Etiological Frequency of Pulmonary Hypertension in a Reference Outpatient Clinic in Bahia, Brazil

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Abstract

Background: Pulmonary hypertension (PH) results from several etiologies, with possible geographic influences; however, few studies have described the etiological frequency of PH, especially in our country. It is not clear whether there is an association between etiology and pulmonary pressure level or symptom intensity.

Objectives: 1) to describe the etiological prevalence of PH in the state of Bahia, Brazil; 2) to evaluate whether the etiology is a determinant factor for the pulmonary pressure level; 3) to evaluate whether the etiology is a determinant factor for functional class; 4) to identify the other predictors of pulmonary pressure level and functional class.

Methods: The present was an observational, cross-sectional study that analyzed individuals with PH treated at the Magalhaes Neto Outpatient Clinic, between June 2005 and December 2007. PH was defined as pulmonary artery systolic pressure (PASP) > 40 mmHg measure at the echocardiogram. Patients with chronic obstructive pulmonary disease or ventricular disease were excluded from the study.

Results: A total of 48 patients with PASP = 86 ± 24 mmHg were studied. Regarding the etiology, 42% of the patients were classified as idiopathic, followed by 25% as schistosomatic, 19% as congenital cardiopathy and 10% of chronic pulmonary embolism. A longer time of disease predicted higher pressures in patients with cardiopathy. Individuals with schistosomiasis had the best functional performance when compared to the others (456 ± 58 vs. 299 ± 138 meters, p=0.005). The schistosomatic etiology and younger age presented better functional class.

Conclusions: 1) the idiopathic classification is the most prevalent, with schistosomiasis being the most frequent specific cause in our country; 2) patients with schistosomatic etiology and of younger age present better functional class. 3) the congenital cardiopathy results in a higher pressure level in the pulmonary artery, probably due to the longer duration of the disease. (Arq Bras Cardiol 2009; 93(6):629-636)

Key Words: Hypertension, pulmonary/etiology; schistosomiasis.

Introduction

Pulmonary Hypertension (PH) represents a group of diseases characterized by the continuous increase in the pulmonary vascular pressure, which can progressively result in advanced pictures of right ventricular failure[1]. In 2003, specialists from the World Health organization defined an etiological classification of PH, aiming at contributing with the clinical management of these patients[2].

There are regional differences regarding the etiology of PH; for instance, in France[3], the frequency of PH due to anorexigenic drugs is higher than the one described in the USA[4]. Therefore, it is likely that there is a strong regional influence in PH etiologies, justifying the reproduction of these prevalence studies in our country, where, for instance, Schistosomiasis is considered an endemic disease.

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In Brazil, the only published study addresses the epidemiological profile of these patients in two reference centers in the city of Sao Paulo[5], based on a retrospective analysis of patients' files. As these centers attract patients from several regions of the country, it was considered by the authors as a representative sample of the Brazilian population with PH.

The present study describes the prevalence of the different etiologies of PH in a reference center located in the capital city of the state of Bahia, northeastern Brazil, using a systematic and pre-defined research of the cause of the disease. We also tested the hypothesis that the clinical severity is associated with the disease etiology.

Methods

Study population

The present observational, cross-sectional study was carried out at the Pulmonary Hypertension Outpatient Clinic of Professor Edgar Santos University Hospital of the Federal University of Bahia, one of two outpatient clinics specialized

in PH in the state of Bahia, Brazil. Patients treated at this unit between June 2005 and December 2007, with a diagnosis of PH at the echocardiogram, defined as pulmonary artery systolic pressure (PASP) > 40 mmHg[6], were considered candidate for the study.

After the initial echocardiogram, a second echocardiogram was carried out, preferentially by the same examiner, in order to confirm the diagnostic findings of PH and minimize possible measurement errors described in the first one. This was possible in 70% of the patients included in the sample.

