



Original / Valoración nutricional

State of malnutrition in hospitals of Ecuador

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Abstract

Rationale: Hospital malnutrition is a global health problem affecting 30-50% of hospitalized patients. There are no estimates of the size of this problem in Ecuadorian hospitals. Hospital malnutrition might influence the quality of medical assistance provided to hospitalized populations.

Objectives: To estimate the current frequency of malnutrition among patients admitted to Ecuadorian public hospitals.

Materials and methods: The Ecuadorian Hospital Malnutrition Study was conducted between November 2011 and June 2012 with 5,355 patients (Women: 37.5%; Ages ≥ 60 years: 35.1%; Length of stay ≤ 15 days: 91.2%) admitted to 36 public hospitals located in the prominent cities of 22 out of the 24 provinces of the country. Malnutrition frequency was estimated by means of the Subjective Global Assessment survey.

Results: Malnutrition affected 37.1% of the surveyed patients. Malnutrition was dependent upon patient's age and education level; as well as the presence of cancer, sepsis, and chronic organic failure. Hospital areas showed different frequencies of hospital malnutrition. Health condition leading to hospital admission influenced negatively upon nutritional status. Malnutrition frequency increased as length of stay prolonged.

Conclusions: Malnutrition currently affects an important proportion of patients hospitalized in public health institutions of Ecuador. Policies and actions are urgently required in order to successfully deal with this health problem and thus to ameliorate its negative impact upon quality of medical care.

(Nutr Hosp. 2014;30:425-435)

DOI:10.3305/nh.2014.30.2.7559

Key words: Hospital malnutrition. Length of stay. Epidemiology. Cancer. Subjective Global Assessment.

ESTADO DE LA DESNUTRICIÓN EN LOS HOSPITALES DEL ECUADOR

Resumen

Justificación: La desnutrición hospitalaria constituye un problema global de salud pública que afecta entre el 30-50% de los internados. En el Ecuador no se tienen estimados de la magnitud de este problema. La desnutrición hospitalaria pudiera influir en la calidad de la prestación de asistencia médica a la población hospitalizada.

Objetivos: Estimar la frecuencia corriente de desnutrición entre los pacientes internados en los hospitales públicos del Ecuador.

Material y Método: El Estudio Ecuatoriano de Desnutrición Hospitalaria se condujo entre Noviembre del 2011 y Junio del 2012 en 5,355 pacientes (Mujeres: 37,5%; Edades ≥ 60 años: 35,1%; Estadía ≤ 15 días: 91,2%) internados en 36 hospitales públicos ubicados en las ciudades cabeceras de 22 de las 23 provincias del país. La frecuencia de desnutrición hospitalaria se estimó mediante la Encuesta Subjetiva Global.

Resultados: La desnutrición afectó al 37,1% de los pacientes encuestados. La desnutrición fue dependiente de la edad y la escolaridad del enfermo; y la presencia de cáncer, sepsis, y falla orgánica crónica. Las áreas de hospitalización difirieron entre sí respecto de la frecuencia observada de desnutrición hospitalaria. El problema principal de salud influyó en el estado nutricional del enfermo. La frecuencia de desnutrición se incrementó a medida que se prolongó la estadía hospitalaria.

Conclusiones: La desnutrición afecta actualmente a una parte importante de los hospitalizados en las instituciones públicas del Ecuador. Urge la adopción de políticas y acciones para lidiar exitosamente con este problema de salud y de esta manera aminorar el impacto negativo del mismo sobre la calidad de la atención médica.

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DOI:10.3305/nh.2014.30.2.7559

Palabras clave: Desnutrición hospitalaria. Estadía hospitalaria. Epidemiología. Cáncer. Encuesta Subjetiva Global.

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Recibido: 29-IV-2014.
Aceptado: 19-V-2014.

Introduction

Hospital malnutrition has been regarded as a global health problem with important social, economical, political and ethical overtones.^{1,2} As of today, malnutrition affects 30-50% of patients admitted to any hospital in the world.³ Malnutrition might be independent of social and economical features of a particular country.³ Malnutrition accompanies health condition leading to admission, increases as hospital length of stay prolongs, and represent an important cause of therapeutic failures, post-surgical complications, and even death.^{4,6} Above all, malnutrition might be the cause for increased costs of medical care.⁷

FELANPE (a Spanish acronym standing for *Federación Latinoamericana de Terapia Nutricional, Nutrición Clínica y Metabolismo**, or Latin American Federation of Nutritional Therapy, Clinical Nutrition and Metabolism[†]) conducted the ELAN Latin American Nutrition Study during 1999-2001, in order to establish malnutrition frequency among patients admitted to the region's public hospitals.⁸ The ELAN Study revealed that half of the hospitalized patients were malnourished at the time of the survey.⁸

Every disease has metabolic and nutritional components, and could place the patient at increased risk of malnutrition.⁹⁻¹⁰ Latin America still suffers from the social debt accumulated during the 1990s, so hospital malnutrition might include a socio-economic component dictated by the place the patient occupies within the economical, productive and social structures of the country.¹¹⁻¹² But the so-called hospital cultural practices as identified by Butterworth in 1973¹³ are the ones that could significantly affect patient's nutritional status and distort his/her response to medical and/or surgical actions.

