Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.7 No. 3 (2026): March 2026 Issue
https://doi.org/10.51168/sjhrafrica.v7i3.2417
Original Article

Prevalence of frailty and its association with Vitamin D levels, a cross-sectional study conducted among elderly patients at Masaka Regional Referral Hospital, Central Uganda.

Simon Arthur Mugabi[1,2], Elastus Ssemwanga[5,6], Ritah Kiconco[1,4], Deusdedit Tusubira[3]

[1]*Department of Medical Laboratory Science, Faculty of Medicine, Mbarara University of Science and Technology*
[2]*Department of Biochemistry, Mengo Hospital Health Training Institute*
[3]*Department of Biochemistry, Faculty of Medicine, Mbarara University of Science and Technology*
[4]*Department of Biochemistry, School of Health Sciences, Soroti University*
[5]*Department of Immunology and Molecular Biology, College of Health Sciences, Makerere University*
[6]*Department of Medical Laboratory Technology, Mayanja Memorial Medical Training Institute*

Abstract

Background:

Frailty is a syndrome of decreased physiological reserve that predisposes older adults to adverse health outcomes. Vitamin D has emerged as a potential biomarker, but data are scarce in Ugandan hospital settings. This study assessed the prevalence of frailty and its association with serum 25-hydroxyvitamin D levels, along with other associated factors, among elderly patients at Masaka Regional Referral Hospital (MRRH).

Methods and Materials:

384 patients aged ≥ 60 years attending in- and outpatient services at MRRH were consecutively recruited. Frailty was measured using the Fried Phenotypic Scale, which is used to assess frailty based on 5 components: unintentional weight loss, exhaustion, low physical activity, slowness, and grip strength. It categorizes a participant as non-frail (score 0), pre-frail (score 1-2), or frail (score 3 and above). Serum 25-hydroxyvitamin D was quantified and classified as deficient (≤ 20 ng/mL), insufficient (21–29 ng/mL), or sufficient (≥ 30 ng/mL). Data were collected using a structured questionnaire. Multivariable Poisson regression with robust error variance estimated adjusted prevalence ratios (aPR) for frailty determinants.

Results:

Participants had a median age of 66.5 years (IQR 62–74.5); 54.4% were female. Vitamin D deficiency and insufficiency were present in 44.8% and 32.6% of participants, respectively. Overall frailty prevalence was 58.3% (95% CI 53.3–63.2%), with 40.9% pre-frail and 0.8% non-frail. Independent associated factors of frailty included no education (aPR 1.62; $p = 0.035$) or primary education only (aPR 1.59; $p = 0.034$), lack of physical activity (aPR 1.61; $p = 0.002$), self-reported depression (aPR 1.33; $p = 0.002$), and comorbidities (aPR 4.59; $p = 0.022$). Nutritional factors also contributed: vitamin D deficiency (aPR 5.13; $p < 0.001$) and insufficiency (aPR 2.87; $p = 0.003$), processed-food consumption (aPR 1.77; $p < 0.001$), and hypomagnesemia (aPR 1.15; $p = 0.029$).

Conclusion:

Frailty affects nearly three-fifths of elderly patients at MRRH, with vitamin D deficiency emerging as the strongest modifiable predictor alongside education, physical inactivity, depression, comorbidities, diet, and magnesium status.

Recommendation:

Integrating routine frailty and vitamin D screening into geriatric care, paired with targeted supplementation, may mitigate frailty and its sequelae among the elderly.

Keywords: Frailty, vitamin D, Fried's, elderly
Submitted: *January 29, 2026* ***Accepted:*** *February 17, 2026* ***Published:*** *March 31, 2026*
Corresponding author: Simon Arthur Mugabi.
Email: amugabisimo@gmail.com
Department of Medical Laboratory Science, Faculty of Medicine, Mbarara University of Science and Technology.

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.7 No. 3 (2026): March 2026 Issue
https://doi.org/10.51168/sjhrafrica.v7i3.2417
Original Article

Background

Frailty is a growing concern worldwide, both in developed and underdeveloped countries. According to the World Health Organisation(WHO), maintaining "functional ability" underlies healthy aging to prevent physiological decline. (Michel and Sadana, 2017). Frailty impairs an individual's ability to respond to stressors and dramatically reduces the quality of life (Veronese, 2020). Older adults are especially at risk, and the growing elderly population is expected to drive a rising global frailty burden. (Hoogendijk et al., 2019). For example, Uganda's population remains very young: only about 2.7% of Ugandans are aged 60 and above. (Gumikiriza-Onoria et al., 2023), Though this older age group is projected to more than triple by 2050 (reaching 5.5 million) (Wandera et al., 2017). This demographic shift highlights an emerging geriatric public health challenge even in traditionally youthful countries.

Global and regional prevalence of frailty varies. In high-income countries such as Canada, about 10–15% of community-dwelling adults ≥65 years are frail, rising with increasing age, especially in those ≥85 years. (Gallibois et al., 2022). In Sub-Saharan Africa, studies show similar concerns as populations age. For instance, Tanzania, an East African country, reported an 11.2% frailty prevalence among older adults from five villages. (Lewis et al., 2018), (Oppong-Yeboah et al., 2024). In Uganda, while no studies have been conducted among the general population of elderly people, a high prevalence of 19% has been observed among older adult HIV-positive patients. (Vecchio et al., 2021). Although HIV-positive elders have specific risk factors, this high rate hints that frailty could be common as Uganda's population ages. This highlights the need for nation-specific data (e.g., Uganda Bureau of Statistics) to inform targeted interventions.

Frailty is more prevalent among the elderly, and there is a strong correlation between frailty and long-term nutritional status, where energy, protein, micronutrients, and overall diet quality are consistently linked to frailty risk. (Cruz-Jentoft and Woo, 2019). While young people's frailty is often caused by severe illnesses and trauma, with minimal dietary impact (Dent et al., 2014)elderly individuals are more susceptible to frailty due to age-related physiological decline and nutritional deficiencies. The effects of frailty on health are profound, leading to higher mortality rates, lower quality of life, increased healthcare utilization, higher treatment costs, and increased risk of cardiovascular events. (Batko-Szwaczka et al., 2020). Frailty is associated with various adverse health outcomes, including fractures, falls, dementia, poor quality of life, and overuse of healthcare resources. (Kojima et al., 2018).

Biomarkers are crucial for diagnosing frailty, with vitamin D levels emerging as a significant and reliable marker. Research indicates that lower vitamin D levels are associated with increased frailty, highlighting the importance of monitoring this biomarker. (Briggs et al., 2018). Vitamin D was chosen for study because of its biological roles in musculoskeletal health and immune regulation. It is necessary for calcium and bone metabolism, essential for maintaining bone strength, and its receptor (VDR) is widely expressed in skeletal muscle cells. (Halfon et al., 2015). In addition, vitamin D is a potent immunomodulator: VDRs on immune cells (T cells, macrophages, etc.) allow vitamin D to regulate inflammatory and innate immune responses. (Sanlier and Guney-Coskun, 2022). Thus, vitamin D influences both physical (bone/muscle) and immune pathways that can affect frailty. Given these mechanisms, assessing vitamin D status alongside frailty can provide insight into the biological underpinnings of weakness in older patients.

Other factors associated with frailty among the elderly include age, gender (with women being more susceptible), living alone, inactivity, malnutrition, smoking, and lack of exercise. (Perez-Riverol et al., 2022). These factors contribute to the complex and multifaceted nature of frailty, necessitating comprehensive assessment and management strategies. At Masaka Regional Referral Hospital (MRRH), the prevalence of frailty among elderly patients is not accurately documented, and there are no known studies exploring the association between vitamin D levels and frailty in this population. Additionally, the factors predisposing elderly patients to frailty at MRRH have not been investigated, despite reports from the hospital healthcare team indicating significant occurrences. This study aimed to assess the prevalence of frailty among the aging population at MRRH, identify the correlation between key biomarkers, such as vitamin D levels, and frailty, and the associated factors of frailty.

Methods

Study Design and Setting

This was a descriptive cross-sectional study. This study was conducted at Masaka Regional Referral Hospital (MRRH), Masaka city, central Uganda. The hospital is located 132 km along Kampala Mbarara highway. The hospital is a regional referral facility that offers diagnostic, preventive, and curative services. The hospital mainly serves the districts of Masaka, Kyotera, Lwengo, Rakai, Kalangala, Ssembabule, and Bukomansimbi. The hospital operates daily, offering both out and inpatient services that

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.7 No. 3 (2026): March 2026 Issue
https://doi.org/10.51168/sjhrafrica.v7i3.2417
Original Article

include maternal and child health, general medicine, and surgical services, among others. The hospital has special clinics that run from Tuesday to Friday; these include ENT, diabetic clinic, hypertensive clinic, pediatrics, sickle cell clinic, and HIV clinic. Each of these clinics is handled by a team of professionals headed by doctors specialized in the respective disciplines. This study site was chosen because MRRH serves a large aging population with multiple chronic conditions, making it an appropriate setting for studying frailty among older adults.

Study population

This study was conducted among patients aged 60 years and above who were getting healthcare at MRRH during the study period. This was chosen because of studies. (Wu et al., 2018), (Galluzzo et al., 2018) had indicated that frailty was common among adults aged ≥60 years. On average, the Diabetes Mellitus clinic serves 200–250 elderly patients per week, while the Hypertensive clinic attends to 150–200 elderly patients weekly. Therefore, our target population was elderly patients from the Masaka and neighbouring districts who had come to seek health care at MRRH. Data collection took place in April 2025.

