博士論文

Frailty and adverse health outcomes in

older people in Kathmandu Valley, Nepal:

a cross-sectional study

**(ネパールカトマンドゥ地域における高齢者のフレイルと
その健康への悪影響)**

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Abbreviations

ADL: Activities of Daily Living

AOR: Adjusted Odds Ratio

β: Standardized beta coefficient

χ^2: Chi-square

CI: Confidence Interval

GARS: Groningen Activity Restriction Scale

GFI: Groningen Frailty Indicator

GoN: Government of Nepal

IADL: Instrumental Activities of Daily Living

LMICs: Low and middle income countries

OR: Odds Ratio

QOL: Quality of Life

r_s: Spearman correlation coefficient

SD: Standard Deviation

USD: US Dollars

WHOQOL-OLD: World Health Organization Quality of Life – OLD questionnaire

Abstract

Background

Frailty is likely to increase in low- and middle-income countries such as Nepal which poses a public health challenge. The objectives of this study were to identify the factors that affect frailty state and to examine the association of frailty status with adverse life outcomes that were quality of life, healthcare utilization, falls, and disability.

Methods

This is a cross-sectional study was conducted from April to June 2019 in three districts of Kathmandu Valley which were Kathmandu, Lalitpur, and Bhaktapur. Data were collected from 694 older people using convenience sampling from various communities and old age homes.

Results

Frailty increased with age (Standardized beta coefficient [β] = 0.14; 95% CI = 0.02, 0.08) and those who rated their lifestyle as unhealthy had higher frailty scores (β = 0.16; 95% CI = 0.62, 1.65). On the other hand, frailty scores were lower in older people who received education (β = -0.09; 95% CI = -1.04, -0.03), and those who were satisfied with their living environment (β = -0.20; 95% CI = -2.83, -1.37).

Conclusion

This thesis highlights the higher frailty in older people residing in old age homes. Education, lifestyle, and satisfaction with the living environment are modifiable factors associated with frailty both among old age homes and the community. Both self-rated lifestyle and satisfaction with the living environment affect frailty and related adverse health outcomes.

All aspects of frailty (physical, cognition, social, and psychological) should be taken into account for future interventions as they affect various facets of adverse health outcomes.

Chapter 1

Introduction

1.1 Global context of older people

The aging population has been increasing worldwide as a result of declining fertility, improved health, and decreased mortality (1). It is a consequence of improving social, economic, and cultural conditions around the world. The number of people aged 60 and above is expected to increase from 962 million in 2017 to 2.1 billion in 2050, globally (2). Along with an increase in the number of older people, comorbidities and healthcare demands and related expenditures are also increasing (3). As people are living longer, the years lived with chronic diseases and related disabilities are also on the rise. This increase is rapid and sudden, and most countries are not prepared to deal with the associated challenges such as frailty and related adverse health outcomes (4).

1.2 Frailty and related adverse health outcomes

Frailty is usually defined as a state of being vulnerable to adverse health outcomes such as falls, delirium, and disability (5, 6). It is a multidimensional concept (7) encompassing physical, social, cognitive, and psychological aspects (8). Old age leads to a decline in physiological and functional reserve capacity of multiple systems and frailty occurs when this reserve capacity is critically low (5, 9). This leads to inability to adapt to health challenges after the threshold to compensate function loss has been crossed and this can cause a series of complications in response to even small disturbances in the body system (5, 10). Factors causing frailty are lack of exercise, poor nutrition, mental health problems, and comorbidities (9). Although frailty is common in old age, it is not the manifestation of old age (5, 11) and is reversible with appropriate interventions (9). It is used as a predictor for older people's mortality and disability (12) and may discover unrecognized health problems (13, 14).

Frail older people have a higher risk of adverse health outcomes such as disability, falls, hospitalization, lower quality of life (QOL), and death (15, 16). These adverse outcomes are a result of progressive physical changes that are generally subtle and deficit accumulation (17, 18). They include undernutrition, weight loss, sarcopenia, low activity level, and difficulty to maintain homeostasis which interact each other via a complex mechanism and result in imbalance of multiorgan systems (18, 19). However, most studies focus only on the physical element of frailty and do not address the related adverse health outcomes adequately.

Increasing life expectancy can also lead to a higher prevalence of disability. Disability can be defined as an inability to perform the expected social roles and life activities needed for independent living for older people (20). Further classification of disability includes activities of daily living (ADL) and instrumental activities of daily living (IADL). ADL involves self-care tasks such as bathing, dressing, and eating whereas IADL measures tasks of household management such as meal preparation and shopping (20). It is caused by loss of functions, comorbidities, frailty, and poses challenges for older people. Older people with higher rates of disability have higher mortality. Frailty and disability are both preventable and can be delayed (20). Older people with disability can be rehabilitated and frailty can be slowed down if actions are taken at an early stage (21). Aging is accompanied by various body changes such as loss of lean muscle mass and muscle strength (22), and declining sensory and motor functions (23). These changes affect stability, balance, and mobility, and may lead to falls in older people. Older people are more susceptible to injuries, fractures, and sometimes death due to falls, which increases their hospital visits and hospitalization.

Older people use healthcare services extensively because of their complex needs. For instance, frail older people in Ireland visited their general practitioners more than non-frail

older people (24). They were also more likely to opt for homecare in various studies

conducted in Europe (24, 25) and to be hospitalized (26) in the US. Frail older people are at a

higher risk of post-operative delirium, in-hospital mortality, and mortality at one year

following a surgical procedure (27, 28). Thus, they are more likely to spend longer time at the

hospital and require further care or rehabilitation once discharged. Nurses play a major role in

providing care to older people with chronic illnesses, frailty and its complications in a health

facility and the community. The care they provide are varied and include wound care and

dressing, injections, monitoring health, medication intake, rehabilitation, intensive care unit

care, oxygen therapy. They also provide professional care at home, support daily life, and

providing counselling (16, 29). Many ill older people receive unpaid informal care from

family members, relatives, or friends. It includes care with daily life activities such as

cooking, cleaning, personal hygiene, transport, and emotional support. It reduces the use and

cost of formal care. On the other hand, it can impose physical and emotional strain on the

caregiver which can range from physical and psychosocial hardship to financial difficulties

(30). Physically frail older people in a study in Canada who received informal care led to

worsen caregiver burden (31). Preventing frailty can improve the QOL of older people and

reduce healthcare costs (32).

QOL is defined as an individual's feeling of his/her position in life, taking into account

the culture and values in which he/she lives and related to his/her goals, standards, concerns,

and expectations (33). It is a subjective broad assessment of one's life quality, taking into

account various contexts such as social, cultural, and environmental (33). Older people have

a higher chance of suffering from a functional impairment that compromises their autonomy,

independence, and eventually, QOL. They are able to contribute actively to society if they

can maintain their QOL. Assessing QOL in older people helps guide public policies to uplift

the social, physical, environmental well-being of older people. Frail older people have lower QOL compared to their non-frail counterparts (34). Physical frailty affects the QOL of older people (17, 35), but the effect of other frailty domains on QOL is poorly understood (34). Similarly, the factors associated with the QOL of older people in low-income countries are also poorly understood.

1.3 Older people in Nepal

The transition to an aging society is faster in low- and middle-countries (LMICs) compared to that in high-income countries (4). For example, the number of older people in Nepal is rising rapidly as elsewhere in the world (36). The Government of Nepal (GoN) implemented Senior Citizens Act 2063 in 2006 and it defined people aged 60 and above as senior citizens (37). However, as the term older people is more appropriate to denote people aged 60 and over as it is less discriminatory and biased towards them (38), this manuscript uses older people instead of senior citizens. According to the 2011 census, 2.1 million individuals were over the age of 60 in Nepal, which was 8% of the total population (39). The average life expectancy in Nepal was 70.2 years in 2018 compared to 27.0 years in 1951, and 64.0 years in 2008, which is a drastic improvement (40).

Nepal is a low-income country with a mountainous terrain which causes difficult access to transportation in the rural areas. The gross national income per capita was 730 US dollars in 2016 and the expenditure on healthcare was only 5.5% of the total household expenditure with a high out-of-pocket payment (41). This causes challenges for the older people to receive basic services such as health. Nepali older women suffer from more illnesses compared to Nepali men (42). The prevalence of depression was about 53% in 2006 (42). The prevalence of malnutrition in a community was 31% and about 51% were at a risk of

being malnourished. In another community, 68% of the older people utilized healthcare services (41, 43). The prevalence of musculoskeletal, hypertensive, diabetic, and psychological problems were high (44).

Most older people in Nepal face poverty, poor access to healthcare, and poor nutrition (45). This is partly because health and nutrition programs are targeted to infants, young children, and pregnant and lactating women (42). The GoN passed the first policy in 1963 addressing the needs of the older people and since then many laws have been passed (46). It established Pashupati Bridashram in 1976, which is the first and only one government-run residential facility for older people in Nepal (47). The GoN provides old-age-allowance of about 20 US dollars (USD) per month to people aged 70 and above, and widows and helpless women above 60 years of age (48). The GoN also provides free health care for older people at public hospitals and health centers and financial subsidies for certain diseases such as cancer, heart disease, uterine prolapse, and kidney disease (49). The healthcare utilization was low despite these services because of lack of knowledge (50).

In a traditional Nepali society, children take care of their aged parents (51). However, it has been changing because of urbanization, favor for nuclear families, and migration. More adults in their prime age are migrating to urban areas and abroad to search for better opportunities. The number of Nepalese living abroad increased from 2.3% to 7.2% between 2001 and 2011 (52), and more than two million Nepalese in their prime age lived abroad (53). About 380,000 Nepalese left the country to work abroad in the fiscal year 2016/17 according to the labor migration report (54). Thus, some older people have to live alone and care for their own needs (55), and some of them face neglect and/or abandonment by their children and/or relatives (56). Neglect is endangering older people's health and safety by a

lack of attention to their basic life needs such as food, clothing, shelter, and medical care (57). Abandonment is intentionally forsaking responsibility towards older people without any justifiable reason which can jeopardize their physical or mental well-being (57). This may lead to older people looking for alternative living facilities such as sheltered or old age homes that cater to their needs (56).

Old age home is not a well-established concept in Nepal. In Nepal, old age home generally refers to shelter or multi-residence housing facility for older people who are 60 years of age or above, are helpless, and do not have children to take care of them (58, 59). They provide facilities such as residence, meals, gatherings, recreation activities, and some form of health care (59). Some old age homes operate free of cost while others charge a fee for their services. Many old age homes that operate free of cost, lack sufficient funds to provide nutritious meals and expensive medical treatment.

The exact number of old age homes in Nepal is not known. There are about 70 registered organizations, mostly charity run, providing shelter to older people (45). Estimates suggest that a total of 1577 older people lived in such homes, of which 965 were women (45). The number of older women residing in old age homes is higher than men because of abandonment and neglect, abuse, and lack of family to take care of them. Also, some old age homes are only for women because they are at a disadvantaged situation in a patriarchal society (59). Recently, the number of older people opting to live or receive care from old age homes and assisted living facilities is on the rise. Most live there out of compulsion while some opt to receive day care. They lack emotional support because of being of away from their families or absence of family which could lead to loneliness, insomnia, and depression (56). Some of them do not receive the old age allowance because of lack of citizenship (60).

1.4 Research gaps

Frailty is likely to increase globally, including in LMICs such as Nepal, which poses a public health challenge. The prevalence of frailty is higher in upper middle-income countries compared to high-income countries. Since, most studies on frailty were conducted in high- and upper middle-income countries, the evidence from lower middle- and lower-income countries remains scarce (61-64). Due to lack of evidence, health and social care planning in these countries is difficult. Little is known about the burden of frailty and the factors leading to frailty in older people in Nepal. The Nepal Demographic Health Survey does not adequately address older people's demographic situations and health status (65).

Geriatrics is a relatively new field in Nepal and the situation of older people is poorly understood. Lack of comprehensive surveys has led to inability to identify the challenges and appropriate intervention through effective policy planning for Nepali older people (66). Although most Nepali older people live at home, the number of older people living in old age homes is increasing. The rising number of old age homes and their residents calls attention for their better health, especially issues involving frailty. The frailty status of older people in old age homes may differ from community-dwelling older people because of different socio-economic and health backgrounds. The prevalence of frailty was different in the community-dwelling older people versus those residing in nursing homes or assisted living facilities in studies conducted in high-income countries (7, 67, 68).

Most studies identify frailty only as a physical condition with physical components (69). Studies using a physical definition of frailty reported lower prevalence of frailty compared to those using a broad definition (68). Frail older people present as a group of patients with the most complex and challenging problems to healthcare providers. They are the major users of

healthcare and social systems (70). Healthcare expenditure for frail older people is higher than the younger population because of the government's inability to meet the complex health and support demands of the frail and disabled older people Health systems mainly target disease-specific problems and do not take chronic and complex needs of the frail older people into consideration (71).

Nepal faces a shortage of health workers, with only 0.67 doctors and nurses per 1000 population (72). It has three registered geriatricians, which is one for every hundred thousand population and only eight health institutions provide services targeted to the older people (73). Nepal also lacks healthcare professionals trained in geriatric care and rehabilitative and long-term care services for them (73). Frailty is important in a low-income setting with limited healthcare resources because it identifies people who need additional medical care. Identifying frailty at an early stage is essential to prevent it from progressing, sourcing healthcare to those in need, reducing healthcare costs, increasing the chances of reversibility, and implementing effective interventions (74, 75). Similarly, it is important to examine the association of frailty with adverse outcomes because frailty progressively leads to them (17, 18). To enable effective and efficient preventive interventions, it should be clear which frailty characteristics or underlying processes predict each outcome most accurately (68).

1.5 Objectives

1) To identify the factors that affect frailty status in community-dwelling older people and those living in old age homes in Kathmandu Valley, Nepal
2) To examine the association of frailty status with QOL, healthcare utilization, falls, and disability in community-dwelling older people and those living in old age homes in Kathmandu Valley, Nepal

Chapter 2

Methods

2.1 Conceptual framework

Socio-demographic factors	Frailty	Adverse outcomes
• Age • Gender • Ethnicity • Religion • Education • Occupation • Income • Marital status • Comorbidities • Lifestyle • Life events • Residence satisfaction	• Physical • Social • Cognition • Psychological	• Disability • Healthcare utilization • Fall • Informal care • Quality of life
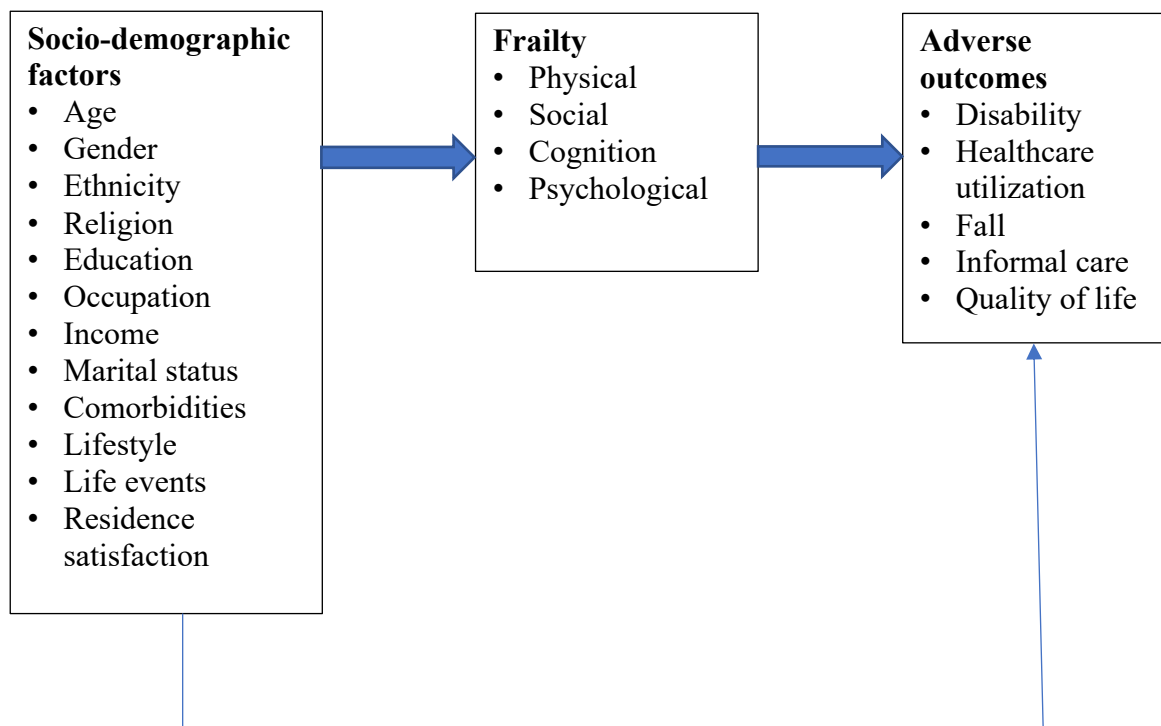
This framework is adapted from a study in the Netherlands conducted by Gobbens et al. (7). The outcome variables in the past study were disability, healthcare utilization, QOL, fall, and death. However, this study has excluded death as it employs a cross-sectional design, and a longitudinal study would be required to measure death. Also, this study uses the Groningen Frailty Indicator (GFI) instead of the Tilburg Frailty Indicator (TFI). TFI includes the question "Do you live alone?" which was not suitable for older people interviewed in this study as many of them living in old age homes perceived themselves to be living alone (76). GFI has been tested and validated in both community-dwelling and institutionalized older people (8). The model outlines factors leading to frailty and eventually, frailty leading to adverse life outcomes. Socio-demographic and health-related variables are mentioned on the left, which are age, gender, education, marital status, income, pension, government allowance, residence, satisfaction with the living environment, self-rated lifestyle, number of comorbidities, medication use, smoking, and alcohol consumption. These variables affect the

progression to frailty over time. This model focuses on the physical, social, cognition, and psychological domains of frailty. The right part of the model illustrates adverse life outcomes due to frailty, which are disability, healthcare utilization, falls, and QOL.

2.2 Study design and settings

This study was cross-sectional in design and was conducted in ten old age homes and among community-dwelling older people in Kathmandu valley in Nepal. Data collection was conducted between April and June 2019. Kathmandu valley is comprised of three districts namely, Kathmandu, Lalitpur, and Bhaktapur. Kathmandu is the capital city of Nepal, and adjacent districts, which are Lalitpur and Bhaktapur, are densely populated. These districts have a higher number of old age homes compared to the rest of the country.

2.3 Study participants

The older people included in this study were aged 60 and above and residing in Kathmandu Valley at the time of the interview. Exclusion criteria were known cognitive disability such as dementia and Alzheimer's disease, and inability to communicate in Nepali language. Those suffering from severe hearing impairment, dumbness, and mental illnesses such as psychosis, bipolar disorder, and schizophrenia were also excluded. Only one older person was recruited from each household based on inclusion and exclusion criteria, availability, and willing to participate in the study. If a couple resided together in an old age home, only one of them was recruited for an interview.

2.4 Sampling

Convenience sampling was used to select the older people in the community as data was not available about the number of older people aged 60 and above in each ward. The selected

wards were within the ring road or a close distance from it, which encircles most of the urban areas of Kathmandu Valley. Urban area in Nepal's context can be defined as one with a minimum population of 10,000 in the hilly region and 20,000 in the terai region (77). The heads of 20 wards offices from Kathmandu, six from Lalitpur, and five from Bhaktapur districts were approached with a request letter for permission to conduct the study from the University of Tokyo. These wards were selected purposively based on the ease of access. In Kathmandu district, verbal approval was obtained for ward numbers 10, 14, 15, 16, 18, and 32. In Lalitpur district, approval was obtained for ward numbers 5, 7, and 16, and ward numbers 2, 7, and 9 in Bhaktapur district. Local leaders from the respective wards were introduced by the head of ward offices and interviews were conducted with their assistance. Older people were recruited through home visits based on the inclusion and exclusion criteria. About 700 older people were approached for interviews, out of which 550 voluntarily participated in the study (Figure 1). Due to incomplete responses, data from 49 older people were excluded from the study. Finally, the study included data from 501 community-dwelling older people.

An official list of old age homes in Nepal was not available. Thus, a non-governmental organization called Ageing Nepal was approached, which works for the welfare of the older people in Nepal. It provided its own list of old age homes in Nepal. The heads of fifteen old age homes in Kathmandu Valley were approached first via telephone calls followed by face-to-face meetings with a request letter for permission from The University of Tokyo. Verbal permission was obtained from ten old age homes which were Center of Services for Helpless, Divine Service Home, Human Service Ashram, Social Welfare Center Elderly's Home, Siddhi Memorial Foundation, Mountain Care Home Service Pvt. Ltd., Matatirtha Old Age Home Committee, Himalaya Briddhashram Kendra, Aama ko Ghar, and Health Home Care.