Patients that presented chronic obstructive pulmonary disease (COPD) or left heart failure were not included in the study, as in these circumstances, the PH has a secondary role in the physiopathology and clinical picture. Patients whose etiological investigation of PH was not performed due to lack of follow-up and those who did not agree to participate in the study were also excluded. All participants signed the Free and Informed Consent Form and the study was approved by the Ethics Committee in Research of the Bahiana Foundation for Scientific Development.

Etiological classification

The study participants were submitted to a protocol of etiological investigation, characterized by ultrasound (US) assessment of the upper abdominal region, serological investigation for collagenosis (anti-nuclear factor and rheumatoid factor), serological assessment for HIV and investigation on illicit drug use during the previous ten years. Patients with moderate to high clinical suspicion of chronic pulmonary thromboembolism (PTE), were submitted to perfusion pulmonary scintigraphy (PS), contrasted computed tomography (CT) of the pulmonary arteries or pulmonary arteriography.

As in the echocardiogram, the abdominal US assessments were preferentially directed at a single observer, aiming at the uniformity of the diagnostic evaluation. The applied diagnostic protocol aimed at defining an etiology for the PH.

The investigation started with the diagnostic test related to the etiology with the highest pre-test probability and was followed by the other examinations when the previous one could not clarify the diagnosis.

The etiologies were previously defined according to the following criteria:

1) schistosomiasis: ultrasonographic pattern of periportal fibrosis (echogenic thickening of the portal vein and its branches, thickening of the gallbladder neck or wall), associated to portal hypertension (increased diameter of the portal vein and its branches, presence of collateral veins, splenomegaly and ascites)[7-12];

(2) Portopulmonary Hypertension: PAH associated to portal hypertension (increased diameter of the portal vein and its branches, presence of collateral veins, splenomegaly and ascites), with no characteristics of schistosomiasis. Liver cirrhosis, one of the most common causes of portal hypertension, was defined as: ultrasonographic pattern of increased left lobe, atrophy of the right liver lobe and thickening with nodular irregularity of the liver surface[13].

3) congenital cardiopathy: echocardiographic evidence of conditions that cause left-right shunt with pulmonary hyperflow, such as interatrial communication (IAC), interventricular communication (IVC) and patent ductus arteriosus (PDA). The assessment was carried out through the apical 4-chamber longitudinal and transversal parasternal, subcostal and suprasternal views. A careful study of the interatrial or interventricular septa was performed to detect discontinuities, with corresponding shunt to the color flow mapping, which would define IAC and IVC, respectively. The existence of retrograde flow in the pulmonary artery was investigated, suggestive of PDA;

4) PTE: high-probability PS[14,15], CT of pulmonary arteries or pulmonary arteriography with filling defects;

5) HIV Infection: positive serological test for HIV by ELISA, confirmed by Western-blot;

6) collagenosis: clinical picture associated to positive specific serological tests;

7) anorexigenic drugs: patients using these drugs or with a history of appetite-inhibiting drugs. The patients who did not present clinical or laboratory data that could confirm the presence of any of the above described morbidities were classified as having idiopathic PAH.

Measurement of the pulmonary artery pressure

All patients had a non-invasive PAP estimate by the echocardiogram, adding the value of the maximum gradient of tricuspid failure to the pressure in the right atrium[6,16]. A random subgroup of patients was submitted to right cardiac catheterism, with an invasive measurement of the mean pulmonary artery pressure (MPAP) through a catheter positioned in this place[17-19].

Clinical severity assessment

Considering that this was a cross-sectional study, there was no clinical follow-up to register mortality. The clinical severity was assessed through morbidity criteria, that is, by the characterization of functional class (FC). The latter was qualitatively defined using the New York Heart Association[20] classification as FC I (asymptomatic at ordinary activities), FC II (mild limitation at ordinary activities), FC III (marked limitation at ordinary activities) and FC IV (symptomatic at rest).

