ORIGINAL ARTICLE

Argentine Registry of Acute Heart Failure (ARGEN-IC). Evaluation of a Partial Cohort at 30 Days

Registro argentino de insuficiencia cardíaca aguda (ARGEN-IC). Evaluación de cohorte parcial a 30 días

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ABSTRACT

Background: Acute heart failure is a current epidemiological problem, closely correlating with increased population age and greater survival of patients with cardiovascular diseases.
Objectives: The aim of this study was to evaluate the clinical profile, diagnostic and therapeutic strategies and complications during hospitalization and 30-day follow up of the ARGEN-IC Registry.
Methods: A national prospective, multicenter registry was performed including patients with confirmed diagnosis of acute heart failure followed-up for 12 months in 50 health centers from August 2018 to March 2019.
Results: Data from 909 patients were provided by 74 investigators from 18 provinces of Argentina. Mean age was 72.2±14 years, and 60.5% of patients were men. Baseline characteristics showed prevalence of diabetes (33%), prior acute myocardial infarction (17%), atrial fibrillation (31%), and private health insurance (38%). Among precipitating factors of decompensation, there was greater incidence of unknown causes (28.5%) followed by infective diseases (15.7%) and food transgression (13.5%). Predominant presentations were ischemic-necrotic etiology (26%), mixed congestion (48%) and the group with reduced ejection fraction (EF (<o = 40%)). Use of natriuretic peptides was almost 50% and 25% (admission and discharge, respectively), and echocardiographic evaluation of diastolic function was performed in 77% of patients, with significant abnormality in 46%. In 77.6% of cases, patients were admitted to the critical care unit, with median hospital stay of 8 days and overall mortality of 7.9%. Pharmacological treatment at discharge was underutilized, even in the group with reduced EF: 78.7% received betablockers, 70.9% angiotensin-converting enzyme inhibitors, angiotensin II receptor blockers or angiotensin receptor–neprilysin inhibitor and 56.3% anti-aldosterone agents, while referral to cardiovascular rehabilitation involved 17% of cases. The 30-day follow-up period showed 16.7% rehospitalizations, 5.5% mortality and 18% combined events. Only 47% of patients had accessed the medical consultation.
Conclusions: The ARGEN-IC registry represents a heterogeneous population, with advanced mean age and high number of comorbidities. The diagnostic and therapeutic strategies are underutilized during hospitalization and in the first 30 days, with poor access to the health system. The overall combined rate of in-hospital events and at 30 days remains high.

Key words: Heart failure – Rehospitalization -Comorbidities

RESUMEN

Introducción: La insuficiencia cardíaca aguda es una problemática epidemiológica actual, en correlación con el incremento de la edad poblacional y la mayor sobrevida de los pacientes con enfermedades cardiovasculares.
Objetivos: Evaluar el perfil clínico, las estrategias diagnósticas y terapéuticas y las complicaciones durante la internación y el seguimiento a 30 días del registro ARGEN-IC.
Materiales y Métodos: Se efectuó un estudio prospectivo multicéntrico nacional, basado en los datos suministrados por 50 instituciones de salud (período: agosto 2018 a marzo 2019) referidos a pacientes con diagnóstico primario de insuficiencia cardíaca aguda, con un seguimiento de 12 meses.
Resultados: Se incluyeron los datos de 909 pacientes aportados por 74 investigadores de 18 provincias. La media y el desvío estándar de la edad de los pacientes fue 72,2 (DS: 14) años y el 60,5% era de sexo masculino. Entre las características basales de esta cohorte, se destacaron las siguientes (prevalencia): diabetes (33%); IAM previo (17%); fibrilación auricular (31%); cobertura médica de prepagas (38%). Entre los factores desencadenantes, predominaron las causas desconocidas (28.5%), seguidas de las infecciosas (15,7%) y de transgresión alimentaria (13,5%). Se destaca la etiología isquémico-necrótica (26%), la presentación como congestión mixta (48%) y el grupo con fracción de eyección (Fey) deteriorada. Las tasas de utilización de péptidos natriuréticos fueron cercanas al 50% y 25% (ingreso y egreso, respectivamente), y en el ecocardiograma se evaluó la función diastólica en un 77%, con alteración significativa en el 46%. El 77,6% ingresó a unidad de cuidados críticos y la mediana de estadía hospitalaria global fue de 8 días, con una mortalidad global del 7,9%. El tratamiento farmacológico al egreso se encontró subutilizado, incluso en el grupo con Fey reducida: beta bloqueantes (BB), 77,8%; IECA, ARA II o ARNI, 70,9%; y antialdosterónicos, 56,3%. La derivación a rehabilitación cardiovascular abarcó el 17%.

