Implications of the body weight of older adults hospitalized for community-acquired pneumonia in the capacity to expectorate, severity on admission and lethality

Implicaciones del peso corporal de adultos mayores hospitalizados por neumonía adquirida en la comunidad en la capacidad para expectorar, gravedad al ingreso y letalidad

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ABSTRACT. Introduction: One of the diseases whose course can be altered as a consequence of the nutritional status of the patient is community-acquired pneumonia. **Objective:** To determine the implications of different states of the body weight of patients hospitalized for pneumonia in the capacity to expectorate, in the state of severity at the time of admission and in the lethality due to the disease, taking into account the age of the patients. **Material and methods:** Descriptive study, with 967 patients hospitalized for community-acquired pneumonia between April 2016 and December 2019, whose body mass index was calculated. Bivariate and multivariate analysis (logistic regression) was performed; The ratio of crossed products (*odds ratio*) and its 95% confidence interval were used as the statistician. **Results:** A slightly significant association was observed between being overweight and age under 60 years (OR 1.3 [1.02;1.8]), and more evident between underweight and older adults (OR 2.3 [1.4,3.7]). Low weight was significantly associated with the inability to expectorate (OR 1.5 [1.1;2.1]), the state of severity at the time of admission (OR 2.1 [1.5;3]) and death of the patient (OR 2 [1.4,2.8]), specifically in older adults. **Conclusions:** Low body weight in older adults with pneumonia determines the inability to expectorate, a state of severity at the time of admission and a higher risk of death, which is why it constitutes an adverse prognostic factor.

Keywords: Community-acquired pneumonia, severity, malnutrition, older adult.

RESUMEN. Introducción: Una de las enfermedades cuyo curso puede alterarse como consecuencia del estado nutricional del paciente es la neumonía adquirida en la comunidad. **Objetivo:** Evaluar las implicaciones de diferentes estados del peso corporal de pacientes hospitalizados por neumonía en la capacidad para expectorar, en el estado de gravedad al momento del ingreso y en la letalidad por la enfermedad, teniendo en cuenta la edad de los pacientes. **Material y métodos:** Se realizó un estudio descriptivo que incluyó 967 pacientes hospitalizados por neumonía entre abril de 2016 y diciembre de 2019, en quienes se evaluó el peso mediante el índice de masa corporal. Para evaluar la asociación del peso corporal con la capacidad para expectorar, el estado de gravedad y la letalidad se realizó análisis bivariante y multivariado (regresión logística); como estadígrafo fue utilizada la razón de productos cruzados (*odds ratio*) y su intervalo de confianza de 95%. **Resultados:** Se observó una asociación significativa entre el exceso de peso y la edad por debajo de 60 años (OR 1.3 [1.02;1.8]), y más evidente entre el bajo peso y los adultos mayores (OR 2.3 [1.4;3.7]). El bajo peso estuvo significativamente asociado a la incapacidad para expectorar (OR 1.5 [1.1;2.1]), al estado de gravedad al momento del ingreso (OR 2.1 [1.5;3]) y al fallecimiento del paciente (OR 2 [1.4;2.8]), específicamente en los adultos mayores. **Conclusiones:** El bajo peso corporal en los adultos mayores con neumonía condiciona incapacidad para expectorar, estado de gravedad al momento del ingreso y mayor riesgo de muerte, por lo que afecta adversamente el pronóstico.

Palabras clave: Neumonía adquirida en la comunidad, gravedad, malnutrición, adulto mayor.