The Ministry of Public Health (MINSAP) of the Republic of Ecuador sustains a hospital national network comprised of more than 50 institutions distributed among the 24 provinces of the country (Galápagos islands included). As of today, there are no systematic estimates of the extension of malnutrition among MINSAP institutions. Past efforts in this direction at a public hospital of the south of the city of Quito are to be duly noted.¹⁴

Effective health public policies can not be developed if extension and magnitude of hospital malnutrition are not taken into account. The School of Nutrition and Dietetics of the Faculty of Public Health located at the ESPOCH (a Spanish acronym standing for *Escuela Superior Politécnica del Chimborazo*, or Higher Polytechnical School of Chimborazo) has conducted the Ecuadorian Study of Hospital Malnutrition* in order to determine the current frequency of malnutrition in public hospitals of the Republic of Ecuador.

*Formerly the Latin American Federation of Parenteral and Enteral Nutrition.

†From here onwards referred as the Ecuador ELAN Study.

Material and method

Study design: Non-experimental, multi-center, cross-sectional, analytical type.

Study location: Hospital institutions eligible from the MINSAP's network of public hospitals. Public institutions located in the capitals of the 24 provinces of the Republic of Ecuador with 100 (or more beds) were selected. Selected hospitals from the IESS (a Spanish acronym for *Instituto Ecuatoriano de Seguridad Social*, or Ecuadorian Institute of Social Security) participated also in this study. Informed consent from the Board of Directors was obtained for including the institution in the present study.

Study subjects: Patients with ages ≥ 18 years hospitalized between November 2011 and June 2012 (at the time the survey took place), and consented with participating in the study after being informed about the purposes, objectives and procedures of the survey, were eligible for inclusion. Those patients who did not provide their consent, or in whom procedures prescribed in the study design were not completed, were excluded from the study.

From each patient sex (Male/Female), age (< 60 years / ≥ 60 years), health condition leading to admission, hospitalization area, admission date, and education level (Grammar/Junior High/High School/University/Senior Technician), were obtained. A sixth, additional "Undetermined" category was created within the education level variable in order to include those patients that did not complete the six grades of grammar school, were illiterates; or did not declare any level of instruction whatsoever.

Additional queries were made in order to establish if the patient had been operated upon (Surgery completed), was placed on waiting list (Surgery programmed), or no surgical treatment had been considered at all (Surgery not considered).

Sample size considerations: It was estimated goals of the survey would be met with a sample of 6,489 patients. Size of study sample was calculated in order to achieve the estimate of a proportion (in this case, the frequency of malnutrition in Ecuadorian hospitals) in an infinite population with a 95% statistical confidence and a 1.5% imprecision. A 50.0% malnutrition frequency was anticipated, according with the ELAN Study results.⁸

Selection of the study subjects in the analysis units: Subjects surveyed in each of the analysis unit (that is: the participating hospital) were selected by means of a systematic, (pseudo)random sampling of hospital beds. An assignation number of 2 was foreseen, thus recommending surveying one patient for every second occupied bed. This prescription was considered feasible to observe in larger hospitals with more than 100 beds. It was then recommended to collect data from 150 patients in each participating hospital in order to meet the set size of the sample study.

Beds were sequentially numbered until exhaustion of hospital's allocation. Sorted numbers (corresponding with surveyed patients) were paired with respective beds. On the day of the survey, the surveyor administered the procedures of the study to the first occupied bed. In case the bed to be surveyed was unoccupied, or the patient unable to complete the procedures of the survey in view of his/her clinical condition, patient occupying the bed following clockwise was surveyed.

Collected data were voided in the corresponding forms, and entered into an *ad hoc* digital container created with Access 7.0 of Office for Windows (Microsoft, Redmond, Virginia, USA).

Survey procedures: The Subjective Global Assessment (SGA) of the nutritional status proposed by Detsky et al.¹⁵ was administered to each of the surveyed patients. According with the subjective perception of the surveyor, the patient was assigned to any of three different nutritional categories: A: *Not Malnourished*, B: *Mildly Malnourished/At risk of malnutrition*, and C: *Severely Malnourished*, respectively.

At the same time, an audit of the nutritional care processes was conducted by means of the Hospital Malnutrition Survey (HMS). Briefly, HMS holds sections for recording the patient's sociodemographic and administrative data, current health conditions (emphasizing sepsis and cancer diagnoses), completion of major surgical procedures, occurrence of fasting, current state of provision of foods by mouth and the use of dietetic supplements, conduction of enteral nutrition schemes, and conduction of parenteral nutrition schemes; respectively. HMS results are to be discussed in a complementary article³.

Surveyors were instructed in survey's procedures by means of Standard Operating Procedures drafted for these purposes.¹⁶⁻¹⁷

Ethical considerations: Procedures conducted on patients were non-invasive in nature. Patients were informed by local surveyors of study's design, and characteristics of tools to be administered; and made aware of their freedom when choosing on their inclusion in the study. Patients were also informed about the confidentiality of data collected from them by local surveyors as part of the procedures of the study.

