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Research Article

Lipid Profile Pattern of Frail Filipino Elderly Patient Admitted in A Tertiary Medical Center

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ABSTRACT

Background: Dyslipidemia and frailty are both associated with an increased risk of cardiovascular disease and other health problems. Dyslipidemia is a condition where there are abnormal levels of lipids in the blood, while frailty is a state of weakness, decreased energy and reduced physical activity.

Objectives: This study aims to investigate the lipid profile pattern of Filipino frail elderly patients. It also aims to determine the prevalence of dyslipidemia among frail elderly patients as well as correlation to its co-morbidities and clinical outcome.

Methods: This is a prospective cohort study among frail elderly Filipino patients aged 60 years old and above admitted in a tertiary medical center from October to December 2024. Demographics, lipid profile, comorbidities, clinical frailty score, length of hospital stay and risk factors for mortality were evaluated.

Results: There are 188 frail elderly Filipino patients included in the study, 89 (47.3%%) were females and 99 (52.7%) were males. Mean age of the patients is 69.05 (+6.79) years. Among 260 elderly patients screened for frailty, 188 are frail. The prevalence rate of frailty among our Filipino elderly admitted is 72% and the prevalence of frail elderly Filipino patients with dyslipidemia is high at 69.65% (131 out of 188). The most common lipid profile abnormality is hypertriglyceridemia at 60%. Among co-morbidities, coronary artery disease is associated with our frail dyslipidemic elderly patients than those without dyslipidemia. There were no association noted in the number of hospital days and mortality rate among those with dyslipidemia from those without.

Conclusion: There is a high rate of frailty and dyslipidemia in our elderly Filipino admitted patients. Both conditions are more common in older people and both condition causes a decline in functionality and an increased vulnerability to illness.

Keywords: Frailty, Dyslipidemia, Elderly

1. Introduction

According to the United Nations, anyone older than 60 is considered an older person. Families and communities, however, frequently define age in terms of other socio-cultural referents, such as physical attributes, age-related health conditions or family status (grandparents). The World Health Organization projects that by 2050, there will be 400 million people aged 80 or above, doubling the number of people who are currently in this age group. This is due to the global population's aging trend[1].

Dyslipidemia is one of the most well-known cardiovascular risk factors and thus related to deaths. However, the roles of plasma lipids are more complex in the survival of geriatric population[2]. Dyslipidemia is defined as a clinical condition characterized by abnormal concentrations of lipids or lipoproteins in the blood, one of the main factors that determine the development of cardiovascular disease. High concentrations of triglycerides (TG), total cholesterol (TC) and their LDL-cholesterol (LDL-c) fraction, related to the decrease in HDL-cholesterol values (HDL-c) increase the likelihood of occurrence of these diseases. With age, the aging of organs and the emergence of concomitant illnesses make elderly patients the preferred target for changes in lipid fractions. Lipid profile components play a role in predicting the development of cardiovascular disease and hence mortality, but recent studies have shown mixed studies in the older population. The prevalence of dyslipidemia is particularly concerning in the elderly population, who often present with additional comorbidities and frailty[3].

Assessments of the association between serum cholesterol and mortality have been studied for decades and extensive research has shown a weak association between total cholesterol and mortality in the elderly; several studies have even shown an inverse association[4].

For frail elderly patients, frailty is not synonymous with either comorbidity or disability, but comorbidity is an etiologic risk factor for and disability is an outcome of, frailty. This provides a potential basis for clinical assessment for those who are frail or at risk and for future research to develop interventions for frailty based on a standardized ascertainment of frailty[5].

This study aims to investigate the lipid profile pattern of Filipino frail elderly patients. And in undertaking this study, this could provide new perspective and understanding on the lipid profile of frail elderly patients with dyslipidemia. The present study will focus on frail elderly patients with dyslipidemia admitted in a tertiary medical center. This study aims to provide insight on how aging causes changes in lipid profile as well as correlation of length of hospital stay and mortality of patients with and without dyslipidemia.

2. Objectives

General Objective:

To determine the lipid profile pattern of frail Filipino elderly patient admitted in a tertiary medical center.

Specific Objectives:

- To determine the prevalence of frailty among admitted elderly Filipino patients.
- To determine the prevalence dyslipidemia among admitted frail elderly Filipino patients.
- To determine the association of dyslipidemic frail elderly with their co-morbidities.
- To determine the clinical outcomes of frail elderly with dyslipidemia (length of hospital stay and mortality).