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INTRODUCTION

The association between the nutritional state and the increase of morbidity and mortality in older adults has determined that a major attention is given to the aspects related to the malnutrition in this population. In this sense, it is recognized that in certain populations called «third and fourth age» the overweight and obesity are not rare,[1,2] the malnutrition is considered as a problem of great incidence in such a stage of life, which could influence in the life quality of the person and in the prognosis of various pathological processes.[3-7]

One of those processes which course can be altered as a consequence of the nutritional state it is the community-acquired pneumonia (CAP). Named by Sir William Osler, ironically, as «the friend of old people» due to its high frequency after 60 years of age, CAP constitutes currently an important problem of public health due to its well known association with death.[8-13] In our country specifically, the infections of the respiratory system have represented the fourth cause of death during the last years, being the first among the causes of infectious nature.[14]

In the Hospital «Dr. Gustavo Aldereguía Lima» of Cienfuegos, Cuba studies have been carried out, directed to the identification, in the local context, of associated factors with death of patients assisted by CAP, which includes the nutritional state in general, and the corporal weight in specific, but without significant statistical results about it.[15] Moreover, the daily assisted practice of the authors has allowed us to observe the affectation to the ability to expectorate from patients whose body weight is diminished; affectation that at the same time interferes in the correct evolution of these sick people.

The objective of the study consisted of assessing the implications of different weight loss state of hospitalized patients by CAP in the capacity to expectorate, in the state of severity at the time of admission and in the lethality due to the disease, taking into account in the analysis their age.

MATERIAL AND METHODS

An observational study was carried out, with a descriptive design, covering a population of 967 patients (221 between 18 and 59 years of age and 746 elderly adults) with a coinciding diagnosis admission-discharge of CAP, hospitalized in the institution in the period between April 2016 and December 2019. The research subjects represented 87.5% of the total CAP admissions in the studied period (1,105 cases), constituting a sample for convenience determined by the quality of the information presented in the clinical history. The diagnosis of pneumonia and its community origin, confirmed by the authors, was based on the clinical, radiological and necropsy criteria (in the diseased, if any) established.[16-19]

Techniques and procedures: The authors reviewed the medical records of each patient to obtain the necessary information: age, weight, size, capacity to expectorate, state of severity at the time of admission and state at discharge; in the cases that required it, clarifications were made directly with the patient or their relatives.

Anthropometric evaluation was performed by calculating the body mass index (BMI) or the index of Quetelet, using the formula «weight (in kg) divided by size (in meters) squared».[20-22] The patient was considered «normal or normal weight» when the BMI was between 18.5 and 24.9, according to the criteria of the World Health Organization (WHO);[23] above and below these values were considered «excess weight» and «low weight», respectively. Low weight in turn, specifically for older adults, was classified as mild (BMI between 17 and 18.4), moderate (BMI between 16 and 16.9) and severe (BMI less than 16).[23]

The patient with «capacity to expectorate» was considered when they presented expectoration during any evolutionary moment of the condition; the condition of «inability to expectorate» was reserved for the absence of cough or the existence of dry or wet cough but not productive. Severity status at admission was assessed using the «Instrument for Stratification of Patients with Out-of-hospital Pneumonia» (IENAC).

The IENAC is based on the use by the attending physician of clinical information supplemented with radiological information to frame the patient in one of three classes, according to the severity of the process: mild, moderate or severe pneumonia.

Each class in turn is subdivided into two categories (A or B), determined by specific criteria for each class. In patients with mild pneumonia, the existence or absence of any factor, of any nature, that limits or affects the possibility of outpatient treatment is used as a criterion. In patients with moderate pneumonia, the criterion is related to the existence of some particularity that increases the probability that the patient presents an unfavorable course, even without being serious at the time of its initial assessment; in the case of patients with severe or serious pneumonia, the criterion used is related to the analysis of the probabilities of recovery of the patient.[24-26]

The data obtained was processed on computer using the SPSS version 15.0 for Windows. Bivariate and multivariate analysis was performed, the latter using logistic regression techniques, as a statistician, given the character of a cross-sectional-study, the Odds Prevalence Ratio (ORP) and its 95% confidence interval were used. The results are presented in text, tables and figures, expressed in numbers and percentages.

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Ethical considerations: given characteristics of the study, it was not necessary to carry out particular bioethical considerations. However, a strictly scientific use of the results obtained and judgments emanating has been ensured. The study was evaluated and approved by the institution's ethical committee.