A 30 días se observó una tasa de reinternaciones del 16,7%; de mortalidad, del 5.5% (eventos combinados: 18%); y solamente el 47% había accedido a la consulta médica.

Conclusiones: El registro ARGEN-IC abarca una población heterogénea, con una elevada edad media y alto número de comorbilidades. Las estrategias diagnósticas y terapéuticas demostraron estar subutilizadas durante la hospitalización y los primeros 30 días, con escaso acceso al sistema de salud. La tasa global de eventos combinados intrahospitalarios y a 30 días continúa siendo elevada.

Palabras clave: Insuficiencia cardíaca – reinternaciones – comorbilidades

INTRODUCTION

Acute heart failure (AHF) is an epidemiological issue of current societies associated with advanced population age and higher survival of patients with cardiovascular diseases. (1, 2)

Greater pathophysiological information and diagnostic tools, as well as use of different pharmacological schemes, have generated a significant progress in this syndrome's understanding. However, associated complications and mortality are permanent challenges, which impact on the health system and its costs. (3)

Improved knowledge has not translated into decreased number of events after discharge (vulnerable phase), the last registries showing constant mortality and rehospitalizations rates (15% and 35% at 30 and 60 days, respectively). (4)

Describing the regional reality of different pathologies is necessary from an epidemiological, healthcare and educational viewpoint. In our country, several registries have been performed with scarce regularity and geographical representativeness, constituting voluntary efforts of scientific society members with considerable value to know our reality.

At a national level, various questionnaires have been generated, and in the Argentine Society of Cardiology (SAC) three AHF registries were developed in 1999, 2003 and 2007. (5-7) The purpose of the Argentine Heart Failure Registry (ARGEN-IC) is to evaluate the epidemiological-clinical profile of patients, the diagnostic and therapeutic strategies used, and patient complications in their evolution during hospital stay and 12-month follow-up. The present study reports a partial 30-day analysis.

METHODS

A national, prospective, descriptive multicenter registry was performed including the information provided by 50 health centers from August 2018 to March 2019. These centers participated voluntarily of the survey generated by the Research Area and the Heart Failure (HF) and Pulmonary Hypertension Council and approved by SAC's Ethics Committee.

The study included patients >18 years of age with confirmed AHF diagnosis who accepted and signed the informed consent. Patients with ST-segment elevation acute myocardial infarction, sepsis on admission, and psychic or physical conditions that limited follow-up were excluded from the analysis. Variables associated with demographic and clinical data, diagnostic methods, therapeutic interventions, hospital evolution, parameters at discharge and events during follow-up were recorded.

Presentation, etiologies, precipitating factors and in-hospital outcome were defined by the investigators according to the corresponding guidelines. Heart failure was considered with preserved, intermediate or reduced ejection fraction (EF) according to the echocardiographic value recorded (≥50%, 41-49% and ≤40%, respectively), left atrial (LA) dilation with area ≥23 cm; (apical 4-chamber view), LA pressure (LAP) classified into four groups: 5, 10, 15 or ≥20 mmHg, according to the inferior vena cava diameter (< or >20 mm) and the degree of collapse (< or >50%).