All older people who met the inclusion criteria were approached for an interview. About 260 older people were approached from old age homes of which 201 voluntarily participated in this study of which eight were excluded because of incomplete responses. The overall response rate was 79.1% (80.4% for old age homes and 78.6% for the community). The final analysis included data from 694 older people.

Figure 1: Study flow
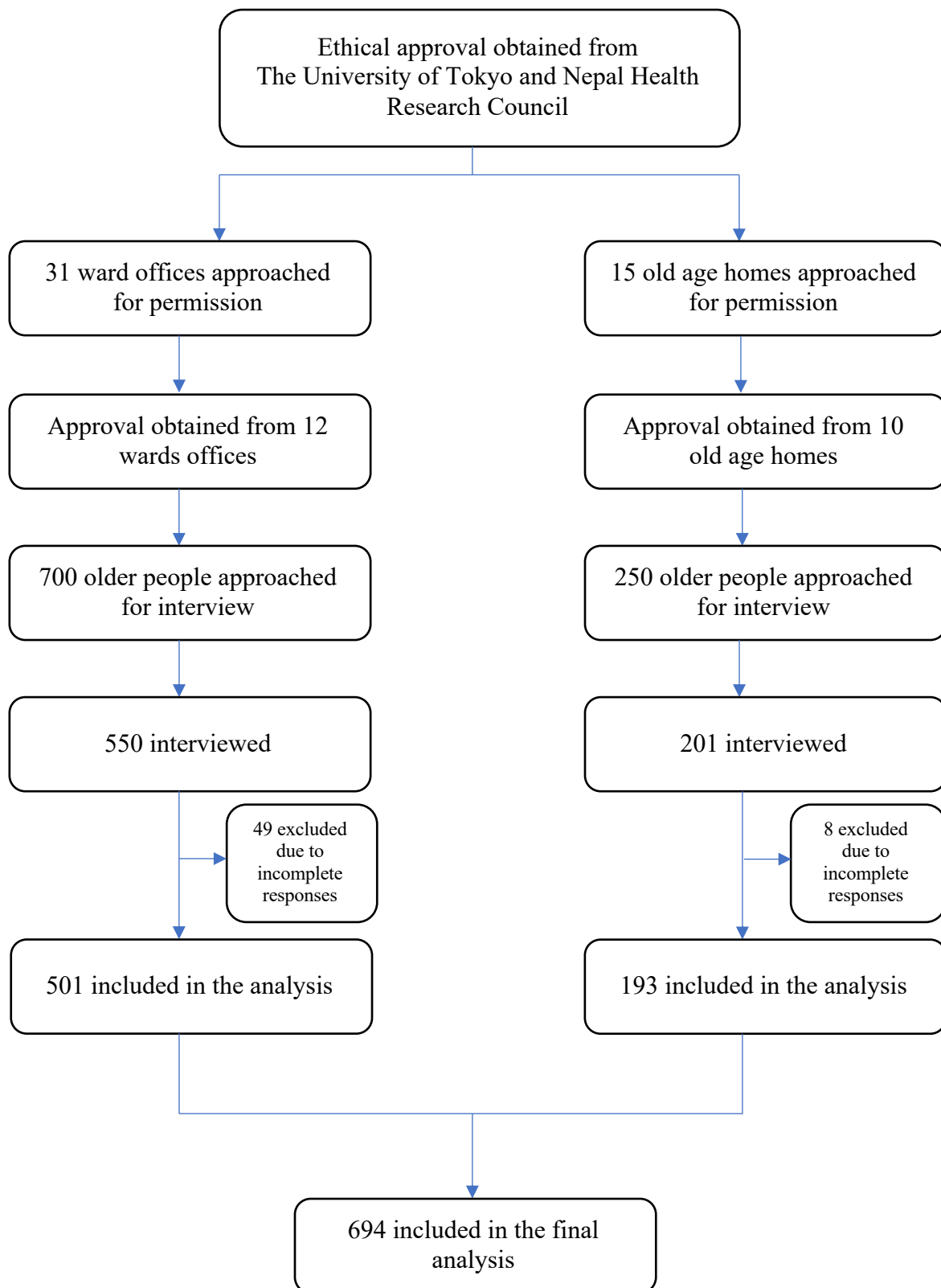
2.5 Measures and instruments

2.5.1 Outcome variables

2.5.1.1 Primary outcome: Frailty

Frailty was the outcome variable for the first objective of this study. GFI was used to assess frailty, which is a well-validated instrument and tested in multiple settings (8, 9, 78). It has 15-items that assess four domains: physical (nine items), cognitive (one item), social (three items), and psychological (two items) (8). Using a multidimensional assessment of frailty is beneficial to predict adverse life outcomes (7). The responses are obtained in three categories (yes, no, and sometimes) and are dichotomized as 0 and 1(8). The maximum possible score is 15 and the lowest possible score is 0 (8). A score of 4 or higher is considered as "moderate" or "severe" frailty (8, 79). The reliability of GFI in this study was measured by Cronbach's alpha, which was 0.75.

2.5.1.2 Secondary outcome: Adverse health outcomes

Quality of life

This study used the 24-item WHOQOL-OLD questionnaire to evaluate the QOL of older people (80). The item scores range from 1 to 5, with a higher score indicating better QOL. It consists of six domains with four items each, which are (i) sensory abilities, (ii) autonomy, (iii) past, present, and future activities, (iv) participation, (v) death and dying, and (vi) intimacy. The possible values for each domain range from 4 to 20. The period assessed was the previous two weeks. Questions with positive responses were reverse coded. The Cronbach's alpha for the overall QOL domain in this study was 0.91.

The domain "sensory abilities" assesses the effect of loss of sensory capacity on QOL. The "autonomy" domain evaluates independent living and dependency on others in old age.

"Past, present, and future activities" domain describes satisfaction to life achievements and things to look forward to, whereas, "participation" assesses involvement in daily activities, especially in the community. "Death and dying" involves concerns and worries related to death and dying, and "intimacy" describes personal relationships.

Negatively worded items in WHOQOL-OLD scale were reverse-coded (items 1, 2, 6, 7, 8, 9, and 10). These items were about the effect of sensory impairment in daily life and the ability to participate in activities, concerns about death, and the effect of sensory impairment on social interaction.

Healthcare utilization

Four indicators were used to asses healthcare utilization (76). They were: (1) number of visits to a doctor in the past year, (2) hospital admission/s in the past year (yes/no), (3) received nursing care (yes/no), and (4) received informal care in the past year (yes/no). These questions were adapted from a study conducted in the Netherlands (16, 81). Nursing care included services such as wound care, injections, oxygen therapy, support with taking medicine, and health monitoring . Informal care meant receiving unpaid personal care for health reasons or personal care such as maintaining hygiene, moving around, cooking, or getting dressed.

Disability and falls

Groningen activity restriction scale (GARS) was employed to assess disability. It is not disease-specific and measures disability in instrumental and daily living activities with 18 items and five response categories (1=Yes, I can do it independently without any difficulty; 2=Yes, I can do it fully independently but with some difficulty; 3=Yes, I can do it fully

independently but with great difficulty; 4=No, I cannot do it fully independently, I can only

do with it someone's help; and 5=No, I cannot do it at all, I need complete help). The scores

range from 18 (no disability) to 90 (maximum disability) with higher scores indicating higher

disability. GARS is further classified into ADL and IADL. Fall was evaluated on the basis of

a history of fall in the past year (yes/no). The Cronbach's alpha for GARS in this study was

0.94.

2.5.2 Exposure variables

The variables include age, gender, marital status, education level, residence (old age

home and community-dwelling), income, receiving a pension, receiving a government

allowance, and satisfied with the home living environment. Age was recorded in completed

years. Health-related variables were the presence of comorbidities, smoking (currently

smoking, never, and past smoker), alcohol consumption (currently consuming, never, and in

the past), number of prescribed medicines taken in a day, and self-perceived health (healthy,

fair, and unhealthy). Religion was removed as a variable because most of the older people

followed Hinduism. Marital status was classified into single (divorced, unmarried, widow, or

widower) and married (married or cohabitation). For the secondary outcome, frailty was

utilized as an exposure variable.

2.6 Sample size

Sample size was calculated based on a previous study by Lin et al. which divided the

population into two groups, frail and robust with means of 52.6 (SD [Standard deviation] 8.8)

for frail and 56.2 (SD 12.8) (82). OpenEpi was used for calculation with 80% power and 5%

significance level. Thus, the minimum sample size obtained was 391. However, anticipating

about 50% refusal rate and incomplete responses, the final sample size was set to 782.

2.7 Ethical considerations

Ethical approval was obtained from the Research Ethics Committee of The University of Tokyo (2018168NI) and the Nepal Health Research Council (160/2019). Permission was also sought from the administration of old age homes and ward offices in Kathmandu Valley. The participants were ensured of their confidentiality, voluntary participation, and their right to refuse participation at any time. Written informed consent was obtained from all the older people who participated in this study. Their identity was kept anonymous using identification codes and data is being managed with high confidentiality.

2.8 Questionnaire and data collection

An interviewer-administered questionnaire (tablet-based) was used for face-to-face interviews. The questionnaire was initially prepared in English and translated to Nepali language. The translated version of the questionnaire was evaluated by a bilingual medical doctor with a background in public health and a researcher in the field of gerontology. Incomprehensible and ambiguous phrases were identified and substituted with more culturally and linguistically appropriate words and phrases. Two independent bilingual native translators with a background in public health back-translated the Nepali questionnaire to English. The Nepali questionnaire was finalized after comparing both versions of the questionnaire and refining it after pre-testing it among ten older people in old age homes and 20 older people in the community who met the eligibility criteria. The main study did not include older people from the pre-test.

Six local research assistants were trained for data collection with a one-day training session before data collection. They were familiarized with the study objectives, study protocol, research ethics, contents of the questionnaire, the process of data collection, and

using tablets for the interview. Principle investigator and research assistants collected data from April to June 2019. Older people were interviewed after obtaining their written informed consent. Each interview lasted 20-30 minutes.

2.9 Statistical analysis

Descriptive analyses were conducted to describe the characteristics of older people. The data were classified by residence, which are old age homes and the community. Some variables were recoded before performing linear and logistic regression analyses. Dummies were created for income ["0" equal to or less than 20 US dollars (USD) and "1" more than 20 USD], education ("0" illiterate and "1" any level of education), self-rated lifestyle ("0" healthy and "1" fair or unhealthy), comorbidities ("0" none and "1" one or more), number of medicines taken ("0" none and "1" one or more), smoking ("0" never and "1" currently smoking or past smoker), and alcohol consumption ("0" never and "1" yes or past consumption).

Simple and hierarchical multiple linear regression analyses were conducted to examine the association of frailty with various sociodemographic and health characteristics. Hierarchical linear and logistic regression analyses were also performed to assess the association between adverse health outcomes and frailty. Factors associated with frailty was observed by performing hierarchical linear regression with four models. Model 1 was adjusted for socio-demographic variables (age, gender, education, marital status, income, pension, and government allowance). Model 2 was adjusted for residence and satisfaction with home-living environment. Model 3 included health-related variables (self-rated health, comorbidities, and medication use). Model 4 included lifestyle variables (smoking and alcohol). To examine the factors associated with adverse health outcomes, model 5 was

added in addition to the above four models which consisted of four frailty domains. Multicollinearity was not observed in the model. Variance inflation factor was below two for all exposure variables.

Construct validity was measured using Cronbach's alpha for all scales which were all above 0.70, indicating satisfactory internal consistency (83). The content validity was tested using bivariate Spearman's rank correlation tests to check the statistical significance of each GFI item with the total GFI score. Furthermore, Spearman's correlation was examined to see the association of total GFI score with GARS and QOL. The data were analyzed using STATA/SE 15.1 software. The level of significance was set to 0.05 (two-tailed).

Chapter 3

Results

3.1 Socio-demographic characteristics

Table 1 summarizes the socio-demographic characteristics of older people who participated in this study. The mean of older people was 73.8 years (SD 8.9, range 60-104) and 179 (25.8%) were aged 80 and above. Among 694 who participated in this study, 387 (55.5%) were women. The number of illiterate older people was 345 (49.7%). The income level of 439 (63.3%) was below 20 USD and 67 (9.7%) were dissatisfied with their home living environment.

The mean age of older people in old age homes was 76.8 years (SD 9.9, range 60-104), and 78 (40.4%) were aged 80 and above. Among 193 older people, 131 (67.9%) were women. The number of illiterate older people was 143 (74.1%). Regarding the income level, 170 (88.1%) had an income below 20 USD. Only 30 (15.5%) were dissatisfied with their home living environment. On the other hand, the mean age of older people in the community was 72.6 years (SD 8.2, range 60-100), and 101 (20.1%) were aged 80 and above. Among 501 older people in the community, 256 (51.1%) were women. The number of illiterate older people was 202 (40.3%). Regarding the income, 269 (53.7%) of them had an income below 20 USD. Only 37 (7.4%) were dissatisfied with their home living environment.

Table 1: Sociodemographic characteristics

Variables	Total n=694		Old age homes n=193		Community n=501	
	n	**%**	**n**	**%**	**n**	**%**
Age [Mean (SD)]	73.8 (8.9)		76.8 (9.9)		72.6 (8.2)	
Male	74.4 (8.9)		76.6 (10.1)		73.9 (8.4)	
Female	73.3 (8.8)		76.9 (9.8)		71.4 (7.7)	
Age categories						
60-64	112	16.1	21	10.9	91	18.1
65-69	121	17.4	27	14	94	18.8
70-74	147	21.2	32	16.6	115	23.0
75-79	135	19.5	35	18.1	100	20.0
80 and above	179	25.8	78	40.4	101	20.1
Gender						
Male	307	44.2	62	32.1	245	48.9
Female	387	55.8	131	67.9	256	51.1
Education						
Illiterate	345	49.7	143	74.1	202	40.3
Non-formal education	161	23.2	23	11.9	138	27.5
Less than higher secondary	114	16.4	18	9.3	96	19.2
Higher secondary and above	74	10.7	9	4.7	65	13.0
Marital Status						
Single	409	58.9	157	81.3	252	50.3
Married	285	41.1	36	18.7	249	49.7
Income (in USD)						
Less than 20	439	63.3	170	88.1	269	53.7
20 to 100	102	14.7	13	6.7	89	17.8
101 to 200	80	11.5	4	2.1	76	15.2
More than 200	73	10.5	6	3.1	67	13.3
Receiving pension						
No	616	88.8	187	96.9	429	85.6
Yes	78	11.2	6	3.1	72	14.4
Receiving government allowance						
No	354	51.0	100	51.8	254	50.7
Yes	340	49.0	93	48.2	247	49.3
Satisfied with home living environment						
No	67	9.7	30	15.5	37	7.4
Yes	627	62.7	163	84.5	464	92.6

USD: US dollars; SD: Standard Deviation

3.2 Health characteristics

Table 2 summarizes the health characteristics of older people in this study. The number of frail older people (GFI score of 4 or higher) was 420 (60.5%). Only 183 (26.4%) self-rated themselves as healthy. Only 94 (13.5%) did not suffer from any chronic disease and 200 (28.8%) did not consume any medicine. Falls were experienced by 190 (27.4%) and 178 (25.6%) received nursing support. The means of total GARS score was 32.8 (SD 15.0, range 18-90) and for QOL was 68.1 (SD 11.23, range 33-98).

Frailty was more prevalent among older people in old age homes (71.5%) compared to those in the community (56.3%). The number of older people who perceived themselves to have a healthy lifestyle was 37 (19.2%) in old age homes compared to 146 (29.1%) in the community. Only 21 older people (10.9%) did not suffer from any chronic disease in old age homes and 73 (14.6%) in the community. The number of older people who consumed three or more medicines to manage chronic disease/s were 69 (35.8%) in old age homes and 147 (29.4%) in the community. About 41% of older people in old age homes experienced falls in the past year compared to 22.2% in the community. The means of total GARS scores were 42.9 (SD 17.7, range 18-90) for old age homes and 28.9 (SD 11.7, range 18-86) for the community. The means of overall QOL were 58.9 (SD 10.7, range 33-89) for old age homes and 71.6 (SD 9.2, range 36-98) for the community.

Table 2: Health characteristics

Variables	Total n=694		Old age homes n=193		Community n=501	
	n	%	n	%	n	%
Frailty score (GFI)						
Less than four	274	39.5	55	28.5	219	43.7
Four or more	420	60.5	138	71.5	282	56.3
Healthy lifestyle						
Healthy	183	26.4	37	19.2	146	29.1
Fair	340	49.0	94	48.7	246	49.1
Unhealthy	171	24.6	62	32.1	109	21.8
Number of visits to doctor last year						
Never	169	24.3	34	17.6	135	27.0
One to four times	301	43.3	76	39.4	225	44.9
Five times or more	224	32.3	83	43.0	141	28.1
Number of comorbidities						
None	94	13.5	21	10.9	73	14.6
One or two	355	51.2	119	61.7	236	47.1
Three or more	245	35.3	53	27.4	192	38.3
Number of medicines						
None	200	28.8	44	22.8	156	31.1
One or two	278	40.1	80	41.4	198	39.5
Three or more	216	31.1	69	35.8	147	29.4
Fall in the past year						
No	504	72.6	114	59.1	390	77.8
Yes	190	27.4	79	40.9	111	22.2
Smoking						
Currently smoking	199	28.7	35	18.1	60	12
Past smoker	400	57.6	47	24.4	152	30.3
Never	95	13.7	111	57.5	289	57.7
Alcohol consumption						
Yes	70	10.1	7	3.7	63	12.5
In the past	486	70.0	63	32.6	75	15
Never	138	19.9	123	63.7	363	72.5
Hospitalization						
No	577	83.1	163	84.5	414	82.6
Yes	117	16.9	30	15.5	87	17.4
Received professional nursing support						
No	516	74.4	133	68.9	383	76.5
Yes	178	25.6	60	31.1	118	23.5

Table 2: Health characteristics continued…

Variables	Total n=694		Old age homes n=193		Community n=501	
	n	**%**	**n**	**%**	**n**	**%**
Receiving informal care						
No	490	70.6	118	61.1	372	74.3
Yes	204	29.4	75	38.9	129	25.7
GARS [Mean (SD)]						
Total	32.8 (15.0)		42.9 (17.5)		28.9 (11.7)	
ADL	16.5 (7.4)		21.1 (10.1)		14.7 (5.0)	
IADL	16.8 (9.0)		21.8 (9.0)		14.1 (8.1)	
QOL [Mean (SD)]						
Total	68.1 (11.3)		58.9 (10.7)		71.6 (9.2)	
Sensory	4.0 (0.8)		3.6 (0.9)		4.1 (0.7)	
Autonomy	2.9 (0.9)		2.3 (0.8)		3.2 (0.8)	
Activities	3.3 (0.7)		2.6 (0.7)		3.5 (0.6)	
Social	3.4 (0.7)		2.9 (0.7)		3.6 (0.5)	
Death	4.1 (1.1)		4.1 (1.1)		4.1 (1.1)	
Intimacy	3.3 (0.9)		2.5 (0.9)		3.6 (0.7)	

3.3 Validity

Table 3 shows the outcomes of construct and content validity. Construct validity was assessed using Cronbach's alpha which was 0.75. All the 15 items showed a positive association with the total GFI score with a statistical significance of p-value < 0.001 (content validity). Seven items correlated below 0.40 (walking, dressing, using the restroom, hearing, weight loss, medication, and memory) and five items correlated above 0.60 (feeling of emptiness, missing someone, loneliness, sadness, and nervousness). r_s (Spearman correlation coefficient) scores between 0.20-0.39 show a weak correlation, whereas scores above 0.39 show moderate to strong correlation (83).

Table 4 depicts correlations between frailty (total, physical, cognition, social, and psychological) and the adverse outcomes, which were healthcare utilization, disability, and QOL. History of receiving nursing care in the past year showed no correlation with total frailty (0.00) and the physical domain of frailty (0.05). For healthcare utilization, only nursing care correlated with cognition domain of frailty. Healthcare utilization did not show any correlation with the social and psychological domains of frailty. All QOL domains correlated negatively with GFI domains except overall QOL, activities QOL, and intimacy QOL, which showed no correlation with the cognition domain of frailty. Other than these uncorrelated items, all items in adverse outcomes correlated with frailty domains significantly with a p-value<0.05. Spearman's coefficient (r) between 0.30-0.49, 0.50-0.70, and 0.70-1.00 show weak, moderate, and strong correlations, respectively (83).