RESULTS

Table 1 shows the general behavior of the variables studied. The inability to expectorate was present in almost half of the cases, while in almost one third, a state of severity was observed at the time of hospitalization; the lethality of the series was of 27%. The three variables mentioned were more frequent and statistically significant in patients 60 years of age or older (ORP of inability to expectorate in older adults versus adults not older equal to 1.7 [1.2;2.3]; ORP of presence of severity at admission in order adults versus adults not older equal to 1.8 [1.2;2.5]; ORP of death in older adults versus adults not older equal to 8.8 [4.8;16.1]).

As for body weight, only 37% of the patients were evaluated as normal; the largest number of patients had excess weight (43%), while 191 cases (20%) were classified as «low weight». In the distribution of patients in the different categories of BMI, differences were also found between the population under 60 years of age and older adults. Although the frequency of patients with adequate weight was similar between both subgroups and patients with BMI predominated above normal in both subgroups, excess weight was significantly more frequent in subjects younger than 60 years of age (ORP of excess weight in patients younger than 60 years of age vs older adults equal to 1.3 [1.02;1.8]), while low weight was significantly more

Table 2: Frequency of inability to expectorate, severity at admission and lethality according to body weight.

	Inability to expectorate (%)	Severity status at admission (%)	Lethality (%)
Excess of weight (N = 422)	45	28	22
Normo weight (N = 354)	48	29	27
Low weight (N = 191)	58	47	40

frequent in patients 60 years of age or older (ORP of low weight in older adults vs patients younger than 60 years of age equal to 2.3 [1.4;3.7]).

the total study population *(Table 2)*, both inability to expectorate and severity status at admission and death were significantly more frequent in patients with low body weight (ORP of inability to expectorate in subjects with low body weight versus subjects without low body weight equal to 2.1 [1.5;3]; ORP of severity status at admission in patients with low body weight versus patients without low body weight equal to 2 [1.4;2.8]).

The behavior described above for the total subjects showed some differences depending on the age of the patients *(Figures 1 to 3)*. For example, in patients under 60 years of age, there were no obvious differences in the frequency of inability to expectorate, the state of severity at admission and lethality, between the different categories of body weight.

In contrast, in the elderly population of the study, the frequency of the inability to expectorate was significantly higher in cases with low body weight (ORP of inability to expectorate in patients with low body weight versus subjects without low body weight equal to 1.5 [1.08;2.1]); also the severity status at admission and the occurrence of death were significantly more frequent in patients with low body weight (ORP of severity status at admission in patients with low weight versus without lower weight equal to 2.2 [1.6;3.2]; ORP of death in patients with low weight versus patients without low weight equal to 1.7 [1.2;2.5]).

Additionally, when particularizing in the subgroup of elderly with low weight, a progressive (not statistically significant) increase in lethality was observed in correspondence with the decrease in body weight: 42% (of 146 patients) in those of the «low light weight» category and 60% (of 20 patients) in the «low moderate weight» (ORP of death in patients with low moderate weight versus subjects with low light weight equal to 2 [0.8;5.4]). The only case with «low severe weight» died.

In the multivariate analysis y logistic regression, the frequency of death by CAP was significantly higher in all
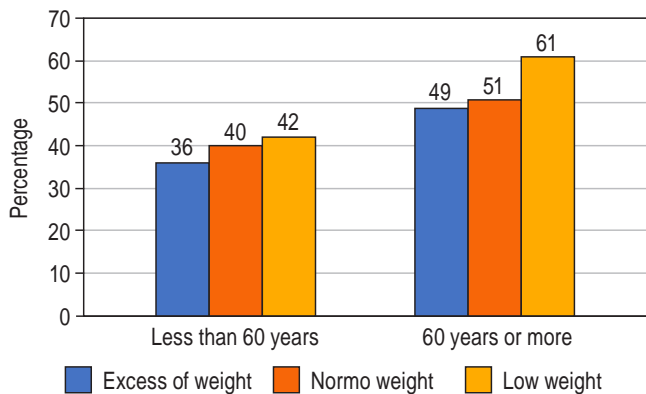
Table 1: Frequency of variables studied according to age group.