A Bioethics Committee at ESPOCH reviewed the project and requested provisions from the Ecuadorian Group for the Study of Hospital Malnutrition regarding the non-invasiveness of procedures to be conducted and proper storing of data to be collected.

Boards of Governors of eligible hospitals were approached by the Group for permission to conduct the study with patients admitted to the institution. Local surveyors presented the Boards with the design, purposes, and possible results of the study. Boards

were made aware of their freedom when deciding about the inclusion of the institution in the study.

Permission from the Board of Governors to interview the patients, as well as to store and manipulate data collected from them, was sought in the form of an informed consent as a prerequisite for conducting the survey at eligible hospitals. Additionally, the institution's Bioethics Committee was consulted by the Board of Governors about the features of the study.

The present work was aimed to show the integrated state of malnutrition in medical centers of different provinces of the Republic of the Ecuador. In any moment an attempt was made to expose malnutrition in a single hospital, and thus, a particular province. Hospitals's Boards were reassured about the confidentiality of the collected data, the proper storing of data, and the integrated nature of the results to be obtained.

Data processing and statistical-mathematical analysis of results: Collected data were reduced down to location (mean), dispersion (standard deviation) and aggregation (absolute frequencies/percentages) statistics, according with variable type.

Malnutrition frequency was obtained as the percentage of SGA surveys with (B + C) scores regarding the total number of recovered surveys. Malnutrition frequency was adjusted for age, sex, education level, health condition, infection (Present/Absent), surgical treatment, hospitalization area, and hospital length of stay (LOS). LOS was calculated as the number of days between date of the survey and admission date, and was distributed as follows: < 24 hours, From 2-3 days, From 4-7 days, From 8-15 days, From 16-30 days, and > 30 days; respectively.

Patient's health condition was categorized as follows: *Hematological diseases:* Anemias in different stages of diagnosis and treatment; *Chronic liver disease* (Liver cirrhosis included); *Cancer* (leukemias and lymphomas were also added); *Chronic kidney disease*; *Respiratory diseases* (tuberculosis, pneumonia, chronic obstructive pulmonary disease and bronchiectasia included); *Diabetes mellitus*; *Heart and blood vessels* (comprising heart and valves diseases, those derived/caused by atherosclerosis, and local | systemic venous insufficiency); *Gastrointestinal diseases* (major acute abdominal pain dramas included); *Gynecological diseases*; *Urological diseases*; *Burns*; *Orthopedic and trauma illnesses* (comprising fractures, trauma and wounds caused by weapons regardless of their type or nature); and *Neurological and psychiatric diseases* (dementia included); respectively. An "Others" additional category was created for those health problems not covered by the preceding categories.

Hospitalization area was stratified as follows: *General Surgery*, *Other surgical specialties*, *Orthopedics and Trauma*, *Internal Medicine*, and *Other medical specialties*; respectively.

Statistical significance of hypothesized differences was assessed by means of homogeneity tests based on

³Nicolalde Cifuentes M, Gallegos Espinosa S, Santana Porbén C. The state of the processes of nutritional care in hospitals of Ecuador. Drafted for publication.

Table I
Participating hospitals. City, province, number of beds, and surveyed patients

Province	Hospital	Number of beds	Surveyed patients
Azuay	Hospital "Vicente Corral Moscoso"	290	150
Azuay	Hospital IESS "José Carrasco Arteaga"	300	150
Bolivar	Hospital "Alfredo Noboa Montenegro"	120	150
Bolivar	Hospital IESS "Humberto del Pozo Santos"	130	150
Cañar	Hospital "Homero Castanier Crespo"	160	150
Cañar	Hospital "Darío Machuca Palacios"	165	152
Carchi	Hospital "Luis Gabriel Davila"	150	150
Cotopaxi	Hospital "Central de Latacunga"	200	150
Chimborazo	Hospital "Docente de Riobamba"	220	149
Chimborazo	Hospital IESS Riobamba	180	150
El Oro	Hospital "Teófilo Davila"	220	150
Esmeraldas	Hospital "Delfina Torres de Concha"	125	155
Guayas	Hospital "Abel Gilbert Pontón"	254	149
Guayas	Hospital Neumológico "Alfredo J. Valenzuela"	340	150
Imbabura	Hospital San Vicente de Paul	166	150
Loja	Hospital IESS "Manuel Ignacio Monteros"	81	150
Loja	Hospital Regional "Isidro Cueva"	243	150
Los Ríos	Hospital "Martín Icaza"	106	103
Los Ríos	Hospital IESS Babahoyo	120	150
Los Ríos	Hospital del Sagrado Corazón de Jesús	71	150
Los Ríos	Hospital "Nicolás Coto Infante"	51	150
Manabí	Hospital "Rafael Rodríguez Zambrano"	220	150
Manabí	Hospital Hospital IESS Manta	120	149
Manabí	Hospital "Verdi Ceballos Balda"	305	150
Manabí	Hospital "Miguel H. Alcívar"	120	149
Morona Santiago	Hospital de Macas	70	150
Napo	Hospital "José María Velasco Ibarra"	120	150
Orellana	Hospital "Francisco de Orellana"	30	150
Pastaza	Hospital de Puyo	35	149
Pichincha	Hospital IESS "Carlos Andrade Marin"	720	150
Pichincha	Hospital "Eugenio Espejo"	470	150
Pichincha	Hospital "Pablo Arturo Suárez"	220	150
Santo Domingo de las Tsachilas	Hospital "Gustavo Domínguez"	141	150
Tungurahua	Hospital Nuestra Señora de la Merced	55	150
Tungurahua	Hospital Provincial Docente de Ambato	386	150
Tungurahua	Hospital IESS Ambato	360	150

