

Frailty Index-CGA and mortality at a 12-month follow-up at Hospital Central de la Fuerza Aérea del Perú

Carmen Eliana Peralta Vargas ^{1,a}; María Ahon Jiraldo ^{1,a}; Claudia Valdivia Alcalde ^{1,a}; Ian Falvy-Bockos* ^{1,a}

ABSTRACT

Objective: To determine the relationship between mortality and level of frailty using the Frailty Index-Comprehensive Geriatric Assessment (FI-CGA) among older adults at a 12-month follow-up.

Materials and methods: A descriptive, observational and prospective study with non-probabilistic sampling conducted with patients over 60 years of age from the Geriatrics Service. Using the FI-CGA, frailty was diagnosed if the score was greater than or equal to 0.2 at the different levels of care: acute care unit, day hospital, outpatient clinic and house call. Moreover, a 12-month telephone follow-up was conducted. In case of death, the event and cause were confirmed in the Sistema Informático Nacional de Defunciones (SINADEF, National Death Computer System) of the Ministry of Health of Peru. Patients who died from coronavirus complications were excluded. To determine the association between FI-CGA and mortality, chi-square and Student's *t* tests were used for the qualitative and quantitative variables, respectively.

Results: A total of 241 subjects with an average age of 85.08 years were included in the research. Out of this population, 222 (92.12 %) were classed as frail (FI-CGA score ≥ 0.2), among which 82 were considered mildly frail (0.2-0.36), 59 moderately frail (0.4-0.52) and 54 severely frail (> 0.56). At the 12-month follow-up, 28 (11.61 %) older adults had died during that period. Out of the deceased, 23 (82.14 %) had a FI-CGA score greater than or equal to 0.56. When analyzing the association between mortality and the FI-CGA, it was found that the higher the FI, the higher the mortality, with very significant differences ($p = 0.001$). There was no association between age and mortality ($p = 0.95$).

Conclusions: The FI-CGA is a useful tool to predict mortality in frail patients, according to their severity, at a 12-month follow-up.

Keywords: Frailty; Mortality; Aged (Source: MeSH NLM).

INTRODUCTION

There is a remarkable increase in aging worldwide, and Peru is not the exception. According to the Instituto Nacional de Estadística e Informática (INEI, National Institute of Statistics and Data Processing) data, there are demographic changes, which showed that the population rate was 5.7 % in 1950 and rose to 13.3 % in 2022 ⁽¹⁾. Frailty—along with sarcopenia—is considered a new and remarkable giant syndrome of geriatrics. In this case, the person is in a vulnerable state and at risk of morbidity or mortality when facing a health problem ⁽²⁾. Frailty itself increases the risk of institutional confinement, falls, disability and cognitive impairment ⁽³⁾. There are two accepted trends to define and measure frailty. The frailty phenotype model identified by Fried et al. ⁽³⁾ with five components (weight loss, poor endurance, weakness, slow gait speed and low physical activity) was the first, and it referred to physical frailty. Later, a second model of deficit accumulation was created: when the number of adverse health conditions is higher, a value or frailty index (FI) is generated in a multidimensional scale that focusses not only on the physical-motor aspect, which results in a wider definition ⁽⁴⁾. In “Frailty Consensus” of 2013, carried out by a group of experts and international associations, frailty was defined as a syndrome with multiple causes that contribute to reduce strength as well as the physiological function, thus exposing the individual to the risk of dependency and/or mortality ⁽⁵⁾.

The prevalence of frailty varies worldwide, depending on the studied population and the tool used to detect it. Research studies have started in Peru in order to determine an approximate prevalence. A study conducted among older adults with heart failure at a hospital in Lima revealed a prevalence of 58.8 % by means of the Edmonton Frail Scale ^(6,7). Another research carried out in Lima at the hospital level using the FRAIL scale was associated with frailty among people over 80 years old, cognitive impairment, depression and malnutrition ⁽⁸⁾. A study conducted in Chiclayo showed 17.5 % of patients with this syndrome using the definition “Women’s Health and Aging Studies.” Another study carried out in the same city among patients of the first healthcare level, which used Fried’s criteria, found a prevalence of 20.7 % ⁽⁹⁾.

1 Hospital de la Fuerza Aérea del Perú. Lima, Peru.

^a Geriatrician.

*Corresponding author.