Selection Criteria

Inclusion criteria

An eligible participant for this study had to be at least 60 years of age and had to consent to participate in the study.

Exclusion criteria

Cognitively impaired patients, based on the caregiver's report, are unable to provide informed consent. Participants who were taking prescribed vitamin D supplements or receiving fortified diets were excluded to avoid confounding the vitamin D-frailty association.

Sampling method

Consecutive sampling was used to recruit participants until the desired sample size was reached. This sampling technique was used to achieve the required sample size within the available time and resource constraints.

Sample size determination

The sample size estimate was done using Kish and Leslie's formula (1965).

$$n = \frac{Z^2 P (1-P)}{D^2}$$

Where n = Sample size estimate.

Z = A standard Normal deviate value that responds to a level of statistical Significance and = 1.96.

D = margin of error, which corresponds to the level of precision 5%

P = Assumed prevalence of frailty 50%.

$$n = \frac{((1.96 \times 1.96)\ 0.5(1-0.5))}{0.05 \times 0.05}$$

$$= 384$$

Data collection tools

A structured questionnaire was used to collect data from the study participants. It was composed of the Fried's scale so as to do a phenotypic assessment of frailty; the tool was also used to capture pertinent information on the study, that is, the demographic characteristics of respondents and the factors associated with frailty among the study subjects. These factors included psychosocial factors, comorbidities, lifestyle factors, and biochemical parameters. The section of the tool was used to record laboratory results.

Data collection procedures

Recruitment and consent

In this study, after obtaining permission from the hospital administration, the researcher approached patients aged 60 years and above in both in- and outpatient facilities at Masaka Regional Referral Hospital. The research team engaged with patients at relevant hospital units where eligible participants were often found, such as the diabetes clinic, hypertensive clinic, adult wards, and outpatient department. Participants were informed about the study's purpose, procedures, potential benefits, and risks in a language they understood. Those who consented to participate signed an informed consent form or provided a thumbprint before proceeding with data collection.

Questionnaire administration

Participants were subjected to a questionnaire for collecting pertinent data.

Frailty assessment

Frailty assessment was done using Fried's Phenotypic Frailty Scale. This defines individuals with a total score of 0 as non-frail (robust), those scoring 1–2 as pre-frail, and those scoring ≥3 as frail.

Clinical assessments

Each participant's blood pressure was also measured using a digital blood pressure machine, which had been calibrated before measuring. Three consecutive readings of blood pressure were taken following five minutes of rest. The rest allowed the participants' vitals to return to their at-rest values. With the subject seated, the blood pressure was measured, and the mean reading was computed from

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.7 No. 3 (2026): March 2026 Issue
https://doi.org/10.51168/sjhrafrica.v7i3.2417
Original Article

the three measurements. High blood pressure was defined as a systolic blood pressure of ≥140 mmHg and/or a diastolic blood pressure of less than 90 mmHg, according to the WHO guidelines. (WHO, 2023).

Blood samples were then collected in red-top vacutainer tubes at a designated phlebotomy site. Following centrifugation, serum was aliquoted into two portions: one for immediate analysis and the other stored at 4–8 °C for potential re-runs if necessary (stored only for the duration of the study and disposed of according to standard operating procedures). The serum samples were quantitatively analyzed for vitamin D, low-density lipoprotein cholesterol (LDL), high-density lipoprotein cholesterol (HDL), total cholesterol, triglycerides, calcium, and magnesium levels using the Cobas chemistry analyzer (*refer to Appendix VI*). The following cut-off values were considered for the analyzed biomarkers: Normal vitamin D levels were at a concentration ≥30ng/mL, insufficient, 21-29ng/mL, and vitamin D deficiency was considered at levels ≤20ng/mL. Elevated total cholesterol >5.18mmol/L, low HDL cholesterol <1.3mmol/L, elevated LDL cholesterol >2.6mmol/L, and elevated triglycerides >1.7mmol/L. Normal serum calcium levels: 2.15 – 2.55 mmol/L and normal serum magnesium levels: 0.70 – 1.10mmol/L.

Quality Control

To ensure accuracy and reliability of both data collection and laboratory results, the following specific quality control measures were implemented:

All research assistants received training on study protocols, participant recruitment, informed consent, questionnaire administration, and sample handling.

Blood samples were collected using sterile Vacutainer tubes, ensuring correct labeling and immediate transport to the laboratory in cool boxes at 4–8 °C.

Laboratory tests were performed on the well-calibrated Cobas c311 chemistry analyzer (Roche Diagnostics) for calcium, magnesium, and lipid profile, and the Cobas e411 immunoassay analyzer for 25-hydroxyvitamin D. Commercially prepared control sera at two levels (normal and pathological) were run daily before patient samples. Each assay run was only accepted if control values fell within the manufacturer's recommended ranges. Any quality control run that fell outside the acceptable range triggered immediate investigation, repeat analysis, and recalibration of the analyzer before proceeding with patient samples.

A random 10% of questionnaires were cross-checked for completeness and consistency by the principal investigator. The PI also checked the questionnaires on a daily basis for any errors or missing data, and these were rectified if found.

Pretesting the tools

To test the reliability of the tools, pre-testing was conducted with five patients at Mulago National Referral Hospital to ascertain the reliability in collecting pertinent information. Although only five participants were included in the pretest due to time and cost constraints, feedback helped refine the tool's clarity and content.

Data analysis report

Data were entered into Microsoft Excel software, version 2019. Quantitative data were exported to STATA software version 17.0 for analysis. Descriptive statistics such as mean, standard deviation, median, interquartile range, and percentages were used to summarize the participants' baseline characteristics. Frequencies and percentages were used to summarize categorical variables such as age group, sex, education level, marital status, and religion. The Shapiro-Wilk test was used to assess the normality of the continuous variables. Mean and standard deviation were used to summarize continuous variables that were normally distributed, while those that were not normally distributed were summarized using median and inter-quartile range.

Prevalence of frailty among elderly patients

The prevalence of frailty among the elderly patients, together with its 95% confidence interval, was determined by dividing the total number of elderly patients with frailty by the total number of study participants, and was expressed as a percentage. Frailty status was classified into normal (non-frail), pre-frail, and frail categories.

Vitamin D levels are associated with frailty among elderly patients.

The association was assessed using modified Poisson regression analysis. Frailty was the dependent variable. Vitamin D levels categories (normal, insufficient, and deficient) at the bivariate level were compared with frailty (which was dichotomized into non-frail and frail). The association was determined using crude prevalence ratios (cPR) together with their 95% confidence intervals (CI), and statistically significant prevalence ratios were indicated by a P value ≤ 0.05 at the bivariate level. Vitamin D levels were also included in the multivariable Modified Poisson regression model. In the final multivariable model, adjusted prevalence ratios were obtained, and associations were considered significant at a P value ≤ 0.05.

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.7 No. 3 (2026): March 2026 Issue
https://doi.org/10.51168/sjhrafrica.v7i3.2417
Original Article

