 geriatric population (females-52, males-39) to assess the nutritional status of geriatric people of Old aged home care. The current study presents the nutritional status of the geriatric population and factors associated with the nutritional status of the geriatric population in different sectors of Koshi Provision, Nepal. 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) 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.

Findings showed that overall the prevalence of malnutrition in geriatric people was found to be 36.3%, 42.8% were at risk of malnutrition and 20.9% were 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(42.3%) than males (28.2%). It consist of majority of people at survey were widowed (41.8%), most of them were self employed (49.5%), most of them had their no formal education (46.2%), most of the reason for participants to stay at old age home were self decision (40.7%), most of the family had moderate source of income i.e 10-15,000 (42.9%), most of the participants were from joint family (50.5%), most of them had overweight Body Mass Index (60.6%) respectively. A significant association was found between nutritional status and gender ($p= 0.225$).

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

Nutritional Status and Associated Factors of Elderly People Living In Old Age Home in Koshi Province, Nepal

1. General Information

a) Name:

b) Age

- 60-70
- 70-80
- Above 80

c) Gender: ☐ Male ☐ Female

2. Anthropometric Data

a) Height (cm):

b) Weight (kg):

c) BMI (kg/m^2):

3. Demographic Data

7. Education status

A) No formal education B) Less than primary

C) Primary/ Secondary school completed D) Above

8. Type of occupation

A) Homemaker B) Self employed

C) Government employ D) Other

9. If earning range of monthly income

A) 2 - 5,000 B) 5 - 10,000

C) 10 - 15,000 D) Above 15,000

10. Marital status

A) Single B) Married

C) Separated /Divorced D) Widowed

11. Reason for staying at old age home

A) Self B) No financial support

C) Loneliness D) Children settled abroad

4. Dietary Information

12. Type of family you had

A) Extended B) Joint

C) Nuclear D) Single

13. Number of children you have

A) 1 – 2 B) 2 – 4

C) 4 – 6 D) ≥ 7

14. Active participation / Involvement in social activities

A) YES B) No

15. Type of occupation

A) Homemaker B) Self employed

C) Government employee D) Other

16. What are the Food Preferences?

A) Vegetarian B) Non vegetarian

C) Ovo vegetarian D) Vegan

17. How many Number of meals consumed in a Day

A) ≤ 3meals B) 3 – 4 meals

C) 4 – 5 meals D) ≥ 6 meals

18. What are the timings of Meal?

A) Regular B) Irregular

19. Skipping of meal

A) Sometimes B) Often

C) Rarely D) Never

20. Consistency of diet you consume daily

A) Normal diet B) Soft diet

C) Semi solid diet D) Liquid diet

21. Type of diet is consumed

A) Regular diet B) Neutropenic diet (weakened immune system)