3. Methodology

This is a prospective cohort study among Filipino frail elderly patients admitted at Quirino Memorial Medical Center, a tertiary hospital in Quezon City in the month of October 2024 - December 2024.

3.1. Inclusion criteria

Admitted patients under Internal Medicine department with age 60 years old and above, diagnosed with Frailty using the Clinical Frailty Scale Criteria[6], with lipid profile extraction in our institutions and are newly diagnosed with dyslipidemia (TC >200mg/dL & LDL >130mg/dL), triglyceride (>150 mg/dL), HDL (<40 mg/dL in males, <50 mg/dL in female).

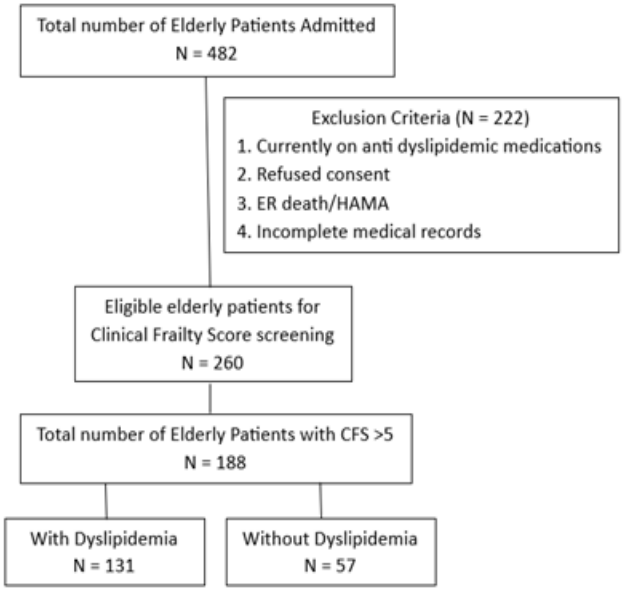
3.2. Exclusion criteria

Patients who refuse consent and refused to have their lipid profile collected, patients previously and currently taking lipid lowering agents. Patients who died in the ER and incomplete medical records.

3.3. Sampling method

The sample size for the cohort study was computed using the rate of admission in elderly population (60 years old and above) in the Internal Medicine department with an average population size of one hundred eighty-eight.

3.4. Conceptual framework



3.5. Study procedure

Approval was obtained from the Internal Medicine department and Professional Education Training and Research Office. The researcher informed the research adviser, chairman, department head, consultants and co-residents about the research procedures. Patients who meet the inclusion criteria were screened for frailty using the Clinical Frailty Scale Criteria. Questionnaires and consent forms were also given to representatives such as a family member who is currently living with the patient and is assisting the patient in his/her activities of daily living. The primary investigator conducted the interview test to the patient themselves or to the relatives or caregivers. The primary investigator also did the assessment to the admitted elderly patients using the Clinical Frailty Scale questionnaires which consists of 7 items, covering different aspects. A score 5 and above indicating mild frailty among admitted elderly patients.

3.6. Data analysis

Data was encoded and tallied in SPSS version 13 for windows. Descriptive statistics were generated for all variables. For nominal data, frequencies and percentages were computed.

For numerical data, mean ± SD were generated. Analysis of the different variables was done using the following test statistics: ANOVA, Phi/Cramer's/V, T-test and Chi-square test.

3.7. Ethical considerations

Data collection process was conducted without any form of coercion, manipulation or inducement. Strict measures were taken to maintain patient confidentiality and no personally identifiable information, such as names, contact numbers or complete addresses, was included in the collected data. The handling of data fully complied with the provisions of the Data Privacy Act of 2012 and its implementing rules and regulations from 2016, unless otherwise required by law. To protect the privacy of participants, each individual included in the study was assigned to a unique code. There are no conflicts of interest regarding financial, familial or proprietary considerations for the primary investigator or the study site. All study outcomes were promptly reported to the hospital administration.

4. Results

This research is based on the data collected from a total of one hundred eighty-eight (188) respondents aged 60 years and above who were admitted at Quirino Memorial Medical Center in 3-month duration (October 2024- December 2024).

Table 1: Prevalence of Filipino elderly patients admitted with frailty.

Total number of Elderly Patients admitted	260
Total number of Elderly Patient with CFS >5	188
Prevalence	72%

Table 1 shows a total number of 260 elderly patients admitted. Out of 260 elderly patients, 188 elderly patients were classified as frail with a Clinical Frailty Score of >5. Hence showing a prevalence rate 72% **(Table 1)**.