Factors predisposing elderly patients to frailty

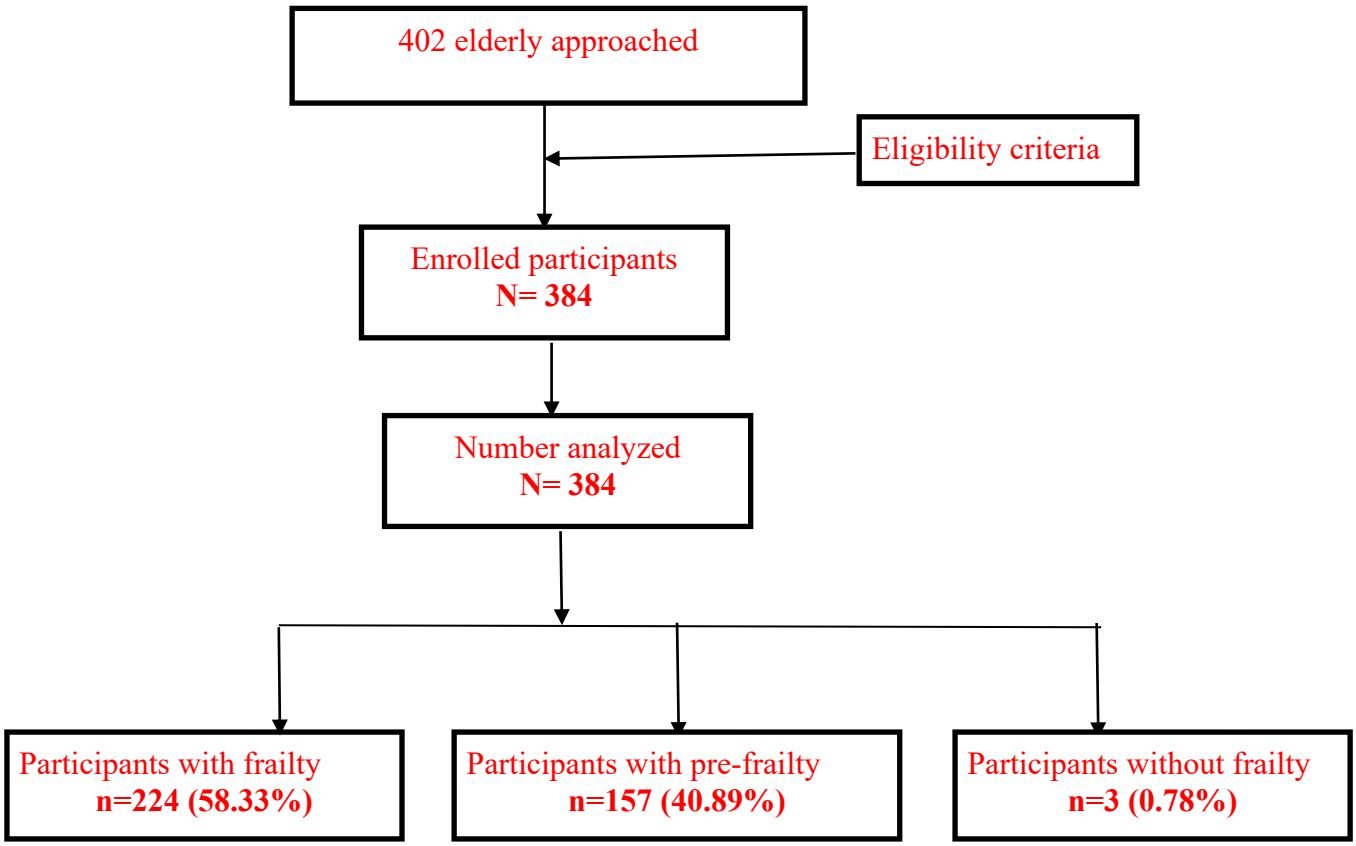
The studied factors were assessed using modified Poisson regression analysis. Frailty was the dependent variable. All independent variables, at the bivariate level, were compared with frailty (which was dichotomized into non-frail and frail). The associations were determined using crude prevalence ratios (cPR) together with their 95% confidence intervals (CI), and the statistically significant prevalence ratios were indicated by a p-value ≤ 0.05 at the bivariate level. The variables that were clinically and/or statistically significant at this level were also included in the multivariable Modified Poisson regression model. In the multivariable logistic regression model, potential confounders, including physical activity, sun exposure, dietary intake, and any sociodemographic factors (such as age, sex, and education level) that may have influenced vitamin D levels or frailty status, were controlled for to reduce bias and ensure robust estimates of association. In this final model, adjusted prevalence ratios (aPR) were obtained, and associations were considered statistically significant if the p-value was ≤ 0.05.

Ethical considerations

This research was approved by the university's Research and Ethics Committee (**MUST-2024-1755**). Clearance was obtained from the Masaka Regional Referral Hospital administration. The purpose of the study was explained to the participants in Luganda, and written informed consent was obtained. Code numbers rather than names were used to maintain confidentiality. Data was also entered into a password-protected computer to ensure the data security and confidentiality of study information.

Results

Study flow diagram



Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.7 No. 3 (2026): March 2026 Issue
https://doi.org/10.51168/sjhrafrica.v7i3.2417
Original Article

Narrative of the study flow diagram

A total of 402 elderly individuals were initially approached for study participation. After applying the eligibility criteria, 384 participants were enrolled. All 384 participants were included in the final analysis. Among these, 224 participants (58.33%) had frailty, 157 participants (40.89%) had pre-frailty, and 3 participants (0.78%) were without frailty.

Participants' socio-demographic and clinical characteristics

Of the 384 participants included in the study, the median age was 66.5 years (IQR: 62–74.5). A majority (67.7%) were aged between 60 and 70 years, and more than half were female (54.4%). Over half had attained primary education (51.0%), while only 7.3% had tertiary-level education. Most respondents were unemployed (72.1%) and married or cohabiting(54.4%).

Table 1: Participants' socio-demographic characteristics

Variable	Total, n=384	
	Frequency	Percentage
Age(yrs), Median (IQR)	66.5	62-74.5
Age group		
60-70	260	67.7%
71-80	89	23.2%
>80	35	9.1%
Sex		
Female	209	54.4%
Male	175	45.6%
Education level		
No education	61	15.9%
Primary education	196	51.0%
Secondary education	99	25.8%
Tertiary education	28	7.3%
Marital Status		
Married/Cohabiting	209	54.4%
Separated/Divorced	171	44.5%
Single	4	1.0%
Employment Status		
Employed	107	27.9%
Unemployed	277	72.1%
Diet		
Eats natural foods	356	92.7%
Eats processed foods	28	7.3%
Physical Activity		
Doesn't exercise	298	77.6%
Exercises	86	22.4%

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.7 No. 3 (2026): March 2026 Issue
https://doi.org/10.51168/sjhrafrica.v7i3.2417
Original Article

Table 2b: Participants' clinical characteristics

Variable	Total, n=384	
	Frequency	Percentage
Depression		
Has depression	195	50.8%
No depression	189	49.2%
Comorbidities		
Has comorbidities	328	85.4%
No comorbidities	56	14.6%
Systolic blood pressure, Median (IQR)	130	120-149.5
Diastolic blood pressure, Median (IQR)	80 (72-90)	
Hypertension		
Normal	179	46.6%
Systolic hypertension only	92	24.0%
Diastolic hypertension only	53	13.8%
Both systolic & diastolic hypertension	60	15.6%
Vitamin D levels		
Deficient	172	44.8%
Insufficient	125	32.6%
Normal	87	22.7%
Total cholesterol		
Normal	268	69.8%
Elevated	116	30.2%
HDL		
Normal	99	25.8%
Low	285	74.2%
LDL		
Normal	221	57.6%
Elevated	163	42.4%
Trigycerides		
Normal	269	70.1%
Elevated	115	29.9%
Calcium		
Hypocalcemia	181	47.1%
Normal	157	40.9%
Hypercalcemia	46	12.0%
Magnesium		
Hypomagnesemia	89	23.2%
Normal	275	71.6%
Hypermagnesemia	20	5.2%

Abbreviations: IQR, Interquartile range

Participants' socio-demographic and clinical characteristics stratified by frailty status

Frailty status significantly varied across several demographic and clinical variables (Table 1). A higher proportion of frail individuals was found in the older age groups: 67.4% in the 71–80 group and 77.1% in those aged >80 years ($p = 0.003$). Patients with comorbidities (67.7%), depression (87.7%), systolic hypertension (83.7%), or vitamin D deficiency (96.5%) were significantly more likely to be frail (all $p < 0.001$). ***See Table 2***

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.7 No. 3 (2026): March 2026 Issue
https://doi.org/10.51168/sjhrafrica.v7i3.2417
Original Article

Table 3: Participants' socio-demographic characteristics stratified by frailty status

Variables	Total, n=384 n (%)	Frailty status		p-value
		Not frail, n=160 n (%)	Frail, n=224 n (%)	
Age(yrs), Median (IQR)	66.5 (62-74.5)	65 (61-70)	69 (63-76)	<0.001
Age group				0.003
60-70	260 (67.7%)	123 (47.3%)	137 (52.7%)	
71-80	89 (23.2%)	29 (32.6%)	60 (67.4%)	
>80	35 (9.1%)	8 (22.9%)	27 (77.1%)	
Sex				0.69
Female	209 (54.4%)	89 (42.6%)	120 (57.4%)	
Male	175 (45.6%)	71 (40.6%)	104 (59.4%)	
Education level				<0.001
No education	61 (15.9%)	12 (19.7%)	49 (80.3%)	
Primary education	196 (51.0%)	62 (31.6%)	134 (68.4%)	
Secondary education	99 (25.8%)	62 (62.6%)	37 (37.4%)	
Tertiary education	28 (7.3%)	24 (85.7%)	4 (14.3%)	
Marital Status				<0.001
Married/Cohabiting	209 (54.4%)	107 (51.2%)	102 (48.8%)	
Separated/Divorced	171 (44.5%)	52 (30.4%)	119 (69.6%)	
Single	4 (1.0%)	1 (25.0%)	3 (75.0%)	
Employment Status				<0.001
Employed	107 (27.9%)	83 (77.6%)	24 (22.4%)	
Unemployed	277 (72.1%)	77 (27.8%)	200 (72.2%)	
Diet				0.29
Eats natural foods	356 (92.7%)	151 (42.4%)	205 (57.6%)	
Eats processed foods	28 (7.3%)	9 (32.1%)	19 (67.9%)	
Physical Activity				<0.001
Doesn't exercise	298 (77.6%)	89 (29.9%)	209 (70.1%)	
Exercises	86 (22.4%)	71 (82.6%)	15 (17.4%)	

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.7 No. 3 (2026): March 2026 Issue
https://doi.org/10.51168/sjhrafrica.v7i3.2417
Original Article