	Less that 60 years (N = 221) n (%)	60 years or more (N = 746) n (%)	Total (N = 967) n (%)
Female	99 (45)	395 (53)	494 (51)
Inability to expectorate	85 (38)	391 (52)	476 (49)
Severity at admission	50 (23)	260 (35)	310 (32)
Deaths	12 (5)	251 (34)	263 (27)
Body weight • Excess of weight • Normo weight • Low weight	110 (50) 86 (39) 25 (11)	312 (42) 268 (36) 166 (22)	422 (43) 354 (37) 191 (20)

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Figure 1: Percentage frequency of the inability to expectorate according to body weight and age.
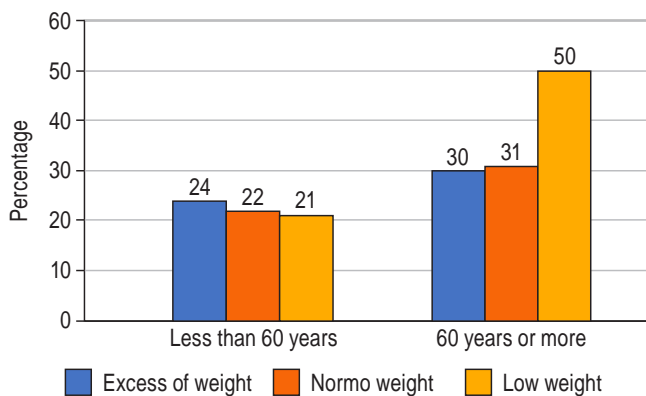

Figure 2: Percentage frequency of the severity status at admission according to body weight and age.

the conditions incorporated into the evaluated model (ORP of death in patients 60 years of age or older versus patients under 60 years of age equal to 8.4 [4.4;15.9]; ORP of death in patients with severity status at admission versus patients without severity status at admission equal to 2.9 [2.1;4]; ORP of death in patients with inability to expectorate versus patients without inability to expectorate equal to 1.4 [1.02;1.9]; ORP of death in patients with low body weight status versus patients without low body weight status equal to 1.4 [1.009;2]).

DISCUSSION

The carried out study found a significantly higher frequency of inability to expectorate, severity at admission and deaths in older adults with CAP, compared to patients under 60 years of age. Similarly, low-body weight status was more frequent (significantly) in this same age group. In these patients with CAP, the elderly, the three variables initially mentioned were significantly associated with low body

weight, a situation that did not occur in cases of younger age. For this reason, the analysis of these results focuses on the theoretical elements and implications of the findings particularly in the elderly population.

In human beings there are age-related anatomical-physiological changes. Among the most visible changes, there is the decrease in the subcutaneous fat content, but also a decrease in body water, muscle mass (phenomenon known as sarcopenia) and bone mass.[20,27]

To these physiological changes that affect body weight, are added the decrease in food intake, anorexia associated with psychosocial factors, masticatory and swallowing problems, physiological changes in gastrointestinal function, chronic oncological and non-oncological diseases, polypharmacy and depression, among others, which makes older adults at a great risk of malnutrition.[28-31] All these elements are decisive in the association identified in this study between older adults and the condition of low body weight.

Unfortunately, and despite the recognized situations that lead to a decrease in body weight in people aged 60 years and over, malnutrition by default in older adults is often a long and overlooked process by the staff in charge of caring for these patients.

The elements analyzed in this study are closely related to each other. Low body weight, usually associated with muscular mass loss and the consequent muscular strength decrease, is one of the factors that limit the capacity to achieve a useful cough for the expulsion of secretions resulting from the inflammatory process of the lung parenchyma. Thus factor (low weight) is added to certain changes in the thorax and respiratory system of the older adult including loss of elastic properties of lung tissue, thorax stiffness due to calcification of the rib cartilage and kyphosis, weakness of the respiratory muscles and less effective cough reflex.[20]