Another study on the frequency and associated factors was conducted using frailty phenotype in Lambayeque, and a prevalence of 22.78 % was found, the related factors being age, arthropathies and vision problems ⁽¹⁰⁾. A prevalence study among outpatients over 60 years old was carried out in Trujillo using the Fried phenotype, and 59.29 % was found ⁽¹¹⁾. It should be mentioned that these studies neither used scales measuring the FI nor calculated mortality as a result. In the FI, the risk of death exponentially increases according to deficit accumulation that has adverse health effects. Also, the scales used are multidimensional and share the approach of the Comprehensive Geriatric Assessment (CGA). Frailty Index-CGA (FI-CGA) is an easy-to-use scale (it takes less than 10 minutes), where variables are taken from a classic CGA comprising 22 general questions for 25 deficits. The FI is obtained dividing the deficits found (considering one point for each) by the potential ones. If the FI is equal to or greater than 0.2, the score corresponds to frail population. From this point, it is divided into three groups: mildly frail (FI 0.2-0.36), moderately frail (FI 0.4-0.52) and severely frailty (FI over 0.56) ⁽¹²⁾. There is an excellent correlation between FI-CGI and mortality, which reduces the bias of age and highlights the importance of deficit accumulation. Also, it can identify the stage of the biological pathway determining the patient's approximate physiological reserve ⁽¹³⁾. Though there are research studies on this topic in different regions of the country, there is no information about the prediction of mortality associated with the degree of frailty or the use of tools that research the concept of frailty on a multidimensional basis and provide a value or index to define it.

MATERIALS AND METHODS

Study design and population

A descriptive, observational and prospective study among patients over 60 years of age from the Geriatrics Service of Hospital Central de la Fuerza Aérea del Perú. During the last two months of 2019, the FI-CGA was used in the following levels of care: acute care unit, day hospital, outpatient clinic and house call.

Variables and measurements

The objective of the study was to determine the relationship between mortality and the level of frailty by using the FI-CGA. At the 12-month telephone follow-up, death was evaluated as an adverse event.

In the case of death, the event and cause were confirmed in the Sistema Informático Nacional de Defunciones (SINADEF, National Death Computer System) of the Ministry of Health of Peru. Patients who died from complications caused by SARS-CoV-2 infection were excluded.

Non-probability convenience sampling was used. The

tool used was the FI-CGA, which is made up of items that evaluate instrumental daily activities with three questions, basic daily activities through the result of the Barthel scale categorized by Shah et al. ⁽¹⁴⁾; cognition by the Global Deterioration Scale developed by Reisberg (GDS) ⁽¹⁵⁾, besides yes/no questions; malnutrition was addressed by the question "Have you lost more than 5 % of weight in the last six months?;" the occurrence of depression, anxiety or insomnia as an emotional marker, delirium, falls, polypharmacy, dysphagia, dyspnea or pain. Finally, questions about the occurrence of chronic diseases are asked. Only if it is confirmed that advanced chronic diseases meet all the criteria of the NECPAL (Necesidad Paliativa, Palliative Need) template, two points are awarded. The result of the addition of each point is divided into 25, which makes up the final score ⁽¹⁶⁾. The remaining background information was obtained during the interview.

Statistical analysis

The chi-square and t Student's tests were used to determine the association between the FI-CGA and mortality for both qualitative and quantitative variables, respectively.

Ethical considerations

Collected data were a part of the routine evaluation without research purposes at that moment. The confidentiality of participants was kept, and the research was authorized by the Geriatrics Service of Hospital Central de la Fuerza Aérea del Perú.

RESULTS

A total of 241 subjects with a mean age of 85.08 years (61-105 years) were included. The percentage of females was 65.97 %. Out of the evaluated sample, 53.53 % had a Barthel Index greater than or equal to 65 points, 87.14 % had some degree of cognitive impairment, 34.02 % had delirium in the last six months, 80.08 % had polypharmacy and 22.82 % had falls in the last six months. In addition, a high prevalence of chronic diseases stands out: 59.33 % suffered from a neurological disease, 48.54 % a renal disease, 47.71 % a cardiovascular disease and 26.97 % a respiratory disease. Moreover, 14.51 % of the patients met the advanced chronicity criteria according to NECPAL.

Only 7.88 % ($n = 19$) of the of the population analyzed according to the FI-CGA had a FI < 0.2, and it should be noted that 92.12 % ($n = 222$) of the patients were frail (FI \geq 0.2). Out of the group of frail patients, 34.02 % ($n = 82$) were mildly frail, 26.14 % ($n = 63$) moderately frail and 31.96 % ($n = 77$), severely frail (Figure 1).