Table 3: Outcomes of the validity criteria: construct, content, and criterion validity for the GFI

Construct Validity (Cronbach's alpha) (n=694)		**0.75**
Content Validity		**r_s**
(contribution of each item to GFI) (n=694)*	Shopping	$0.44^{\dagger}$
	Walking	$0.32^{\dagger}$
	Dressing	$0.23^{\dagger}$
	Restroom	$0.20^{\dagger}$
	Vision	$0.41^{\dagger}$
	Hearing	$0.36^{\dagger}$
	Weight loss	$0.36^{\dagger}$
	Medication	$0.25^{\dagger}$
	Memory	$0.38^{\dagger}$
	Emptiness	$0.67^{\dagger}$
	Missing someone	$0.67^{\dagger}$
	Loneliness	$0.69^{\dagger}$
	Sadness	$0.70^{\dagger}$
	Nervousness	$0.68^{\dagger}$
	Physical fitness	$0.42^{\dagger}$

r_s: Spearman correlation coefficient
$\dagger p < 0.001$

Table 4: Pearson correlations (r) between GFI, domains of GFI, and adverse outcomes of frailty

Adverse outcomes	GFI	Phy GFI	Cog GFI	So GFI	Psy GFI
Healthcare utilization					
Number of visits to doctor	0.08*	0.13***	0.20	0.02	0.02
Hospitalization	0.12**	0.18***	0.06	0.06	0.03
Received nursing care	0.00	0.05	-0.13***	0.01	-0.03
Received informal care	0.11**	0.17***	-0.06	0.05	0.00
Falls	0.24***	0.27***	0.13***	0.09*	0.14***
Disability					
Total GARS	0.55***	0.68***	0.19***	0.18***	0.26***
ADL	0.47***	0.58***	0.17***	0.13***	0.24***
IADL	0.53***	0.64***	0.19***	0.19***	0.25***
QOL					
Total QOL	-0.17***	-0.17***	-0.00	-0.10**	-0.11**
Sensory	-0.52***	-0.51***	-0.22***	-0.28***	-0.30***
Autonomy	-0.33***	-0.28***	-0.13***	-0.20***	-0.25***
Activities	-0.30***	-0.25***	-0.06	-0.18***	-0.25***
Social	-0.38***	-0.34***	-0.10*	-0.23***	-0.29***
Death	-0.24***	-0.14***	-0.14***	-0.16***	-0.26***
Intimacy	-0.24***	-0.24***	-0.07	-0.13***	-0.14***

Phy GFI: Physical domain; Cog GFI: Cognition domain; So GFI: Social domain; Psy: Psychological domain
Statistical significance indicated by *p<0.05, **p<0.01, and ***p < 0.001

3.4 Frailty scores

Table 5 depicts the mean frailty scores for overall and individual domains. The overall mean GFI score was 4.73 (SD 3.07). Higher frailty scores were seen in older people residing in old age homes compared to the community. The cognition domain consisted of only one question. Thus, the mean (SD) score for cognition domain was 0 for non-frail older people residing in old age homes as all of them answered "sometimes" or "no" which was coded as 0.

Table 5: Frailty scores

Frailty domain scores	Mean (SD)		
	Total score	**Frail**	**Non-frail**
Overall frailty (Range: 0-15)	4.73 (3.07)	6.73 (2.15)	1.66 (1.10)
Old age home	5.56 (3.17)	7.03 (2.46)	1.87 (1.04)
Community	4.41 (2.97)	6.58 (1.97)	1.60 (1.11)
Physical domain (Range: 0-9)	2.17 (1.76)	2.91 (1.63)	1.05 (0.96)
Old age home	2.86 (1.92)	3.46 (1.86)	1.36 (1.08)
Community	1.91 (1.49)	2.64 (1.44)	0.97 (0.91)
Cognition domain (Range: 0-1)	0.20 (0.40)	0.29 (0.45)	0.06 (0.24)
Old age home	0.20 (0.40)	0.28 (0.45)	0.00 (0.00)
Community	0.20 (0.40)	0.29 (0.45)	0.08 (0.27)
Social domain (Range: 0-3)	1.50 (1.34)	2.22 (1.12)	0.39 (0.75)
Old age home	1.53 (1.33)	1.98 (1.22)	0.40 (0.81)
Community	1.49 (1.34)	2.34 (1.05)	0.39 (0.73)
Psychological domain (Range: 0-2)	0.85 (0.91)	1.30 (0.84)	0.16 (0.47)
Old age home	0.97 (0.92)	1.31 (0.85)	0.11 (0.31)
Community	0.81 (0.91)	1.30 (0.84)	0.17 (0.50)

3.5 Association between the independent variables and frailty

Table 6 illustrates simple and multiple linear regression analyses of the factor associated with frailty. In the simple linear regression, frailty was positively associated with increasing age (Standardized beta coefficient [β] = 0.22; 95% CI = 0.05, 0.10), in women (β = 0.13; 95% CI = 0.33, 1.25), those receiving government allowance (β = 0.13; 95% CI = 0.32, 1.23), and those who perceived their lifestyle as unhealthy (β = 0.25; 95% CI = 1.23, 2.24). Frailty was also positively associated with comorbidities (β = 0.17; 95% CI = 0.90, 2.21) and those who consumed medicine/s to manage these comorbidities daily (β = 0.15; 95% CI = 0.50, 1.50). On the contrary, frailty scores were lower in those who were satisfied with their home living environment (β = -0.24; 95% CI = -3.27, -1.76). Frailty was negatively associated with education (β = -0.18; 95% CI = -1.56, -0.66) and income above 20 USD (β = -0.18; 95% CI = -1.62, -0.69). Those residing in the community had lower frailty scores than those residing in old age homes (β = -0.17; 95% CI = -1.66, 0.65). Frailty score was lower in married older people (β = -0.10; 95% CI = -1.07, 0.15) compared to those who were single.

After adjusting for covariates and confounders, it was seen that frailty increased with higher age (β = 0.14; 95% CI = 0.02, 0.08) and those who rated their lifestyle as unhealthy had higher frailty scores (β = 0.16; 95% CI = 0.62, 1.65). On the other hand, frailty scores were lower in older people who received any level of education (β = -0.09; 95% CI = -1.04, -0.03), and those who were satisfied with their home living environment (β = -0.20; 95% CI = -2.83, -1.37).

Table 6: Simple and multiple linear regression: Factors associated with overall GFI (n=694)

Variables	Unadjusted	Adjusted
	β (95% CI)	β (95% CI)
Age	0.22 (0.05, 0.10)***	0.14 (0.02, 0.08)**
Gender (vs. Male)		
Female	0.13 (0.33, 1.25)**	0.06 (-0.14, 0.94)
Education (vs. Illiterate)		
Yes	-0.18 (-1.56, -0.66)***	-0.09 (-1.04, -0.03)*
Marital status (vs. Single)		
Married	-0.10 (-1.07, -0.15)*	0.05 (-0.17, 0.80)
Income (in USD) (vs. Less than 20)		
20 and above	-0.18 (-1.62, -0.69)***	-0.04 (-0.80, 0.33)
Pension (vs. No)		
Yes	-0.06 (-1.33, 0.12)	0.00 (-0.73, 0.81)
Government allowance (vs. No)		
Yes	0.13 (0.32, 1.23)**	0.00 (-0.51, 0.55)
Residence (vs. Old age homes)		
Community	-0.17 (-1.66, -0.65)***	-0.06 (-0.97, 0.13)
Residence satisfaction (vs. No)		
Yes	-0.24 (-3.27, -1.76)***	-0.20 (-2.83, -1.37)***
Self-rated health (vs. Healthy)		
Unhealthy	0.25 (1.23, 2.24)***	0.16 (0.62, 1.65)***
Comorbidities (vs. None)		
One or more	0.17 (0.90, 2.21)***	0.05 (-0.31, 1.23)
Medication use (vs. None)		
Yes	0.15 (0.50, 1.50)***	0.06 (-0.18, 0.94)
Smoking (vs. Never)		
Yes	-0.02 (-0.57, 0.36)	-0.01 (-0.53, 0.41)
Alcohol consumption (vs. Never)		
Yes	-0.08 (-1.04, -0.05)*	-0.06 (-0.87, 0.13)

Statistical significance indicated by *$p < 0.05$, **$p < 0.01$, and ***$p < 0.001$

β: Standardized beta coefficient

Table 7 shows the hierarchical regression analysis that was run to examine the degree to which the above factors were truly associated with frailty and to show the risk factors associated with it. Age was associated with frailty in all the four models ($\beta = 0.14$, $p < 0.01$). Frailty score was higher in older people who were women ($\beta = 0.10$, $p < 0.001$) and lower in those who received any form of education ($\beta = -0.09$, $p < 0.05$) in Model 1. However, education became insignificant in Model 2, which indicated that education was affected by residence and satisfaction with home-living environment. Model 3 showed that older people, who were women, were more likely to have higher frailty scores ($\beta = 0.08$, $p < 0.05$), but it did not show association with frailty in Model 4. It signified that gender was influenced by smoking and alcohol consumption. Model 4 explained a total of 16.22% of the variance of frailty. Satisfaction with home-living environment had the strongest association with frailty ($\beta = -0.20$, $p < 0.001$).

Table 7: Hierarchical regression analysis predicting factors associated with overall GFI in older people (n=694)

	Model 1	Model 2	Model 3	Model 4
Age	0.20***	0.17***	0.15***	0.14**
Gender (Female)	0.10*	0.10*	0.08*	0.06
Education	-0.09*	-0.07	-0.08	-0.09*
Marital status (Married)	0.01	0.04	0.05	0.05
Income	-0.09*	-0.05	-0.05	-0.04
Pension	0.01	0.02	0.00	0.00
Government allowance	-0.03	0.02	0.00	0.00
Residence (Community-dwelling)		-0.07	-0.05	-0.06
Residence satisfaction		-0.22***	-0.20***	-0.20***
Self-rated health (Unhealthy)			0.16***	0.16***
Comorbidities	.		0.05	0.05
Medication use (Yes)			0.06	0.06
Smoking		.		-0.01
Alcohol consumption				-0.06
R² (%)	8.30	13.56	17.61	17.92
Δ R² (%)	7.37***	12.43***	16.16***	16.22***

Standardized beta coefficients (β) from all steps of the regression equation (with all the predictors in the model)
Statistical significance indicated by *$p < 0.05$, **$p < 0.01$, and ***$p < 0.001$

3.6 Association between frailty and adverse life outcomes

Table 8 shows hierarchical regression analyses predicting the factors associated with the nine adverse outcomes of frailty. Five models run to predict the outcomes and R-squared (R^2) are given after each block and at the bottom end, which exhibit how much of the variance of the adverse outcome was explained by the independent variables. Standardized beta coefficients with their significance of the model are shown with all independent variables included. Effects were strong ($R^2 > 25\%$) for disability and all domains of QOL except death, and no effect was observed on visit to doctor in the past year. The predictor variables explained a significant part of all adverse life outcomes. Total explained variances were 57.9% (disability), 40.3% (sensory QOL), 34.5% (autonomy QOL), 41.1% (activities QOL), 36.6% (social QOL), 12.9% (death QOL), 37.9% (intimacy QOL). Residence and satisfaction with home living environment explained 10.9%, 13.7%, 12.9%, and 16.7% variances for disability, activities QOL, social QOL, and intimacy QOL. Socio-demographic characteristics and frailty explained 16.8% and 14.1% variance of the sensory domain of QOL, respectively. Socio-demographic characteristics explained 21.7% , 23.7%, 15.7%, and 19.4% variances of autonomy activities, social, and intimacy domains of QOL, respectively.

The regression coefficients show that only community-dwelling state affected all the adverse life outcomes except the death domain of QOL. Older people with higher age had a higher disability (β=0.21) and better scores for the death domain (β=0.10) of QOL but lower scores for the sensory domain (β=-0.15) of QOL. Women scored lower for the death domain (β=-0.13) of QOL but higher for the intimacy domain (β=0.12). Older people with any level of education scored higher than those who were illiterate in all QOL domains. QOL (autonomy, activities, social, and intimacy) was higher in older people with income higher

than 20 USD. Those who received government allowances had a lower score for death QOL (β=-0.09) but higher score for intimacy QOL (β=0.08).

Disability scores were lower in older people residing in the community (β=-0.22) and in those who were satisfied with their home living environment (β=-0.08). Sensory QOL score was lower for those with an unhealthy lifestyle (β=-0.12) and those who smoked (β=-0.07). Those who resided in the community had higher QOL scores for all domains except the death domain. Residence satisfaction led to higher QOL scores for autonomy (β=0.09), activities (β=0.09), social (β=0.11), and intimacy QOL domains (β=0.09). Older people with self-perceived unhealthy lifestyle were more likely to have lower QOL domain scores (sensory, activities, and social) whereas those suffering from comorbidities were likely to have lower values for the autonomy domain of QOL (β=-0.10).

The disability score was higher in those who suffered from physical frailty (β=0.52). The sensory QOL score was lower in those with higher scores in physical (β=-0.31), cognition (β=-0.08), and social frailty domains (β=-0.12). Physical frailty was related to the sensory and social QOL (β=-0.14), whereas cognition frailty was only associated with sensory QOL (β=-0.08). High social frailty scores led to lower sensory (β=-0.12), social (β=-0.08), and intimacy QOL scores   (β=-0.09). Those with higher psychological frailty scores were more likely to have lower scores for autonomy (β=-0.09), activities (β=-0.11), social (β=-0.11), and death domains (β=-0.23) of QO

Table 8: Hierarchical regression analyses predicting factors associated with adverse life events

	Disability	Visit doctor	Sensory QOL	Autonomy QOL	Activities QOL	Social QOL	Death QOL	Intimacy QOL
Age	0.21^c	-0.04	-0.15^c	-0.05	0.03	-0.01	0.10^a	0.01
Gender (female)	0.06	0.03	0.02	-0.04	0.03	0.03	-0.13^b	0.12^b
Education	-0.01	0.03	0.09^b	0.15^c	0.20^c	0.15^c	0.10^a	0.20^c
Marital status (married)	0.02	0.12^b	-0.05	0.04	0.02	-0.02	-0.08	0.03
Income	0.03	-0.01	0.01	0.14^b	0.13^b	0.09^a	-0.01	0.09^a
Pension	-0.04	0.01	0.03	0.04	0.06	-0.01	-0.08	0.02
Government allowance	0.01	0.01	-0.03	0.04	0.03	0.03	-0.09^a	0.08^a
R^2 (%)	22.86^c	0.97	16.82^c	21.73^c	23.71^c	15.73^c	4.98^c	19.44^c
Residence (community-dwelling)	-0.22^c	-0.16^c	0.15^c	0.27^c	0.39^c	0.32^c	-0.01	0.44^c
Residence satisfaction	-0.08^b	-0.02	0.06	0.09^b	0.09^b	0.11^b	-0.01	0.09^b
R^2 (%)	10.86^c	2.80^c	5.56^c	7.50^c	13.71^c	12.93^c	0.37	16.68^c
Self-rated health (unhealthy)	0.01	0.13^b	-0.12^c	-0.07	-0.08^b	-0.09^a	0.00	-0.06
Comorbidities	-0.00	0.02	0.04	-0.10^b	-0.06	-0.06	0.04	-0.04
Medication use (Yes)	-0.02	0.16^c	0.00	0.09^a	0.04	0.06	-0.02	0.02
R^2 (%)	1.22	5.69	3.45^c	2.02^c	1.56^c	2.39^c	0.18	0.73
Smoking	0.03	0.01	-0.07^a	-0.06	0.01	-0.03	0.00	0.02
Alcohol consumption	0.03	-0.03	0.01	0.02	-0.01	-0.06	-0.08^a	-0.03
R^2 (%)	0.07	0.10	0.36	0.24	0.02	0.33	0.38	0.06
Physical frailty	0.52^c	0.06	-0.31^c	-0.04	-0.02	-0.14^c	-0.07	-0.05
Cognition frailty	0.02	0.00	-0.08^b	-0.06	0.00	-0.02	-0.07	-0.04
Social frailty	0.01	0.03	-0.12^b	-0.07	-0.05	-0.08^a	0.00	-0.09^a
Psychological frailty	0.06	-0.06	-0.07	-0.09^a	-0.11^b	-0.11^a	-0.23^c	0.02
R^2 (%)	22.92^c	0.41	14.09^c	2.99^c	2.13^c	5.25^c	6.97^c	1.03^a
R^2 total (%)	57.93^c	9.97	40.28^c	34.48^c	41.13^c	36.63^c	12.88^c	37.94^c

Standardized beta coefficients (β) from the last step of the regression equation (with all the predictors in the model)
Statistical significance indicated by a: $p < 0.05$, b: $p < 0.01$, and c: $p < 0.001$

Table 9 shows hierarchical logistic regression analyses predicting factors associated with the four dichotomous adverse outcomes of frailty. Like analyses in Table 8, five models were run to predict the outcomes and chi-square tests ($\chi2$) are given after each block and at the bottom of the table. Women were less likely to be hospitalized than men (AOR [Adjusted odds ratio]=0.55). Educated older people were less likely to be hospitalized (AOR=0.44), but more likely to receive nursing support (AOR=1.57). Those who were satisfied with their home living environment were less likely to experience falls than those who were dissatisfied (AOR=0.49). Unhealthy older people (AOR=3.63) and those who consumed medication (AOR=3.49) to manage their comorbidities were more likely to be hospitalized, and receive nursing support (AOR=2.36) and informal care (AOR=3.32) than those who perceived themselves as healthy. Older people with higher physical frailty scores were more likely to be hospitalized (AOR=1.29), receive informal care (AOR=1.14) and experience fall (AOR=1.25). Those with higher cognition frailty scores were less likely to receive nursing support (AOR=0.38) and informal care (AOR=0.56).

Table 9: Hierarchical logistic regression analyses predicting factors associated with adverse life events

	Hospitalization	Nursing support	Informal care	Fall
Age	0.98	1.02	1.01	1.02
Gender (female)	0.55[a]	0.99	1.07	1.16
Education	0.44[b]	1.57[a]	1.30	0.86
Marital status (married)	1.44	0.99	1.27	0.71
Income	1.36	0.85	0.57[a]	0.93
Pension	1.45	0.80	1.01	0.74
Government allowance	1.57	0.86	1.02	1.12
χ^2 (7)	19.62[b]	12.87	22.40[b]	42.21[c]
Residence (community-dwelling)	1.58	0.80	0.72	0.70
Residence satisfaction	1.97	0.58	1.08	0.49[a]
χ^2 (9)	0.71	6.39[b]	6.14[a]	19.60[c]
Self-rated health (unhealthy)	3.63[c]	2.36[b]	3.32[c]	1.15
Comorbidities	0.86	0.91	0.80	0.86
Medication use (Yes)	3.49[b]	3.27[c]	2.64[c]	1.04
χ^2 (12)	49.16[c]	39.72[c]	53.48[c]	1.82
Smoking	0.96	0.93	0.95	0.92
Alcohol consumption	1.16	1.13	1.09	1.21
χ^2 (14)	0.15	0.76	0.19	0.49
Physical frailty	1.29[b]	1.00	1.14[a]	1.25[c]
Cognition frailty	1.12	0.38[b]	0.56[a]	1.43
Social frailty	0.92	1.02	1.10	1.01
Psychological frailty	1.01	0.85	0.83	1.09
χ^2 (4)	13.53[a]	17.64[b]	11.32[a]	22.85[c]
χ^2 (18)	83.17[c]	77.38[c]	93.53[c]	86.97[c]

Adjusted Odds Ratios (AOR) from the last step of the logistic equation (with all the predictors in the model)
Statistical significance indicated by a: $p < 0.05$, b: $p < 0.01$, and c: $p < 0.001$

Chapter 4

Discussion, conclusion, and recommendations

4.1 Discussion

4.1.1 Major findings

This study presents the factors associated with frailty in older people residing in Kathmandu Valley, Nepal. The overall prevalence of frailty was 60.5% with higher overall mean frailty score for older people living in old age homes. Frailty was associated with age, gender, education, satisfaction with living environment, and self-rated lifestyle. Disability, healthcare utilization, and fall were higher in older people suffering from physical frailty. Physical, cognition, and social frailties negatively affected the sensory domain of QOL. In addition, physical and social frailty influenced the social domain with QOL inversely. Social frailty was also negatively associated with the intimacy domain of QOL. Psychological frailty was inversely associated with autonomy, activities, social, and death domains of QOL.