A centralized monitoring team of trained staff was in charge of follow-up and telephone contact at 30, 60, 90, 180 and 360 days to record clinical and therapeutic aspects and combined events (readmission and/or death). Data were collected through a closed questionnaire (Survey Monkey electronic database) and the information was monitored by an event and data committee. Events of interest were defined according to international recommendations and overall readmissions and for AHF (rehospitalization for AHF or emergency IV diuretic requirement) were identified within the 12-month follow-up period.

The registry data were verified with the original documents in 20% of patients, by specially trained staff.

Statistical analysis

Qualitative variables are expressed as percentages and the risk ratio as odds ratio (OR) with its 95% confidence interval (95% CI). Quantitative variables are expressed as mean and standard deviation or median and interquartile range, according to normal or non-normal distribution. Student's t, chi-square, Wilcoxon or Mann Whitney tests were used for statistical analysis. Multivariate linear regression or logistic regression analyses were performed, according to quantitative or qualitative variable characteristics and fulfilling test assumptions. Variable selection for the univariate analysis was based on p <0.2 or biological significance. A p value <0.05 was considered statistically significant. STATA 14 software package was used for statistical analyses.

RESULTS

A total of 938 patients recruited for the study were provided by 73 investigators working in different health centers of 18 provinces of Argentina, and data from 909 were included in the analysis, as 29 patients were excluded due to inconsistent data (Figure 1). Mean age was 72.2±14 years and 60.5% were men. Baseline cohort characteristics, described in Table 1, showed prevalence of diabetes (33%), acute myocardial infarction (AMI) (17%) and atrial fibrillation (31%). Health coverage was distributed as follow: 38% private health insurance, 54.5% social security (32.5% social work and 22% PAMI), 6.6% without health coverage and 0.9% private patients. Patient educational level was: 1% no schooling, 34% primary level, 48.8 % secondary level and 15.4% tertiary level.

Excluding cardiovascular risk factors, comorbidities were present in 54.7% of patients, with preva-
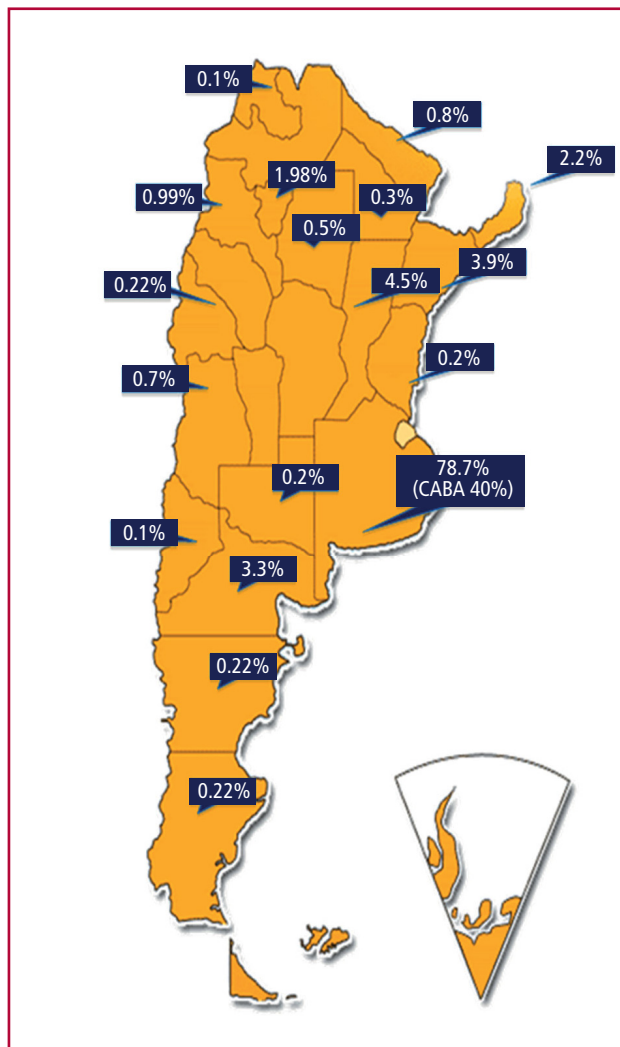
Fig. 1. Distribution of centers integrating the ARGEN-IC registry according to national regionalization