Table 2 shows that among 188 frail Filipino elderly patients, 131 were dyslipidemic and 57 have normal lipid profile. The prevalence of dyslipidemia among our frail Filipino elderly patients is 69.65% **(Table 2)**.

Table 2: Prevalence of Dyslipidemia among Frail elderly patients admitted.

Total number of Elderly Patient with CFS >5	188
Total number of patients with dyslipidemia	131
Total number of patients without dyslipidemia	57
Prevalence of dyslipidemia with CFS >5	69.65%

Table 3: Prevalence of Frail elderly dyslipidemia in specific age group.

Age	With Dyslipidemia N=131	Without Dyslipidemia N= 57	Total	Prevalence
60-69	77	25	102	75.5%
70-79	43	27	70	61%
>80	11	5	16	69%
Total	131	57	188	69.65%

Table 3 shows the distribution of dyslipidemia among specific age groups of admitted frail elderly Filipino patients. There were 77 (75.5%) out of 102 in the age range of 60-69 years old, 43 (61%) out of 70 in the age range if 70-79 years and 11 (69%) out of 16 in the age range of >80 years of age **(Table 3)**.

Table 4: Lipid Profile Pattern of Filipino Frail Elderly with dyslipidemia.

	Abnormal (n)	Normal (n)	Total	Prevalence
TC	66	65	131	50%
TG	78	53	131	60%
HDL	27	104	131	21%
LDL	54	77	131	41%
Combination	80	51	131	61%

Table 4 shows the different lipid profile patterns of admitted frail Filipino elderly. Among 131 dyslipidemic patients, 50% have hypercholesterolemia, 60% has hypertriglyceridemia, 21% have decrease HDL levels and 41% have elevated LDL levels. 61% of them have multiple combinations of abnormal lipid profile patterns **(Table 4)**.

Table 5: Demographic profile of frail elderly Filipino patients with & without dyslipidemia.

Variables	Categories	DYSLIPIDEMIA Incidence				Total		Chi-Square	Phi/Cramers V	p-value	Interpretation
		With Dyslipidemia		No Dyslipidemia							
		Freq	%	Freq	%	Freq	%				
Sex	F	62	69.7	27	30.3	89	47.3	0.000	.000	.996	Not Significant
	M	69	69.7	30	30.3	99	52.7				
	Total	131	69.7	57	30.3	188	100.0				
HYPERTENSION	Without	79	67.5	38	32.5	117	62.2	.684[a]	-.060	.408	Not Significant
	With	52	73.2	19	26.8	71	37.8				
	Total	131	69.7	57	30.3	188	100.0				
CVD	Without	118	68.6	54	31.4	172	91.5	1.204	-.077	.273	Not Significant
	With	13	81.3	3	18.8	16	8.5				
	Total	131	69.7	57	30.3	188	100.0				
PAOD	Without	128	70.3	54	29.7	182	96.8	1.046	.078	.306	Not Significant
	With	3	50.0	3	50.0	6	3.2				
	Total	131	69.7	57	30.3	188	100.0				
CAD	Without	100	65.8	52	34.2	152	80.9	5.69	-.174	.017	Significant
	With	31	86.1	5	13.9	36	19.1				
	Total	131	69.7	57	30.3	188	100.0				