Table 4b: Participants' clinical characteristics stratified by frailty status

Variables	Total, n=384 n (%)	Frailty status		p-value
		Not frail, n=160 n (%)	Frail, n=224 n (%)	
Depression				<0.001
Has depression	195 (50.8%)	24 (12.3%)	171 (87.7%)	
No depression	189 (49.2%)	136 (72.0%)	53 (28.0%)	
Comorbidities				<0.001
Has comorbidities	328 (85.4%)	106 (32.3%)	222 (67.7%)	
No comorbidities	56 (14.6%)	54 (96.4%)	2 (3.6%)	
Systolic blood pressure, Median (IQR)	130 (120-149.5)	122 (114-131.5)	140 (121-160)	<0.001
Diastolic blood pressure, Median (IQR)	80 (72-90)	80 (75-90)	78 (70-88)	0.003
Hypertension				<0.001
Normal blood pressure	179 (46.6%)	84 (46.9%)	95 (53.1%)	
Systolic hypertension only	92 (24.0%)	15 (16.3%)	77 (83.7%)	
Diastolic hypertension only	53 (13.8%)	40 (75.5%)	13 (24.5%)	
Both systolic & diastolic hypertension	60 (15.6%)	21 (35.0%)	39 (65.0%)	
Vitamin D levels				<0.001
Deficient	172 (44.8%)	6 (3.5%)	166 (96.5%)	
Insufficient	125 (32.6%)	74 (59.2%)	51 (40.8%)	
Normal	87 (22.7%)	80 (92.0%)	7 (8.0%)	
Total cholesterol				0.029
Normal	268 (69.8%)	102 (38.1%)	166 (61.9%)	
Elevated	116 (30.2%)	58 (50.0%)	58 (50.0%)	
HDL-cholesterol				0.038
Normal	99 (25.8%)	50 (50.5%)	49 (49.5%)	
Low	285 (74.2%)	110 (38.6%)	175 (61.4%)	
LDL-cholesterol				<0.001
Normal	221 (57.6%)	76 (34.4%)	145 (65.6%)	
Elevated	163 (42.4%)	84 (51.5%)	79 (48.5%)	
Triglycerides				0.81
Normal	269 (70.1%)	111 (41.3%)	158 (58.7%)	
Elevated	115 (29.9%)	49 (42.6%)	66 (57.4%)	
Serum Calcium levels				<0.001
Hypocalcemia	181 (47.1%)	57 (31.5%)	124 (68.5%)	
Normal	157 (40.9%)	83 (52.9%)	74 (47.1%)	
Hypercalcemia	46 (12.0%)	20 (43.5%)	26 (56.5%)	
Serum Magnesium levels				0.004
Hypomagnesemia	89 (23.2%)	25 (28.1%)	64 (71.9%)	
Normal	275 (71.6%)	129 (46.9%)	146 (53.1%)	
Hypermagnesemia	20 (5.2%)	6 (30.0%)	14 (70.0%)	

Abbreviations: HDL-C, High Density Lipoproteins -Cholesterol, IQR, Interquartile range, LDL-C, Low Density Lipoproteins - Cholesterol. p-value ≤ 0.05 was considered to be statistically significant.

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.7 No. 3 (2026): March 2026 Issue
https://doi.org/10.51168/sjhrafrica.v7i3.2417
Original Article

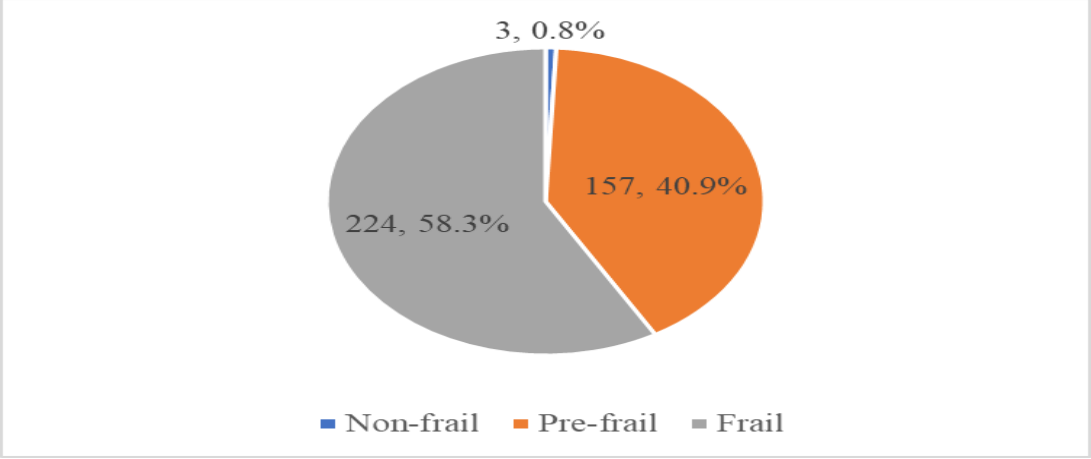
Prevalence of frailty among the elderly patients at MRRH

The overall prevalence of frailty was 58.3% (95% CI: 53.3%–63.2%). A further 40.9% were classified as pre-frail, while only 0.8% were non-frail (robust). ***See Table 3 and Figure 2.*** This classification was based on Fried's frailty phenotype, which defines individuals with a total score of 0 as non-frail (robust), those scoring 1–2 as pre-frail, and those scoring ≥3 as frail.

Table 5: Prevalence of frailty among the elderly patients at MRRH

Frailty	Frequency	Percentage (%)	Confidence interval (%)
Non-frail	3	0.78	0.25 - 2.40
Pre-frail	157	40.89	36.06 - 45.89
Frail	224	58.33	53.32 - 63.18

Figure 1: Prevalence of frailty among the elderly at MRRH



Vitamin D levels (25-hydroxyvitamin D) association with frailty among the elderly patients at MRRH

Vitamin D deficiency was significantly associated with frailty at both bivariate (cPR = 12.00; 95% CI: 5.89–24.44; $p < 0.001$) and multivariate levels (aPR = 5.13; 95% CI: 2.53–10.37; $p < 0.001$). Also, Vitamin D insufficiency showed statistical significance at both bivariate (cPR=5.07; 95% CI: 2.41 - 10.65; $p < 0.001$) and multivariate analysis aPR=2.87; 95% CI: 1.42-5.81; P= 0.003).

Table 6: showing the association of Vitamin D (25-hydroxyvitamin D) levels with frailty among the elderly patients at MRRH

Variable	Bivariate analysis		Multivariate analysis	
	cPR (95%CI)	p-value	aPR (95%CI)	p-value
Vitamin D levels				
Deficient	12.00(5.89 - 24.44)	<0.001*	5.13 (2.53-10.37)	<0.001*
Insufficient	5.07(2.41 - 10.65)	<0.001*	2.87 (1.42-5.81)	0.003*
Normal	1.00		1.00	

* Statistically significant factors (p-value ≤ 0.05), cPR: Crude prevalence ratio, 95%CI: 95% Confidence Interval. Normal vitamin D levels were at a concentration ≥30ng/mL, insufficient; 21-29ng/mL, and vitamin D deficiency was considered at levels ≤20ng/mL.

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.7 No. 3 (2026): March 2026 Issue
https://doi.org/10.51168/sjhrafrica.v7i3.2417
Original Article

Factors predisposing the elderly patients to frailty at MRRH

Bivariate analysis showing factors predisposing the elderly patients to frailty at MRRH

Table 4 summarizes the bivariate regression analysis of factors associated with frailty among elderly patients. In the bivariate analysis, several variables were significantly associated with increased risk of frailty. Advancing age was a notable factor; individuals aged >80 years had 46% higher prevalence of frailty compared to those aged 60–70 (cPR = 1.46; 95% CI: 1.18–1.81; p < 0.001). Lower educational attainment was also significantly linked to frailty. For example, individuals with no formal education had over five times the risk of being frail compared to those with tertiary education (cPR = 5.62; 95% CI: 2.25–14.07; p < 0.001).

Unemployment (cPR = 3.22; p < 0.001), lack of physical activity (cPR = 4.02; p < 0.001), presence of depression (cPR = 3.23; p < 0.001), and the presence of comorbidities (cPR = 18.95; 95% CI: 4.84–74.19; p < 0.001) were also significantly associated with frailty. In terms of clinical variables, systolic hypertension, vitamin D deficiency, hypocalcemia, and elevated LDL were significantly associated with frailty. However, low HDL showed borderline statistical significance (p=0.054).

Table 7: Bivariate analysis showing socio-demographic factors predisposing the elderly patients to frailty at MRRH

Variables	Bivariate analysis	
	cPR (95%CI)	p-value
Age group		
60-70	1.00	
71-80	1.27(1.06 - 1.53)	0.009*
>80	1.46(1.18 -1.81)	<0.001*
Sex		
Female	1.00	
Male	1.04(0.87 - 1.23)	0.690
Education level		
No education	5.62(2.25 - 14.07)	<0.001*
Primary education	4.79(1.92 - 11.93)	0.001*
Secondary education	2.62(1.02 - 6.72)	0.046*
Tertiary education	1.00	
Marital Status		
Married/Cohabiting	0.65(0.36 - 1.17)	0.149
Separated/Divorced	0.93(0.52 - 1.65)	0.799
Single	1.00	
Employment Status		
Employed	1.00	
Unemployed	3.22(2.25 - 4.62)	<0.001*
Diet		
Eats natural foods	1.00	
Eats processed foods	1.18(0.90 - 1.54)	0.234
Physical Activity		
Doesn't exercise	4.02(2.52 - 6.41)	<0.001*
Exercises	1.00	

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.7 No. 3 (2026): March 2026 Issue
https://doi.org/10.51168/sjhrafrica.v7i3.2417
Original Article

Table 8b: Bivariate analysis showing clinical factors predisposing the elderly patients to frailty at MRRH