Additionally, if the low weight is due to a malnutrition by default, then the risk of infection and poor defense against it
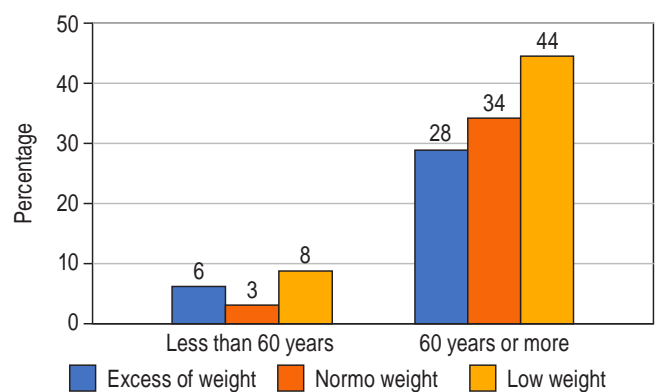

Figure 3: Percentage of lethality according to body weight and age.

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(due to deterioration of cellular immune function) is added to the previous elements to condition not only higher risk of pneumonia, but of a more unfavorable prognosis.[20,32] In this sense, the study has shown the early torpid evolution of elderly patients with low body weight, in whom a high percentage already showed signs of severity at hospital admission. It is true that there is a diversity of nutritional assessment scales.

Mini-Nutritional Assessment, Nutrition Screening Initiative, Nutrition Risk Assessment Scale, Global Subjective Assessment (GSA) and Malnutrition Universal Screening Tool.[21] But within the anthropometric evaluation as a dimension of nutritional evaluation, and although it is not devoid of controversy,[20] some authors consider BMI as the most important of all anthropometric parameters, since it is a good prognostic marker in the elderly (higher mortality with a low BMI). The desirable range established by the WHO in people over 65 years of age is 24-30 kg/m^{2}, because values outside this range increase morbidity and mortality. According to the SENECA study *(Survey in Europe on Nutrition and the Elderly),* for example, it is the BMI of 27.1 (confidence interval [CI] of 95% 24.1-29.3) that confers the lowest risk of mortality. For its part, an excess mortality has been described in an inverse linear relationship with BMI, which begins when it is less than 23.5 in men and 22 in women.[21] In this study, an increase in lethality was observed in patients with CAP as body weight decreased, within the «low weight» condition itself.

Unfortunately, there are not many recent studies that analyze with specificity the associations addressed here, although we already mentioned a previous investigation by the authors where the status of body weight below normal was not associated with higher mortality in patients with pneumonia. However, this study did not take into account in the analysis a distinction of patients according to age, so the analysis was carried out from the results of the total set of subjects.

CONCLUSIONS

It has been considered, by way of conclusion, that in the series of patients with acquired pneumonia in the studied community, the state of low body weight was not only more frequently observed in older adults than in younger ones, but also that in the former, unlike in the latter, it also conditioned the inability to expectorate, the state of severity at admission and higher risk of death, so it has an adverse impact on the prognosis in this subgroup of patients.

The authors recognize as a limitation of the research the difficulties for the extrapolation of their results to subjects with CAP assisted in the community environment, who may not be reflected in the characterization carried out.

REFERENCES

1. Mamani OY, Illanes VDE, Luizaga LJM. Factores sociodemográficos asociados a la malnutrición del Adulto Mayor en Cochabamba, Bolivia. Gac Med Bol. 2019;42(2):98-105.

2. Vera BDE. Factores asociados a sobrepeso y obesidad en adultos mayores que acuden al centro Católico Virgen de la Reconciliación en la comuna Nigeria situado en la Isla Trinitaria del cantón Guayaquil período mayo-agosto 2016. Available in: http://repositorio.ucsg.edu.ec/handle/3317/15240

3. Contreras AL, Ángel M GV, Romaní DA, Tejada GS, Yeh M, Ortiz PJ, *et al.* Malnutrición del adulto mayor y factores asociados en el distrito de Masma Chicche, Junín, Perú. Rev Med Hered. 2013;24:186-191.

4. Ginnette RM, Giomar SE. Mortalidad por desnutrición en el adulto mayor, Colombia, 2014-2016. Biomédica. 2019;39:663-672. doi: https://doi.org/10.7705/biomedica.4733.