CKD	Without	100	68.5	46	31.5	146	77.7	.436[a]	-.048	.509	Not Significant
	With	31	73.8	11	26.2	42	22.3				
	Total	131	69.7	57	30.3	188	100.0				
DM	Without	69	67.0	34	33.0	103	54.8	.781[a]	-.064	.377	Not Significant
	With	62	72.9	23	27.1	85	45.2				
	Total	131	69.7	57	30.3	188	100.0				
DEMENTIA	Without	119	70.0	51	30.0	170	90.4	.086[a]	.021	.770	Not Significant
	With	12	66.7	6	33.3	18	9.6				
	Total	131	69.7	57	30.3	188	100.0				
RESPIRATORY	Without	54	67.5	26	32.5	80	42.6	.381[a]	-.045	.537	Not Significant
	With	77	71.3	31	28.7	108	57.4				
	Total	131	69.7	57	30.3	188	100.0				
LIVER DISEASE	Without	115	70.1	49	29.9	164	87.2	.118[a]	.025	.731	Not Significant
	With	16	66.7	8	33.3	24	12.8				
	Total	131	69.7	57	30.3	188	100.0				
MALIGNANCY	Without	114	72.2	44	27.8	158	84.0	2.862[a]	.123	.091	Not Significant
	With	17	56.7	13	43.3	30	16.0				
	Total	131	69.7	57	30.3	188	100.0				
HEMATOLOGIC DISEASE	Without	91	71.7	36	28.3	127	67.6	.721[a]	.062	.396	Not Significant
	With	40	65.6	21	34.4	61	32.4				
	Total	131	69.7	57	30.3	188	100.0				
Smoker	No	91	67.4	44	32.6	135	71.8	1.172[a]	-.079	.279	Not Significant
	Yes	40	75.5	13	24.5	53	28.2				
	Total	131	69.7	57	30.3	188	100.0				
Alcoholic Beverage Drinker	No	106	70.2	45	29.8	151	80.3	.097[a]	.023	.755	Not Significant
	Yes	25	67.6	12	32.4	37	19.7				
	Total	131	69.7	57	30.3	188	100.0				

Table 5 presents the demographic data of the respondents. Out of 188 frail elderly Filipino patients 89 (47.3%%) were females and 99 (52.7%) were males. There was significant association noted on frail elderly dyslipidemia Filipino patients with coronary artery disease with p-value of <0.05. Other demographic variables such as hypertension, cerebrovascular Disease/CVD, peripheral arterial occlusive disease, chronic kidney disease/CKD, diabetes mellitus, dementia, respiratory disease: COPD bronchial asthma, liver disease, malignancy, hematologic disease, smoking history and alcoholic beverage drinkers showed no association with p-value of >0.05 **(Table 5)**.

Table 6 presents the mean age of the patients is 69.05 (±6.79) years with dyslipidemia and 70.10 (±6.360) years without dyslipidemia. The mean hospital length of stay is 20.008 days (±7.998) days with dyslipidemia and 20.789 days (±7.798) days without dyslipidemia. There is no significant difference in the length of hospital stay between dyslipidemia and without dyslipidemia with a p value of >0.05 **(Table 6)**.

Table 6: Clinical outcome of frail elderly dyslipidemic patients in number of hospital days.

	With Dyslipidemia		No Dyslipidemia		Overall		t-test	effect size	p-value	Interpretation
	Mean	SD	Mean	SD	Mean	SD				
Age	69.053	6.792	70.105	6.360	69.372	6.665	-0.995	−0.16	0.321	Not Significant
Hospital days	20.008	7.998	20.789	7.798	20.245	7.925	-0.621	−0.10	0.536	Not Significant

Table 7: Clinical outcome of frail elderly dyslipidemic patients in mortality rate.

Variables	Categories	DYSLIPIDEMIA				Total		Chi-Square	Phi/ Cramer's V	p-value	Interpretation
		With		Without							
		Freq	%	Freq	%	Freq	%				
Outcome	DISCHARGED	129	70.10	56	29.78	185	98.4	.736	.049	.692	Not Significant
	EXPIRED	2	66.7	1	33.3	3	1.6				

Table 7 shows that there was no difference in mortality rate among dyslipidemic frail elderly Filipino patients from those without dyslipidemia with p-value of >0.05 **(Table 7)**.

5. Discussion

Frailty is a medical condition that causes a decline in functionality and an increased vulnerability to illness. Frailty may increase the risk of dyslipidemia, a condition that involves abnormal levels of lipids in the blood. Both conditions are more common in older people. The prevalence of frailty is different base on the setting of the research, it is usually lower in the community and higher in the hospital. Studies showed that the prevalence rate of frailty in the community ranges from 6.9-24%[5,7], while in hospital setting, it showed a prevalence rate of 41-71%[8]. In a local study made by Laude T-MP et al, A total of 109 elderly was included in the study, only 8.3% were frail, 81.6% were prefrail and 10.1% are robust using Fried's frailty criteria. It was also noted that 60.6% of participants has dyslipidemia[9]. Based on our research, 72% of our elderly admitted patients were frail.