Variables	Bivariate analysis	
	cPR (95%CI)	p-value
Depression		
Has depression	3.23(2.47 - 3.95)	<0.001*
No depression	1.00	
Comorbidities		
Has comorbidities	18.95(4.84 - 74.19)	<0.001*
No comorbidities	1.00	
Hypertension		
Normal blood pressure	1.00	
Systolic hypertension only	1.58(1.34 - 1.86)	<0.001*
Diastolic hypertension only	0.46(0.28 - 0.76)	0.002*
Both systolic & diastolic hypertension	1.22(0.97 - 1.54)	0.086
Vitamin D levels		
Deficient	12.00(5.89 - 24.44)	<0.001*
Insufficient	5.07(2.41 - 10.65)	<0.001*
Normal	1.00	
Total cholesterol		
Normal	1.00	
Elevated	0.81(0.66 - 0.99)	0.041*
HDL-cholesterol		
Normal	1.00	
Low	1.24(1.00 - 1.55)	0.054
LDL-cholesterol		
Normal	1.00	
Elevated	0.74(0.61 - 0.89)	0.001*
Triglycerides		
Normal	1.00	
Elevated	0.98(0.81 - 1.18)	0.808
Serum Calcium levels		
Hypocalcemia	1.45(1.20 - 1.76)	<0.001*
Normal	1.00	
Hypercalcemia	1.20(0.89 - 1.62)	0.240
Serum Magnesium levels		
Hypomagnesemia	1.35(1.14 - 1.61)	0.001*
Normal	1.00	
Hypermagnesemia	1.32(0.97 - 1.79)	0.079

* Statistically significant factors (p-value ≤ 0.05), cPR: Crude prevalence ratio, 95%CI: 95% Confidence Interval

Multivariate analysis showing factors predisposing the elderly patients to frailty at MRRH

In the multivariate model, those with no education had a higher adjusted PR of frailty (aPR = 1.62; 95% CI: 1.04–2.52; p = 0.035), as did those with only primary education (aPR = 1.59; 95% CI: 1.04–2.43; p = 0.034). Lack of physical activity remained significantly associated with frailty (aPR = 1.61; 95% CI: 1.19–2.18; p = 0.002), depression (aPR = 1.33; 95% CI: 1.11–1.61; p = 0.002), and comorbidities (aPR = 4.59; 95% CI: 1.25–16.89; p = 0.022). Notably, vitamin D deficiency was among the strongest independent predictors (aPR = 5.13; 95% CI: 2.53–10.37; p < 0.001), followed by insufficient levels (aPR = 2.87; p = 0.003). Also, consuming processed foods

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.7 No. 3 (2026): March 2026 Issue
https://doi.org/10.51168/sjhrafrica.v7i3.2417
Original Article

(aPR = 1.77; p < 0.001) and hypomagnesemia (aPR = 1.15; p = 0.029) were statistically significantly associated with frailty. ***See Table 6 and 6b***

Table 9: Multivariate analysis showing socio-demographic factors predisposing the elderly patients to frailty at MRRH

Variables	Multivariate analysis	
	aPR (95%CI)	p-value
Age group		
60-70	1.00	
71-80	1.08 (0.96 - 1.21)	0.219
>80	1.06 (0.90 - 1.26)	0.475
Sex		
Female		
Male		
Education level		
No education	1.62 (1.04 - 2.52)	0.035*
Primary education	1.59 (1.04- 2.43)	0.034*
Secondary education	1.38(0.90- 2.14)	0.143
Tertiary education	1.00	
Marital Status		
Married/Cohabiting		
Separated/Divorced		
Single		
Employment Status		
Employed	1.00	
Unemployed	1.15 (0.88-1.51)	0.315
Diet		
Eats natural foods	1.00	
Eats processed foods	1.77(1.45-2.16)	<0.001*
Physical Activity		
Doesn't exercise	1.61 (1.19- 2.18)	0.002*
Exercises	1.00	

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.7 No. 3 (2026): March 2026 Issue
https://doi.org/10.51168/sjhrafrica.v7i3.2417
Original Article

Table 10b: Multivariate analysis showing clinical factors predisposing the elderly patients to frailty at MRRH

Variables	Multivariate analysis	
	aPR (95%CI)	p-value
Depression		
Has depression	1.33(1.11- 1.61)	0.002*
No depression	1.00	
Comorbidities		
Has comorbidities	4.59(1.25- 16.89)	0.022*
No comorbidities	1.00	
Hypertension		
Normal blood pressure	1.00	
Systolic hypertension only	1.20 (1.06- 1.35)	0.003*
Diastolic hypertension only	0.92(0 .67- 1.25)	0.578
Both systolic & diastolic hypertension	1.16 (0.98-1.38)	0.081
Vitamin D levels		
Deficient	5.13 (2.53-10.37)	<0.001*
Insufficient	2.87 (1.42-5.81)	0.003*
Normal	1.00	
Total cholesterol		
Normal	1.00	
Elevated	1.03(0.84 - 1.27)	0.785
HDL-cholesterol		
Normal	1.00	
Low	0.99(0.82 - 1.19)	0.888
LDL-cholesterol		
Normal	1.00	
Elevated	0.94(0.79 - 1.12)	0.471
Triglycerides		
Normal	1.00	
Elevated	1.10(0.96 - 1.27)	0.171
Serum Calcium levels		
Hypocalcemia	0.98(0.86 - 1.11)	0.728
Normal	1.00	
Hypercalcemia	1.11(0.91 - 1.36)	0.299
Serum Magnesium levels		
Hypomagnesemia	1.15(1.01 - 1.31)	0.029*
Normal	1.00	
Hypermagnesemia	1.12(0.93 - 1.35)	0.250

* Statistically significant factors (p-value ≤ 0.05), aPR: Adjusted prevalence ratio; 95%CI: 95% Confidence Interval

Discussion

Prevalence of frailty among the elderly patients

In this study, a high prevalence of frailty of 58.3% among elderly patients was found by the Fried phenotype. This high prevalence likely reflects the advanced age and comorbidity burden in our setting. Frailty is defined as an age-related state of decreased physiological reserve and resilience. (Fedarko, 2011)So older patients with chronic illness and poor nutrition are more susceptible. (Wang et

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.7 No. 3 (2026): March 2026 Issue
https://doi.org/10.51168/sjhrafrica.v7i3.2417
Original Article

al., 2022). Studies in similar African hospital settings have reported comparable frailty rates. For instance, Adebusoye et al. (2019) in a tertiary hospital found 63.3% frailty among older patients in Nigeria, and Davidson et al. (2024) in a multi-center hospital study reported 57.0% frailty in Tanzanian elderly patients. Likewise, Sakyi et al. (2023) observed 59.7% frailty among Ghanaian hypertensive elders at a university hospital. These similar findings support our prevalence and likely reflect shared risk factors such as advanced age, disability, multimorbidity, and undernutrition in low-resource hospital settings.

However, our frailty prevalence exceeds many other reported prevalences. For instance, a population survey in Morocco found 46.4% frailty. (Mejdouli et al., 2024), and a Saudi Arabian study reported only 21.4% frailty among community-dwelling elderly adults (Alqahtani et al., 2021). Mejdouli et al. in Morocco, an upper-middle-income country, observed 46.4% frailty. (Mejdouli et al., 2024), lower than our rate, perhaps reflecting their mix of healthier community health-center patients. Furthermore, higher-income countries typically report far lower frailty rates. For example, large studies in the USA and China found that only 9% and 9.9% of older adults were frail, respectively, among community-dwelling elderly. (Kurnat-Thoma et al., 2022). These differences likely reflect methodological and contextual factors, such as community samples in high-income countries may be healthier on average, have better chronic disease management and nutrition, or stronger social support systems in those settings. (Majid et al., 2020).

On the other hand, we found 157 participants (40.9%) to be prefrail, which is consistent with other published studies. For instance, an Indian systematic review reported 39.8% prefrailty. (Debnath et al., 2024) among the elderly patients. This similarity could be due to related challenging study settings with high pre-frailty prevalence. By contrast, Dzando and Moussa (2025) in Côte d'Ivoire found only 24.6% prefrailty from three regions, a much lower prevalence. The Côte d'Ivoire study used a 30-item frailty index and included some younger elderly (50+), which might undercount the Fried-phenotype prefrail group.

Furthermore, in our study, only 0.78% were non-frail. This near-absence of non-frail elderly highlights the heavy frailty burden. This finding aligns with other African hospital reports showing very few non-frail elders. Adebusoye et. al. noted that only 36.7% non-frail Nigerian patients in a tertiary hospital. (Adebusoye et al., 2019), and the Côte d'Ivoire survey had merely 16.1% non-frail (Dzando and Moussa, 2025). In contrast, population studies in high-income countries report relatively higher prevalences of non-frailty; for example, a study in the USA reported a 47% non-frailty prevalence. (Kurnat-Thoma et al., 2022). The scarcity of non-frail individuals in our sample likely reflects the limited preventive healthcare common in our setting.

Comprehensively, our findings reveal a very high frailty burden in this Ugandan hospital cohort. Given the similarities with other African studies, our results highlight that low-resource hospitals face a disproportionate elderly vulnerability, showcasing the need to strengthen elder care services and preventive strategies in our region.

Vitamin D levels are associated with frailty among elderly patients.