4.1.2 Factors associated with frailty

The percentage of frail older people in this study was higher in those residing in old age homes. This finding is in line with a study in the Netherlands, where older people residing in assisted-living facilities were more frail (7). The prevalence of frailty ranged from 4.0% to 59.1% in community-dwelling older people aged 65 and above in various high- and middle-income countries according to a systematic review by Collard et al. (68). The prevalence ranged between 19% and 76% in older people who were nursing home residents (67). The prevalence ranged from 5.4% to 44% in community-dwelling older people and 32.3% to 49.3% in institutionalized older people in a systematic review on LMICs (63). The finding in this study could be because of the higher age of older people residing in old age homes. Hence, frailty is associated with increasing age. As people age, oxidative damage results in cell death, necrosis, and proliferation because of damage to DNA, which ultimately leads to loss of muscle mass called sarcopenia (22). Sarcopenia is directly related to age and

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manifests as weak muscle strength, slowed gait, and poor balance (22). Physiological and functional deficits increase with age which lead to frailty (5).

Women were more likely to be more frail than men. Older women were found to be more frail than their male counterparts in studies conducted in the UK, Mexico, China, and India (62, 84-86). Women suffer from more deficits in their life course as opposed to men which leads to a higher incidence of illnesses with longer durations because of longer lifespan than men (87, 88). Another reason for higher frailty among older women could be post-menopausal state, which accelerates biological aging and frailty because of estrogen deficiency (89). Women also have low levels of male hormones which are needed for muscle mass and strength, the lack of which can contribute to frailty (90). On the other hand, frailty can also be triggered by low physical activity and caloric consumption in women compared to men (11). However, the effect of gender became insignificant after adding alcohol and smoking in the model. Moderate alcohol consumption has shown to reduce the probability of incident frailty in older people, both men and women (91).

In this study, frailty was lower in educated older people, which is consistent with findings from studies conducted in Italy and the Netherlands (92, 93). Education capacitates older people to identify their health problems and seek healthcare when needed through health-related knowledge and behavior (94). It also improves their cognitive performance and decreases functional limitations (95). Higher education enables older people to access health information, communicate better, and perform complex activities at home and in the community. Education may affect the prospects of finding a well-paying job past the retirement age and in turn prevent decline of function through physical, cognitive, and psychological activation (96).

Older people who were satisfied with their home-living environment were less likely to be frail. This finding was previously found in European studies but is new for a low-income setting (81, 97). Progression of frailty can be prevented or slowed down if older people can maintain independent living. When older people lack resources to support aging in their living environment, their frailty state can deteriorate (98, 99). A living environment that is not age-friendly could lead to limited physical activity and reduced opportunities, thus contributing to loneliness and isolation leading to decline in cognitive functions (100). Factors that can promote satisfaction with the living environment in France and the Netherlands were the availability of basic living facilities located on the floor of residence, enough opportunities for social contact, and feeling of safety at home and the neighborhood (101, 102). Nepal lacks age-friendly infrastructure and studies on this topic are scarce (73). New development and city expansion projects did not take into account sitting and socializing places close to residential areas (73). A qualitative study in a hospital-setting in Nepal showed that older people were dissatisfied with the lack of ramp ways and elevators, which made moving around difficult, especially if they were wheelchair-bound. Similarly, the traditional squat toilets were also inconvenient to use (103). Old age homes also lacked age-friendly infrastructure. Older people had to climb stairs, bathrooms were inaccessible, railing support was lacking, and doorways were inaccessible for wheelchair users (59).

This study also found that older people who perceived themselves to have an unhealthy lifestyle were more likely to be frail. This finding is consistent with previous study in the Netherlands and Hong Kong which show that lifestyle factors such as diet, physical activity, smoking, and alcohol consumption have a crucial effect on frailty (11, 104). This finding is also new for a low-income country as previous studies analyzed lifestyle factors such as alcohol and smoking but not self-rated lifestyle (64, 81, 97). Self-rated health was

independently associated with frailty in a study conducted in Mexico (105). Subjective feeling of an unhealthy lifestyle could lead to an increase in the effect of an unhealthy lifestyle on frailty (11). Older people who perceive themselves to be unhealthy usually are not physically active, do not consume a healthy diet, and lead a sedentary lifestyle which may accelerate the development of frailty (99, 106).

4.1.3 Disability

In this study, higher disability was seen with advancing age and in those with physical frailty. This could be explained by sarcopenia in older age as explained above under factors associated with frailty (22). The consequences of frailty are decreased muscle strength, weakness, and reduced motor activity which lead to disability in older people. Although frailty and disability are distinctly defined terms in geriatrics, transitions from one to other is likely (22, 107). However, disability was lower in those residing in the community than those residing in old age homes and in those who were satisfied with their home living environment. Community-dwelling older people are usually more independent and more capable of performing their daily life activities compared to those living in old age homes. Most older people live in old age homes because of multiple health problems and the inability to perform daily life activities independently. Living in an environment that caters to the needs of older people helps them to remain physically active and prevent disability (100).

4.1.4 Healthcare utilization

Healthcare utilization was explained in four domains which were visited doctor in the past year, hospitalization, received nursing support, and received informal care. Older women were less likely to be hospitalized which is a different finding compared to studies conducted in the United States and Italy (108, 109). In the US, women were more likely to be

hospitalized than men due to higher morbidity from diabetes (108). In Italy, women were older than men, many were widowed, lived longer than men, and lived alone. These factors put them at high risk of suffering from depression, hypertension, and cardiovascular diseases and thus, hospitalization (109). However, women in LMICs usually take up the role of caregivers even in old age and hence are likely to put their family before themselves and ignore their poor health (109). They also tend to rely on family and relatives to seek healthcare, but men are usually given preference in terms of healthcare due to a patriarchal society (110).

Educated older people were less likely to be hospitalized than those without education. This finding is different from a study conducted in Taiwan where educated older people were more likely to utilize healthcare and those with lower education levels were less conscious of their health (111). However, the finding in this study could be because educated people are more likely to engage in a healthy lifestyle and health-promoting behavior and thus, less likely to suffer from ailments that require hospitalization (94, 95). They are also more likely to seek nursing support which could be due to identification of health problems and seeking care when needed (94).

Those residing in the community were less likely to visit a doctor compared to older people residing in old age homes. Usually, old age homes have healthcare staff to cater to the health needs of older residents residing there. Thus, older people residing there might have better access to healthcare providers than community-dwelling older people and see doctors more frequently. Those who were married were more likely to visit a doctor as having a spouse has a decisive influence and improves health-seeking behavior. A spouse can provide

social, psychological, and financial support, as well as accompany one to visit a doctor (112). This finding is supported by other studies conducted in Nepal (41, 43).

Older people with self-rated poor health utilized healthcare more than those who perceived themselves as healthy. This finding is consistent with a study conducted in Ghana and China (113, 114). In this study, having a comorbidity was not associated with healthcare utilization which suggests that self-rated health could predict healthcare utilization better. Self-rated health is an individual's perception of his/her health and it influences his/her healthcare utilization rate (114). On the contrary, having an income decreased the likelihood of receiving informal care which is a new finding compared to a study in Ghana (113). Older people with an income could be self-reliant and prefer to use formal care when needed.

Also, in this study, medication use led to visit doctor, hospitalization, and receiving informal care. The number of medications prescribed is higher in those with multiple comorbidities. The number of prescription drugs usually increases with age and some of them could be unnecessary, causing adverse reactions and poor adherence (115). Some adverse reactions are functional impairment, weight loss, loss of appetite leading to poor nutrition, and impaired balance which inversely affect frailty (18, 116). This, in turn, might increase healthcare utilization in older people.

Physical frailty increased hospitalization rate and informal care, whereas older people with cognition frailty were less likely to utilize nursing support and informal care. The hospitalization rate was higher in frail older people compared to those who were not frail in the US as they may not be able to care for themselves (117). Cognitive impairment increased healthcare utilization in the US which is a different finding from this study which could be

because mild cognitive impairment did not affect functional limitation (118). Older people with severe cognitive impairment were excluded from this study.

4.1.5 Fall

In this study, older people who suffered from physical frailty and were dissatisfied with their home living environment were more likely to experience falls. Increasing age leads to a decline in physiological and functional capacity because of joint deformity and swelling. This can lead to a decrease in range of motion in joints and, in turn, causes difficulty in walking and maintaining balance (119). Moreover, vestibular and visual functions decline with age, and may cause difficulty in maintaining body balance (23). Loss of muscle mass because of aging also puts older people at higher risk of falls.

Frailty can be complicated by living in an environment that is not age-friendly. For example, fall was related to the location of bathroom, living room, and stairs at home in Iran due to the absence of handrails for support (120). Frailty is also a strong predictor of future falls, irrespective of the history of falls (121). In addition, slippery floors in bathrooms and houses, inadequate lighting, and uneven floors were the causes of falls in Thailand (122). Frailty affects mobility before the occurrence of falls (123). Falls caused 16,600 deaths and about 1.47 million non-fatal injuries in Nepal in 2014 (124). Common places for falls were toilets and gardens (125). A hospital-based study in Nepal further identified factors such as lack of ramp and elevator, insufficient lighting, traditional pan-style toilets, slippery toilets, and transportation systems caused inconvenience to older people (103). Lack of elevators and handrail support could have led to falls in old age homes (59). These factors could have contributed to falls. Thus, identifying frail older people can prevent the incidence of future falls.

4.1.6 Quality of life

The present study shows that overall QOL and QOL in five domains were better for older people residing in the community than in old age homes. This finding is consistent with a study conducted in India (126). In India, community-dwelling older people received care and support from their family and friends which improved their QOL (126). Those residing in old age homes could have a lower QOL because of poor living conditions, separation from family, or poor health (126).

Older people with higher age had lower QOL in the sensory domain, whereas higher QOL in the death and dying domain. Worsening sensory functions affect the QOL as explained above. Older people accept death as a natural process and are prepared to deal with it as they may have experienced demise of family and friends due to old age (127). However, women scored lower for the death and dying facet of QOL which is a different finding compared to previous studies conducted in different countries including Scotland, China, Japan, and Turkey (80, 128). It could be because Nepalese women are usually dependent on their families to support them, and when they do not get proper care or support, their perception towards death may change. Having social relationships and support affect the QOL of older people positively (16).

Educated older people scored higher in all six QOL domains whereas having an income above 20 USD scored higher in three QOL domains. Education empowers older people, promotes health-seeking behavior (94), and increases social participation (129). Having an income enables them to seek healthcare when needed, make life decisions, and participate in social activities. On the other hand, perceiving oneself as unhealthy, correlated negatively with sensory, activities, and social domains of QOL. Having a chronic disease/s also led to

lower QOL scores in the autonomy domain. Loss of autonomy affects QOL as QOL is related to the ability to perform daily tasks and life activities. Comorbidities limit independent living and self-care whereas taking medications to treat them improves QOL by relieving symptoms of the disease.

Lack of satisfaction with the living environment affects QOL negatively (102). Factors associated with the living environment in a previous study in the Netherlands were housing facility, neighbors, neighborhood design, traffic, safety, and noise (102). Feeling of being unsafe can have a negative influence on physical and mental health which can lower the QOL. Facilities in the neighborhood and traffic may affect the mobility of older people for recreational activities, shopping, and maintaining social contacts (102). A self-rated unhealthy lifestyle can decrease QOL as it influences social contacts (106). Feeling of being unhealthy can lead to decreased mobility and reduced physical activity.

Both physical and social frailty affect the sensory and social domains of QOL negatively, whereas the cognition domain of frailty affected only sensory QOL. Previous studies have established that physical frailty affects the QOL of older people (35, 82) which is explained by decreased muscle mass and function in old age (22). Older people also suffer from sensory declines such as poor eyesight and reduced hearing (23). They could lead to difficulty in mobility and thus, reduced opportunities for social contact. Maintaining social contacts is an important factor in maintaining QOL of older people (130). Cognitive decline impaired neuromotor and sensory functions in a study conducted in Singapore (131). It showed that cognitive decline could affect hearing and smell and thus lower the QOL. Psychological frailty was inversely related to four QOL domains. Psychological frailty can occur as a consequence of lack of support and care which may lead to loneliness and depression in

severe cases. They can affect one's emotions negatively, making one unable to perform daily life activities and participate in social activities (132). Depressive symptoms are more common in frail older people which may affect their psychological well-being.

4.1.6 Strengths and limitations

This is one of the first studies to measure the frailty status and explore the factors associated with frailty in both old age homes and the community in South Asia which provides a baseline for future studies on frailty. This study also employed a multidimensional concept of frailty instead of only the physical concept which enabled to study frailty and related adverse outcomes in various domains. The effect of potential confounders was limited by adjusting the analysis for sociodemographic and health variables, also by conducting hierarchical regression analyses.

As this study was cross-sectional in design, cause-effect interpretations between frailty and adverse life outcomes could not be established (7, 34). This limitation can be overcome by employing a longitudinal design. Another limitation of a cross-sectional design could be reverse causality. As baseline data was not available, it was not possible to conduct a longitudinal study. However, the objective of this study was to assess the association between exposure and outcome variables rather than to observe cause-effect relationships.

The findings may not be generalizable to the entire population because it was conducted in an urban setting and older people were recruited through non-probability sampling. However, this study recruited older people from various socioeconomic backgrounds living in urban areas of Kathmandu Valley. Frailty is an understudied field in low-income countries.

Thus, the results can be generalized among older people with similar characteristics and from resource limited settings.

Some of the measures, such as GFI, GARS, and WHOQOL-OLD, have not been validated in Nepal's context. However, they were translated carefully, pre-tested, checked for reliability, face validity performed with experts, and analyses conducted to evaluate their content validity. Selection bias is possible because of the probability of participation of older people with better health willing to be interviewed for this study. Ten old age homes included in this study had their own characteristics such as payment options and availability of healthcare staff and size. Since old age homes in Nepal are not regulated, it might have affected the results of the study. A randomized controlled trial could have eliminated this bias. However, the response rate in this study was about 79% which shows good representative cross-section of the population of older people (133). Variable associated with selection such as age was included in the analysis which also minimizes the effect of selection bias (134).

The results of this study were not correlated clinically due to time and resource limitations. The results were based on self-reported data. A study in conducted in the Netherlands suggests that GFI moderately overlaps with clinical measure of frailty and can be used to detect frailty (135). Self-administration of the questionnaire was not possible as 49.7% of older people in this study were illiterate. To minimize social-desirability bias, the older people were interviewed in privacy after ensuring them of their anonymity (136).

4.2 Conclusion

This thesis highlights the higher frailty in older people residing in old age homes. The determinants of frailty in this study were illiteracy, self-rated unhealthy lifestyle and dissatisfaction with the living environment. Frailty led to disability, falls, and increase in healthcare utilization in terms of hospitalization and informal care. Similarly, frailty also led to lowered QOL in all QOL domains. The QOL domains are predicted by different components of frailty.

4.3 Recommendations

This study helps us understand the frailty status of the older people residing in the community and various old age homes in Nepal. The findings of this study can be used to formulate policies to address the healthcare needs of frail older people and develop strategies for integrated care targeted to support them so that they receive the right combination of services.

The results of this study call for provisions to prevent frailty and its adverse outcomes by focusing on the modifiable risk factors. Measures to maintain a healthy lifestyle and provision of informal education to illiterate older people can be implemented. The management of frailty should include health education through disseminating information and increasing awareness on frailty in the community (137). It promotes behavioral changes, health-seeking behavior, and enhances positive attitude towards health, and improves long-term adherence to strategies for frailty management (138, 139).

A randomized controlled trial suggested that the progression of frailty can be dealt with resistance exercises and addition of nutritional supplements in diet which lead to increase in

lean body mass improving strength, tolerance to physical activity, and walking speed (140). Some frail older people with reduced mobility are unlikely to get adequate sun exposure which results in lack of intrinsic vitamin D production. They can be supplemented with vitamin D (141). Similarly, those who are underweight, can be supplemented with dietary protein and increased calorie intake (142). Cognitive training by stimulating short-term memory, enhancing attention and problem solving can enable older people to cope with daily life activities (143). This can decrease frailty and improve quality of life.

Along with these, living spaces should be made age-friendly so that older people are satisfied with their home-living environment. At the same time, increasing facilities for physical activity and social connections would elevate the QOL of older people. Assessment of frailty may help in the reduction of related adverse life outcomes such as healthcare utilization and falls, and improve the QOL of older people. A longitudinal study is important to evaluate the predictive power of the instrument to detect older people who are at risk of developing adverse health outcomes and also to measure cause-effect interpretations of the associations between frailty and adverse life outcomes. The results should be correlated with clinical assessment of frailty.

In the future, qualitative studies can be conducted to fill the gap between this study and existing studies. A qualitative study could be a detailed information about the needs and expectations of the older people. GFI instrument does not differentiate between robust, pre-frailty, and frailty. Future studies can evaluate the association of frailty with various factors based on scoring and also scores of GFI can be correlated with clinical frailty scores.

Older people in high-income countries accounted for the highest costs in healthcare (144) which makes it important for policy-makers to explicitly state their target population. Older people should be included in policy formulation as they can tell the best about their needs. Public health sectors in the government can collaborate with local communities to implement community interventions through health education and health promoting activities. Similarly, provisions for informal or vocational education should be provided to older people who want to be able to read and write as the number of illiterate older people in Nepal is high (145). Lack of basic literacy skill can both be a cause and effect of poverty, unemployment, abuse and isolation, and oppression (146). Education can empower the older people, especially the older women, by improving their skills and competencies, and enable them to socialize and remain active (147).

The living environment in old age homes can be improved by creating a safe and comfortable living space for older people residing there. A previous study in old age homes in Nepal showed that basic facilities in these homes were lacking (59). It can be improved by creating lighted spaces with light bulbs for better visibility at night, building western style toilets instead of traditional toilets which may be difficult for older people, handrail support in bathroom and stairs, and wheelchair accessible doorways and ramps. Social participation can be increased by activities such as religious chanting and meditation which older people generally enjoy (58). Presence of a common gathering room would give older people residing in old age homes more opportunities to communicate with fellow residents and do things they enjoy. In addition, health literacy should be implemented to encourage healthy behaviors and social participation (137). It would also enable older people, including those who are illiterate, to identify their health problems and seek healthcare when needed.

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References

1.	Christensen K, Doblhammer G, Rau R, Vaupel JW. Ageing populations: the challenges ahead. Lancet. 2009;374(9696):1196-208.
2.	United Nations. World population prospects: The 2017 revision, key findings and advance tables. Working paper no. ESA/P/WP/248. New York, USA: Department of Economic and Social Affairs, Population Division; 2017.
3.	Denton FT, Spencer BG. Chronic health conditions: changing prevalence in an aging population and some implications for the delivery of health care services. Can J Aging. 2010;29(1):11-21.
4.	United Nations. World population ageing 2015 (ST/ESA/SER.A/390). New York, USA: Department of Economic and Social Affairs, Population Division; 2015.
5.	Clegg A, Young J, Iliffe S, Rikkert MO, Rockwood K. Frailty in elderly people. Lancet. 2013;381(9868):752-62.
6.	Eeles EM, White SV, O'Mahony SM, Bayer AJ, Hubbard RE. The impact of frailty and delirium on mortality in older inpatients. Age Ageing. 2012;41(3):412-6.
7.	Gobbens RJ, Krans A, van Assen MA. Validation of an integral conceptual model of frailty in older residents of assisted living facilities. Arch Gerontol Geriatr. 2015;61(3):400-10.
8.	Peters LL, Boter H, Buskens E, Slaets JP. Measurement properties of the Groningen Frailty Indicator in home-dwelling and institutionalized elderly people. J Am Med Dir Assoc. 2012;13(6):546-51.
9.	Morley JE, Vellas B, van Kan GA, Anker SD, Bauer JM, Bernabei R, et al. Frailty consensus: a call to action. J Am Med Dir Assoc. 2013;14(6):392-7.
10.	Fulop T, Larbi A, Witkowski JM, McElhaney J, Loeb M, Mitnitski A, et al. Aging, frailty and age-related diseases. Biogerontology. 2010;11(5):547-63.
11.	Gobbens RJ, van Assen MA, Luijkx KG, Wijnen-Sponselee MT, Schols JM. Determinants of frailty. Journal of the American Medical Directors Association. 2010;11(5):356-64.
12.	Frisoli A, Jr., Ingham SJ, Paes AT, Tinoco E, Greco A, Zanata N, et al. Frailty predictors and outcomes among older patients with cardiovascular disease: Data from Fragicor. Arch Gerontol Geriatr. 2015;61(1):1-7.
13.	van Mourik Y, Bertens LC, Cramer MJ, Lammers JW, Reitsma JB, Moons KG, et al. Unrecognized heart failure and chronic obstructive pulmonary disease (COPD) in frail elderly detected through a near-home targeted screening strategy. J Am Board Fam Med. 2014;27(6):811-21.
14.	Kiely DK, Cupples LA, Lipsitz LA. Validation and comparison of two frailty indexes: The MOBILIZE Boston Study. J Am Geriatr Soc. 2009;57(9):1532-9.
15.	Bergman H, Ferrucci L, Guralnik J, Hogan DB, Hummel S, Karunananthan S, et al. Frailty: an emerging research and clinical paradigm--issues and controversies. J Gerontol A Biol Sci Med Sci. 2007;62(7):731-7.
16.	Gobbens RJ, van Assen MA, Luijkx KG, Schols JM. The predictive validity of the Tilburg Frailty Indicator: disability, health care utilization, and quality of life in a population at risk. Gerontologist. 2012;52(5):619-31.
17.	Masel MC, Ostir GV, Ottenbacher KJ. Frailty, mortality, and health-related quality of life in older Mexican Americans. J Am Geriatr Soc. 2010;58(11):2149-53.
18.	Fried LP, Tangen CM, Walston J, Newman AB, Hirsch C, Gottdiener J, et al. Frailty in older adults: evidence for a phenotype. J Gerontol A Biol Sci Med Sci. 2001;56(3):M146-56.