Size of the study serie: 5355.

Source: Records of the Ecuadorian ELAN Study of Hospital Malnutrition.

Records closed on: December 31th, 2012.

the chi-square distribution.¹⁸ A probability of occurrence of the event lower than 5% was assumed as statistically significant.¹⁸

Strength of associations between nutritional status and variables included in the study's experimental design was assessed indistinctively by means of techniques based on the chi-square distribution,¹⁸ or logistic regression.¹⁹

EPI-INFO (Centers for the Diseases Control. Atlanta: Georgia) and SPSS (SPSS Inc., Chicago, IL, EEUU) statistical packages were used for the statistical analysis of the results.

Results

Final sample size was 5,355 patients: a figure representing 82.5% of the goal set by survey design. These patients were surveyed in 36 hospitals of 23 (out of 24 of the) provinces of the country. Table I shows the hospitals surveyed as part of the Ecuador ELAN Study.

Table II shows the demographic and clinical features of the sample study. Women were more represented than men. Patients with ages ≥ 60 years represented a third of the sample. Grammar and junior high education levels were prevalent among the surveyed patients.

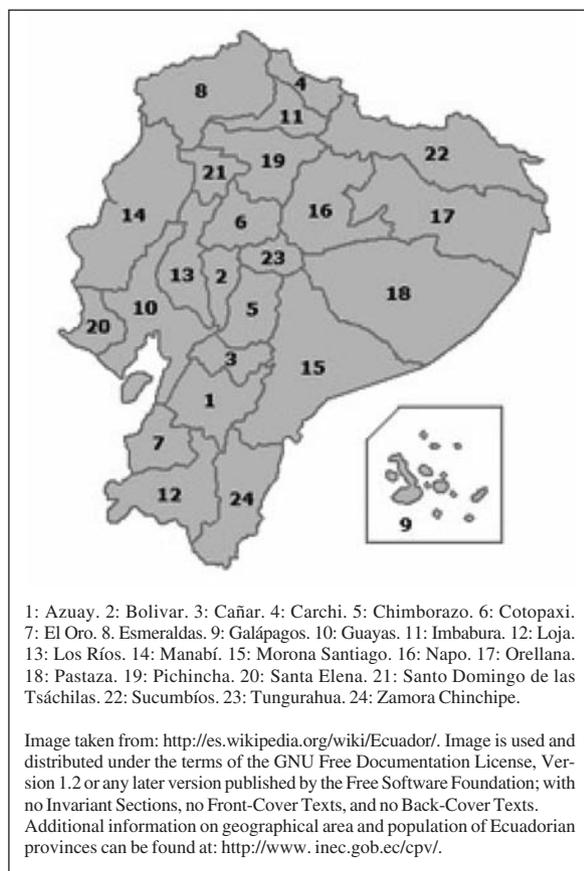


Fig. 1.—Provinces of Ecuador. The country is comprised of 24 provinces distributed between the Pacific coast, the Andes, and the Amazonia. Ecuador holds a population of 14,483,499 inhabitants over a 283,520 squared kilometers area.

Roughly 10.0% of the patients were included within the “Undetermined” category of education.

General Surgery (32.6%) and Internal Medicine (51.7%) services concentrated the surveyed hospitalizations. More than 90.0% of the patients had stayed at least 15 days in hospital. Gastrointestinal diseases, orthopedic and trauma illnesses, and respiratory illnesses concentrated 53.0% of the patients in the study sample. Infection was present in a quarter of the surveyed patients, mostly from the very moment of hospital admission. Cancer affected only 3.4% of the sample. Chronic organic failure was present in 8.2% of the patients. More than 20.0% of the patients had been already operated upon, while another 9.2% was waiting for completion of surgical program.

Estimated frequency of hospital malnutrition was 37.1% (95% CI: 35.8%-38.4%). According with SGA score, patients were distributed as follows: “A”: 63.0%; “B”: 29.1%; and “C”: 7.9%; respectively, as shown in figure 2.

Table III shows the association between SGA score and Body Mass Index (BMI) current value calculated for 4,884 of the surveyed patients (amounting to 91.2% of study sample). A strong association was found between SGA score and BMI current value: 84.2% of

the patients with (B + C) SGA scores had BMI values < 18.5 Kg.m⁻², in contrast with only 33.8% of those with “A” scores (OR = 10.48; p < 0.05; 95% CI: 7.75-14.19).