In this study, vitamin D deficiency was an independent frailty predictor (aPR≈5.13 for deficiency; 2.87 for insufficiency). This fits a growing concern that low 25(OH)D impairs bone and muscle health, increasing frailty. (Marcos-Pérez et al., 2020). For instance, a study in Japan reported that the lowest vitamin D quartile had frailty in 49% of subjects versus only 15% in the highest quartile. (Saeki et al., 2020). Furthermore, a meta-analysis by Marcos-Pérez et al. (2020) likewise found significantly lower serum 25(OH)D in frail versus non-frail elders. Similar associations have been observed in developed countries. (Giustina et al., 2023; Zheng et al., 2022), further highlighting a global health challenge of low vitamin D levels among the elderly, resulting in frailty. Biologically, vitamin D promotes bone mineralization and muscle protein synthesis. (Latham et al., 2021)Without it, the elderly develop sarcopenia, weakness, and falls. (Zhang and Li, 2024), key components of frailty. Our finding that vitamin D-deficient elders were 5 times more likely to be frail thus concurs with the literature.

Factors predisposing the elderly patients to frailty among the elderly patients

This study found that the elderly with no or only primary education were much more likely to be frail. This agrees with other reports. For example, a study in Tanzania observed that frail hospitalized elders had significantly lower education and literacy levels. (Davidson et al., 2024). Similarly, Bellelli et al. (2023) in Italy noted that frailty increased exponentially with advancing age and fewer years of formal education. In fact, a recent umbrella review highlighted that lower education is consistently associated with higher frailty risk. (Boucham et al., 2024). Plausible explanations include poorer health literacy and socioeconomic disadvantage among the less educated. (Stormacq et al., 2020). Geriatric patients with minimal education may lack knowledge about nutrition, preventive care, and disease management. (Cristina and Lucia, 2021). These factors can accumulate over the life course,

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.7 No. 3 (2026): March 2026 Issue
https://doi.org/10.51168/sjhrafrica.v7i3.2417
Original Article

depleting physiological reserves and predisposing to frailty.

In the same vein, physical inactivity was associated with frailty (aPR=1.61). This is biologically plausible: a sedentary lifestyle leads to loss of muscle mass and strength (sarcopenia), poorer cardiovascular fitness, and a higher risk of obesity and metabolic dysfunction, all of which contribute to frailty. (Mo et al., 2023). Indeed, studies have repeatedly found that inactivity is a key driver of frailty. For example, Sobhani et al. (2022) reported that low physical activity was the strongest factor associated with frailty in the Iranian elderly (odds ratios ≈36 for frailty phenotype). Likewise, an Indian study noted that "frailty was associated with physical inactivity or a lack of exercise." (Kendhapedi and Devasenapathy, 2019). In other words, the elderly who do not exercise tend to have weaker muscles and higher inflammation, making them more vulnerable. (Pan et al., 2021). In our context, few elderly engage in regular exercise (often due to comorbidities), which likely contributes to poor health and higher frailty. Furthermore, in our study, depression (self-reported) significantly increased frailty risk (aPR=1.33). This aligns with prior research. Clinically, chronic depression activates stress-response systems (e.g., dysregulated cortisol) and pro-inflammatory cytokines, which can cause fatigue, muscle wasting, and poor appetite, all pathways to frailty. (Pradipta et al., 2025; Pan and Ma, 2024; Vaughan et al., 2015). This study's findings align with prior research. Chu et al. found that older adults with depression were far more likely to be frail than those without (Chu et al., 2019). Similarly, Lan et al. (2023) reported that depressed Chinese inpatients had 5.3 times the odds of frailty, and Mbabazi et al. (2022) found depressed Ugandan elderly had an aOR of 7.52 for frailty. Our finding is thus consistent with the literature linking psychological distress to frailty. (Chu et al., 2019; Lan et al., 2023).

Having comorbidities, particularly diabetes and cardiovascular disease, was associated with frailty (aPR=4.59). This is in agreement with other published studies. A study in Ghana showed that having hypertension complications had 3 times higher odds of frailty. (Sakyi et al., 2023), and in Nigeria, Adebusoye et al. (2019) found that having multiple comorbidities tripled to quadrupled frailty odds (OR=4.41). A global review also identified diabetes, hypertension, and other chronic conditions as consistent frailty predictors. (Boucham et al., 2024). Mechanistically, diseases like DM and CVD produce systemic inflammation and end-organ damage (e.g., neuropathy, impaired mobility, poor circulation), which erode physical reserve and function. (Adebusoye et al., 2019, Boucham et al., 2024).

Furthermore, high consumption of processed foods raised frailty prevalence (aPR≈1.77). Diets rich in ultra-processed items (high in salt, sugar, unhealthy fats, and additives) can drive inflammation and nutritional imbalance. (Tristan Asensi et al., 2023). This is supported by Zupo et al. (2023), who found that older Italians with moderate processed-food intake had 1.5 times higher odds of "nutritional frailty" compared to low-intake peers (and the highest quintile had 3.2 times higher odds) (Zupo et al., 2023). The harms likely come from excess additives and poor nutrient density: for example, trans fats and sodium in many processed foods can exacerbate cardiovascular strain, metabolic syndrome, and chronic disease. (Saravanan et al., 2023), which in turn promotes frailty. Thus, our finding agrees that diets heavy in processed foods correlate with frailty. (Zupo et al., 2023).

Lastly, we also found that low serum magnesium was associated with frailty (aPR=1.15). Magnesium is critical for muscle and nerve function; its deficiency produces fatigue, cramps, and weakness. (Struijk et al., 2024, Barbagallo et al., 2021). Our result is consistent with emerging evidence. For instance, Turkish elderly with hypomagnesemia had significantly worse Fried frailty scores. (Kocyigit and Katipoglu, 2024). Further supporting this, a large cohort study showed that higher magnesium intake is protective: Struijk et al. (2024) found that older women who met the RDA for magnesium had a 14% lower frailty risk compared to those who did not. (Struijk et al., 2024). In other words, sufficient dietary magnesium appears to reduce frailty risk, likely because Mg supports muscle contraction and cellular energy metabolism. (Struijk et al., 2024).

Conclusion

This study demonstrated a very high burden of frailty among elderly patients at Masaka Regional Referral Hospital, with only 0.78% remaining non-frail. Key factors associated with frailty included low educational attainment (no or primary education), physical inactivity, self-reported depression, comorbidities (notably diabetes and cardiovascular disease), and dietary factors (processed-food consumption and hypomagnesemia). Vitamin D status emerged as the strongest modifiable predictor: elders with deficiency were over five times more likely to be frail, and those with insufficiency nearly three times more likely, compared to those with sufficient levels.

Limitations

Some exposures were measured crudely. Notably, we assessed depression by a simple yes/no question rather than a validated scale (like the Geriatric Depression Scale), and we dichotomized exercise (yes/no) without a quantitative

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.7 No. 3 (2026): March 2026 Issue
https://doi.org/10.51168/sjhrafrica.v7i3.2417
Original Article

physical-activity scale. Similarly, diet was categorized coarsely (processed vs. natural foods). These simplifications may attenuate the true associations. Future studies should use standardized instruments (e.g., GDS for depression, validated activity questionnaires, and detailed dietary logs) to more precisely characterize these risk factors and confirm our findings.

Recommendations

To address the high frailty burden identified, we recommend that the Ministry of Health and hospital administrators integrate routine frailty screening and vitamin D testing into geriatric care protocols, coupled with clear clinical guidelines for vitamin D and magnesium supplementation. Clinicians and geriatric care teams should provide tailored education to low-literacy older patients on nutrition and chronic-disease self-management, prescribe supervised resistance and balance exercise programs for sedentary elderly, and implement validated depression screening (such as the Geriatric Depression Scale) with prompt referral for psychosocial support. Public health and nutrition departments ought to promote diets rich in whole, unprocessed foods, particularly sources of vitamin D and magnesium, and collaborate with community health workers to deliver home-based supplementation where deficiencies are detected. Finally, researchers should pursue longitudinal intervention studies examining the effects of nutrient repletion, physical-activity promotion, and mental-health support on frailty progression, and validate simple case-finding questions against gold-standard scales in this population.

List of abbreviations

CVD: Cardiovascular disease
DM: Diabetes Mellitus
EFS: Edmond Frailty Scale
EFS: Edmonton Frailty Scale
HDL: High-Density Lipoproteins
LDL: Low-Density Lipoproteins
MRRH: Masaka Regional Referral Hospital
MUST: Mbarara University of Science and Technology
TAGS: Triacyl glycerides
WHO: World Health Organization

Declarations

Consent for publication

All authors have consented to the publication of this work.

Authors' contributions

All authors played a significant role in this study, including contributions to methodology, writing the original draft, reviewing, and editing of the final draft of the manuscript. They also participated in the investigation, formal analysis, and interpretation of the findings.

Acknowledgments

We appreciate the administration and the laboratory staff at Masaka Regional Referral Hospital for their technical support throughout the period of data collection.

Declaration of competing interests

The authors declare no conflict of interest.

Availability of data and materials

The analyzed datasets are available from the corresponding author upon reasonable request.

Funding

The study did not receive any funding.