Table 1. Baseline characteristics of a partial cohort of the ARGEN-IC registry (August 2018-March 2019) with primary diagnosis of acute heart failure on admission

variable*	percentage**
Age (years)	72.2 (14.3)
Male gender	60.5
Hypertension	74
Diabetes mellitus	33
Smoking	30
Dyslipidemia	49
Prior AMI	17.3
Coronary angioplasty	14
CABG	8.5
Previous HF	36.4
Pacemaker	8
Atrial fibrillation	31
Chagas disease	1.6
Obesity	14.6
CRF	18.8
COPD	15.2
Hypothyroidism	13
SBP (mmHg)	136 (32)
DBP (mmHg)	81 (19)
HR (beats/min)	92.5 (25)
O2 saturation	93 (4.2)

*All variables not followed by their corresponding unit express percentages.
**Values between brackets indicate standard deviation.
AMI: Acute myocardial infarction. CABG: Coronary artery bypass graft surgery. HF: Heart failure. CRF: Chronic renal failure. COPD: Chronic obstructive pulmonary disease. SBP: Systolic blood pressure. DBP: Diastolic blood pressure. HR: Heart rate.

lence of chronic renal failure (CRF), obesity, chronic obstructive pulmonary disease (COPD) and hypothyroidism (Table 1).

Prior patient treatment is depicted in Table 2. An outstanding aspect was that 63.3% had no vaccination history, 33% had received prophylactic immunization against influenza or pneumococcus and 3% had received both vaccines.

The major precipitating factors were unknown causes (28.5%), infective (15.7%) and dietary transgression (13.5%) (Table 3). Physical examination revealed 79% jugular engorgement and crackling rales, 73% inferior limb edema, 46% positive hepatojugular reflux, 13.5% positive third (S3) heart sound and 7.5% ascites as outstanding clinical signs. On admission, average systolic blood pressure (SBP) was 136±32 mmHg, diastolic blood pressure (DBP) 81±19 mmHg, heart rate (HR) 92.5±25 beats/min and O2 saturation 93%.

The predominant etiology was ischemic-necrotic (26%), followed by unknown causes (22%), heart valve disease (20%) and hypertensive disease (13%) categories. The most usual forms of presentation were mixed (48%) and pulmonary (24%) congestion with lower prevalence of the most severe conditions such as acute lung edema (16%) and cardiogenic shock (3.4%). The electrocardiogram revealed sinus rhythm in 62% of cases, atrial fibrillation in 37%, QRS ≥120 milliseconds in 29% and left bundle branch block in 20.6%. Chest X-ray was performed in 97% of patients, with signs of pulmonary congestion in 84.6%. Pulmonary ultrasound was implemented in 9% of cases, with median comet-tail artifacts of 33 in 4 fields analyzed. (IQR 29-36).

Laboratory parameters described in Table 4 show a high percentage of diabetes diagnosis during hospitalization (17.4%). On admission, natriuretic peptides were quantified in 54.7% of patients, pro-BNP in 40.3%, with median level of 5,702 pg/ml (IQR 2,993-10,000) and BNP in 14.4%, with median level of 1,140 pg/ml (IQR 553-2,440).

An echocardiogram performed in 90% of patients showed mean EF of 41±15.4%, with reduced EF in 49.5%, preserved in 35.5% and intermediate in 15% of cases. Mean LA area was 32±10.6 cm2, with 90% of

cases with dilation criteria. Left ventricular diastolic function, evaluated in 77% of patients, evidenced 46% of cases with significant abnormalities (22.6% pseudo-normal and 23.1% restrictive pattern) and 19% with monophasic flow. Five, 10, 15 and ≥20 mmHg DBP was estimated in 24%, 8%, 27% and 46.5% of patients, respectively, with 77% of cases with DBP >10 mmHg.