Table IV shows the influence of demographic and clinical features of the patient upon SGA score. SGA score was dependent upon age (< 60 years: 30.9% vs. ≥ 60 years: 48.5%; D = -17.6%; $\chi^2 = 162.0$; p < 0.05) and education level ($\chi^2 = 99.75$; p < 0.05). Malnutrition concentrated among patients with grammar and junior high levels of instruction, as well as those included within the “Undetermined” category (OR = 0.812; p < 0.05; 95% CI: 0.773-0.851; odds-ratio estimated by means of logistic regression techniques). Likewise, hospital malnutrition was influenced by presence of cancer (Present: 64.5% vs. Absent: 36.1%; D = 28.4%; $\chi^2 = 61.0$; p < 0.05), infection (Present: 47.8% vs. Absent: 33.5%; D = 14.3%; $\chi^2 = 88.60$; p < 0.05), and chronic organic failure (Present: 58.2% vs. Absent: 35.2%; D = 23.0%; $\chi^2 = 91.48$; p < 0.05); respectively.

In addition, patients going through different stages of surgical program differed among them regarding the observed frequencies of malnutrition ($\chi^2 = 119.51$; p < 0.05), being the proportion of (B + C) SGA scores higher in those in whom no surgical option of treatment was considered.

Table V shows the distribution of hospital malnutrition in relation to hospitalization area. Hospital areas exhibited varying malnutrition frequencies ($\chi^2 = 144.22$; p < 0.05), with higher frequencies among wards of Internal Medicine and other medical specialties.

Table VI shows malnutrition regarding health condition leading to admission. Malnutrition was heterogeneously distributed among different health conditions ($\chi^2 = 395.79$; p < 0.05). Observed estimates of malnutrition for hematological diseases, chronic liver diseases (including liver cirrhosis), cancer, kidney chronic disease, respiratory illnesses and Diabetes mellitus surpassed the globally estimated value for the study sample.

Finally, figure 3 shows the influence of hospital LOS upon nutritional status. Malnutrition frequency increased as LOS prolonged, from an initial value of 31.2% in the first 24 hours of hospitalization, to reach 64.7% among those patients with LOS between 16-30 days (D = 33.5%; p < 0.05).

Discussion

This article has presented the results of the Ecuadorian Study of Hospital Malnutrition: the first concerted effort aimed to expose the magnitude and ramifications of this health problem in public health institutions of the country. As such, the Ecuador ELAN Study distincts itself from others conducted in the Latin American region for encompassing the public medical care centers of all (but one of) the provinces of the country; and for being the culmination of a Mastery in Nutrition

Table II

Demographical and clinical features of the surveyed population. Numbers and (between brackets) percentages of subjects for the corresponding level of distribution are shown

<i>Feature</i>	<i>Observed findings</i>
Sex	Female: 2756 [51.5] Male: 2599 [48.5]
Age	< 60 years: 3474 [64.9] ≥ 60 years: 1881 [35.1]
Education level	Grammar: 2770 [51.7] Junior high: 1395 [26.1] High school: 118 [2.2] University: 441 [8.2] Senior technician: 62 [1.1] Undetermined: 569 [10.6]
Health condition leading to admission	Gastrointestinal diseases: 1396 [26.1] Orthopedic and trauma illnesses: 790 [14.7] Respiratory diseases: 654 [12.2] Heart and blood vessels: 525 [9.8] Diabetes mellitus: 460 [8.6] Urological illnesses: 411 [7.7] Neurological and psychiatric illnesses: 190 [3.5] Cancer, leukemias and lymphomas: 180 [3.4] Chronic kidney disease: 139 [2.6] Chronic liver disease: 67 [1.3] Gynecological illnesses: 68 [1.3] Burns: 40 [0.7] Hematological diseases: 33 [0.6] Others [*] : 402 [7.5]
Infection [§]	Present: 1338 [25.0] • Present on admission: 1323 [98.9] • Developed during admission: 15 [1.1]
Organic chronic failure	Present: 438 [8.2]
Surgical program	Completed: 1197 [22.3] Programmed: 498 [9.3] Not considered: 3660 [68.4]
Hospitalization area	General Surgery: 1748 [32.6] Other surgical specialties [†] : 129 [2.4] Orthopedics and Trauma: 336 [6.3] Internal Medicine: 2769 [51.7] Other medical specialties [‡] : 373 [7.0]
Length of stay	Up to 24 hours: 1142 [21.3] Between 2-3 days: 1875 [35.0] Between 4-7 days: 1226 [22.9] Between 8-15 days: 641 [12.0] Between 16-30 days: 289 [5.4] More than 30 days: 182 [3.4]

^{*}Hernia of varying etiology | topology (168), snake biting (40), HIV/aids (53), dengue (26).

[§]HIV/aids cases are included.

[†]Urology (44), Neurosurgery (43), Cardiovascular surgery (31), Otorhinolaryngology (9), Ophthalmology (2).

[‡]Gastroenterology (91), Cardiology (68), Neumology (57), Nephrology (51), Neurology (31), Endocrinology (26), Oncology (23), Infectology (18), Dermatology (4), Hematology (3), Psychiatry (1).