19.   Vermeiren S, Vella-Azzopardi R, Beckwee D, Habbig AK, Scafoglieri A, Jansen B, et al. Frailty and the Prediction of Negative Health Outcomes: A Meta-Analysis. J Am Med Dir Assoc. 2016;17(12):1163.e1-.e17.

20.   Crimmins EM, Hayward MD, Hagedorn A, Saito Y, Brouard N. Change in disability-free life expectancy for Americans 70-years-old and older. Demography. 2009;46(3):627-46.

21.   Lewin GF, Alfonso HS, Alan JJ. Evidence for the long term cost effectiveness of home care reablement programs. Clin Interv Aging. 2013;8:1273-81.

22.   Cesari M, Landi F, Vellas B, Bernabei R, Marzetti E. Sarcopenia and physical frailty: two sides of the same coin. Front Aging Neurosci. 2014;6:192.

23.   Fhon JR, Rodrigues RA, Neira WF, Huayta VM, Robazzi ML. Fall and its association with the frailty syndrome in the elderly: systematic review with meta-analysis. Rev Esc Enferm USP. 2016;50(6):1005-13.

24.   Roe L, Normand C, Wren MA, Browne J, O'Halloran AM. The impact of frailty on healthcare utilisation in Ireland: evidence from the Irish longitudinal study on ageing. BMC Geriatr. 2017;17(1):203.

25.   Hoeck S, Francois G, Geerts J, Van der Heyden J, Vandewoude M, Van Hal G. Health-care and home-care utilization among frail elderly persons in Belgium. Eur J Public Health. 2012;22(5):671-7.

26.   Hastings SN, Purser JL, Johnson KS, Sloane RJ, Whitson HE. Frailty predicts some but not all adverse outcomes in older adults discharged from the emergency department. J Am Geriatr Soc. 2008;56(9):1651-7.

27.   Oakland K, Nadler R, Cresswell L, Jackson D, Coughlin PA. Systematic review and meta-analysis of the association between frailty and outcome in surgical patients. Ann R Coll Surg Engl. 2016;98(2):80-5.

28.   Persico I, Cesari M, Morandi A, Haas J, Mazzola P, Zambon A, et al. Frailty and Delirium in Older Adults: A Systematic Review and Meta-Analysis of the Literature. J Am Geriatr Soc. 2018;66(10):2022-30.

29.   Institute of Medicine. Keeping Patients Safe: Transforming the Work Environment of Nurses. Washington (DC): National Academies Press (US): 2005

30.   Bevans M, Sternberg EM. Caregiving burden, stress, and health effects among family caregivers of adult cancer patients. Jama. 2012;307(4):398-403.

31.   Ringer TJ, Hazzan AA, Kennedy CC, Karampatos S, Patterson C, Marr S, et al. Care recipients' physical frailty is independently associated with subjective burden in informal caregivers in the community setting: a cross-sectional study. BMC Geriatr. 2016;16(1):186.

32.   Brinkman S, Voortman T, Kiefte-de Jong JC, van Rooij FJA, Ikram MA, Rivadeneira F, et al. The association between lifestyle and overall health, using the frailty index. Arch Gerontol Geriatr. 2018;76:85-91.

33.   Development of the World Health Organization WHOQOL-BREF quality of life assessment. The WHOQOL Group. Psychol Med. 1998;28(3):551-8.

34.   Gobbens RJ, Luijkx KG, van Assen MA. Explaining quality of life of older people in the Netherlands using a multidimensional assessment of frailty. Qual Life Res. 2013;22(8):2051-61.

35.   Chang YW, Chen WL, Lin FG, Fang WH, Yen MY, Hsieh CC, et al. Frailty and its impact on health-related quality of life: a cross-sectional study on elder community-dwelling preventive health service users. PLoS One. 2012;7(5):e38079.

36.   Shrestha DRS, A.; Ghimire, J. Emerging challenges in family planning programme in Nepal. J Nepal Health Res Counc. 2012;10(21):108-12.

37.   Nepal Law Commission. Senior Citizen Act 2063. Kathmandu, Nepal: Nepal Law Commission, Government of Nepal; 2006.

38.   Lundebjerg NE, Trucil DE, Hammond EC, Applegate WB. When It Comes to Older Adults, Language Matters: Journal of the American Geriatrics Society Adopts Modified American Medical Association Style. J Am Geriatr Soc. 2017;65(7):1386-8.

39.   Central Bureau of Statistics. National Population and Housing Census 2011. Kathmandu, Nepal: National Planning Commission Secretariat; 2012.

40.   Amin S, Bajracharya A, Bongaarts J, Chau M, Melnikas A. Demographic changes of Nepal: Trends and policy implications. Kathmandu, Nepal: National Planning Commission, Government of Nepal; 2017.

41.   Acharya S, Ghimire S, Jeffers EM, Shrestha N. Health Care Utilization and Health Care Expenditure of Nepali Older Adults. Front Public Health. 2019;7:24.

42.   Shrestha L. Geriatric health in Nepal: concerns and experience. Nepal Med Coll J. 2013;15(2):148-52.

43.   Sanjel S, Mudbhari N, Risal A, Khanal K. The utilization of health care services and their determinants among the elderly population of Dhulikhel municipality. Kathmandu Univ Med J (KUMJ). 2012;10(37):34-9.

44.   Manandhar N, Joshi SK. Morbidity Pattern among Elderly Population of Changu Narayan Municipality, Bhaktapur. J Nepal Health Res Counc. 2019;17(3):408-12.

45.   Geriatric Center Nepal. Status report on elderly people (60+) in Nepal on health, nutrition and social status focusing on research needs. Kathmandu, Nepal: Ministry of Health and Population, Government of Nepal; 2010.

46.   Population education and health research center. Nepal Population report 2016. Kathmandu, Nepal: Ministry of population and environment, Government of Nepal; 2016.

47.   Dhakal M. Ageing and health in Nepal. Special issue on ageing and health. 2012;16.

48.   Ojha A. Senior citizens receive allowance. The Kathmandu Post. 2017.

49.   Bisht P, Pathak P, Subedi D, Shakya M, Gautam M. Health and Social Care Needs Assessment of Elderly: The Context of Piloting Service Developments and Care of Elderly in Pharping, Kathmandu, Nepal. Kathmandu, Nepal: Tribhuvan University, Ageing Nepal, and United Nations Population Fund. 2012.

50.   Gurung L, Paudel G, Yadav U. Health service utilization by elderly population in urban nepal: a cross-sectional study. Journal of Manmohan Memorial Institute of Health Sciences. 2016;2:27-36.

51.   Shrestha SL, Shrestha N. Dynamics of population ageing in Nepal and the need for action. Journal of Population Ageing. 2014;7(2):81-95.

52.   Central Bureau of Statistics. National Population and Housing Census 2011. Kathmandu, Nepal: National Planning Commission Secretariat; 2012.

53.   Ministry of Finance. Economic survey: Fiscal year 2013/14. Kathmandu, Nepal; 2014.

54.   Ministry of Labour and Employment. Labour Migration for Employment, A Status Report for Nepal: 2015/2016-2016/2017. Kathmandu, Nepal; 2018.

55.   Chalise HN. Demographic situation of population ageing in Nepal. Kathmandu Univ Med J (KUMJ). 2006;4(3):354-62.

56.   Khanal P, Ra S, Chalise H. Children's Migration and Its Effect on Elderly People: A Study at Old Age Homes in Kathmandu. Am J Gerentol Geriatr 2018; 1 (1).1001.

57.   Department of Human Services. Neglect and Abandonment Oregon: DHS Oregon; [Available from: http://www.dhs.state.or.us/spd/tools/cm/aps/community/neglect_aband.pdf.

58.   Mishra S, Chalise HN. Health Status of Elderly living in Government and Private Old Age Home in Nepal. Sciences. 2018;11(4):173-8.

59.   Sanner H. Old and Alone: Analyzing the Developed and Inherent Social Avenues for Elderly in a Modernizing Society. 2013.

60.	Acharya P. Senior citizens and the elderly homes: A survey from Kathmandu. Dhaulagiri Journal of Sociology and Anthropology. 2008;2:211-26.

61.	Theou O, Brothers TD, Rockwood MR, Haardt D, Mitnitski A, Rockwood K. Exploring the relationship between national economic indicators and relative fitness and frailty in middle-aged and older Europeans. Age Ageing. 2013;42(5):614-9.

62.	Biritwum RB, Minicuci N, Yawson AE, Theou O, Mensah GP, Naidoo N, et al. Prevalence of and factors associated with frailty and disability in older adults from China, Ghana, India, Mexico, Russia and South Africa. Maturitas. 2016;91:8-18.

63.	Nguyen TN, Cumming RG, Hilmer SN. A Review of Frailty in Developing Countries. J Nutr Health Aging. 2015;19(9):941-6.

64.	Siriwardhana DD, Hardoon S, Rait G, Weerasinghe MC, Walters KR. Prevalence of frailty and prefrailty among community-dwelling older adults in low-income and middle-income countries: a systematic review and meta-analysis. BMJ Open. 2018;8(3):e018195.

65.	Nepal. MoH, New ERA, ICF. Nepal Demographic and Health Survey 2016. Kathmandu, Nepal: Ministry of Health, Nepal; 2017.

66.	Parker S, Khatri R, Cook IG, Pant B. Theorizing aging in Nepal: beyond the biomedical model. Canadian Journal of Sociology. 2014;39(2):231-54.

67.	Kojima G. Prevalence of Frailty in Nursing Homes: A Systematic Review and Meta-Analysis. J Am Med Dir Assoc. 2015;16(11):940-5.

68.	Collard RM, Boter H, Schoevers RA, Oude Voshaar RC. Prevalence of frailty in community-dwelling older persons: a systematic review. J Am Geriatr Soc. 2012;60(8):1487-92.

69.	Sternberg SA, Wershof Schwartz A, Karunananthan S, Bergman H, Mark Clarfield A. The identification of frailty: a systematic literature review. J Am Geriatr Soc. 2011;59(11):2129-38.

70.	Rockwood K, Hubbard R. Frailty and the geriatrician. Age Ageing. 2004; 429-30.

71.	De Lepeleire J, Iliffe S, Mann E, Degryse JM. Frailty: an emerging concept for general practice. Br J Gen Pract. 2009;59(562):e177-82.

72.	Nepal Health Sector Support Programme and HRH Technical Working Group. Human Resources for Health Nepal Country Profile. Kathmandu, Nepal: Nepal Health Sector Support Programme; 2013.

73.	Kandel R. Ageing and the elderly. The Kathmandu Post. 2018.

74.	Cerreta F, Eichler HG, Rasi G. Drug policy for an aging population--the European Medicines Agency's geriatric medicines strategy. N Engl J Med. 2012;367(21):1972-4.

75.	Acosta-Benito MA, Sevilla-Machuca I. Using prefrailty to detect early disability. J Family Community Med. 2016;23(3):140-4.

76.	Gobbens RJ, van Assen MA, Luijkx KG, Wijnen-Sponselee MT, Schols JM. The Tilburg Frailty Indicator: psychometric properties. J Am Med Dir Assoc. 2010;11(5):344-55.

77.	Choe K, Pradhan P. Unleashing Economic Growth: region-based urban development strategy for Nepal. Mandaluyong City, Philippines: Asian Development Bank; 2010.

78.	Daniels R, van Rossum E, Beurskens A, van den Heuvel W, de Witte L. The predictive validity of three self-report screening instruments for identifying frail older people in the community. BMC Public Health. 2012;12:69.

79.	Schuurmans H, Steverink N, Lindenberg S, Frieswijk N, Slaets JP. Old or frail: what tells us more? J Gerontol A Biol Sci Med Sci. 2004;59(9):M962-5.

80.	Power M, Quinn K, Schmidt S. Development of the WHOQOL-old module. Qual Life Res. 2005;14(10):2197-214.

81.	Gobbens RJ, van Assen MA. Frailty and its prediction of disability and health care utilization: the added value of interviews and physical measures following a self-report questionnaire. Arch Gerontol Geriatr. 2012;55(2):369-79.

82.   Lin CC, Li CI, Chang CK, Liu CS, Lin CH, Meng NH, et al. Reduced health-related quality of life in elders with frailty: a cross-sectional study of community-dwelling elders in Taiwan. PLoS One. 2011;6(7):e21841.

83.   Raykov T, Marcoulides GA. Introduction to Psychometric Theory: Routledge; 2011.

84.   Garcia-Gonzalez JJ, Garcia-Pena C, Franco-Marina F, Gutierrez-Robledo LM. A frailty index to predict the mortality risk in a population of senior Mexican adults. BMC Geriatr. 2009;9:47.

85.   Shi J, Song X, Yu P, Tang Z, Mitnitski A, Fang X, et al. Analysis of frailty and survival from late middle age in the Beijing Longitudinal Study of Aging. BMC Geriatr. 2011;11:17.

86.   Hanlon P, Nicholl BI, Jani BD, Lee D, McQueenie R, Mair FS. Frailty and pre-frailty in middle-aged and older adults and its association with multimorbidity and mortality: a prospective analysis of 493 737 UK Biobank participants. Lancet Public Health. 2018;3(7):e323-e32.

87.   Hardy SE, Allore HG, Guo Z, Gill TM. Explaining the effect of gender on functional transitions in older persons. Gerontology. 2008;54(2):79-86.

88.   Gordon EH, Peel NM, Samanta M, Theou O, Howlett SE, Hubbard RE. Sex differences in frailty: A systematic review and meta-analysis. Exp Gerontol. 2017;89:30-40.

89.   Nedergaard A, Henriksen K, Karsdal MA, Christiansen C. Menopause, estrogens and frailty. Gynecol Endocrinol. 2013;29(5):418-23.

90.   He B, Ma Y, Wang C, Jiang M, Geng C, Chang X, et al. Prevalence and Risk Factors for Frailty among Community-Dwelling Older People in China: A Systematic Review and Meta-Analysis. J Nutr Health Aging. 2019;23(5):442-50.

91.   Shah M, Paulson D, Nguyen V. Alcohol Use and Frailty Risk among Older Adults over 12 Years: The Health and Retirement Study. Clin Gerontol. 2018;41(4):315-25.

92.   Liotta G, O'Caoimh R, Gilardi F, Proietti MG, Rocco G, Alvaro R, et al. Assessment of frailty in community-dwelling older adults residents in the Lazio region (Italy): A model to plan regional community-based services. Arch Gerontol Geriatr. 2017;68:1-7.

93.   Hoogendijk EO, van Hout HP, Heymans MW, van der Horst HE, Frijters DH, Broese van Groenou MI, et al. Explaining the association between educational level and frailty in older adults: results from a 13-year longitudinal study in the Netherlands. Ann Epidemiol. 2014;24(7):538-44.e2.

94.   Elo IT. Social class differentials in health and mortality: Patterns and explanations in comparative perspective. Annual review of sociology. 2009;35:553-72.

95.   Herd P, Goesling B, House JS. Socioeconomic position and health: the differential effects of education versus income on the onset versus progression of health problems. J Health Soc Behav. 2007;48(3):223-38.

96.   Fujiwara Y, Shinkai S, Kobayashi E, Minami U, Suzuki H, Yoshida H, et al. Engagement in paid work as a protective predictor of basic activities of daily living disability in Japanese urban and rural community-dwelling elderly residents: An 8-year prospective study. Geriatr Gerontol Int. 2016;16(1):126-34.

97.   Coelho T, Paul C, Gobbens RJ, Fernandes L. Determinants of frailty: the added value of assessing medication. Front Aging Neurosci. 2015;7:56.

98.   Kerr J, Rosenberg D, Frank L. The role of the built environment in healthy aging: community design, physical activity, and health among older adults. Journal of planning Literature. 2012;27(1):43-60.

99.   Landi F, Abbatecola AM, Provinciali M, Corsonello A, Bustacchini S, Manigrasso L, et al. Moving against frailty: does physical activity matter? Biogerontology. 2010;11(5):537-45.

100.   Wilson RS, Krueger KR, Arnold SE, Schneider JA, Kelly JF, Barnes LL, et al. Loneliness and risk of Alzheimer disease. Arch Gen Psychiatry. 2007;64(2):234-40.

101.   Rioux L, Werner C. Residential satisfaction among aging people living in place. Journal of environmental psychology. 2011;31(2):158-69.

102.   Gobbens RJJ, van Assen M. Associations of Environmental Factors With Quality of Life in Older Adults. Gerontologist. 2018;58(1):101-10.

103.   Karki S, Bhatta DN, Aryal UR. Older people's perspectives on an elderly-friendly hospital environment: an exploratory study. Risk Manag Healthc Policy. 2015;8:81-9.

104.   Woo J, Chan R, Leung J, Wong M. Relative contributions of geographic, socioeconomic, and lifestyle factors to quality of life, frailty, and mortality in elderly. PLoS One. 2010;5(1):e8775.

105.   Gonzalez-Pichardo AM, Navarrete-Reyes AP, Adame-Encarnacion H, Aguilar-Navarro S, Garcia-Lara JM, Amieva H, et al. Association between Self-Reported Health Status and Frailty in Community-Dwelling Elderly. J Frailty Aging. 2014;3(2):104-8.

106.   Andrade JM, Duarte YAO, Alves LC, Andrade FCD, Souza Junior PRB, Lima-Costa MF, et al. Frailty profile in Brazilian older adults: ELSI-Brazil. Rev Saude Publica. 2018;52Suppl 2(Suppl 2):17s.

107.   Gill TM, Gahbauer EA, Allore HG, Han L. Transitions between frailty states among community-living older persons. Arch Intern Med. 2006;166(4):418-23.

108.   Lee JM, Davis MM, Gebremariam A, Kim C. Age and sex differences in hospitalizations associated with diabetes. J Womens Health (Larchmt). 2010;19(11):2033-42.

109.   Corrao S, Santalucia P, Argano C, Djade CD, Barone E, Tettamanti M, et al. Gender-differences in disease distribution and outcome in hospitalized elderly: data from the REPOSI study. Eur J Intern Med. 2014;25(7):617-23.

110.   Young JT, Menken J, Williams J, Khan N, Kuhn RS. Who receives healthcare? Age and sex differentials in adult use of healthcare services in rural bangladesh. World Health Popul. 2006;8(2):83-100.

111.   Tsou M-T. Healthcare Service Utilization and Associated Factors in Community-Dwelling Elderly in Northern Taiwan: One Medical Center's Experience. International Journal of Gerontology. 2018;12(2):144-9.

112.   DiMatteo MR. Social support and patient adherence to medical treatment: a meta-analysis. Health Psychol. 2004;23(2):207-18.

113.   Exavery A, Klipstein-Grobusch D, Debpuur C, editors. Self-rated health and healthcare utilization among rural elderly Ghanaians in Kassena-Nankana District: Working paper. In: Session 59: trends, patterns, and consequences of non-communicable diseases in Africa: 6th Union for African Population Studies Conference. Ghana; 2010

114.   Jiang M, Yang G, Fang L, Wan J, Yang Y, Wang Y. Factors associated with healthcare utilization among community-dwelling elderly in Shanghai, China. PLoS One. 2018;13(12):e0207646.

115.   Gnjidic D, Hilmer SN, Blyth FM, Naganathan V, Cumming RG, Handelsman DJ, et al. High-risk prescribing and incidence of frailty among older community-dwelling men. Clin Pharmacol Ther. 2012;91(3):521-8.