In-hospital treatment included furosemide in 99% of patients (80% as bolus, with mean dose of 183 mg/day), vasodilators in 39% (with predominance of nitroglycerine), inotropic agents in 15%, non-invasive ventilation (NIV) in 20%, mechanical ventilation (MV) in 6% and coronary angiography in 12%; 6.2% evolved with shock. In the multivariate analysis, the follow-ing variables were significantly associated with over-all mortality(p <0.05): peripheral perfusion (OR: 3.7), atrial fibrillation on admission (OR: 2.2), anemia (OR: 1.94), change of diuretic strategy (OR: 2.65), MV (OR: 12,5) and sepsis (OR: 3.05). The model presented an area under the ROC curve of 0.85 (Figure 2).

Table 5 shows the pharmacological treatment at discharge. The group with reduced EF presented the following distribution: betablockers (BB) in 78.7% of cases, ACEI, ARBs or ARNI in 70.9%, anti-aldosterone agents in 56.3%, while referral to cardiovascular rehabilitation was indicated in 17% of patients. Also, at discharge, a great percentage of patients did not meet with the therapeutic objective of HR (≥ 80 and >70 beats/min in 34% and 58.8% of cases), with SBP (>130 mmHg in 18.5%) and persistent signs of congestion (edema in 9.6% and dyspnea in 11.1%). These data agree with the underutilized optimal dose in those with reduced EF (BB: 17.5%, ACEI/ARB/ARNI: 29,3% and anti-aldosterone agents: 24%).

In 77.6% of cases, patients were admitted to the critical care unit and the rest were referred to the general ward, with a median hospital stay of 8 days including 5 days in the critical care unit. Total in-hospital mortality was 7.9%, with 6% due to cardiovascular causes. In- hospital complications are shown in Table 6.

Table 2. Prior pharmacological treatment of the partial cohort

Medication	percentage**
Furosemide	46.6
Thiazide	5.3
Anti-aldosterone agents	26.2
Digoxin	5.9
Angiotensin-converting-enzyme inhibitors (ACEI)	30
Angiotensin II receptor blockers (ARB)	26.9
Sacubitril/valsartan (ARNI)	3
Beta blockers (BB)	61.7
Calcium blockers	11.1
Ivabradine	1.8
Statins	31.3
Acetylsalicylic acid (ASA)	32
Amiodarone	9.9
Oral hypoglycemic agents	16.6
Insulin	6.6
Anticoagulation	29
Oral nitrates	2
Hydralazine	1

Table 3. Precipitating factors of acute heart failure

Precipitating factors	percentage**
Unknown	28.5
Infection	15.7
Dietary transgression	13.5
HTN	10.6
Lack of pharmacological adherence	10.4
Arrhythmia	9.7
Others	11.6

Table 4. Laboratory variables measured during hospitalization

Variable	Mean	SD	Min	Max	Percentage with abnormal values
Hematocrit (%)	38	6.9	16.5	70	37% (anemia)
RBC (microl)	9,443	7,060	2,600	118,000	33% (leukocytosis)
Glycemia (mg/dl)	139.7	62.4	47	488	13,3% (hyperglycemia >200 mg/dl)
Urea (mg/dl)	64.7	40	9	323	
Creatinine (mg/dl)	1.50	1.2	0.4	13	9% (≥2.5 mg/dl)
Glomerular filtration rate (ml/min/1.73 m^2)	55	26.1	4.5	171	60% (<60 ml/min/m2)
Sodium (meq/l)	137	4.9	9	153	
Potassium (meq/l)	4.1	0.6	2.2	7	23% (<135 meq/l)
Albumin (mg/dl)	3.58	0.49	2.2	5.8	14% (hypoalbuminemia)