References

1. ADEBUSOYE, L. A., CADMUS, E. O., OWOLABI, M. O. & OGUNNIYI, A. 2019. Frailty and mortality among older patients in a tertiary hospital in Nigeria. Ghana Medical Journal, 53, 210-216. https://doi.org/10.4314/gmj.v53i3.5
2. ALQAHTANI, B. A., ALENAZI, A. M., ALSHEHRI, M. M., OSAILAN, A. M., ALSUBAIE, S. F. & ALQAHTANI, M. A. 2021. Prevalence of frailty and associated factors among Saudi community-dwelling older adults: A cross-sectional study. BMC Geriatrics, 21, 1-8. https://doi.org/10.1186/s12877-021-02142-9
3. BARBAGALLO, M., VERONESE, N. & DOMINGUEZ, L. J. 2021. Magnesium in aging, health, and diseases. Nutrients, 13, 463. https://doi.org/10.3390/nu13020463
4. BATKO-SZWACZKA, A., WILCZYŃSKI, K., HORNIK, B., JANUSZ-JENCZEŃ, M., WŁODARCZYK, I., WNUK, B., SZOŁTYSEK, J., DURMAŁA, J., SZUSTER-KOWOLIK, K. & ANTONIAK-SOBCZAK, K. 2020. Predicting adverse outcomes in healthy aging community-dwelling early-old adults with the timed up and go test. Clinical interventions in aging, 1263-1270. https://doi.org/10.2147/CIA.S256312
5. BELLELLI, F., CONSORTI, E., HETTIARACHCHIGE, T., ROSSI, P., LUCCHI, T., FROLDI, M. & CESARI, M. 2023. Relationship among age, education, and frailty in

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.7 No. 3 (2026): March 2026 Issue
https://doi.org/10.51168/sjhrafrica.v7i3.2417
Original Article

older persons. The Journal of Frailty & Aging, 12, 326-328. https://doi.org/10.14283/jfa.2023.39

6. BOUCHAM, M., SALHI, A., EL HAJJI, N., GBENONSI, G. Y., BELYAMANI, L. & KHALIS, M. 2024. Factors associated with frailty in older people: an umbrella review. BMC Geriatrics, 24, 737. https://doi.org/10.1186/s12877-024-05288-4
7. BRIGGS, A. M., VALENTIJN, P. P., THIYAGARAJAN, J. A. & DE CARVALHO, I. A. 2018. Elements of integrated care approaches for older people: a review of reviews. BMJ Open, 8, e021194. https://doi.org/10.1136/bmjopen-2017-021194
8. CHU, W., CHANG, S. F., HO, H. Y. & LIN, H. C. 2019. The relationship between depression and frailty in community-dwelling older people: A systematic review and meta-analysis of 84,351 older adults. Journal of Nursing Scholarship, 51, 547-559. https://doi.org/10.1111/jnu.12501
9. CRISTINA, N. M. & LUCIA, D. A. 2021. Nutrition and healthy aging: Prevention and treatment of gastrointestinal diseases. Nutrients, 13, 4337. https://doi.org/10.3390/nu13124337
10. CRUZ-JENTOFT, A. J. & WOO, J. 2019. Nutritional interventions to prevent and treat frailty. Current Opinion in Clinical Nutrition & Metabolic Care, 22, 191-195. https://doi.org/10.1097/MCO.0000000000000556
11. DAVIDSON, S. L., EMMENCE, L., MOTRAGHI-NOBES, S. M., BICKERSTAFF, E., RAYERS, G., LYIMO, G., KILASARA, J., CHUWA, M., KISHEO, F. & KISARUNI, E. 2024. Assessing frailty amongst older people admitted to hospital in a low-income setting: a multicentre study in northern Tanzania. BMC Geriatrics, 24, 190.
    a. https://doi.org/10.1186/s12877-024-04789-6
12. DEBNATH, A., GUPTA, S., YADAV, A., CHARAG, S., MONDAL, A. & KISHORE, J. 2024. Exploring frailty prevalence among adults in Indian healthcare settings: A systematic review and meta-analysis. Journal of Family Medicine and Primary Care, 13, 4759-4774. https://doi.org/10.4103/jfmpc.jfmpc_484_24
13. DENT, E., CHAPMAN, I., HOWELL, S., PIANTADOSI, C. & VISVANATHAN, R. 2014. Frailty and functional decline indices predict poor outcomes in hospitalised older people. Age and Ageing, 43, 477-484. https://doi.org/10.1093/ageing/aft181
14. DOODY, P., LORD, J. M., GREIG, C. A. & WHITTAKER, A. C. 2023. Frailty: pathophysiology, theoretical and operational definition (s), impact, prevalence, management and prevention, in an increasingly economically developed and ageing world. Gerontology, 69, 927-945. https://doi.org/10.1159/000528561
15. DZANDO, G. & MOUSSA, R. K. 2025. Association between frailty and subjective life expectancy in Sub-Saharan Africa: Evidence from Côte D'Ivoire. Archives of Gerontology and Geriatrics, 131, 105757.
    a. https://doi.org/10.1016/j.archger.2025.105757
16. FEDARKO, N. S. 2011. The biology of aging and frailty. Clinics in geriatric medicine, 27, 27. https://doi.org/10.1016/j.cger.2010.08.006
17. GALLIBOIS, M. A., ROGERS, K., FOLKINS, C., JARRETT, P. & MAGALHAES, S. 2022. Prevalence of frailty among hospitalized older adults in New Brunswick, Canada: an administrative data population-based study. Canadian Geriatrics Journal, 25, 375. https://doi.org/10.5770/cgj.25.563
18. GALLUZZO, L., O'CAOIMH, R., RODRÍGUEZ-LASO, Á., BELTZER, N., RANHOFF, A. H., VAN DER HEYDEN, J., LAMPRINI-KOULA, M., CIUTAN, M., LOPEZ-SAMANIEGO, L. & LIEW, A. 2018. Incidence of frailty: a systematic review of scientific literature from a public health perspective. Annali dell'Istituto superiore di sanità, 54, 239-245.
19. GIUSTINA, A., BOUILLON, R., DAWSON-HUGHES, B., EBELING, P. R., LAZARETTI-CASTRO, M., LIPS, P., MARCOCCI, C. & BILEZIKIAN, J. P. 2023. Vitamin D in the older population: a consensus statement. Endocrine, 79, 31-44. https://doi.org/10.1007/s12020-022-03208-3
20. GUMIKIRIZA-ONORIA, J., NAKIGUDDE, J., MUKASA, M. K., TIBASIIMA, I., MAYEGA, R. & NAKASUJJA, N. 2023. Reflections of ageing among older adults in a Ugandan community: A qualitative analysis into the benefits and pains of ageing. Journal of mental health and aging, 7, 171.
21. HALFON, M., PHAN, O. & TETA, D. 2015. Vitamin D: a review on its effects on muscle strength, the risk of falls, and frailty. BioMed Research International, 2015, 953241. https://doi.org/10.1155/2015/953241

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.7 No. 3 (2026): March 2026 Issue
https://doi.org/10.51168/sjhrafrica.v7i3.2417
Original Article

22. HOOGENDIJK, E. O., AFILALO, J., ENSRUD, K. E., KOWAL, P., ONDER, G. & FRIED, L. P. 2019. Frailty: implications for clinical practice and public health. The Lancet, 394, 1365-1375. https://doi.org/10.1016/S0140-6736(19)31786-6
23. KENDHAPEDI, K. K. & DEVASENAPATHY, N. 2019. Prevalence and factors associated with frailty among community-dwelling older people in rural Thanjavur district of South India: a cross-sectional study. BMJ Open, 9, e032904. https://doi.org/10.1136/bmjopen-2019-032904
24. KOCYIGIT, S. E. & KATIPOGLU, B. 2024. Hypomagnesemia may be related to frailty, gait and balance problems, and basic activities of daily living in older adults. Acta Clinica Belgica, 79, 160-167. https://doi.org/10.1080/17843286.2024.2364143
25. KOJIMA, G., ILIFFE, S. & WALTERS, K. 2018. Frailty index as a predictor of mortality: a systematic review and meta-analysis. Age and ageing, 47, 193-200. https://doi.org/10.1093/ageing/afx162
26. KURNAT-THOMA, E. L., MURRAY, M. T. & JUNEAU, P. 2022. Frailty and determinants of health among older adults in the United States, 2011-2016. Journal of aging and health, 34, 233-244. https://doi.org/10.1177/08982643211040706
27. LAN, X., YI, B., CHEN, X., JIN, S., CHEN, Q. & WANG, Z. 2023. Prevalence of frailty and associated factors among hospitalized older adults: A Cross-sectional study. Clinical Nursing Research, 32, 759-766.
    a. https://doi.org/10.1177/10547738221082218
28. LATHAM, C. M., BRIGHTWELL, C. R., KEEBLE, A. R., MUNSON, B. D., THOMAS, N. T., ZAGZOOG, A. M., FRY, C. S. & FRY, J. L. 2021. Vitamin D promotes skeletal muscle regeneration and mitochondrial health. Frontiers in Physiology, 12, 660498. https://doi.org/10.3389/fphys.2021.660498
29. LEWIS, E. G., COLES, S., HOWORTH, K., KISSIMA, J., GRAY, W., URASA, S., WALKER, R. & DOTCHIN, C. 2018. The prevalence and characteristics of frailty by frailty phenotype in rural Tanzania. BMC Geriatrics, 18, 1-11. https://doi.org/10.1186/s12877-018-0967-0
30. MAJID, Z., WELCH, C., DAVIES, J. & JACKSON, T. 2020. Global frailty: the role of ethnicity, migration, and socioeconomic factors. Maturitas, 139, 33-41. https://doi.org/10.1016/j.maturitas.2020.05.010
31. MARCOS-PÉREZ, D., SÁNCHEZ-FLORES, M., PROIETTI, S., BONASSI, S., COSTA, S., TEIXEIRA, J. P., FERNÁNDEZ-TAJES, J., PÁSARO, E., VALDIGLESIAS, V. & LAFFON, B. 2020. Low vitamin D levels and frailty status in older adults: a systematic review and meta-analysis. Nutrients, 12, 2286.
    a. https://doi.org/10.3390/nu12082286
32. MBABAZI, P., CHEN, G., RITCHIE, C. S., TSAI, A. C., REYNOLDS, Z., PAUL, R., SEELEY, J., TONG, Y., HOEPPNER, S. & OKELLO, S. 2022. Prevalence and correlates of frailty among older people with and without HIV in rural Uganda. JAIDS Journal of Acquired Immune Deficiency Syndromes, 10.1097.
33. MEJDOULI, H., BAALI, A., AMOR, H. & OUZENNOU, N. 2024. Prevalence and determinants of frailty among the elderly in the province of Essaouira, Morocco. The Pan African Medical Journal, 48, 43.
    a. https://doi.org/10.11604/pamj.2024.48.43.41695
34. MICHEL, J.-P. & SADANA, R. 2017. "Healthy aging" concepts and measures. Journal of the American Medical Directors Association, 18, 460-464. https://doi.org/10.1016/j.jamda.2017.03.008
35. MO, Y., ZHOU, Y., CHAN, H., EVANS, C. & MADDOCKS, M. 2023. The association between sedentary behaviour and sarcopenia in older adults: a systematic review and meta-analysis. BMC Geriatrics, 23, 877.
    a. https://doi.org/10.1186/s12877-023-04489-7
36. NGUYEN, T., CUMMING, R. & HILMER, S. 2015. A review of frailty in developing countries. The Journal of nutrition, health and aging, 19, 941-946. https://doi.org/10.1007/s12603-015-0503-2
37. OPPONG-YEBOAH, B., AMINI, N., VAN UFFELEN, J., GIELEN, E., YAWSON, A. E. & TOURNOY, J. 2024. Frailty and falls in community-dwelling older adults in sub-Saharan Africa: A scoping review. Archives of Gerontology and Geriatrics Plus, 100062. https://doi.org/10.1016/j.aggp.2024.100062
38. PAN, L., XIE, W., FU, X., LU, W., JIN, H., LAI, J., ZHANG, A., YU, Y., LI, Y. & XIAO, W. 2021. Inflammation and sarcopenia: a focus on circulating inflammatory cytokines. Experimental