5. Rodríguez CFW, Quispe LMP, Oyola GAE, Consuelo CMCY, Portugal MMA, Lizarzaburu CEE, *et al.* Calidad de vida y su relación con la malnutrición en el adulto mayor de la provincia de Ica. Rev Fac Med Hum. 2018;18(4):74-83. doi: 10.25176/RFMH.v18n4.1734.

6. Yeguez MFA, Sánchez JA. Estado nutricional, masa muscular, fuerza y riesgo cardiometabólico en adultos mayores no institucionalizados. Salus. 2019;23(2):8-17. Available in: https://www.redalyc.org/articulo.oa?id=375967530003

7. Mejía E. Prevalencia y factores asociados a malnutrición en adultos mayores que acuden al Hospital de Gualaceo. Período enero-agosto 2019 [Tesis de Pregrado]. Cuenca: Universidad Católica de Cuenca; 2019. Available in: https://dspace.ucacue.edu.ec/handle/ucacue/8741

8. Julián-Jiménez A, Adán Valero I, Beteta López A, Cano Martín LM, Fernández Rodríguez O, Rubio Díaz R, *et al.* Recomendaciones para la atención del paciente con neumonía adquirida en la comunidad en los Servicios de Urgencias. Rev Esp Quimioter 2018;31(2):186-202.

9. De Jong E, Van Oers JA, Beishuizen A. Efficacy and safety of procalcitonin guidance in reducing the duration of antibiotic treatment in critically ill patients: a randomised, controlled, open-label trial. Lancet Infect Dis. 2016;16:819-827.

10. Montero SG, Hernández RG, Vega CJC, Ramírez CM. Manejo de la neumonía adquirida en la comunidad en el adulto mayor. Rev Cl EMed UCR. 2017;7(2):11-20.

11. Espinosa J, Álvarez PA, Castro V, Cáceres MF, Soler Riera MC, Bril F. Central nervous system depressants and risk of hospitalization due to community-acquired pneumonia in very old patients. Current Drug Safety. 2020;15(2):131-136.

12. Leoni D, Rello J. Severe community-acquired pneumonia: optimal management. Curr Opin Infect Dis. 2017;30(2):240-247.

13. Donoso NRF, Gómez MN, Rodríguez PA. Incidencia de la neumonía adquirida por habitantes de la parroquia Moraspungo, Cantón Pangua

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y posibles estrategias de prevención. Revista Universidad y Sociedad. 2021;13(S2):433-440.

14. Verano GNC, Rodríguez PA. Componentes de riesgo para neumonía adquirida en la comunidad en pacientes de la tercera edad en el Hospital "Alfredo Noboa Montenegro". Revista Universidad y Sociedad. 2021;13(S1):82-88.

15. Ministerio de Salud Pública. Anuario estadístico de Salud. La Habana: Dirección Nacional de Registros Médicos y estadísticas del Minsap; 2019. Available in: http://bvscuba.sld.cu/anuario-estadistico-de-cuba/

16. Corona ML, González MI, Fragoso MM, Cruz de los Santos H. Factores relacionados con la letalidad en pacientes con neumonía adquirida en la comunidad hospitalizados. Medisur. 2021;19(1). Available in: http://medisur.sld.cu/index.php/medisur/article/view/4500

17. Tsilogianni Z, Grapatsas K, Vasileios L, Zarogoulidis P, Katsikogiannis N, Sarika E, *et al*. Community-acquired pneumonia: current data. Ann Res Hosp. 2017;1:25. Available in: http://dx.doi.org/10.21037/arh.2017.05.02

18. Noya CME, Moya GNL. Parte VII. Enfermedades del sistema respiratorio. Capítulo 31. Neumopatías inflamatorias agudas no tuberculosas. Roca Goderich. Temas de Medicina Interna. Tomo I. Quinta edición. 5 ed. La Habana, CU: ECIMED, 2017. Available in: http://bvs.sld.cu/libros_texto/roca_temas_medicina_interna_tomo1_quintaedicion/ cap31.pdf

19. Monedero Mira MJ, Sales MB, Domingo CG, Monedero Mira MJ, Saura BP, Mallen GR, Porcar LT. Tratamiento empírico de las infecciones del adulto. FMC. 2016;23:9-71. doi: 10.1016/j.fmc.2015.12.002.