116.   Jyrkka J, Enlund H, Lavikainen P, Sulkava R, Hartikainen S. Association of polypharmacy with nutritional status, functional ability and cognitive capacity over a three-year period in an elderly population. Pharmacoepidemiol Drug Saf. 2011;20(5):514-22.

117.   McNallan SM, Singh M, Chamberlain AM, Kane RL, Dunlay SM, Redfield MM, et al. Frailty and healthcare utilization among patients with heart failure in the community. JACC Heart Fail. 2013;1(2):135-41.

118.   Chodosh J, Seeman TE, Keeler E, Sewall A, Hirsch SH, Guralnik JM, et al. Cognitive decline in high-functioning older persons is associated with an increased risk of hospitalization. J Am Geriatr Soc. 2004;52(9):1456-62.

119.   Salzman B. Gait and balance disorders in older adults. Am Fam Physician. 2010;82(1):61-8.

120.   Mahmoodabad SSM, Zareipour M, Askarishahi M, Beigomi A. Effect of the Living Environment on falls among the Elderly in Urmia. Open Access Maced J Med Sci. 2018;6(11):2233-8.

121.   Kojima G, Kendrick D, Skelton DA, Morris RW, Gawler S, Iliffe S. Frailty predicts short-term incidence of future falls among British community-dwelling older people: a prospective cohort study nested within a randomised controlled trial. BMC Geriatr. 2015;15:155.

122.   Sophonratanapokin B, Sawangdee Y, Soonthorndhada K. Effect of the living environment on falls among the elderly in Thailand. Southeast Asian J Trop Med Public Health. 2012;43(6):1537-47.

123.   Sánchez-García S, García-Peña C, Salvà A, Sánchez-Arenas R, Granados-García V, Cuadros-Moreno J, et al. Frailty in community-dwelling older adults: association with adverse outcomes. Clin Interv Aging. 2017;12:1003-11.

124.   Gupta S, Gupta SK, Devkota S, Ranjit A, Swaroop M, Kushner AL, et al. Fall Injuries in Nepal: A Countrywide Population-based Survey. Ann Glob Health. 2015;81(4):487-94.

125.   Rai BK, Chaudhari R, Yadav A, Rai B. A cross-sectional study of fall injuries in senior people attending emergency ward in BPKIHS, a tertiary level hospital, Dharan, eastern region of Nepal. Health Renaissance. 2015;13(1):77-85.

126.   Amonkar P, Mankar MJ, Thatkar P, Sawardekar P, Goel R, Anjenaya S. A Comparative Study of Health Status and Quality of Life of Elderly People Living in Old Age Homes and within Family Setup in Raigad District, Maharashtra. Indian J Community Med. 2018;43(1):10-3.

127.   Dias FM, Costa SO, Pereira de Freitas J, Pinto AaC, Vigário PoS, Mainenti MR. Functional Capacity of Oldest Old Living in a Long-stay Institution in Rio De Janeiro, Brazil. J Phys Ther Sci. 2014;26(7):1097-105.

128.   Top M, Dikmetaş E. Quality of life and attitudes to ageing in Turkish older adults at old people's homes. Health Expect. 2015;18(2):288-300.

129.   Pereira RMP, Batista MA, Meira AS, Oliveira MP, Kusumota L. Quality of life of elderly people with chronic kidney disease in conservative treatment. Rev Bras Enferm. 2017;70(4):851-9.

130.   Rondon Garcia LM, Ramirez Navarrro JM. The Impact of Quality of Life on the Health of Older People from a Multidimensional Perspective. J Aging Res. 2018;2018:4086294.

131.   Nyunt MSZ, Soh CY, Gao Q, Gwee X, Ling ASL, Lim WS, et al. Characterisation of Physical Frailty and Associated Physical and Functional Impairments in Mild Cognitive Impairment. Front Med (Lausanne). 2017;4:230.

132.   Hoeyberghs LJ, Schols JM, Verté D, De Witte N, Consortium D-S. Psychological Frailty and Quality of Life of Community Dwelling Older People: a Qualitative Study. Appl Res Qual Life. 2019;1-18.

133.   Hammer GP, du Prel JB, Blettner M. Avoiding bias in observational studies: part 8 in a series of articles on evaluation of scientific publications. Dtsch Arztebl Int. 2009;106(41):664-8.

134.   Keeble C, Law GR, Barber S, Baxter PD. Choosing a method to reduce selection bias: a tool for researchers. Open Journal of Epidemiology. 2015;5(3):155-62.

135.   Drubbel I, Bleijenberg N, Kranenburg G, Eijkemans RJ, Schuurmans MJ, de Wit NJ, et al. Identifying frailty: do the Frailty Index and Groningen Frailty Indicator cover different clinical perspectives? a cross-sectional study. BMC Fam Pract. 2013;14:64.

136.   Larson RB. Controlling social desirability bias. International Journal of Market Research. 2019;61(5):534-47.

137.   Archibald MM, Ambagtsheer R, Beilby J, Chehade MJ, Gill TK, Visvanathan R, et al. Perspectives of Frailty and Frailty Screening: Protocol for a Collaborative Knowledge Translation Approach and Qualitative Study of Stakeholder Understandings and Experiences. BMC Geriatr. 2017;17(1):87.

138.   Sorensen K, Van den Broucke S, Fullam J, Doyle G, Pelikan J, Slonska Z, et al. Health literacy and public health: a systematic review and integration of definitions and models. BMC Public Health. 2012;12:80.

139.   Juul L, Rowlands G, Maindal HT. Relationships between health literacy, motivation and diet and physical activity in people with type 2 diabetes participating in peer-led support groups. Prim Care Diabetes. 2018;12(4):331-7.

140.   Scott DL, Berry H, Capell H, Coppock J, Daymond T, Doyle DV, et al. The long-term effects of non-steroidal anti-inflammatory drugs in osteoarthritis of the knee: a randomized placebo-controlled trial. Rheumatology (Oxford). 2000;39(10):1095-101.

141.   Ministry of Health. Food and Nutrition Guidelines for Healthy Older People: A background paper. Wellington, New Zealand: Ministry of Health; 2013.

142.   Apostolo J, Cooke R, Bobrowicz-Campos E, Santana S, Marcucci M, Cano A, et al. Effectiveness of interventions to prevent pre-frailty and frailty progression in older adults: a systematic review. JBI Database System Rev Implement Rep. 2018;16(1):140-232.

143.   Ng TP, Feng L, Nyunt MS, Niti M, Tan BY, Chan G, et al. Nutritional, Physical, Cognitive, and Combination Interventions and Frailty Reversal Among Older Adults: A Randomized Controlled Trial. Am J Med. 2015;128(11):1225-36.e1.

144.   Fassbender K, Fainsinger RL, Carson M, Finegan BA. Cost trajectories at the end of life: the Canadian experience. J Pain Symptom Manage. 2009;38(1):75-80.

145.   Ghimire S, Baral BK, Karmacharya I, Callahan K, Mishra SR. Life satisfaction among elderly patients in Nepal: associations with nutritional and mental well-being. Health Qual Life Outcomes. 2018;16(1):118.

146.   Electronic Platform for Adult Learning in Europe (EPALE). On the relationship between functional illiteracy and poverty Netherlands; 2016 [Available from: https://epale.ec.europa.eu/en/resource-centre/content/relationship-between-functional-illiteracy-and-poverty.

147.   Villar F, Celdran M. Learning in later life: participation in formal, non-formal and informal activities in a nationally representative Spanish sample. Eur J Ageing. 2013;10(2):135-44.

Appendix 1: Map of Nepal and study districts

Appendix 2: Research questionnaire (English)

Frailty and adverse health outcomes in community-dwelling older adults and those living in old age homes in Kathmandu Valley, Nepal: a mixed-method study

Participants ID [ ] [ ] [ ] [ ]

Interviewer:……………

Section 1
Socio-demographic information

1. What is your age?
   …………. Years

2. Gender
   [   ] Male   [   ] Female [   ]

3. What is your permanent address (district)? ……………

4. What is your caste/ethnicity?
   a) Brahmin
   b) Chhetri
   c) Janajati
   d) Dalit
   e) Madhesi
   f) Muslim
   g) Others ………………… (specify)

5. What is your religion?
   a) Hindu
   b) Buddhist
   c) Muslim
   d) Christian
   e) Other ……………….. (specify)

6. What is your marital status?
   a) Single
   b) Married
   c) Widow/widower
   d) Divorced
   e) Separated
   f) Living together

7. What is the highest level of education you have completed?
   a) Illiterate
   b) Non- formal education
   c) Primary level (Class 1-5)
   d) Lower secondary level (Class 6-8)
   e) Secondary level (Class 9-10)
   f) Higher secondary level (10+2)
   g) Bachelor/undergraduate level
   h) Master/graduate level and above

8. Are you employed?
    a) Yes
    b) No (skip to 10)

9. What kind of work do you do at present? ………….................. (specify the occupation)

10. What kind of work did you do in the past?………………………… (specify the occupation)

11. What is your current income source?
    a) Current Job
    b) Business
    c) Pension
    d) Old age allowance
    e) Family support
    f) Support from an organization
    g) Others ………….. (specify)
    h) None

12. What is your monthly income amount? …………………………… NRs

13. Where do you live currently live?
    a) Old age home
    b) Living with spouse at old age home (skip to 17)
    c) Living alone at home (skip to 17)
    d) Living with spouse at home (skip to 17)
    e) Living with other family members (skip to 17)

14. Name of the old age home ……………..

15. What kind of facilities do you get in old age home where you live?
    ……………………………..

16. How long have you been staying in old age home?
    ……………… years ……………… months

17. Are you satisfied with your home living environment? (yes/no)

Section 2
General health
1. Overall, how healthy would you say your lifestyle is?
    a) Healthy   b)Not healthy, not unhealthy   c)Unhealthy

2. Do you feel physically feel healthy? (yes/no)

3. Do you consume alcohol?
    a) Yes   b)In the past   c)Never (skip to 7)

4. What type of alcohol do/did you consume?……………………………….

5. How often do/did you consume alcohol?
   a) Everyday
   b) Few times a week
   c) Once a week
   d) Once in few weeks
   e) Once a month
   f) Once in few months

6. How much alcohol do/did you consume? ……………………..ml

7. Do you smoke?
   a) Never (skip to 10)
   b) Past smoker
   c) Currently smoking (skip to 9)
   d) Passive smoker (skip to 10)

8. When did you stop smoking?   Stopped since ………. Years

9. How many cigarettes did/do you consume in a day?
   …………….. number of cigarettes per day

10. How long have you been smoking or how long did you smoke? (in years) …………..

11. Do you suffer from any illness/disease?
    a) None
    b) Hypertension
    c) Diabetes
    d) Dyslipidemia
    e) Heart disease
    f) Osteoporosis
    g) Chronic renal failure
    h) Cancer
    i) Osteoarthritis
    j) Others………………….. (specify)

12. How many prescribed medicines do you take in a day? ………..

13. Did you fall in the previous year? (yes/no)

Section 3
Oral health

1. In general, would you say the health of your teeth and mouth is
   a) Excellent
   b) Very good
   c) Good
   d) Fair
   e) Poor

2. Do you have one or more of your own teeth? (Do you still have your natural teeth?) (yes/no)

3. Do you wear dentures or false teeth? (yes/no)

In the past three months

		Never	Seldom	Sometimes	Often	Always
4.	How often did you limit the kinds or amounts of food you eat because of problems with your teeth or denture?	1	2	3	4	5
5.	How often did you have trouble biting or chewing any kinds of food, such as a firm meat or apples?	1	2	3	4	5
6.	How often were you able to swallow comfortably?	1	2	3	4	5
7.	How often have your teeth or dentures prevented you from speaking the way you wanted?	1	2	3	4	5
8.	How often were you able to eat anything without feeling discomfort?	1	2	3	4	5
9.	How often did you limit contacts with people because of the condition of your teeth or dentures?	1	2	3	4	5
10.	How often were you pleased or happy with the appearance of your teeth, gums or dentures?	1	2	3	4	5
11.	How often did you use medication to relieve pain or discomfort around your mouth?	1	2	3	4	5
12.	How often were you worried or concerned about the problems with your teeth, gums or dentures?	1	2	3	4	5
13.	How often did you feel nervous or self-conscious because of problems with your teeth, gums or dentures?	1	2	3	4	5
14.	How often did you feel uncomfortable eating in front of people because of problems with your teeth or dentures?	1	2	3	4	5
15.	How often were your teeth or gums sensitive to hot, cold or sweet foods?	1	2	3	4	5

Section 4
Frailty (Groningen Frailty Indicator)

	Yes	No	
Mobility			

Can you perform the following tasks without assistance from another person (walking aids such as a can or a wheelchair are allowed)			
1. Grocery shopping	0	1	
2. Walk outside house (around house or to neighbor)	0	1	
3. Do you experience problems in your daily life due to difficulty in walking?			
4. Getting (un)dressed	0	1	
5. Do you experience problems in your daily life due to lack of strength in your hands?			
6. Visiting restroom	0	1	
7. Do you experience problems in your daily life due to physical tiredness?	1	0	
8. Do you experience problems in your daily life due to difficulty in maintaining your balance?	1	0	
Vision			
9. Do you encounter problems in daily life because of impaired vision?	1	0	
Hearing			
10. Do you encounter problems in daily life because of impaired hearing?	1	0	
Nutrition			
11. Have you unintentionally lost a lot of weight in the past 6 months (6kg in 6 months or 3kg in 3 months)?	1	0	
Co-morbidity			
12. Do you use 4 or more different types of medication?	1	0	
	Yes	No	Sometimes
Cognition			
13. Do you have any complaints on his/her memory (or diagnosed with dementia)?	1	0	0
Psychosocial			
14. Do you ever experience emptiness around him? e.g. You feel so sad that you have no interest in your surroundings. Or if someone you love no longer love you, how do you feel?	1	0	1
15. Do you ever miss the presence of other people around him? Or do you miss anyone you love?	1	0	1
16. Do you ever feel left alone? e.g. You wish there is someone to go with you for something important	1	0	1
17. Have you been feeling down or depressed lately?	1	0	1
18. Have you felt nervous or anxious lately? (in the past month)	1	0	1
19. Do you receive enough support from other people?	1	0	
20. Are you able to cope with problems well?	1	0	
21. Have you felt down during the last month?	1	0	
Physical Fitness			
22. How would you rate his/her own physical fitness? (0-10 ; 0 is very bad, 10 is very good) 0 – 6 = 1 and 7 – 10 = 0	1	0	
TOTAL SCORE GFI			

Section 5
Quality of life (WHOQOL-OLD)

This questionnaire asks for your thoughts and feelings about certain aspects of your quality of life and addresses issues that may be important to you as an older member of society. Please answer all the questions. If you are unsure about which response to give to a question, please choose the one that appears most appropriate. This can often be your first response. Please keep in mind your standards, hopes, pleasures and concerns. We ask that you think about your life in the last two weeks.

The following questions ask about how much you have experienced certain things in the last two weeks, for example, freedom of choice and feelings of control in your life. If you have experienced these things an extreme amount circle the number next to "An extreme amount". If you have not experienced these things at all, circle the number next to "Not at all". You should circle one of the numbers in between if you wish to indicate your answer lies somewhere between "Not at all" and "Extremely". Questions refer to the last two weeks.

		Not at all	A little	A moderate amount	Very much	An extreme amount
1	To what extent do impairments to your senses (e.g. hearing, vision, taste, smell, touch) affect your daily life?	1	2	3	4	5
2	To what extent does loss of, for example, hearing, vision, taste, smell or touch affect your ability to participate in activities?	1	2	3	4	5
3	How much freedom do you have to make your own decisions?	1	2	3	4	5

		Not at all	Slightly	Moderately	Very much	Extremely
4	To what extent do you feel in control of your future?	1	2	3	4	5
5	How much do you feel that the people around you are respectful of your freedom?	1	2	3	4	5

		Not at all	A little	A moderate amount	Very much	An extreme amount

6	How concerned are you about the way in which you will die?	1	2	3	4	5

		Not at all	Slightly	Moderately	Very much	Extremely
7	How much are you afraid of not being able to control your death?	1	2	3	4	5
8	How scared are you of dying?	1	2	3	4	5

		Not at all	A little	A moderate amount	Very much	An extreme amount
9	How much do you fear being in pain before you die?	1	2	3	4	5

The following questions ask about how completely you experience or were able to do certain things in the last two weeks, for example getting out as much as you would like to. If you have been able to do these things completely, circle the number next to "Completely". If you have not been able to do these things at all, circle the number next to "Not at all". You should circle one of the numbers in between if you wish to indicate your answer lies somewhere between "Not at all" and "Completely". Questions refer to the last two weeks.

		Not at all	A little	Moderately	Mostly	Completely
10	To what extent do problems with your sensory functioning (e.g. hearing, vision, taste, smell, touch) affect your ability to interact with others?	1	2	3	4	5
11	To what extent are you able to do the things you'd like to do?	1	2	3	4	5
12	To what extent are you satisfied with your opportunities to continue achieving in life?	1	2	3	4	5
13	How much do you feel that you have	1	2	3	4	5

	received the recognition you deserve in life?					
14	To what extent do you feel that you have enough to do each day?	1	2	3	4	5

The following questions ask you to say how satisfied, happy or good you have felt about various aspects of your life over the last two weeks. For example, about your participation in community life or your achievements in life. Decide how satisfied or dissatisfied you are with each aspect of your life and circle the number that best fits how you feel about this. Questions refer to the last two weeks.

		Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very satisfied
15	How satisfied are you with what you have achieved in life?	1	2	3	4	5
16	How satisfied are you with the way you use your time?	1	2	3	4	5
17	How satisfied are you with your level of activity?	1	2	3	4	5
18	How satisfied are you with your opportunity to participate in community activities?	1	2	3	4	5

		Very unhappy	Unhappy	Neither happy nor unhappy	Happy	Very happy
19	How happy are you with the things you are able to look forward to?	1	2	3	4	5

		Very poor	Poor	Neither poor nor good	Good	Very good
20	How would you rate your sensory functioning (e.g.	1	2	3	4	5

	hearing, vision, taste, smell, touch)?					

The following questions refer to any intimate relationships that you may have. Please consider these questions with reference to a close partner or other close person with whom you can share intimacy more than with any other person in your life.

		Not at all	A little	A moderate amount	Very much	An extreme amount
21	To what extent do you feel a sense of companionship in your life?	1	2	3	4	5
22	To what extent do you experience love in your life?	1	2	3	4	5

		Not at all	A little	Moderately	Mostly	Completely
23	To what extent do you have opportunities to love?	1	2	3	4	5
24	To what extent do you have opportunities to be loved?	1	2	3	4	5

Section 5
Disability (Groningen Activity Restriction Scale)

The following questions refer to daily activities which should be performed frequently. In each question it is asked whether you are able to perform the activity at this moment. It is not intended to assess whether you are actually performing the activities, but if you can do them if necessary.

Response categories for each item
1. Yes, I can do it fully independently without any difficulty
2. Yes, I can do it fully independently but with some difficulty
3. Yes, I can do it fully independently but with great difficulty
4. No, I cannot do it fully independently, I can only do it with someone's help
5. No, I cannot do it at all, I need complete help

		1	2	3	4	5
	Activities of daily living					
1	Can you, fully independently, dress yourself?					
2	Can you, fully independently, get in and out of bed?					
3	Can you, fully independently, stand up from sitting in a chair?					
4	Can you, fully independently, wash your face and hands?					

5	Can you, fully independently, wash and dry your whole body?					
6	Can you, fully independently, get on and off the toilet?					
7	Can you, fully independently, feed yourself?					
8	Can you, fully independently, get around in the house (if necessary with a cane or walker)?					
9	Can you, fully independently, go up and down the stairs?					
10	Can you, fully independently, walk outdoors (if necessary with a cane or walker)?					
11	Can you, fully independently, take care of your feet and toenails?					
	Instrumental activities of living					
12	Can you, fully independently, prepare breakfast or lunch?					
13	Can you, fully independently, prepare dinner?					
14	Can you, fully independently, do "light" household activities (for example, dusting and tidying up)?					
15	Can you, fully independently, do "heavy" household activities (for example mopping, cleaning the windows, and vacuuming)?					
16	Can you, fully independently, wash and iron your clothes?					
17	Can you, fully independently, make the beds?					
18	Can you, fully independently, do the shopping?					