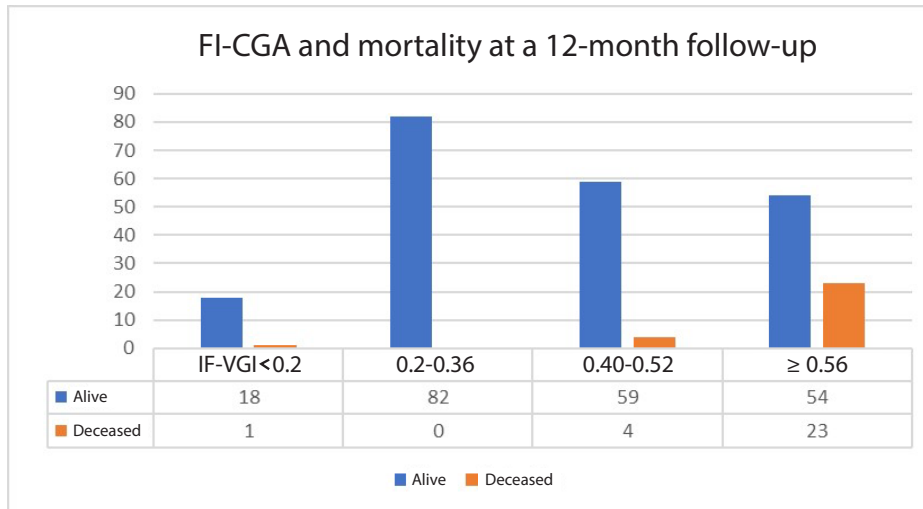


Figure 1. FI-CGA and mortality at a 12-month follow-up

The follow-up finished with death as an adverse event or it was carried out up to 12 months after the first evaluation. After a year, a mortality rate of 11.61 % ($n = 28$) was found. Out of the 28 deceased, 82.14 % ($n = 23$) showed severe frailty ($FI \geq 0.56$).

When analyzing the association between mortality and the FI-CGA, it was found that the higher the FI, the higher the mortality, with very significant differences ($p = 0.001$). There was no association between age and mortality ($p = 0.95$).

DISCUSSION

Due to population aging, there are various research studies that use deficit accumulation models worldwide resulting in a FI ^(17,18).

The mean age of the studied population was 85 years, which differs from other research studies conducted in Peru, where the mean was under 80 years ⁽⁷⁻⁹⁾.

The prevalence of frailty using the FI-CGA was high: 92.12 % of the studied population. This value is very different from those found by other studies conducted in our setting, which had a prevalence of frailty of 7.70 % in the community ⁽¹⁹⁾, 22.78 % in two hospitals in the north of the country ⁽⁹⁾ and 20.00 % at a first level of healthcare ⁽²⁰⁾. Although there is evidence of a large gap between the prevalence found in this study compared to others, it should be mentioned that they used the physical frailty phenotype proposed by Fried to detect frailty ⁽²¹⁾. The prevalence of frailty shown by the sample of this research was high, and it was attributed to two reasons: frailty measured by our study was multidimensional, not only physical but also cognitive and social; in addition, our sample corresponds to an area specialized in treating vulnerable older people ^(22,23). Both reasons explain the increase in our percentage.

When evaluating the functionality of the Barthel scale, a little more than a half had mild dependence, which was

similar to other studies ^(10,19). Concerning polypharmacy, 80 % of the studied population showed such condition, which was higher than that found in other frailty studies conducted in Peru ⁽²⁴⁾.

Age did not influence mortality significantly in this study, as Amblàs-Novellas et al. demonstrated ^(12,13), which reflected that biological age and physiological reserve should be given more importance.

In addition, it should be mentioned that the FI-CGA showed excellent correlation with mortality, as prior studies showed ⁽²⁵⁻²⁷⁾.

The predictive ability of the instrument for this cohort was also previously described by other frailty indices ^(28,29).

That fact became evident after the SARS-CoV-2 pandemic, when the health of older adults was compromised, and this is an important factor of higher frailty. Our healthcare center is a place where patients are referred to for diagnosis/management of more complex cases that occur in older adults, this being the reason that could explain the high percentage of frail patients in our sample. The described cohort is not representative of general population; therefore, new studies should be carried out to confirm data described in less elderly populations with lower percentage of advanced chronicity as well as in other healthcare levels. Despite there is not a gold standard

definition of frailty, and it complicates the use of current instruments, the indices allow not only to diagnose but also to predict the risk of adverse events, even death⁽³⁰⁾.

In conclusion, the higher the frailty index, the higher the mortality at a 12-month follow-up. The FI-CGA is a simple and useful tool to predict mortality after a 12-month follow-up among older adults.

Author contributions: The authors collected the data and processed, analyzed and wrote the manuscript.

Funding sources: This article was funded by the authors.