C) Therapeutic diet (food allergies) D) Restricted diet

22. Religious fasting

A) Weekly B) Monthly

C) Yearly D) None

5. Food Frequency Questionnaire

23. If you are a vegetarian, what vegetables do you consume?

A) Green leafy vegetables B) Seasonal vegetables

C) Root and tubers D) other vegetables

24. How often you consume green leafy vegetables like Spinach:

A) Everyday B) Once a week

C) Twice a week D) Once a month

25. How often you consume Root and tubers:

A) Everyday B) Once a week

C) Twice a week D) Once a month

26. How often do you consume other vegetables?

A) Everyday B) Once a week

C) Twice a week D) Once a month

27. If you are non vegetarian, how often do you consume non vegan.

A) Daily B) Once a week

C) Twice a week D) Never

28. What you consume in Non vegetarian mostly:

A) Poultry B) Meat

C) Egg D) Sea food

29. How often do you consume Non vegetarian food?

A) Everyday B) Once a week

C) Once a month D) Never

30. How often do you consume fruits?

A) Everyday B) Once a week

C) Twice a week D) Once a month

31. How many serving of cereals are consumed in a day:

A) 1 serving B) 2 – 3 servings

C) 4 – 5 servings D) More than 5 servings

32. How many serving of pulses are consumed in a day:

A) 1 serving B) 2 – 3 servings

C) 4 – 5 Servings D) More than 5 servings

33. How often do you consume milk?

A) Once a day B) Twice a day

C) Weekly D) Never

34. Do you consume snacks?

A) Yes B) No

35. If yes, what type of snacks do you prefer?

A) Chips B) Biscuits

C) Bakery items D) Samosa

36. What kind of Unhealthy life style habits do you carry?

A) Tobacco B) Smoking

C) Alcohol D) Nil

37. How often do you consume sweet?

A) Everyday B) Once a week

C) Alternate day D) Once a month

38. Do you consume Dry fruits?

A) Yes B) No

39. How often do you consume drink carbonated beverages?

A) Everyday B) Once a week

C) Fortnightly D) Once a month

6. Disease Profile

40. Do you have any medical history?

A) Yes B) No

41. If YES specify:

42. Have you recently experienced any kind of change in your weight?

A) Gain B) Lost

C) Gain or loss rapidly D) None

43. How many hours of sleep do you have per night:

A) ≥ 8 hours B) 6 – 7 hours

C) 5 – 6 hours D) ≤ 5 hours

44. What kind of physical activities you do in an average day:

A) Walking B) Jogging

C) Yoga D) Nil

45. Do you expose yourself to sunlight?

A) Yes B) No

46. If YES, what is the duration of exposure to sunlight?

A) 5 mins B) 5 – 10 mins

C) 10 – 15 mins D) more than 30 mins

47. Number of consultation in the past 6 months:

A) 1 – 2 B) 2 – 3

C) 3 – 4 D) None

48. Number of Polypharmacy (Number of medication)

A) 1 – 2 B) 2 – 3

C) ≥ 3 D) Nil

49. Suffering from any of the following condition:

Symptoms	Yes	No
1) DIZZINESS		
2) INSOMNIA		
3) DIABETES		
4) HYPERTENSION		
5) ARTHRITIS		
6) OSTEOPOROSIS		
7) ASTHMA		
8) HEART PROBLEMS		
9) ANY OTHER		
10) NONE		

50. How do you rate your health?

A) Poor B) Fair

C) Good D) Excellent.

APPENDIX – II

MINI NUTRITION ASSESSMENT (MNA)

(Nestle Nutrition Institute)

Complete the screen by filling in the boxes with the appropriate numbers.

First name:

Last name:

Sex:

Age:

Weight, kg:

Height, cm:

Date:

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 3 kg (6.6 lbs)

1 = does not know

2 = weight loss between 1 and 3 kg (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

F1) 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

24 Hour Dietary Recall: Time Recipe Ingredients Amount Serving size

Timing	Time	Description of food	Amount	Quantity/Serving size
Breakfast				
Lunch				
Snacks				
Dinner				

Appendix-B

Consent form

Hello, I am Luna Rai, a student of BSc. Nutrition and Dietetics at Central Campus of Technology, Dharan. For the completion of this bachelor's degree I need to carry out a dissertation.

The topic for the study is **"**Nutritional Status and Associated Factors of Elderly People Living In Old Age Home in Koshi Province, Nepal".

This is a survey to help understand the current situation and need of the community. There are no entitlements attached to participation in the survey. Participation is voluntary and you can decide not to answer some questions and stop the interview anytime. I guarantee confidentiality of data collected. It will take around 30 minutes of your time. Are you willing to take the interview?

I hereby give consent to participate in the above study. I am also aware that I can withdraw this consent at any later date, if I wish to. This consent form being signed voluntarily indicates participate in the study until I decide otherwise. I understand that I will receive a signed and dated copy of this form.

I have signed this consent forms before my participation in the study.

Signature of parent: _____ Sign of witness: _____

Date:

Place:

I hereby state the study procedures were explained in the detail and all questions were fully and clearly answered to the above mentioned participant /his/her relative.

Investigator's sign:

Date:

Appendix- C

Photo gallery


माया घर नेपाल
केन्द्रीय कार्यालय इटहरी-२, सुनसरी (कोशी प्रदेश) नेपाल
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माया घर नेपाल
तपाईको जन्मदिन, विवाह, आफन्तहरूको सम्झनामा एक छाक भोजन गराउन सक्नु हुनेछ ।