Section 6
Health care utilization

1. How frequently have you visited or been visited by a general practitioner during the last year?
   a. Never
   b. 1 time
   c. 2 times
   d. 3 times
   e. 7 times or more

2. Were you admitted to a hospital in the last year?
   a. Yes
   b. No

3. How many times were you admitted in a hospital?
   a. Never
   b. 1 time
   c. 2 times
   d. 3 times
   e. 4 times or more

4. Have you used professional support for your personal care in the last year?
   a. Yes
   b. No

5. Have you used professional nursing support in the last year, for example to care for wounds or give injections?

a. Yes
b. No
6. Have you received informal care during the past 12 months because of your health status?
   a. Yes
   b. No

Appendix 3: Research questionnaire (Nepali)

(वृद्धाश्रम र समुदायमा बस्ने वृद्धहरुमा हुने शरीरिक कमजोरी र कमजोरीले गर्दा हुने प्रतिकुल स्वास्थ्य परिणामको अवस्था)

Participants ID ☐ ☐ ☐ ☐
Interviewer:……………
Ward no.: …………..
District:- …………….

भाग १: सामाजिक तथा जनसांख्यिक जानकारी (विवरण)

18. तपाईको पुगेको उमेर कति हो?   वर्ष

19. [   ] पुरुष   [   ] महिला

20. तपाईको स्थाई ठेगाना कता हो? ………………

21. तपाईको जात/जातिय पहिचान के हो?
    a) ब्राह्मण
    b) छेत्री
    c) दलित
    d) जनजाति
    e) मधेशी
    f) मुस्लिम
    g) अन्य………… (अन्यको खन्डमा जात खुलाउनु होस्)

22. तपाई कुन धर्म मान्नु हुन्छ?
    a) हिन्दु
    b) बौद्ध
    c) इस्लाम
    d) इसाई
    e) अन्य ……………….. (अन्यको खन्डमा धर्म खुलाउनु होस्)

23. तपाईको बैवाहिक स्थिति?
    a) अविवाहित
    b) विवाहित
    c) विधवा/विधुर
    d) सम्बन्ध विच्छेद
    e) छुट्टीएर बसेको

24. तपाईले कती सम्म शिक्षा प्राप्त गर्नु भएको छ?
    a) अशिक्षित
    b) अनौपचारिक शिक्षा
    c) प्राथमिक बिद्यालय (कक्षा १-५)
    d) निम्न माध्यमिक बिद्यालय (कक्षा ६-८)

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f) माध्यमिक बिद्यालय (कक्षा ९ -१०)

g) उच्च माध्यमिक (10+2)

h) स्नातक तह (Bachelors)

i) स्नातकोत्तर वा सो भन्दा माथि (Masters and above)

j) व्यावसायिक शिक्षा (Vocational education)

25. के तपाई हालमा कार्यरत हुनुहुन्छ? छु/छैन

26. तपाई हालमा कस्तो खाले काम गर्नु हुन्छ? (oocupation) …………... (specify)

27. तपाईले पहिले के काम गर्नु हुन्थ्यो? (oocupation)………………………… (specify)

28. तपाईको हालको आर्थिक श्रोत के हो?

a) जागिर

b) व्यापार

c) पेन्शन

d) वृद्ध भत्ता

e) परिवार बाट

f) कुनै संस्था बाट

g) अन्य …………….. (आर्थिक श्रोत खुलाउनु होस्)

h) छैन

29. तपाईको मासिक आम्दानी कति छ? …………………………… NRs

30. तपाई अहिले कता बस्नु हुन्छ?

a) वृद्धाश्रममा

b) श्रीमान/श्रीमती संग वृद्धाश्रममा

c) घरमा एक्लै

d) श्रीमान/श्रीमती संग घरमा

e) श्रीमान/श्रीमती र बच्चाहरु सँग

f) बच्चाहरु सँग

g) परिवारका अरु सदस्य सँग

h) अन्य …………….. (अन्यको खन्डमा कत बस्नु हुन्छ खुलाउनु होस्।)

31. तपाई बस्नु भएको वृद्धाश्रमको नाम के हो? ……………

32. तपाई वृद्धाश्रममा बस्नु भएको कति वर्ष भयो? ……………… वर्ष

33. तपाई बस्ने वृद्धाश्रममा के के सुबिधाहरु छन्? जस्तै डाक्टर अथवा नर्स द्वारा जाच, औषधी बितरण, खानाको सुबिधा, मान्छेहरु सँग घुलमिल गर्ने ठाउँ, इत्यादी।...……………………………

34. के तपाई आफु बसेको ठाउँको वातावरण बाट सन्तुष्ट हुनुहुन्छ? छु/छैन

भाग २: स्वास्थ्य

14. समस्तमा तपाईंलाई आफ्नो जीवनशैली कत्ती को स्वस्थ लाग्छ?
    a) स्वस्थ छ
    b) ठिकै
    c) अस्वस्थ

15. के तपाई शारीरिक रूपमा स्वस्थ महसुस गर्नुहुन्छ? गर्छु/गर्दिन

16. तपाई जाड रक्सि खानु हुन्छ?
    a) खान्छु
    b) पहिले खान्थे
    c) कहिले खाएको छैन

17. कस्तो प्रकारको जाड रक्सि खानु हुन्थ्यो?
    …………………………………

18. हप्तामा कति दिन जाड रक्सि खानु हुन्छ/खानु हुन्थ्यो?
    a) दिनहुँ
    b) हप्ताको केहि दिन
    c) हप्ताको एक चोटी
    d) केहि हप्तामा एक चोटी
    e) महिनामा एक चोटी
    f) केहि महिनामा एक चोटी

19. कति खानु हुन्छ/हुन्थ्यो? ………………………..ml

20. तपाई चुरोट खानु हुन्छ?
    a) कहिले खाको छैन
    b) पहिले खान्थे
    c) खान्छु
    d) अप्रतक्ष धुम्रपान

21. तपाईंले चुरोट खान छोडेको कती समय भयो? ……………….(वर्षमा)

22. एक दिनमा कति वटा चुरोट खानु हुन्थ्यो/खानु हुन्छ?
    दिनमा …………….. वटा खिली

23. तपाईंले चुरोट खाएको कती वर्ष भयो? (तपाईंले कती वर्ष चुरोट खानु भयो?)………….. वर्ष

24. तपाई कुनै बीमारी / रोगबाट ग्रस्त हुनुहुन्छ?
    a) कुनै छैन
    b) उच्च रक्तचाप/प्रेसर
    c) मधुमेह/चिनी रोग
    d) रगतमा बोसो बढेको कोलेस्टेरोल बढेको
    e) मुटु रोग

f) हड्डी खिएको

g) मृगौलाको समस्या

h) क्यान्सर

i) बाथ

j) अन्य…………………..

25. अन्य रोग भए खुलाउनु होस्। ………………

26. एक दिनमा तपाई कतिवटा डाक्टर द्रारा निर्धारिक औषधी खानु हुन्छ?...........

27. तपाई गएको वर्ष लड्नु भएको थियो? थिए/थिइन

<div align="center">

भाग 3
मुखको स्वास्थय

</div>

1. तपाईले आफ्नो दात र मुखको स्वास्थलाई कस्तो ठान्नु हुन्छ?
   a) उत्कृष्ट
   b) धेरै राम्रो
   c) राम्रो
   d) ठिकै
   e) नराम्रो

2. तपाईको सबै दात प्राकृतिक हो? हो/ होइन

3. नक्कली दात लगाउनु हुन्छ? लगाउछु/लगाउदिन

अबका प्रश्नहरु गएको तीन महिनाको बारेमा हुने छन।

4. दातको समस्याले गर्द तपाईले खानाको किसिम वा मात्रा कतिको बार्नु भयो?
   a) कहिले बारिन
   b) शायद नै
   c) कहिले काही
   d) धेरै जसो
   e) सधैं

5. तपाईलाई कुनै खाने कुरा, जस्तै स्याउ वा मासु, चपाउन अथवा टोक्न कत्तिको समस्या भयो?
   a) कहिले भएन
   b) शायद नै
   c) कहिले काही
   d) धेरै जसो
   e) सधैं

6. सजिलै खान निल्न कत्तिको गाह्रो भयो?
   a) कहिले भएन
   b) शायद नै
   c) कहिले काही

d) धेरै जसो

e) सधैं

7. तपाईंको दात अथवा नक्कली दातले गर्दा तपाईंलाई आफुले खोजेको जस्तो बोल्न कत्तिको समस्या भयो?

a) कहिले भएन

b) शायद नै

c) कहिले काही

d) धेरै जसो

e) सधैं

8. कुनै अप्ठ्यारो बिना खाने कुरा कत्तिको खान सक्नु भयो?

a) कहिले भएन

b) शायद नै

c) कहिले काही

d) धेरै जसो

e) सधैं

9. दात को समस्याले गर्दा अरु मान्छे सँग भेटघाट गर्न कत्तिको काम गर्नु भयो?

a) कहिले भएन

b) शायद नै

c) कहिले काही

d) धेरै जसो

e) सधैं

10. तपाईं आफ्नो दात, गिजा वा नक्कली दातको बनवट बाट कत्तिको खुशी हुनु हुन्थ्यो?

a) कहिले भएन

b) शायद नै

c) कहिले काही

d) धेरै जसो

e) सधैं

11. मुख वरीपरीको दु:खाई काम गर्न औषधीको प्रयोग कत्तिको गर्नुभयो?

a) कहिले भएन

b) शायद नै

c) कहिले काही

d) धेरै जसो

e) सधैं

12. तपाईंलाई आफ्नो दात, गिज वा नक्कली दातको समस्याले गर्द कत्तिको चिन्ता भएको थियो?

a) कहिले भएन

b) शायद नै

c) कहिले काही

d) धेरै जसो

e) सधैं

13. दातको समस्याले गर्दा तपाईंले कत्तिको अत्तालिएको वा सचेत भएको महसूस गर्नु भयो?
   a) कहिले भएन
   b) शायद नै
   c) कहिले काही
   d) धेरै जसो
   e) सधैं

14. दात को समस्याले गर्दा अरु मान्छेको अगाडि खाना खान कत्तिको अप्ठ्यारो महसूस गर्नु भयो?
   a) कहिले भएन
   b) शायद नै
   c) कहिले काही
   d) धेरै जसो
   e) सधैं

15. तातो, चिसो वा गुलियो कुरा खादा दात वा गिजा कत्तिको सिरिङ्ग हुन्थ्यो?
   a) कहिले भएन
   b) शायद नै
   c) कहिले काही
   d) धेरै जसो
   e) सधैं

भाग 4
कमजोरी

	सक्छु/छ	सक्दिन/छैन	
गतिशीलता			
के तपाईं तल उल्लेखित कार्यहरु अर्को व्यक्तिको सहयोग न लिईकन गर्न सक्नु हुन्छ? (हिड्नको लागि लट्ठी अथवा व्हीलचेयरको सहाराले)			
१. घरको सरसामान खरिददारी	0	1	
२. घर बाहिर हिड्डुल गर्ने (घर वरिपरी अथवा छिमेकमा)	0	1	
३. लुगा लगाउन अथवा फेर्ने	0	1	
४. शौचालय जाने	0	1	
के तपाईंलाई दैनिक जीवनमा हिड्डुल गर्न अप्ठ्यारो भएर समस्या हुन्छ?	हुन्छ	हुँदैन	
के तपाईं आफ्नो हातमा बल को कमी को कारण आफ्नो दैनिक जीवनमा समस्याहरू अनुभव गर्नुहुन्छ?	हुन्छ	हुँदैन	
के तपाईंलाई शारीरिक थकानको कारण दैनिक जीवनमा समस्याहरू अनुभव हुन्छ?	हुन्छ	हुँदैन	
के तपाईंलाई आफ्नो दैनिक जीवनमा शारीरिक सन्तुलन बनाई राख्न गाह्रो भएर समस्या हुन्छ?	हुन्छ	हुँदैन	
दृष्टि			
५. के तपाईंले दैनिक जीवनमा दृष्टिको कमजोरीले गर्दा समस्याहरू को सामना गर्नु परेको छ?	1	0	
श्रवणशक्ति			
६. के तपाईंले दैनिक जीवनमा श्रवणशक्तिको कमजोरीले गर्दा समस्याहरू को सामना गर्नु परेको छ?	1	0	

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पोषण				
७. के तपाई पछिल्लो ६ महिनामा नचाहिकन धेरै दुब्लाउनु भएको छ? (६ महिनामा ६ किलो वा ३ महिनामा ३ किलो जति)	1	0		
रोगहरु				
८. के तपाई ४ वा ४ भन्दा बढी प्रकारको औषधिहरु खानु हुन्छ?	1	0		
	हो	होइन	कहिलेकाही	
बोध				
९. के तपाईलाई आफ्नो स्मरण शक्ति प्रति कुनै गुनासो छ (अथवा देमेंसिया, बिर्सिने रोग लागेको छ)?	1	0	0	
सामाजिक तत्व र ब्यक्तिगत भावना र स्वभाव को अन्तरसम्बन्ध का बारेमा				
१०. के तपाईले कहिले आफु वरिपरि खालीपन महसुस गर्नु हुन्छ? जस्तै आफुलाई वरिपरिको कुरामा रुचि न हुदा दुख लाग्ने वा आफुले माया गरेको मान्छेले आफुलाई माया न गर्दा।	1	0	1	
११. के तपाईले कहिल्यै आफ्नो वरीपरी अरु मान्छेहरुको उपस्थितिको अभाव महसुस गर्नु हुन्छ? अथवा आफुले माया गरेको मान्छेको अभाव महसुस गर्नु हुन्छ?	1	0	1	
१२. के तपाईले कहिल्यै एक्लो महसुस गर्नु हुन्छ? उदाहरण को लागि कुनै जरुरी काममा संगै गई दिने मान्छे भई दिएको भए हुन्थ्यो जस्तो।	1	0	1	
१३. के तपाईले हालमा निराश्यता अथवा उदासीनता महसुस गर्नु भएको छ?	1	0	1	
१४. के तपाईले हालमा अत्तालिएको वा व्याकुलता महसुस गर्नु भएको छ?	1	0	1	
के तपाईले अरु मानिस बाट पर्याप्त सहयोग पाउनु हुन्छ?	पाउछु	पाउदिन		
के तपाईं समस्याहरूसँग राम्रोसँग सामना गर्न सक्नुहुन्छ?	सक्छु	सक्दिन		
के तपाईले गएको महिना उदासीनता महसूस गर्नु भएको छ?				
शारीरिक स्वस्थता				
१५. तपाई आफ्नो शारीरिक स्वस्थतालाई ० देखि १० को अंकमा कसरी मूल्याङ्कन गर्नुहुन्छ? (0-10 ; 0 is very bad, 10 is very good) 0 – 6 = 1 and 7 – 10 = 0	1	0		
TOTAL SCORE GFI				

भाग ५
स्वास्थयसंग सम्बन्धित जीवनको गुणस्तरबारे प्रश्नावली

अबका प्रश्नहरुल तपाईको जीवनको गुणस्तरको बारे, तपाईंको विचार र भावनाहरू को बारेमा हुने छन् र साथै वृद्धको रुपमा यो समाजलाई महत्वपूर्ण हुन सक्ने मुद्दाहरू सम्बोधन गर्दछ। कृपया सबै प्रश्नहरुको उत्तर दिनुहोस्। यदि तपाई प्रश्नको जवाफ बारे निश्चित हुनुहुन्न भने, कृपया सबैभन्दा उपयुक्त उत्तर छनौट गर्नुहोस्।कृपया आफ्नो स्तर, आशा, आनन्द र चिन्ताहरु लाई ध्यान दिनुहोस्। हरेक प्रश्नका पाँचवटा विकल्पहरू छन्। हामी तपाईंलाई बितेका दुई हप्तामा तपाईंले आफ्नो जीवन कस्तो अनुभव गर्नु भएको छ भन्ने बारेमा प्रश्नहरु सोध्नेछौ। हरेक प्रश्नहरुमा आफुलाई सबैभन्दा बढी लागेको उत्तर रोज्नु होला।

निम्न प्रश्नहरू तपाईंले गत दुई हप्तामा अनुभव गर्नुभएको विभिन्न परिस्थितिहरूको बारेमा हुनेछन्, उदाहरणका लागि, तपाईंको जीवनमा नियन्त्रण र निर्णय गर्ने स्वतन्त्रता। यदि तपाईंले यी कुराहरू अत्यधिक मात्रामा अनुभव गर्नुभएको छ भने "असाध्यै धेरै" र पटक्कै अनुभव गर्नुभएको छैन भने, "कत्ति पनि छैन" उत्तर दिनुहोस्।

		कत्ति पनि छैन	अलिकति /केही	ठिक्कै मात्रामा	धेरै	असाध्यै धेरै
1	तपाईंको दैनिक जीवनमा इन्द्रियहरुमा भएको हानिले (उदाहरणका लागि सुन्नु, दृष्टि, स्वाद, गन्ध, स्पर्श) कत्तिको असर पार्छ?	1	2	3	4	5

2	श्रवणशक्ती, देख्ने वा हेर्ने शक्ती, स्वाद लिने, सुघ्ने शक्ति र स्पर्श मा भएको कमजोरीले तपाईको विभिन्न गतिविधिहरुमा भाग लिने क्षमतालाई कत्तिको असर गरेको छ?	1	2	3	4	5
3	तपाई संग आफ्नो निर्णय आफै लिने कत्तिको स्वतन्त्रता छ?	1	2	3	4	5

		कत्ति पनि छैन	अलिकति /केही	ठिक्कै मात्रामा	धेरै	असाध्यै धेरै
4	तपाईलाई कत्तिको आफ्नो भविष्य आफ्नो नियन्त्रणमा भएको जस्तो लाग्छ?	1	2	3	4	5
5	तपाई को वरिपरिका मानिसले तपाईको स्वतन्त्रताको सम्मान गरेको कत्तिको महसुस गर्नुहुन्छ?	1	2	3	4	5

		कत्ति पनि छैन	अलिकति /केही	ठिक्कै मात्रामा	धेरै	असाध्यै धेरै
6	तपाई आफ्नो मृत्यु कसरी हुन्छ भन्ने बारेमा कत्तिको चिन्तित हुनु हुन्छ?	1	2	3	4	5

		कत्ति पनि छैन	अलिकति /केही	ठिक्कै मात्रामा	धेरै	असाध्यै धेरै
7	तपाईलाई आफ्नो मृत्युको नियन्त्रण गर्न न सक्ने बारे कति को डर लाग्छ?	1	2	3	4	5
8	तपाईलाई मृत्यु देखि कत्तिको डर लाग्छ?	1	2	3	4	5

		कत्ति पनि छैन	अलिकति /केही	ठिक्कै मात्रामा	धेरै	असाध्यै धेरै
9	मृत्यु अगाडी हुने पिडा बारे तपाई कत्तिको डर मान्नु हुन्छ?	1	2	3	4	5

अबका प्रश्नहरुले गएको दुई हप्तामा तपाईले कति सम्म निश्चित कार्य हरु गर्न सक्षम हुनुभयो भन्ने बारे हुनेछन। उदाहरणको लागि आफुले चाहेको जति बाहिर जानु।

		कत्ति पनि छैन	केहि मात्रामा	मध्यम/ सामान्य	धेरै मात्रामा	अधिकतम
10	इन्द्रियहरुमा भएको कम्जोरीले (उदाहरणका लागि सुन्नु, दृष्टि, स्वाद, गन्ध, स्पर्श) तपाईले अरुसंग कुराकानी गर्ने क्षमतालाई कत्तिको असर पार्छ?	1	2	3	4	5
11	तपाईले आफूले चाहेको कुरा गर्न कत्तिको सक्षम हुनुहुन्छ?	1	2	3	4	5

12	तपाई कति हद सम्म आफुले जीवनमा अगाडी बढ्न पाएको अवसरहरु बाट सन्तुष्ट हुनुहुन्छ?	1	2	3	4	5
13	तपाईलाई आफुले योग्यता अनुसारको पहिचान प्राप्त गरेको भन्ने कत्तिको लाग्छ?	1	2	3	4	5
14	तपाईलाई कति हद सम्म तपाई संग दिनहुँ गर्ने पर्याप्त कार्यहरु भएको जस्तो लाग्छ?	1	2	3	4	5

निम्न प्रश्नहरु पछिल्लो दुई हप्तामा जीवनका विभिन्न पक्षहरुमा तपाईको सन्तुष्टी, प्रसन्नता र खुशीको बारेमा हुनेछ। उदाहरणको लागि, सामुदायिक जीवनमा तपाईको सहभागिता अथवा जीवनमा उप्लब्धिहरु।