Size of the study serie: 5355.

Source: Records of the Ecuadorian ELAN Study of Hospital Malnutrition.

Records closed on: December 31th, 2012.

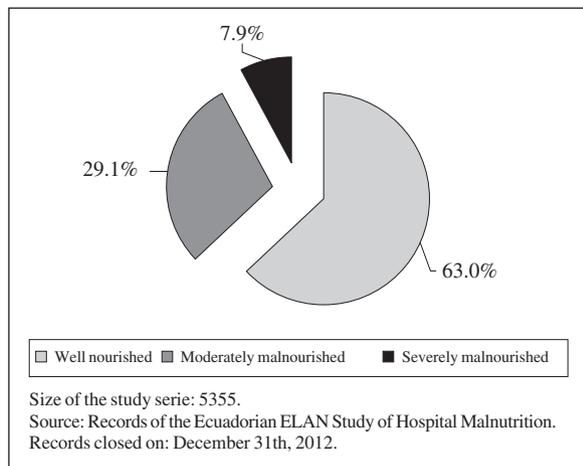


Fig. 2.—State of hospital malnutrition. Hospital malnutrition frequency was calculated from the proportion of patients with (B + C) SGA scores.

in Public Health project led by the School of Nutrition and Dietetics of the Faculty of Public Health at the ESPOC in Riobamba (Chimborazo) with the students acting as surveyors in the research units.

The estimated frequency of hospital malnutrition is consistent with findings previously reported by the

Table III

Association between Body Mass Index (BMI) and Subjective Global Assessment (SGA) score. Data recovered from 4,884 patients was distributed according with BMI calculated value and score assigned with SGA. Nature of association was assessed by means of statistical tests based on the chi-square distribution.¹⁸ Strength of association was estimated after calculation of the corresponding odds-ratio.¹⁸ Proportions of patients with a specified SGA score with BMI values on one side or the other of the selected cut-off point are shown

BMI, Kg.m ²	SGA		Totals
	B + C	A	
< 18.5	278 [84.2]	52 [15.8]	330 [6.7]
≥ 18.5	1538 [33.8]	3016 [66.2]	4554 [93.3]
Totals	1816 [37.2]	3068 [62.8]	4884 [100.0]

$\chi^2 = 335.564952$; $p < 0.05$.

OR = 10.4837 [7.7477-14.1861]

Size of the study serie: 5355.

Source: Records of the Ecuadorian ELAN Study of Hospital Malnutrition.

Records closed on: December 31th, 2012.

Table IV

Influence of demographical and clinical features of the patient upon the nutritional status of the patient

Feature	(B + C) score [§]	Interpretation
Sex		
• Male	37.5	$\chi^2 = 0.39$; $p > 0.05$ OR _j = 0.9651 [0.8637-1.0784]
• Female	36.6	
Age		
• < 60 years	30.9	$\chi^2 = 162.57$; $p < 0.05$ OR _j = 2.1089 [1.8787-2.3673]
• ≥ 60 years	48.5	
Education level		
• Grammar	40.6	$\chi^2 = 99.57$; $p < 0.05$ OR _L = 0.812 [0.773-0.851]
• Junior high school	30.2	
• High school	24.6	
• University	27.2	
• Senior technician	27.4	
• Undetermined	47.6	
Presence of cancer	64.5	$\chi^2 = 62.39$; $p < 0.05$ OR _j = 3.2905 [2.4098-4.4931]
Presence of sepsis	47.8	$\chi^2 = 87.70$; $p < 0.05$ OR _j = 1.8161 [1.6016-2.0594]
Presence of chronic organic failure	58.2	$\chi^2 = 91.66$; $p < 0.05$ OR _j = 2.5693 [2.1063-3.1341]
Stage of the surgical plan		
• Completed	29.0	$\chi^2 = 118.795$; $p < 0.05$ OR _L = 0.721 [0.672-0.774]
• Programmed	21.7	
• Not considered	41.8	

[§]Proportion of patients with (B + C) SGA scores in each level of distribution of the corresponding category.

OR_j: Odds-ratios estimated by means of chi-square techniques.¹⁸ OR_L: Odds-ratios estimated by means of logistic regression.¹⁹

Size of the study serie: 5355.

Source: Records of the Ecuadorian ELAN Study of Hospital Malnutrition.

Records closed on: December 31th, 2012.

Table V
Distribution of malnutrition regarding hospitalization area

Hospitalization area	(B + C) score [§]
General Surgery	30.6
Other surgical specialties	33.3
Orthopedics and Trauma	16.1
Internal Medicine	43.2
Other medical specialties	41.8
All areas	37.1

$\chi^2 = 143.72$; $p < 0.05$.

[§]Proportion of patients with (B + C) SGA scores in each surveyed area.

Size of the study serie: 5355.

Source: Records of the Ecuadorian ELAN Study of Hospital Malnutrition.

Records closed on: December 31th, 2012.