In our study, the prevalence rate of dyslipidemia who are frail elderly is 69.65%. The prevalence rate of dyslipidemia in the Philippines, base on cut off values: borderline (200–239 mg/dL) to high TC (≥240 mg/dL), borderline (130–159 mg/dL) to high LDL-C (≥160 mg/dL), low HDL-C (<40 mg/dL) and elevated TG (≥150 mg/dL) in adults aged ≥20 years were 46.9%, 47.2%, 71.3% and 38.6%, respectively. 72% of adults in this survey had at least one abnormal lipid component[10]. In a study done by Rosada et al, the prevalence of hyperlipidemia was more frequent in the elderly group (76%) compared to the young group (41%). Hypercholesterolemia was the most common (64%), followed by hyperlipoproteinemia (18%), hypertriglyceridemia (7%) and combined hyperlipoproteinaemia (5%)[11]. According to Xi, Y. et al, the age-standardized prevalence of dyslipidemia was 31.2%. The prevalence of dyslipidemia generally increased with age but was decreased in the age group 65-75 years. The same trend was observed for elevated LDL-C and TG. The prevalence of dyslipidemia was significantly higher in men than in women[12].

Lipid metabolism is altered during old age. As a result of aging, all gastrointestinal processes (such as movement, enzyme, hormone release) are altered, which in turn affects digestion and absorption, thereby leading to reduced nutrient uptake. Changes in lipid synthesis and catabolism that occur with aging lead to abnormal lipid utilization in tissues. The dysregulation of the lipid metabolism in older adults is often reflected by changes in blood lipid levels, which are associated with the onset of various chronic diseases. Specifically, the levels of triglycerides, total cholesterol and low-density lipoprotein cholesterol tend to increase, while high-density lipoprotein cholesterol (HDL-C) concentrations become relatively irregular during aging. Regarding lipoprotein levels, low-density lipoproteins have been reported to increase with age. The primary age-related change in pancreatic function is the decline of the pancreatic lipase activity. Bile acid levels showed a consistent decrease with age. The absorption of dietary fat initiates an increase in the plasma triglyceride concentration and the resultant increase in chylomicron and very low-density lipoproteins (VLDL) in the blood in the postprandial state. The dysregulation of the lipid metabolism in older adults is often reflected by changes in blood lipid levels, which are associated with the onset of various chronic diseases[13].

In an article written by Paolo P. et al, the mechanisms behind this age-related increase in plasma cholesterol are still incompletely characterized. Of particular interest is the finding of a gradual decline in the fractional clearance of LDL from the circulation with age and evidence of the reduced expression of hepatic LDL receptors (LDLRs) with increasing age in some species. The capacity for body cholesterol removal through the conversion of cholesterol to bile acids is also progressively reduced with age and a decrease in the activity of the rate-limiting enzyme in bile acid biosynthesis, cholesterol 7α-hydroxylase, has been demonstrated in the aging rat. In addition, there is some evidence that the synthesis of apolipoprotein B-100 in VLDL may be increased with age. A number of explanations to these findings have been discussed, including both dietary and hormonal factors. An interesting hypothesis states that the critical changes in cholesterol and lipoprotein metabolism depend on the progressive decrease in growth hormone secretion, which occurs with normal aging[14].

Lipid profile from the National Health and Nutrition Examination Survey (NHANES) 2003-2004 showed the comparison of lipid profile pattern from 30–79-year-olds old, there is a slight decrease in LDL, non-HDL-C and triglycerides with similar HDL levels in individuals 70-79 years of age. Other cross-sectional studies have reported similar results. Prospective studies with longitudinal follow-up have also observed small decreases in total cholesterol, LDL and HDL levels in men and women as they become elderly. It should be noted that the changes in lipid levels reported with aging are relatively small and vary somewhat from study to study. Other studies also showed that older individuals have an increase postprandial lipemia compared with younger individuals. However, the clinical significance of these small changes is uncertain. It is well recognized that as one becomes older, the likelihood of other medical disorders increases, older patients usually have multiple co-morbidities and this can affect lipid levels. For example, inflammation, infections, poor nutrition or socio-economic factors can decrease LDL and HDL levels. Finally, frailty is a syndrome associated with aging and increases with age[15].

Lipid metabolism plays a role in frailty. Pathogenesis includes decreased muscle mass, reduced physical function and increased vulnerability to health issues; this is due to changes in lipid levels, particularly phospholipids, which can affect muscle function and contribute to the overall decline seen in frail individuals. In a study of Ramirez-Velez, et al, a lipidomic approach found that five circulating metabolites including ceramides, cholesterol and phosphatidylcholines were significantly increased in physically frail compared with robust older adults at hospital admission. Moreover, cholesterol and ceramides had acceptable levels of accuracy to discriminate physically frail at hospital admission and, therefore, might be useful biomarkers in clinical practice. The non-targeted metabolic study can open a wide view of the physically frail features changes at the plasma level, which would be linked to the physical frailty phenotype at hospital admission[16].