Additionally, a 6-minute walk test (6MWT) was performed, using a previously validated protocol[18,21] in order to quantify FC in meters walked during the 6 minutes. Echocardiographic criteria of severity, such as right ventricular diameter, right ventricular systolic dysfunction of at least moderate degree and presence of pericardial effusion were carefully recorded during the echocardiogram. Hemoglobin saturation was assessed by a pulse oximeter and hemoglobin levels were measured in blood.

Data analysis

The prevalence of each cause of PH was expressed as a proportion and 95% confidence interval. To assess whether the etiology was a determinant factor for the pulmonary pressure level, the PASP was compared among the etiological

groups through analysis of variance (ANOVA). To evaluate the association of the etiology with the FC, the numerical value of the 6MWT was compared among the etiological groups through ANOVA. Student's *t* test was used to compare these continuous variables among two groups defined according to the presence or absence of schistosomiasis.

Finally, to identify predictors of clinical severity, the value of the 6MWT was dichotomized at its median and the continuous variables were compared between the two groups by Student's *t* test, whereas the categorical ones were compared by the Chi-square test or Fisher exact test. The same was done regarding the dichotomization of the pulmonary pressure at its median. The logistic regression analysis was used to adjust the predictors of severity for confounding variables. All statistical analyses were carried out with the SPSS (SPSS Inc., Chicago, Il) statistical package, version 12.0 and statistical significance was set at $p < 0.05$.

Results

General characteristics of the sample and etiological prevalence

During the study period, 84 patients with clinical suspicion and signs of PH were assessed at the initial echocardiogram. Of these, 20 did not meet the inclusion criteria: 8 did not have PH confirmed by the second echocardiogram; one presented normal MPAP at the cardiac catheterism; six presented PH caused by COPD and five due to heart or left valvular failure. Sixteen patients did not maintain the necessary follow-up for the confirmatory diagnostic investigation, as well as the etiological definition, to be carried out.

Therefore, the final sample consisted of 48 individuals, with 67% of women, with a mean age of 46 ± 16 years and time of symptom duration of 69 ± 82 months. The mean PASP estimated by the echocardiogram in all patients was 86 ± 24 mmHg, indicating severely elevated levels of pulmonary pressure.

In concordance, the MPAP estimated by the cardiac catheterism in a subgroup of 27 patients was 58 ± 15 mmHg. As for the etiological definition, 20 patients did not have a specific cause identified by the routine assessment, being classified as idiopathic etiology (prevalence of 42%; 95% CI: 28-56%). The schistosomatic etiology was identified in 12 patients (prevalence of 25%; 95% CI: 14-39%), congenital cardiopathy in 9 patients (prevalence of 19%; 95% CI: 10-32%), followed by PTE in 5 patients (prevalence of 10%; 95% CI: 4-22%). A 48-year-old woman received the diagnosis of collagenosis (dermatomyositis) and another 49-year-old woman was diagnosed as having portopulmonary hypertension secondary to liver cirrhosis (Figure 1).

Among the 20 patients classified as having the idiopathic etiology, six did not undergo the complete assessment through the planned examinations. In this group of 20 patients, 4 did not undergo the abdominal US, 3 did not undergo serological tests for collagenosis and HIV and another 3 did not undergo PTE investigation. The congenital cardiopathies were distributed as follows: 6 cases of IAC, 2 cases of IVC and one case of PDA. Of the 5 cases with PTE, 2 had the diagnosis confirmed by high-probability PS and one by chest CT. The diagnosis was confirmed by both PS and CT in one patient and in another three by the combination of three examinations: PS, CT and pulmonary arteriography. When compared regarding the demographic characteristics, the patients presented a predominance of the female gender, except for the schistosomatic etiology, which presented a 42% rate of female individuals, when compared to 75% in the other groups considered jointly ($p = 0.03$). A longer time of disease was observed in patients with congenital cardiopathy (171 ± 139 months), when compared to the others (54 ± 62 *vs.* 54 ± 37 *vs.* 31 ± 21 months, $p = 0.006$). The other characteristics were similar in all groups. It is noteworthy the fact that there was no difference among these groups regarding the frequency of sildenafil therapy (Table 1).