20. Menéndez R, Cilloniz C, España PP, Almirall J, Uranga A, Méndez R, *et al*. Neumonía adquirida en la comunidad. Normativa de la Sociedad Española de Neumología y Cirugía Torácica (SEPAR). Actualización 2020. Archivos de Bronconeumología. 2020;56:1-10. Available in: https://www.sciencedirect.com/science/article/pii/S0300289620300405

21. Romero CAJ. Asistencia clínica al adulto mayor. 2012. La Habana: Editorial Ciencias Médicas. Available in: http://www.bvscuba.sld.cu/libro/asistencia-clinica-al-adulto-mayor/

22. León OM, Ariza ZG. Valoración nutricional en el anciano. Fundamentos de la atención sanitaria a los mayores. 2016. En: Tratado de Medicina geriátrica. Available in: http://www.clinicalkey.es/#%21/browse/book/3-s2.0-C20130139219

23. Camina MMA, de Mateo Silleras B, Malafarina V, López MR, Nino MV, López TJA, *et al*. Valoración del estado nutricional en Geriatría: declaración de consenso del Grupo de Nutrición de la Sociedad Española de Geriatría y Gerontología. Rev Esp Geriatr Gerontol.

2016;51(1):52-57. Available in: http://www.sciencedirect.com/science/article/pii/S0211139X15001341

24. Corona ML, González MI, Fragoso MMC. Intrahospitalary location and antimicrobial initial treatment in patients with acquired pneumonia in the community and their relationship with the frequency and quality of the stratification process. International Journal of Medical and Surgical Sciences. 2021;8(2):1-15. Available in: https://doi.org/10.32457/ijmss.v8i2.1423

25. Corona MLA, González MI, Fragoso MMC. Letalidad por neumonía adquirida en la comunidad y su relación con el proceso de estratificación y con el cumplimiento de las sugerencias de ubicación intrahospitalaria y de tratamiento antimicrobiano inicial. Eur J Health Research. 2021;7(2):1-20. Available in: https://revistas.uautonoma.cl/index.php/ejhr/article/view/1478. doi: 10.32457/ejhr.v7i2.1478

26. Corona MLA, González MI, Fragoso MMC. Evaluación del proceso de estratificación en pacientes hospitalizados con neumonía adquirida en la comunidad. Rev Cubana Med. 2021;60(1):e1397. Available in: http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S0034-75232021000100010&lng=es

27. Penny ME, Melgar CF. Geriatría y Gerontología para el médico internista. 2012. Editorial La Hoguera. Available in: http://up-rid2.up.ac.pa:8080/xmlui/handle/123456789/1546

28. Varela LF. Nutrición en el adulto mayor. Rev Med Hered. 2013;24:183-185.

29. Mila R, Formiga F, Duran P, Abellano R. Prevalencia de malnutrición en la población anciana española: una revisión sistemática. Med Clin (Barc). 2012;139(11):502-508.

30. Choque AV. Estado Nutricional y Riesgo de Desnutrición en Adultos Mayores atendidos en consultorio externo del policonsultorio de la Caja de Salud de la Banca Privada, Regional La Paz, durante los meses de julio-septiembre 2016 [Tesis de Especialidad]. La Paz, Bolivia: Universidad Mayor de San Andrés; 2017.

31. Tarqui MC, Álvarez DD, Espinoza OP, Gómez GG. Estado nutricional asociado a características sociodemográficas en el adulto mayor peruano. Rev Peru Med Exp Salud Publica. 2014;31:467-472. Available in: http://www.scielo.org.pe/scielo.php?script=sci_arttext&pid=S1726-46342014000300009

32. Galeano UDF. Valor predictivo de escalas de gravedad en neumonía adquirida de la comunidad. Rev Virtual Soc Parag Med Int. 2016;3(2):85-94. doi: 10.18004/rvspmi/2312-3893/2016.03(02)85-094.