In a study made by Lee WJ, et al, wherein they correlated frailty and the components of metabolic syndrome, 12.9% were frail. The prevalence of frailty and metabolic syndrome increased along with aging. Those with metabolic syndrome were strongly associated with frailty status and presenting a dose-dependent effect than their counterparts. The study demonstrated associations between frailty and metabolic syndrome and its individual components (elevated triglyceride levels) but not in low HDL-C, especially in females and older adults[17]. A cross-sectional investigation of the relationship between dyslipidemia

and frailty showed that increased TG was associated with the development of frailty. Gale et al. found an association between high TC levels and new-onset frailty[18]. However, in a systemic review of association between cardiometabolic risk factors and frailty in older adults showed that there was inconsistency across the studies regarding the associations between dyslipidemia and frailty. Further studies should be done[19].

In our study, the prevalence rate of different lipid profile components in our frail elderly were hypertriglyceridemia (60%), hypercholesterolemia (50%) and High LDL-C (41%) and low HDL-C (27%). Our results are much higher compared to a study done at Iran by Delbari et. al, wherein high levels of total cholesterol, triglyceride, low-density lipoprotein and low level of high-density lipoprotein were seen among 9.74%, 24.66%, 5.54%, 19.20% of their elderly participants, respectively[20]. Reasons of this is maybe due to ethnic backgrounds, different study settings and subjects.

Lipid profile levels in elderly may affect their functionality. The prevalence of activities of daily living disability showed downward trend with an increase of the LDL-C and triglyceride and an increase in HDL-C levels had a protective effect against activities of daily living disability[21].

Studies showed that incidence of frailty (CFS score ≥5, mild-severely frail) was higher in those with cardiovascular disease compared to those without cardiovascular disease (76% vs 66%). A history of cardiovascular disease was significantly associated with higher rate of first readmission or death within 12 months, compared to no history of cardiovascular disease[22]. In a Taiwanese retrospective cohort study, older females with the lowest quartile of TC and LDL cholesterol had higher cardiovascular mortality. Older females with the lowest quartile of HDL had higher mortality from cardiovascular and cerebrovascular diseases and concluded that TC, mostly attributed to LDL cholesterol, was inversely related to all-cause mortality. HDL remained to be protective against both cardiovascular and stroke mortality in older females[23]. In our study, there was significant association noted on frail elderly dyslipidemic Filipino patients with coronary artery disease than those without dyslipidemia, hence treatment of dyslipidemia is still warranted among them.

In a study done by Onder G et al, among older hospitalized adults, low serum cholesterol levels appear to be an independent predictor of short-term mortality[24]. According to Wang, R et al. The mean total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C) and low-density lipoprotein cholesterol (LDL-C) levels in elderly were higher among those who died than among those who survived. Participants in the second HDL-C quartile and the highest LDL-C and triglyceride (TG) quartiles had 28% higher, 23% lower and 49% lower risks of all-cause mortality, respectively[25]. Our study showed no significant association noted in the number of hospital days and mortality rate among our frail elderly dyslipidemic patient from those without dyslipidemia.

6. Conclusion

The study revealed the prevalence of frail elderly Filipino patients with dyslipidemia is high at 69.65% and the prevalence of frail dyslipidemic in specific age group is almost the same ranging from 61 to 75%. The most common lipid profile abnormality is hypertriglyceridemia at 60% among our frail elderly patients. Among co-morbidities, coronary artery disease is associated with our frail dyslipidemic elderly patients than those without dyslipidemia. This study may serve as a baseline study in the Philippines and aims to provide information on frail elderly with dyslipidemia.

7. Contributors

All authors designed the study, acquired the data, analysed the data, drafted the manuscript and critically revised the manuscript for important intellectual content. All authors had full access to the data, contributed to the study, approved the final version for publication and take responsibility for its accuracy and integrity.

8. Funding/Support

No specific grant or funding received.

9. Data Availability

All data generated or analyzed during the present study are available from the corresponding author on reasonable request.

10. Ethics Approval

Approval was obtained from the Internal Medicine department, Professional Education Training and Research Office and Review and Ethics Board of Quirino Memorial Medical Center.

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