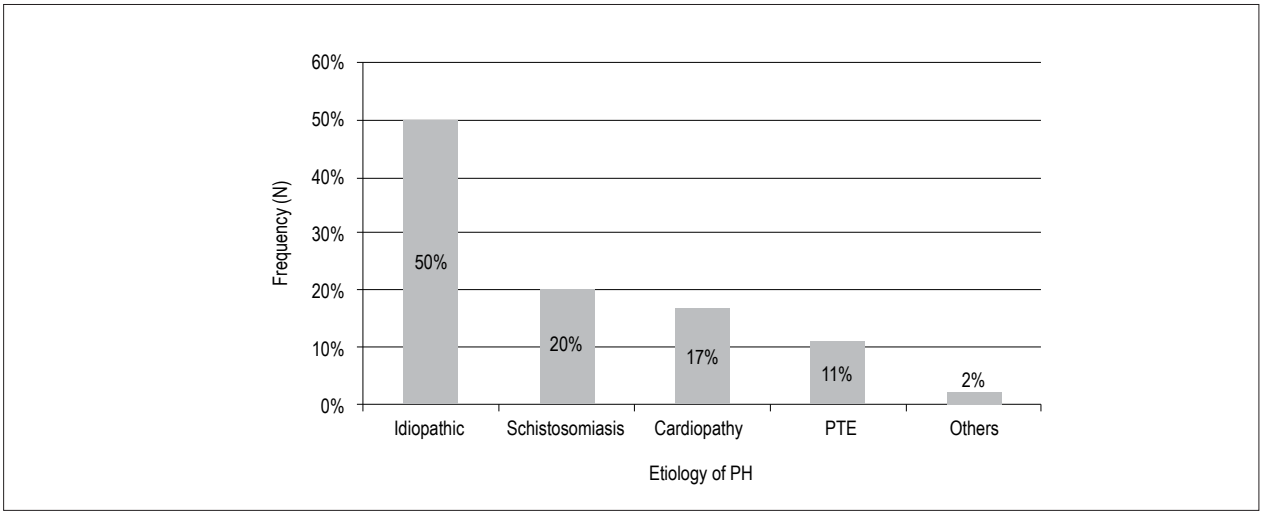

Figure 1 - Bar chart representing the etiological prevalence of PH in relative frequency. The numbers above the bars represent the absolute number of patients in each group. Cardiopathy: congenital cardiopathy; PTE: pulmonary thromboembolism. Others: collagenosis and portopulmonary hypertension.

Influence of etiology on pulmonary pressure and functional class

There was no statistical difference in the PASP levels measured by the echocardiogram among patients with idiopathic (79 ± 23 mmHg), schistosomatic (95 ± 20 mmHg), congenital cardiopathy (94 ± 32 mmHg) or embolic (83 ± 18 mmHg) etiology, in spite of an apparent superiority in patients with congenital cardiopathy and schistosomiasis (p = 0.18) (Figure 2). Collagenosis and portopulmonary hypertension did not participate in this comparison, as each one of these etiologies was represented by only one patient.

Cardiac catheterism was performed in more than half of the idiopathic, schistosomatic and congenital patients. When comparing these three groups regarding the MPAP measured by catheterism, it can be observed that patients with congenital cardiopathy presented a higher pressure level (71 ± 12 mmHg) when compared to idiopathic (53 ± 14 mmHg) and schistosomatic (53 ± 14 mmHg) etiologies, with statistical significance (p = 0.02) (Figure 3 - panel A). Pulmonary thromboembolism did not participate in this comparison, as only one patient underwent catheterism. When patients with congenital cardiopathy were compared to the other etiologies considered as a group, the MPAP difference was highly significant (71 ± 12 mmHg *vs*. 54 ± 13 mmHg; p = 0.005) (Figure 3 - panel B). After adjustment for time of disease, congenital cardiopathy lost its association with MPAP (p = 0.79), indicating that probably, this condition presents higher pressure levels due to a longer time of disease.