ELAN Latin American Hospital Nutrition Study.⁸ In a chaotic, hardly intervened scenario, it can be anticipated that between 30-50% of hospitalized patients are malnourished, as this study has shown.

Malnutrition concentrated among patients with ages ≥ 60 years, as well as those diagnosed with cancer, infection, and organic chronic failure. Aging affects the capacity of the human being to adapt and respond successfully to injury.²⁰ Illness, and the events it unleashes, might convey a nutritional and metabolic cost overriding the homeostatic mechanisms of the aging subject.²¹ Vulnerability and frailty of the family, community and social networks might also affect the capacity of the elder to sustain his/her nutritional status by himself/herself.²²⁻²³

Influence of cancer upon nutritional status has been extensively recognized. Malnutrition is present in 20-25% of the patients newly diagnosed with cancer, but it can become a highly prevalent phenomenon among those going through the several stages of the treatment of the neoplastic disease, as well as those submitted for palliative care.²⁴⁻²⁶

Infection can unleash | perpetuate | aggravate malnutrition that underlies in the hospitalized patient. Infection puts in motion molecular, biochemical and hormone events that result in inflammation, insulin resistance and hypercatabolism.²⁷⁻²⁸ Wasting syndromes associated with HIV/aids²⁹⁻³⁰ and tuberculosis cachexia³¹⁻³² are illustrative examples of the aforementioned. Regarding the present study serie, patients affected with HIV/aids and tuberculosis represented 3.7% and 9.9%; respectively; but malnutrition affected 84.0% of the formers, and 94.0% of the latters.

Chronic organic failure deeply alters the maintenance of the internal milieu of the patient, and thus, the way metabolic events required for the use of energy contained in foods operate.³³⁻³⁵ Chronic inflammation is also part of the biochemical events that organic chronic failure sets in motion. The elevated malnutrition rates observed in patients with end-stage kidney disease, chronic liver disease and chronic heart disease are a permanent reminder of the consequences brought

Table VI
Distribution of malnutrition regarding primary health condition

Primary health condition	(B + C) score [§]
Hematological diseases	69.7
Chronic liver disease	67.2
Cancer	65.0
Chronic kidney disease	62.6
Respiratory diseases	58.9
Diabetes mellitus	38.5
Heart and blood vessels	35.6
Gastrointestinal diseases	34.3
Gynecological diseases	30.9
Urological diseases	25.3
Burns	25.0
Orthopedic and trauma illnesses	24.1
Neurological and psychiatric illnesses	21.6
Others	29.4
All problems	37.1

$\chi^2 = 393.99$; $p < 0.05$.

[§]Proportion of patients with (B + C) SGA scores for each health condition.

Size of the study serie: 5355.

Source: Records of the Ecuadorian ELAN Study of Hospital Malnutrition.

Records closed on: December 31th, 2012.

about by disruption of the functions tissues | organs | systems play in the economy.³⁶⁻³⁸

Malnutrition can also be an important comorbidity in other surgical clinical situations, as can be inferred from examining the relationships that might exist between nutritional status and health condition leading to admission. In this regard, malnutrition observed in (almost) one-quarter of the patients assisted for bone fractures, trauma and wounds caused by different types of weapons, as well in one-third of those with abdominal pain syndromes originated from cholecystitis, pancreatitis and appendicitis; is to be noticed.

Relationships between nutritional status and health status of the hospitalized patient as previously discussed might permeate other aspects of hospital manutrition. Malnutrition could be one the distinctive features of Internal Medicine services, occupied mostly by patients affected with non-communicable chronic diseases, and in whom organic chronic failure is prevalent; and the wards of General Surgery, on one hand, and Trauma, on the other; which concentrate patients evolving with major abdominal, orthopedic and trauma dramas, consuming prolonged lengths of hospital stay, and in whom infectious events such as pneumonia usually occur.

Malnutrition observed in Diabetes mellitus is not to be overlooked. The study revealed that 38.5% of the diabetic patients were malnourished, an estimate surpassing the one obtained for all-diseases. Diabetes mellitus has always been examined in the context of Obesity,³⁹⁻⁴⁰ but this association should not hide the