Conflicts of interest: The authors declare no conflicts of interest.

BIBLIOGRAPHIC REFERENCES

1. Instituto Nacional de Estadística e Informática. Situación de la población adulta mayor [Internet]. INEN; 2022. Available from: <https://www.inei.gob.pe/media/MenuRecursivo/boletines/04-informe-tecnico-poblacion-adulta-mayor-iii-trim-2022.pdf>
2. Morley JE. Frailty and sarcopenia: The new geriatric giants. *Rev Invest Clin* [Internet]. 2016;68(2):59-67.
3. Fried LP, Ferrucci L, Darer J, Williamson JD, Anderson G. Untangling the concepts of disability, frailty, and comorbidity: Implications for improved targeting and care. *J Gerontol A Biol Sci Med Sci* [Internet]. 2004;59(3):255-63.
4. Rockwood K, Mitnitski A. Frailty defined by deficit accumulation and geriatric medicine defined by frailty. *Clin Geriatr Med* [Internet]. 2011;27(1):17-26.
5. Morley JE, Vellas B, Abellan van Kan G, Anker SD, Bauer JM, Bernabei R, et al. Frailty consensus: A call to action. *J Am Med Dir Assoc* [Internet]. 2013;14(6):392-7.
6. Carhuallanqui Bastidas J, Mejía Sánchez EG, Carhuallanqui Bastidas JL, Villanueva Pérez F, Ludeña Riveros E. Fragilidad en adultos mayores con falla cardíaca crónica en un hospital de Lima. *Arch Peru Cardiol Cir Cardiovasc* [Internet]. 2021;2(1):15-21.
7. Rolfson DB, Majumdar SR, Tsuyuki RT, Tahir A, Rockwood K. Validity and reliability of the Edmonton frail scale. *Age Ageing* [Internet]. 2006;35(5):526-9.
8. Chuquipoma-Quispe LI, Lama-Valdivia JE, De la Cruz-Vargas HA. Factores asociados al síndrome de fragilidad en adultos mayores que acuden a consulta externa de Geriatria del Hospital Nacional Hipólito Unanue, Lima-Perú. *Acta médica peru* [Internet]. 2019;36(4):267-73.
9. González-Mechán MC, Leguía-Cerna J, Díaz-Vélez C. Prevalencia y factores asociados al síndrome de fragilidad en adultos mayores en la consulta de atención primaria de EsSalud, enero-abril 2015. Chiclayo, Perú. *Horiz méd* [Internet]. 2017;17(3):35-42.
10. Bustamante-Chávez RX, Peña-Sánchez ER, Leguía-Cerna JA. Fragilidad y factores asociados en adultos mayores de los consultorios de geriatría de dos hospitales nivel III de Lambayeque. *Rev Cuerpo Med HNAAA* [Internet]. 2019;9(4):231-4.
11. Guarniz Aguilar JM, Guarniz Lozano RE. Prevalencia de síndromes geriátricos y fragilidad en los adultos mayores atendidos en el Centro de Especialidades Médicas de Florencia de Mora, Trujillo - Perú. *Rev Cienc Tecnol* [Internet]. 2021;17(1):11-17.
12. Amblàs-Novellas J, Martori JC, Molist Brunet N, Oller R, Gómez-Batiste X, Espauella Panicot J. Índice frágil-VIG: diseño y evaluación de un índice de fragilidad basado en la Valoración Integral Geriátrica. *Rev Esp Geriatr Gerontol* [Internet]. 2017;52(3):119-27.
13. Amblàs-Novellas J, Martori JC, Espauella J, Oller R, Molist-Brunet N, Inzitari M, et al. Frail-VIG index: a concise frailty evaluation tool for rapid geriatric assessment. *BMC Geriatr* [Internet]. 2018;18(1):29.
14. Shah S, Vanclay F, Cooper B. Improving the sensitivity of the Barthel Index for stroke rehabilitation. *J Clin Epidemiol* [Internet]. 1989;42(8):703-9.
15. Reisberg B, Ferris SH, de Leon M, Crook T. The Global Deterioration Scale for assessment of primary degenerative dementia. *Am J Psychiatry* [Internet]. 1982;139(9):1136-9.
16. Gómez-Batiste X, Martínez-Muñoz M, Blay C, Amblàs J, Vila L, Costa X. Identificación de personas con enfermedades crónicas avanzadas y necesidad de atención paliativa en servicios sanitarios y sociales: elaboración del instrumento NECPAL CCOMS-ICO. *Med Clin (Barc)* [Internet]. 2013;140(6):241-5.