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.7 No. 3 (2026): March 2026 Issue
https://doi.org/10.51168/sjhrafrica.v7i3.2417
Original Article

Gerontology, 154, 111544. https://doi.org/10.1016/j.exger.2021.111544
39. PAN, Y. & MA, L. 2024. Inflammatory markers associated with physical frailty and cognitive impairment. Aging and Disease, 16, 859.
40. PEREZ-RIVEROL, Y., BAI, J., BANDLA, C., GARCÍA-SEISDEDOS, D., HEWAPATHIRANA, S., KAMATCHINATHAN, S., KUNDU, D. J., PRAKASH, A., FRERICKS-ZIPPER, A. & EISENACHER, M. 2022. The PRIDE database resources in 2022: a hub for mass spectrometry-based proteomics evidence. Nucleic acids research, 50, D543-D552. https://doi.org/10.1093/nar/gkab1038
41. PRADIPTA, A. R., MARIANA, M. & IDRIS, F. 2025. A Cortisol dynamics in the elderly: Systematic Review. Health System and Medical Journal, 1, 19-30.
42. SAEKI, C., KANAI, T., NAKANO, M., OIKAWA, T., TORISU, Y., SARUTA, M. & TSUBOTA, A. 2020. Low serum 25-hydroxyvitamin D levels are related to frailty and sarcopenia in patients with chronic liver disease. Nutrients, 12, 3810. https://doi.org/10.3390/nu12123810
43. SAKYI, S. A., TAWIAH, P., SENU, E., AMPOFO, R. O., ENIMIL, A. K., AMOANI, B., ANTO, E. O., OPOKU, S., EFFAH, A. & ABBAN, E. 2023. Frailty syndrome and associated factors among patients with hypertension: A cross-sectional study in Kumasi, Ghana. Health science reports, 6, e1664. https://doi.org/10.1002/hsr2.1664
44. SANLIER, N. & GUNEY-COSKUN, M. 2022. Vitamin D, the immune system, and its relationship with diseases. Egyptian Pediatric Association Gazette, 70, 39. https://doi.org/10.1186/s43054-022-00135-w
45. SARAVANAN, D., KHATOON, S. & SABARATHINAM, S. 2023. A narrative review on the impact of processed foods/junk foods/preserved foods: why special attention is required to prevent metabolic syndrome? Obesity Medicine, 42, 100507. https://doi.org/10.1016/j.obmed.2023.100507
46. SOBHANI, A., SHARIFI, F., FADAYEVATAN, R., KAMRANI, A. A. A., MOODI, M., KHORASHADIZADEH, M., KAZEMI, T., KHODABAKHSHI, H., FAKHRZADEH, H. & ARZAGHI, M. 2022. Low physical activity is the strongest factor associated with frailty phenotype and frailty index: data from the baseline phase of Birjand Longitudinal Aging Study (BLAS). BMC Geriatrics, 22, 498. https://doi.org/10.1186/s12877-022-03135-y
47. STORMACQ, C., WOSINSKI, J., BOILLAT, E. & VAN DEN BROUCKE, S. 2020. Effects of health literacy interventions on health-related outcomes in socioeconomically disadvantaged adults living in the community: a systematic review. JBI evidence synthesis, 18, 1389-1469. https://doi.org/10.11124/JBISRIR-D-18-00023
48. STRUIJK, E. A., FUNG, T. T., BISCHOFF-FERRARI, H. A., WILLETT, W. C. & LOPEZ-GARCIA, E. 2024. Total magnesium intake and risk of frailty in older women. Journal of Cachexia, Sarcopenia and Muscle, 15, 1275-1282. https://doi.org/10.1002/jcsm.13450
49. TRISTAN ASENSI, M., NAPOLETANO, A., SOFI, F. & DINU, M. 2023. Low-grade inflammation and ultra-processed foods consumption: a review. Nutrients, 15, 1546. https://doi.org/10.3390/nu15061546
50. VAUGHAN, L., CORBIN, A. L. & GOVEAS, J. S. 2015. Depression and frailty in later life: a systematic review. Clinical interventions in aging, 1947-1958. https://doi.org/10.2147/CIA.S69632
51. VECCHIO, A., NAKIGOZI, G., NAKASUJJA, N., KISAKYE, A., BATTE, J., MAYANJA, R., ANOK, A., ROBERTSON, K., WAWER, M. J. & SACKTOR, N. 2021. Assessment, prevalence, and correlates of frailty among middle-aged adults with HIV in rural Uganda. Journal of Neurovirology, 27, 487-492.
    a. https://doi.org/10.1007/s13365-021-00969-x
52. VERONESE, N. 2020. Frailty as a cardiovascular risk factor (and vice versa). Frailty and Cardiovascular Diseases: Research into an Elderly Population, 51-54. https://doi.org/10.1007/978-3-030-33330-0_6
53. WANDERA, S. O., DDUMBA, I., AKINYEMI, J. O., ADEDINI, S. A. & ODIMEGWU, C. 2017. Living alone among older persons in Uganda: Prevalence and associated factors. Ageing international, 42, 429-446.
    a. https://doi.org/10.1007/s12126-017-9305-7
54. WANG, X., HU, J. & WU, D. 2022. Risk factors for frailty in older adults. Medicine, 101, e30169.
    a. https://doi.org/10.1097/MD.0000000000030169

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.7 No. 3 (2026): March 2026 Issue
https://doi.org/10.51168/sjhrafrica.v7i3.2417
Original Article

55. WHO. 2023. Hypertension [Online]. World Health Organization. Available: https://www.who.int/news-room/fact-sheets/detail/hypertension [Accessed 2025].
56. WU, C., SMIT, E., XUE, Q.-L. & ODDEN, M. C. 2018. Prevalence and correlates of frailty among community-dwelling Chinese older adults: the China Health and Retirement Longitudinal Study. The Journals of Gerontology: Series A, 73, 102-108. https://doi.org/10.1093/gerona/glx098
57. ZHANG, F. & LI, W. 2024. Vitamin D and sarcopenia in the senior population: a review of mechanisms and comprehensive prevention and treatment strategies. Therapeutics and Clinical Risk Management, 577-595.
    a. https://doi.org/10.2147/TCRM.S471191
58. ZHENG, Z., XU, W., WANG, F., QIU, Y. & XUE, Q. 2022. Association between vitamin D3 levels and frailty in the elderly: A large sample cross-sectional study. Frontiers in Nutrition, 9, 980908.
    a. https://doi.org/10.3389/fnut.2022.980908
59. ZUPO, R., DONGHIA, R., CASTELLANA, F., BORTONE, I., DE NUCCI, S., SILA, A., TATOLI, R., LAMPIGNANO, L., SBORGIA, G. & PANZA, F. 2023. Ultra-processed food consumption and nutritional frailty in older age. Geroscience, 45, 2229-2243. https://doi.org/10.1007/s11357-023-00753-1

Publisher Details

Student's Journal of Health Research (SJHR)
(ISSN 2709-9997) Online
(ISSN 3006-1059) Print
Category: Non-Governmental & Non-profit Organization
Email: studentsjournal2020@gmail.com
WhatsApp: +256 775 434 261
Location: Scholar's Summit Nakigalala, P. O. Box 701432, Entebbe Uganda, East Africa