RBC: Red blood cell count
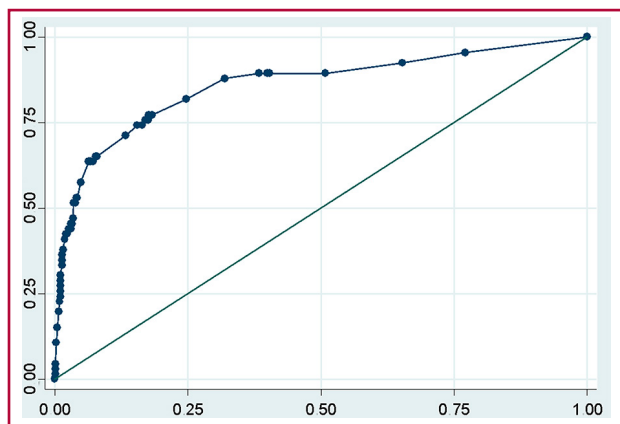
Fig. 2. Area under the curve.

Table 5. Pharmacological treatment at discharge

Medication	Percentage (%)	EF ≤40 (%)
Betablockers	73	78.7
ACEI	36.7	45.4
ARB	34.4	25.3
ARNI	5.2	8.8
ACEI/ARB/ARNI	63.8	70.9
Furosemide	67.5	72.3
Anti-aldosterone	39.8	56.3
Digoxin	6.3	6.4
Ivabradine	2.4	4.4

ACEI: Angiotensin-converting-enzyme inhibitors. ARB: Angiotensin II receptor blockers. ARNI: Angiotensin receptor-neprilysin inhibitors.

Table 6. In-hospital events

Precipitating factors	percentage**
de novo AHF	10.9
Sepsis	7.4
Ultrafiltration	7.83
Atrial fibrillation	7.2
Shock	6.2
Change of diuretic strategy	39
MV	6
NIV	20
Combined events	20

AHF: Acute heart failure. MV: Mechanical ventilation. NIV: Non-invasive ventilation.

Eighty-eight percent of the population discharged completed the 30-day follow-up period (12% without telephone contact), with 16.7% rate of readmissions, 6% mortality and 18% combined events. In 53% of cases, patients did not attend the medical control consultation within the first 30 days. This group presented greater incidence of readmissions compared with those assessed by general practitioners and cardiologists (21.6%, 12.3% and 9%; p=0.0004, respectively).

DISCUSSION

The ARGEN-IC registry included 909 patients, a recruitment greater than the 2003 and 2007 studies (615 and 736, respectively), with participation of different provinces, although most centers (78%) corresponded to Buenos Aires. In addition, there was a predominance of social security and private health insurance as medical coverage. We observed a heterogeneous population, with advanced mean age (72 years) and 40% of female sex, which generates an important representativeness for analysis and agrees with other cohorts.

The prevalence of cardiovascular risk factors was high, with 74% hypertensive patients, which emphasizes the positive association. The percentage of diabetic patients (33%) was similar to other analyses,

which is a relevant information, given its relationship with prognosis and the new therapeutic tools available.

The most prevalent etiology was ischemic-necrotic (26%), with a percentage similar to that found in previous registries, although we should consider the inclusion of all HF groups, the predominance of other entities and the absence of diagnosis in a group greater than 20%. Moreover, significant heart valve diseases represented 20% of overall entities, generating different clinical characteristics and prognosis at follow-up. We should point out the scarce number of cases with Chagas disease, probably due to population characteristics and the absence of routine serological tests.

Patient clinical profile on admission showed prevalence of mixed and pulmonary congestion, with less inclusion of acute lung edema and cardiogenic shock, which is related with in-hospital mortality. (10) Regarding precipitating causes, absence of risk factor identity (almost 30%) constituted the most frequent finding, in agreement with different registries, probably due to inadequate analysis of decompensation causes or progression of the underlying disease. However, among the mechanisms identified, infective etiology was the most frequent, and comorbidities and extra-cardiovascular complications stood out in this specific population.