		एकदमै असन्तुष्ट	असन्तुष्ट	बराबर	सन्तुष्ट	एकदमै सन्तुष्ट
15	तपाई आफ्नो जीवनमा हासिल गर्नुभएको कुराहरुमा कत्तिको सन्तुष्ट हुनुहुन्छ?	1	2	3	4	5
16	तपाई आफ्नो समय प्रयोग गर्ने तरिकाबाट कत्तिको सन्तुष्ट हुनुहुन्छ?	1	2	3	4	5
17	तपाई आफुले गर्ने गतिविधिको स्तरबाट कत्तिको सन्तुष्ट हुनुहुन्छ?	1	2	3	4	5
18	तपाई सामुदायिक गतिविधिहरूमा भाग लिने अवसरहरु बाट कत्तिको सन्तुष्ट हुनु हुन्छ?	1	2	3	4	5

		धेरै दुखि	दुखि	न दुखि न खुशी	खुशी	धेरै खुशी
19	तपाई जीवनमा अगाडी बढ्न मिल्ने कुराहरुमा कत्तिको खुशी महसुस गर्नु हुन्छ?	1	2	3	4	5

		धेरै खराब	खराब	न त खराब न त राम्रो	राम्रो	धेरै राम्रो
20	तपाई आफ्नो इन्द्रिय शक्तिहरु/ वा अनुभव गर्ने क्षमताहरु (जस्तै सुन्नु, दृष्टि, स्वाद, गन्ध, स्पर्श) लाई कसरी मुल्यांकन गर्नु हुन्छ?	1	2	3	4	5

अबको प्रश्नहरु तपाईको सम्बन्ध नाताहरुको बारेमा हुनेछन्।

		कत्ति पनि छैन	अलिकति /केही	ठिक्कै मात्रामा	धेरै	असाध्यै धेरै

21	तपाई कति हद सम्म जीवनमा मित्रता अथवा बन्धुत्वको अनुभूति गर्नु हुन्छ?	1	2	3	4	5
22	तपाईंले आफ्नो जीवनमा कति मात्रामा मायाको अनुभव गर्नुहुन्छ?	1	2	3	4	5

		कत्ति पनि छैन	केहि मात्रामा	मध्यम/ सामान्य	धेरै मात्रामा	अधिकतम
23	तपाईंले जीवनमा माया गर्ने अवसरहरू कत्तिको पाउनु भएको छ?	1	2	3	4	5
24	तपाईंले कत्तिको हद सम्म माया पाएको अनुभूति गर्ने अवसर पाउनु हुन्छ?	1	2	3	4	5

भाग ६
असमर्थता

निम्न प्रश्नहरू दैनिक गतिविधिहरू सम्बन्धित हुन्। यी प्रश्नहरु तपाईँले दैनिक गतिविधिहरू गर्न सक्षम हुनुहुन्छ कि छैन भनि मुल्यांकन गर्नलाई हो। यी प्रश्नहरुले तपाई वास्तवमा दैनिक गतिविधिहरू गरिरहनु भएको छ कि छैन भनि विश्लेस्न गर्ने हैन तर आवश्यक भएमा गर्न सक्नुहुन्छ कि हुन्न भनी मुल्यांकन गर्ने हो।

विभिन्न प्रकारका प्रतिक्रियाहरु:

१. हो, म कुनै कठिनाई बिना स्वतंत्र रूपमा पूर्ण गर्न सक्छु

२. म स्वतन्त्र रूपमा पूर्ण गर्न सक्छु तर केहि कठिनाई संग

३. म स्वतन्त्र रूपमा पूर्ण गर्न सक्छु तर धेरै कठिनाई संग

४. म स्वतन्त्र रूपमा पूर्ण गर्न सक्दिनँ, तर कसैको सहयोग पाएमा गर्न सक्छु

५. म गर्न सक्दिन। मलाई पूर्ण सहयोग चाहिन्छ

		1	2	3	4	5
	दैनिक गतिविधिहरू					
1	के तपाईं आफैले लुगाफाटा लगाउन सक्नुहुन्छ?					
2	के तपाईं आफै ओछ्यानमा सुत्न जान वा ओछ्यानबाट उठ्नु सक्नु हुन्छ?					
3	के तपाईं कुर्सीमा बसिरहेको अवस्थामा उठ्नु परेमा आफै उठ्न सक्नुहुन्छ?					
4	के तपाईं आफैले मुख हात धुन सक्नुहुन्छ?					
5	के तपाईं पूर्णतया आफैले नुहाएर सम्पूर्ण शरीर पुछ्न सक्नुहुन्छ?					
6	के तपाईं आफैले शौचालयमा बस्न वा उठ्न सक्नुहुन्छ?					
7	के तपाईं आफैले खाना खान सक्नुहुन्छ?					
8	के तपाईं आवश्यक परेमा घरको वरिपरि हिंडडुल गर्न सक्नुहुन्छ (या लठ्ठीको सहारा लिएर)?					
9	के तपाईं आफैले भर्याङ्ग चड्न वा ओर्लिन सक्नुहुन्छ?					
10	के तपाईं आफैले घर बाहिर हिंडडुल गर्न सक्नुहुन्छ (या लठ्ठीको सहारा लिएर)?					
11	के तपाईं आफैले आफ्नो खुट्टा र खुट्टाको नङको देखरेख गर्न सक्नुहुन्छ?					
	बाच्न को लागि आवश्यक गतिविधिहरू					
12	के तपाईं आफैले खाजा वा खान पकाउन सक्नुहुन्छ?					
13	के तपाईं आफैले रातिको खान पकाउन सक्नुहुन्छ?					
14	के तपाईं हल्का घरायसी कामहरू गर्न सक्नुहुन्छ (उदाहरणका लागि कुचो लगाउनु र कोठा मिलाउनु)?					

15	के तपाई भारी काम गर्न सक्नुहुन्छ (उदाहरणका लागि घर पुछनु, झ्याल सफा गर्नु, भ्याक्युम लगाउनु)?				
16	के तपाई आफ्नो लुगा आफैले धुन, सुकाउन र इस्त्री गर्न सक्नुहुन्छ?				
17	के तपाई आफैले ओछ्यान मिलाउन सक्नुहुन्छ?				
18	के तपाई आफैले किनमेल गर्न सक्नुहुन्छ?				

<div align="center">

भाग ७
स्वास्थ्य सेवाको प्रयोग

</div>

7. तपाईले गएको वर्ष कति चोटी डाक्टर कहाँ जानु भयो अथवा तपाई लाई हेर्न डाक्टर आउनु भयो?

    a) एक चोटी पनि गइन

    b) एक चोटी

    c) दुइ चोटी

    d) तीन चोटी

    e) सात अथवा सो भन्दा बढी चोटी

8. के तपाई गत वर्ष अस्पतालमा भर्ना हुनुभएको थियो?

    a) थिए

    b) थिइन

9. तपाई गत वर्ष अस्पतालमा कति पटक भर्ना हुनुभएको थियो?

    a) एक चोटी पनि गइन

    b) एक चोटी

    c) दुइ चोटी

    d) तीन चोटी

    e) चार अथवा त्यो भन्दा बढी चोटी

10. तपाईले आफ्नो व्यक्तिगत हेरविचारको लागि गत वर्षमा पेशेवर सहायताको प्रयोग गर्नुभयो?

    a) गरे

    b) गरिन

11. तपाईले गएको वर्षमा पेशेवर नर्सिंग सेवाको सहायता लिनु भएको छ, जस्तै घाउको सरसफाई वा सुई लगाउन?

    a) गरे

    b) गरिन

12. तपाईले आफ्नो स्वास्थ्य स्थितिको कारण गत 12 महिनामा अनौपचारिक हेरविचार प्राप्त गर्नुभएको छ?

    a) छ   b) छैन

Appendix 4: Information sheet (English)

Information Sheet for Participants (Quantitative Study)
Title: Frailty and adverse health outcomes in community-dwelling older adults and those living in old age homes in Nepal: a mixed-method study

Introduction
We are conducting study on frailty and related adverse outcomes among older adults aged 60 and above. In this study, we will ask you to provide information about yourself, your background, your knowledge, and factors related to frailty. We are requesting your co-operation as a voluntary participation in this study. We also request, you to read this sheet or we will read it for you so that you are fully aware of the research process. If you feel difficult to understand, please feel free to ask at any time.

Objective of the study
The objective of this study to explore the frailty status and the associated factors in community dwelling older adults and those living in old age homes in Nepal. If you decide for your participation in this study, it will take about 30 minutes. We will ask several questions about you, your background, frailty state, quality of life, health care utilization, and disability.

Possible risk and benefits
There is no risk to the participants of this study. While we are asking you the question, if you are uncomfortable and hesitant to answer any question, you may skip such questions or also withdraw your participation from the study.

Confidentiality
We will not record your name on the questionnaire. In place of your name, we will assign identification code number. Your name, address, and phone number will only be recorded in the consent sheet and correspondence sheet which are different from the questionnaire. Therefore, please be assured of the confidentiality of information you may provide. Your participation is purely voluntary. You have right to withdraw from the study at any time during interview without penalty. In this study, data collection will be conducted anonymously, and your name will not be included in any of the report of this study.

Withdrawal from participation
We assure you that your participation in this study is entirely voluntary. It is guaranteed that you have rights to withdraw from study at any time during interview until one month after completion of interview.

Volunteer agreement:
If you understand what this study involves and agree to participate, you can join this study as a participant. If you do not agree to participate, you can discontinue participation. You do not need to provide us any reason.

Funding
This study is financially supported by The University of Tokyo.

If you have further questions about the study, please do not hesitate to contact me or the relevant persons listed below:

1. Richa Shah, Researcher, Tel: + 977-9841539615, Email: Richa_np@hotmail.com

Appendix 5: Information sheet (Nepali)

सहभागिताको लागि जानकारी पत्र

अध्ययनको शिर्षक: (वृद्धाश्रम र समुदायमा बस्ने वृद्धहरुमा हुने शरीरिक कमजोरी र कमजोरीले गर्दा हुने प्रतिकुल स्वास्थ्य परिणामको अवस्था)

परिचय

यो अध्ययन टोक्यो विश्वविद्यालय, ग्राजुएट स्कुल अफ मेडिसिनको स्कुल अफ इन्टरनेशनल हेल्थ अन्तर्गत कम्युनिटी तथा ग्लोबल हेल्थ विभागमा अध्ययनरत विद्यार्थी द्वारा गरिदैं छ।

यो अध्ययन ६० वर्ष र माथिका व्यसकहरुमा वृद्धावस्थामा हुने कमजोरीको बारेमा हो। यो अध्ययनमा हामी तपाईलाई, तपाईको जानकारी जस्तै तपाईको सामाजिक पृष्ठभूमि र वृद्धावस्थामा हुने कमजोरीको ज्ञान र सम्बन्धित प्रतिकुल असरहरुको बारेमा सोध्नेछौं। हामी तपाईको स्वेच्छिक सहभागिताको लागि आग्रह गर्दछौं। यस अनुसन्धानको प्रक्रिया राम्ररी बुझ्नको लागि हामी तपाईलाई यस जानकारी पत्रमा दिइएका कुराहरु पढ्न आग्रह गर्छौं अथवा आवश्यक परेमा पढेर सुनाउछौं। यो अध्ययन बुझ्न केहि कठिनाई भयो भने तपाईले कुनै पनि समयमा सोध्नु हुन्छ।

अध्ययनको उदेश्य

यस अध्ययनको उदेश्य समुदाय र वृद्धाश्रममा बस्ने ६० वर्ष र माथिका वयस्कहरुमा भएको विभिन्न खाले कमजोरीको अवस्था बुझ्नु हो।

अध्ययन प्रक्रिया

यदि तपाईले यस अध्ययनमा सहभागी हुने निर्णय गर्नुभयो भने यस अन्तर्वार्ताको लागि लगभग ३० मिनट लाम्ने जानकारी गराउछौं। हामी तपाईलाई तपाईको सामाजिक पृष्ठभूमि, कमजोरीको अवस्था, जीवनको गुणस्तर, स्वास्थ्य सेवाको प्रयोग र असमर्थताको बारेमा सोध्नेछौं।

सम्भावित जोखिम र फाइदाहरु

यस अध्ययनमा सहभागी हुदाँ कुनै जोखिम छैन। यो अनुसन्धानले नेपालमा व्रिद्धास्वथा हुने कमजोरीको बारेमा बुझ्न मद्दत गर्नेछ।

गोपनियता

यस प्रश्नावलीमा तपाइको नाम कतै पनि प्रयोग गरिने छैन, प्रश्नपत्रमा कोड नम्बर मात्र प्रयोग गरिनेछ। प्रदान गर्नु भएको जानकारी यस अध्ययनको लागि मात्र प्रयोग गरिने छ र अध्ययन पछि यो जानकारीलाई नष्ट गरिने छ।

स्वेच्छिक सहभागिता तथा प्रतिकार

तपाईको सहभागिता स्वेच्छिक हि भन्ने कुराको विश्वास दिलाउन चाहन्छौं। तपाईले यो अन्तर्वार्ताको क्रममा कुनै पनि बेला छोड्न सक्नुहुनेछ।

स्वेच्छिक सहमति

यदि तपाई यो अध्ययनबारे बुझेर यसमा सहमत हुनुहुन्छ भने मात्र यो अन्तर्वातामा भाग लिन सक्नुहुन्छ। यदि सहमत हुनुहुन्न भने, कुनै कारण पेश नगरिकन यो अध्ययन छोड्न सक्नु हुनेछ।

यस अध्ययनमा सहभागी हुन सहमत हुनु हुन्छ भने कृपया अनुमति पत्रमा आफ्नो सही गरेर सहमति जनाईदिन विनम्र अनुरोध गर्दछौं। तपाईको सहभागिता र सहयोगको लागि धेरै धेरै धन्यबाद।

जिज्ञासा

यस अध्ययनसंग सम्बधित कुनै पनि जिज्ञासा वा प्रश्नहरि छन् भने कृपया निम्न लिखित नाम र ठेगानामा सम्पर्क गर्नुहोला।

डा. ऋचा शाह, टोक्यो विश्वविद्यलय

७-३-१ होङ्गो, बुन्क्यो वार्ड, टोक्यो ११३-००३३, जापान

मोबाइल फोन नं : ९८४१-५३९६१५

इमेल: richa_np@hotmail .com

Appendix 6: Written informed consent form (English)

<u>**Informed Consent Form for Research**</u>

To: The Dean of Graduate School of Medicine, The University of Tokyo

Research title: Frailty and adverse health outcomes in community-dwelling older adults and those living in old age homes in Nepal: a mixed-method study:

Supervisor and Principal Investigator: Masamine Jimba (The University of Tokyo)

Researcher: Richa Shah (The University of Tokyo)

After reading and understanding the contents of this study, I have agreed to participate in this research as a participant. I understand:

1. The purpose and procedure of the study
2. The consent of the questionnaire
3. That I will not be placed under any harm of discomfort
4. That I may refuse to answer any question if I don't want to answer
5. That I can withdraw from the study at any time without giving a reason
6. That I can withdraw from the study at any time (during or after study) without any harm or without in any way affecting the health service I receive
7. That any information I provide will be strictly treated in a confidential manner that I will not be identified in the reporting of the result.

Name……………………..
Signature………………………….
Phone number……………………….
Address………………………..
Name of the person who obtained consent……………………
Date……………………..

Appendix 7: Written informed consent form (Nepali)

Participant ID:

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सहभागिताका लागि मन्जुरीनामा

</div>

डिन, ग्य्राजुएट स्कूल अफ मेडिसिन, टोक्यो विश्वविध्यालय, जापान

अनुसन्धानको विषय: वृद्धाश्रम र समुदायमा बस्ने वृद्धहरुको कमजोरी र कमजोरीले गर्दा हुने प्रतिकुल स्वास्थ्य परिणामको अवस्था

प्रमुख अनुसन्धानकर्ता: डा. ऋचा शाह (टोक्यो विश्वविध्यालय)

म यस अनुसन्धानको उदेश्यहरु राम्रोसंग पढेर र बुझेर, सहभागिताकोलागि मन्जुर छु ।

तल दिइएका बुंदाहरु मैले राम्रोसंग बुझेको छु :

१. यस अध्ययनका उदेश्यहरु र अनुसन्धान प्रक्रिया

२. प्रश्नावलीमा उल्लेखित विषय वस्तुहरु

३. मलाई कुनै हानी/ नोक्सानी हुने छैन

४. मैले उत्तर दिन नचाहेको कुनै पनि प्रश्नको उत्तर नदिए पनि हुन्छ।

५. मैले यसबाट कुनै पनि बेला कुनै नोक्सानी बिना आफ्नो सहभागिता फिर्ता लिन सक्नेछु।

६. मैले दिएका सूचना तथा जवाफहरु गोपनीय तरिकाबाट प्रयोग गरिने छन् र मेरो नाम कुनै पनि रिपोर्ट तथा लेखहरुमा प्रकाशित हुने छैनन्।

मिति:

मन्जुरी दिनेको नाम:

मन्जुरी दिने को फोन नम्बर:

मन्जुरी दिनेको हस्ताक्षर: मन्जुरीपत्र पाउँनेको हस्ताक्षर:

Appendix 8: Ethical approval from The University of Tokyo (Japanese)

（医）

審査番号	2018168NI

西暦　2019年03月26日

審　査　結　果　通　知　書
実　施　許　可　通　知　書

倫理委員会の設置者、実施機関の長
　東京大学大学院医学系研究科・医学部長　殿

倫理委員会委員長
　東京大学大学院医学系研究科・医学部倫理委員会
　非介入等研究倫理委員会

神馬　征峰

審査依頼のあった件についての審査結果を下記のとおり通知いたします。

記

研究課題名	ネパールにおける高齢者のフレイルと健康への悪影響：混合研究
審査結果	■承認する　□条件付きで承認する　□変更を勧告する　□承認しない □該当しない　□既承認事項の取り消し
審査事項 （審査資料）	＜新規案件＞ ■研究の新規実施 ＜継続案件＞ □研究に関する変更 □その他（　　　　　　）
審査区分	■委員会審査（審査日：西暦2019年03月18日） □迅速審査（審査日：西暦　　年　月　日）
指摘事項および 理由・条件等	
備考	

研究責任者　神馬　征峰　殿

依頼のあった研究に関する審査事項について上記のとおり決定しましたので通知いたします。
倫理委員会での審査結果が承認となりましたので、研究の実施を許可いたします。

西暦　2019年03月26日

倫理委員会の設置者、実施機関の長
　東京大学大学院医学系研究科・医学部長
　　　宮園　浩平（公印省略）

Appendix 9: Ethical approval from Nepal Health Research Council

Government of Nepal

Nepal Health Research Council (NHRC)

Estd. 1991

Ref. No.: 2644

Date: 31 March 2019

Ms. Richa Shah
Principal Investigator
The University of Tokyo
Japan

Ref: **Approval of thesis proposal** entitled **Frailty and adverse health outcomes in community-dwelling older adults and those living in old age homes in Kathmandu Valley, Nepal: A mixed-method study**

Dear Ms. Shah,

It is my pleasure to inform you that the above-mentioned proposal submitted on **11 March 2019** (**Reg. no. 160/2019**) please use this Reg. No. during further correspondence) has been approved by Nepal Health Research Council (NHRC) Ethical Review Board on **28 March 2019**.

As per NHRC rules and regulations, the investigator has to strictly follow the protocol stipulated in the proposal. Any change in objective(s), problem statement, research question or hypothesis, methodology, implementation procedure, data management and budget that may be necessary in course of the implementation of the research proposal can only be made so and implemented after prior approval from this council. Thus, it is compulsory to submit the detail of such changes intended or desired with justification prior to actual change in the protocol. Expiration date of this proposal is **March 2020**.
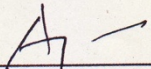
If the researcher requires transfer of the bio samples to other countries, the investigator should apply to the NHRC for the permission. The researchers will not be allowed to ship any raw/crude human biomaterial outside the country; only extracted and amplified samples can be taken to labs outside of Nepal for further study, as per the protocol submitted and approved by the NHRC. The remaining samples of the lab should be destroyed as per standard operating procedure, the process documented, and the NHRC informed.

Further, the researchers are directed to strictly abide by the National Ethical Guidelines published by NHRC during the implementation of their project proposal and **submit progress report in between and full or summary report upon completion.**

As per your thesis proposal, the total research amount is **Rs 3,00,000** and accordingly the processing fee amounts to **Rs 10,000**. It is acknowledged that the above-mentioned processing fee has been received at NHRC.

If you have any questions, please contact the Ethical Review M & E Section at NHRC.

Thanking you,

Prof. Dr. Anjani Kumar Jha
Executive Chairperson

Tel: +977 1 4254220, Fax: +977 1 4262469, Ramshah Path, PO Box: 7626, Kathmandu, Nepal
Website: http://www.nhrc.org.np, E-mail: nhrc@nhrc.org.np