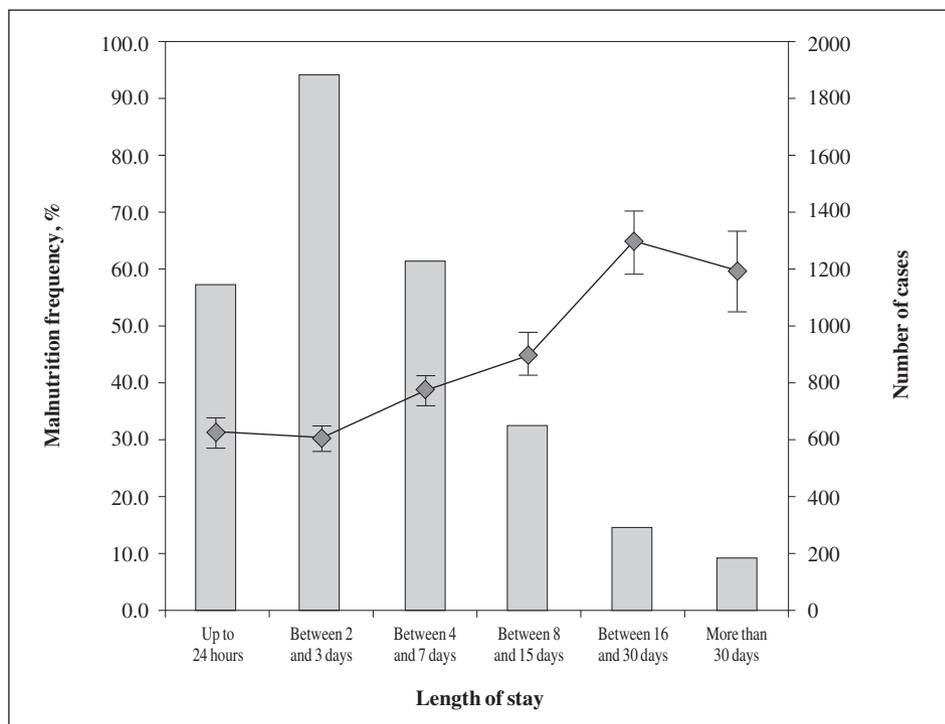


Fig. 3.— Influence of length of stay upon nutritional status. Estimated values of hospital malnutrition in each moment of hospitalization are shown, along with corresponding 95% confidence intervals.

increased risk of malnutrition diabetic patients are placed at due to complications resulting from diabetic microangiopathy such as kidney failure, peripheral arterial insufficiency and diabetic foot.⁴¹⁻⁴²

The influence of epi-biological factors upon hospital malnutrition could be estimated from the relationships existing between nutritional status and education level. Education level could be a subrogate of social and economical *status* of the subject within the community and society, as it has been previously pointed out.⁴³ Low education levels would imply incomes lower than the national average wage, and thus, inequities in the provision of medical care and/or difficulties in accessing foods and/or nutritional support therapies. On the other hand, education level would determine patient's capacity to assimilate knowledge and to incorporate skills allowing him/her to successfully deal with disease's metabolic and nutritional demands. In the case of the present study, it was striking that malnutrition concentrated among patients with grammar and junior high levels of instruction, as well as among those included within the "Undetermined" category, implying other interventions beyond those merely nutritional and medical would be required in order to ameliorate the existing nutritional disorders.

The cross-sectional design of the Ecuador ELAN Study withholds inferences that could be made about how hospitalization, and, by extension, the way medical care teams operate, affects nutritional status of the patient. Nonetheless, this study has been consistent with others⁴³⁻⁴⁵ in showing that malnutrition frequency increases as the patient accumulates more and more days of hospitalization, after adjusting the study serie

for LOS. The hypothesis advanced by many authors that malnutrition is the distinctive feature of hospital populations with 16 (or more) days of admission is thus reinforced. Although the size of such populations could be artificially limited by means of an intense and rapid rotation of hospital beds, an elevated readmission rate would serve to signal those patients with a deteriorating nutritional status that are admitted again and again for the treatment of complications caused by a comorbidity that has not been identified and treated time- and convenient-ly.⁴⁶⁻⁴⁷

Clinical relevancy of the results of the present study

This study has presented the current state of malnutrition in public hospitals of Ecuador. As such, it represents the first organized, national-reaching effort to expose the magnitude of this co-morbidity. The study also extended to discuss possible determinants of hospital malnutrition after examining the influence of several selected demographic and clinical variables upon patient's nutritional status. In the current context, malnutrition seems to reflect opportunities lost by local medical care teams to address the metabolic and nutritional consequences of disease upon patient's health status, and thus, to conduct the required actions to identify, treat, and ultimately prevent malnutrition. It is abundantly documented the negative influence of malnutrition upon response to medical surgical treatment, quality and costs of medical care, and above all, the patient's own life. However, and in spite of such an

immense wealth of evidence, this study regrettably shows that hospital malnutrition is still a pending issue in the Latin American region.

Conclusions

Hospital malnutrition is an important health problem in public hospitals of the Republic of Ecuador. Further research could be oriented to the causes of this prevailing epidemiological phenomenon. In this regard, it would be interesting to explore the validity of a model previously described that sees hospital malnutrition as the result of failures in the availability of resources, failures in recognizing opportunities for nutritional intervention and/or absence of knowledge and skills in issues of clinical and hospital nutrition, nutritional support, artificial nutrition and metabolism.⁴⁸ Identification and removal of barriers that today still surround the implementation of coherent, cost-effective nutritional support schemes in the hospitalized patient would bring about containment of the costs of medical care, and a quality care better perceived by the patient and his/her relatives.⁴⁹

Epilogue

The completion of the Ecuadorian ELAN Study of Hospital Malnutrition has shown the maturity achieved by the School of Nutrition and Dietetics of the Faculty de Public Health at ESPOCH as a teaching and research institution that can successfully take on multi-center projects of national reach. This article thus becomes the best endorsement of the capacity of the School to satisfy other social commissions aimed to the continuous improvement of the quality of the health of the Ecuadorian people.

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