In the acute treatment it is notable the use of loop diuretics with predominant intravenous administration (99%) and a maximum dose of 183 mg. It is noticeable the low use of intravenous vasodilators (39%), similarly to other registries, pointing out the limited consideration of the vascular effect in therapeutic strategies. An interesting finding is the significant association between overall mortality and peripheral perfusion as indicator of antegrade cardiac output, and peripheral resistance and the change in diuretic strategy as expression of HF transient worsening, data that has already been defined in other studies as an indicator of prognosis.

Different comorbidities, such as anemia, atrial fibrillation and sepsis become relevant in the multivari-

ate analysis due to their association with in-hospital mortality, emphasizing the implications of extra-cardiovascular diseases in the prognosis. The incorporation of these variables generated an adequate predictive model with an area under the curve of 0.85.

The indication of evidence-based drugs at discharge in the global population and in those with reduced EF is limited, with absence of BB administration in 27% and 22% of cases, ACEI/ ARB/ARNI in 36% and 19% and anti-aldosterone agents in 64% and 27.8%, comparable to international observational studies. The analysis of optimal doses evidences underutilization in the group with reduced EF (17.5%, 29.3% and 24%, respectively), put in evidence by the hemodynamic variables at discharge, and emphasizing the need to adapt titration. This subgroup shows absence of guideline-based implementation and the deficit in attaining therapeutic objectives (HR, SBP, edema, signs of persistent congestion) at discharge. It is of vital importance to highlight the direct relationship between adequate medical care and adherence to HF guidelines.

Among echocardiographic parameters, 50% of patients presented reduced EF, and 40% showed no signs of significant diastolic dysfunction, a remarkable aspect considering the diagnosis of AHF, although the delay in hemodynamic evaluation may limit the correlation. In addition, a high percentage of patients presented DBP >10 mmHg on admission.

In-hospital mortality was 7.9%, a value close to other national registries (SAC 2003, 8.94%, SAC 2007 8%), but higher than international ones (ADHERE, 4%, Argentine participation in the European registry, 2.5% EuroHeart Failure Survey II, 6.7%). (12, 13) In our registry, a mortality rate of 5.5% was observed at 30 days, grouping 13.4% of deaths, including nosocomial events. These data are in accordance with reports from the international literature, which mention the stability of mortality values in the last 20 years, probably related to poor implementation of therapeutic alternatives, the delay in interventions and the limitation in the evaluation of precipitating factors, among others. (14)

Readmissions at 30 days are still high, as they reached 16.7% of cases, mainly due to HF (77%), added to the fact that only 50% of patients underwent medical control. Patients without evaluation presented a higher rate of readmissions compared with those who consulted their general practitioner or cardiologist (21.6%, 12.3% and 9%, respectively). At this vulnerable stage, readmission increases the risk of mortality, and absence of medical control is a variable significantly associated with this outcome and an amendable protection factor.

This cohort provides current information on the population with AHF, with the participation of different Argentine centers and follow-up during the vulnerable phase. This analysis reveals insufficient indication of evidence-based pharmacological treatment and lack of post-discharge control (50% within 30 days), aspects that might be considered opportunities of intervention to improve the evolution of patients admitted with AHF.

In conclusion, we may highlight that, despite the technological and therapeutic progress of the last decades to approach this entity, the rates of nosocomial and follow-up events are still high, indicating a deficit in the implementation of adequate measures.

Limitations

The ARGEN-IC registry represents a heterogeneous, non-random population, so selection biases cannot be excluded, and the voluntary participation of centers limits national representativeness. Moreover, the analysis of events at 30 days involved 88% of the population included and is a partial view of the 12-month registry.

CONCLUSIONS

The ARGEN-IC registry includes a heterogeneous population, with advanced mean age and several comorbidities. In addition, this registry has predominance of ischemic-necrotic etiology and HF with decreased EF. Diagnostic and therapeutic strategies are underutilized during hospitalization and the vulnerable phase, with in-hospital mortality of 7.9% and 5.5% at 30 days, and an overall readmission rate of 16.7%. These data alert us on the need to implement an early strategy, with the aim of reducing the existing gap between guideline recommendations and our patients' care.