17. Díaz-Toro F, Nazar G, Troncoso C, Concha-Cisternas Y, Leiva-Ordoñez AM, Martínez-Sanguinetti MA, et al. Frailty index as a predictor of mortality in middle-aged and older people: A prospective analysis of Chilean adults. *Int J Environ Res Public Health* [Internet]. 2023;20(2):1195.
18. Gordon EH, Reid N, Khetani IS, Hubbard RE. How frail is frail? A systematic scoping review and synthesis of high impact studies. *BMC Geriatr* [Internet]. 2021;21(1):719.
19. Varela-Pinedo L, Ortiz-Saavedra PJ, Chávez-Jimeno H. Síndrome de fragilidad en adultos mayores de la comunidad de Lima metropolitana. *spmi* [Internet]. 2019;21(1):11-5.
20. Herrera-Perez D, Soriano-Moreno AN, Rodrigo-Gallardo PK, Toro-Huamanchumo CJ. Prevalencia del síndrome de fragilidad y factores asociados en adultos mayores. *Rev Cuba Med Gen Integral* [Internet]. 2020;36(2):e1098.
21. Rowe JW, Fried LP. Incorporating frailty into clinical practice and clinical research. *J Frailty Aging* [Internet]. 2013;2(3):126-7.
22. Henry JD, Coundouris SP, Mead J, Thompson B, Hubbard RE, Grainger SA. Social frailty in late adulthood: Social cognitive and psychological well-being correlates. *J Gerontol B Psychol Sci Soc Sci* [Internet]. 2023;78(1):87-96.
23. Sugimoto T, Arai H, Sakurai T. An update on cognitive frailty: Its definition, impact, associated factors and underlying mechanisms, and interventions. *Geriatr Gerontol Int* [Internet]. 2022;22(2):99-109.
24. Runzer-Colmenares FM, Samper-Ternent R, Al Snih S, Ottenbacher KJ, Parodi JF, Wong R. Prevalence and factors associated with frailty among Peruvian older adults. *Arch Gerontol Geriatr* [Internet]. 2014;58(1):69-73.
25. Malmstrom TK, Miller DK, Morley JE. A comparison of four frailty models. *J Am Geriatr Soc* [Internet]. 2014;62(4):721-6.
26. Romero Ortuño R. El Instrumento de Fragilidad para Atención Primaria de la Encuesta de Salud, Envejecimiento y Jubilación en Europa (SHARE-FI): resultados de la muestra española. *Rev Esp Geriatr Gerontol* [Internet]. 2011;46(5):243-9.
27. Mitnitski AB, Mogilner AJ, MacKnight C, Rockwood K. The mortality rate as a function of accumulated deficits in a frailty index. *Mech Ageing Dev* [Internet]. 2002;123(11):1457-60.
28. Theou O, Brothers TD, Mitnitski A, Rockwood K. Operationalization of frailty using eight commonly used scales and comparison of their ability to predict all-cause mortality. *J Am Geriatr Soc* [Internet]. 2013;61(9):1537-51.
29. Badosa-Collell G, Latorre-Vallbona N, Martori JC, Oller R, Trullàs JC, Amblàs-Novellas J. Capacidad predictiva de mortalidad del índice Frágil-VIG (IF-VIG) en pacientes ancianos con fractura de fémur. *Rev Esp Geriatr Gerontol* [Internet]. 2022;57(4):220-3.
30. Sobhani A, Fadayeatan R, Sharifi F, Kamrani AA, Ejtahed H-S,

Frailty Index-CGA and mortality at a 12-month follow-up at Hospital Central
de la Fuerza Aérea del Perú

Hosseini RS, et al. The conceptual and practical definitions of frailty in older adults: a systematic review. *J Diabetes Metab Disord* [Internet]. 2021;20(2):1975-2013.

Corresponding author:

Ian Christian Falvy Bockos

Address: Calle Los Tucanes 274, San Isidro. Lima, Perú.


Telephone: +51 965 960 514

E-mail: ifalvy@yahoo.com

Reception date: June 21, 2023

Evaluation date: September 28, 2023

Approval date: October 06, 2023

© The journal. A publication of Universidad de San Martín de Porres, Peru.
 Creative Commons License. Open access article published under the terms of Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0>).

ORCID iDs

Carmen Eliana Peralta Varga  <https://orcid.org/0000-0001-5607-1017>

María Ahon Jiraldo  <https://orcid.org/0009-0007-8069-6704>

Claudia Valdivia Alcalde  <https://orcid.org/0000-0002-9997-3421>

Ian Falvy-Bockos  <https://orcid.org/0000-0002-7328-5292>