Conflicts of interest

None declared.

(See authors' conflicts of interest forms on the website/ Supplementary material)

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Appendix 1. Centers and participating investigators

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4. Clinica Ramón Cereijo　　Diego Sanchez
5. Clinica de Cuyo "Mendoza"　　Ariel Baigorria
6. Clinica del Sol　　Diana Millán
7. Clinica IMA Adrogué　　Fernando Sokn – Rosana Palacios
8. Clínica Santa Isabel　　Yanina Castillo Costa – Leonardo Caceres
9. Clinica Pasteur "Catamarca"　　Pia Marturano - Julio Bisutti
10. CORDIS Instituto del Corazón　　Eduardo Ferro
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15. Hospital Austral　　Jose Santucci
16. Hospital de Clínicas "Jose San Martin"　　Bruno Guarino - Sandra Swieszkowski
17. Hospital Churruca VISCA　　Stella Pereiro - Diego Fernandez
18. Hospital de Alta Complejidad de Formosa　　Cristian Smith
19. Hospital Durand　　Julieta Soricetti
20. Hospital General de Agudos "Bernardino Riv."　　Enrique Dominé – Alfredo Hirschon Prado
21. Hospital General de Agudos "Dr. Cosme Argerich"　　Alejandro Stwart Harris – Juan Gagliardi
22. Hospital Italiano de Buenos Aires　　Rodolfo Pizarro
23. Hospital Privado de San Juan　　Pablo Coria
24. Hospital Provincial Jose Maria Cullen "Santa Fe"　　Leonel Perello
25. Hospital San Juan XXIII General Roca　　Noelia Taquirini
26. Hospital Santojanni　　Raul Berenguer - Rubén Kevorkian
27. Hospital Zonal Esquel　　Damián Serebrinsky
28. Instituto Cardiovascular de Rosario　　Juan Pablo Escalante
29. Instituto de Cardiología de Corrientes "Juana Cabral"　　Lorena Coronel – Eduardo Perna
30. Instituto de Cardiología "Tucumán"　　Lilia Lobo Marquez
31. Policlinico Regional Avellaneda UOMRA　　Guillermina Sorasio
32. Sanatorio Británico "Rosario"　　Luis Keller
33. Sanatorio Delta de Rosario　　Ritondale – Chacon
34. Sanatorio Dupuytren　　Paula Perez Terns – Paola Harwich
35. Sanatorio Finochietto　　Miguel Gonzalez
36. Sanatorio Franchin　　Daniel Iglesias
37. Sanatorio Los Lopachos "Jujuy"　　Freijo Luis
38. Sanatorio Mendez　　Ariel Leeds – Daniel Zivano
39. Sanatorio Modelo Lanús　　Tomas Mullis
40. Sanatorio Modelo de Quilmes　　Marcelo Pais - Alberto Fernández
41. Sanatorio IOT "Posadas"　　Oscar Voggelmann – Vanesa Quino
42. Sanatorio Otamendi　　Ricardo Perez de la Hoz
43. Sanatorio Posadas "Misiones"　　Jose Romano
44. Sanatorio Prof. Dr. Luis Güemes　　Ezequiel Zaidel - María Inés Sosa Liprandi
45. Sanatorio Racedo "Tucumán"　　Sebastían Galdeano
46. Sanatorio Santa Clara Quilmes　　Agustina Rossi – Paul Vargas
47. Sanatorio de la Trinidad Mitre　　Nicolas Carusso – Guillermo Bortman
48. Sanatorio de la Trinidad Palermo　　Analia Guazzone – Hugo Grancelli
49. Sanatorio de Trinidad de Quilmes　　Ezequiel Besmalinovich – Carmen Miranda
50. Sanatorio de la Trinidad Ramos Mejías　　Esteban Romeo