Regarding the FC, individuals with the schistosomatic etiology presented a trend toward a better a performance at the 6MWT (456 ± 58 meters), when compared to patients with idiopathic (291 ± 135 metros), cardiopathy (320 ± 132 meters) or embolic (241 ± 262 metros) etiologies – p = 0.06 (Figure 4 - panel A). In concordance, when we compare individuals with schistosomiasis with the others, the performance at the 6MWT was significantly higher in this group (456 ± 58 meters) when compared to patients without schistosomiasis analyzed jointly (299 ± 138 meters; p = 0.005) (Figure 4 - panel B).

On the other hand, the NYHA classification did not reflect the FC in the same sense, without the predominance of less limited patients (functional class ≤ II) in individuals with schistosomiasis in relation to the other patients (33% *vs*. 36% ; p = 0.86).

Study of other clinical predictors of pulmonary pressure and functional class

To study the predictors of pulmonary pressure, the patients were dichotomized according to the PASP above or below the median and their characteristics were compared. Only the age variable presented a difference among the groups, being younger in the group with the highest pulmonary pressure (42±16 yrs *vs*. 51±14 yrs; p = 0.05) (Table 2). Considering that congenital cardiopathy is associated with a higher level of pulmonary pressure, after adjustment for this etiology by logistic regression, age lost its association with PASP dichotomized at the median (p = 0.97). When

Table 1 - Comparison of the demographic and clinical characteristics between the etiologies of pulmonary hypertension.

	Idiopathic	Schistosomiasis	Cardiopathy	PTE	P value
Sample size	20	12	9	5	
Age (years)	48 ± 19	41 ± 9	43 ± 17	54 ± 17	0.52
Female sex	65%	42%	78%	100%	0.12
Time of disease (months)	54 ± 62	54 ± 37	171 ± 139	31 ± 21	0.006
PASP (mmHg)	79 ± 23	95 ± 20	94 ± 32	83 ± 18	0.18
Catheterism performed	10	8	7	1	
MPAP (mmHg)	52 ± 14	53 ± 14	71 ± 12	58	0.08
6MWT performed	13	8	5	2	
6MWT (meters)	291 ± 135	456 ± 58	320 ± 132	241 ± 262	0.06
Functional Class III-IV	65%	67%	56%	80%	0.90
Hb saturation (%)	93 ± 7	95 ± 2	89 ± 8	93 ± 5	0.30
Serum Hb (mg/dl)	15 ± 1.7	14 ± 3.1	16 ± 2.0	14 ± 4.2	0.31
RV systolic dysfunction	55%	42%	67%	86%	0.86
RV diameter (mm)	37 ± 12	39 ± 6	35 ± 20	40 ± 9	0.92
Sildenafil use	80%	75%	78%	100%	0.65

PASP - pulmonary artery systolic pressure, MPAP - mean pulmonary artery pressure, 6MWT - six-minute walk test, Hb saturation - hemoglobin saturation measured by digital oximetry; RV - right ventricle. Means were compared among the four groups by ANOVA and the proportions by the Chi-square test.

the patients were dichotomized by the median of the MPAP values, the only difference was a longer time of disease, as previously described. Additionally, the use of sildenafil was more frequent in patients with higher levels of MPAP (100% *vs*. 83%; p = 0.02) (Table 3). Therefore, in addition to the congenital cardiopathy, which predicts pulmonary pressure via longer time of disease, no other predictor of pulmonary pressure was identified.

As for the FC, there was no difference regarding the clinical characteristics when the patients were divided according to the NYHA classification. When analyzing the subgroup of 29 patients submitted to the 6MWT, there was no linear correlation between the PASP levels and the distance walked during the test (r = 0.12; p = 0.56). Similarly, individuals who walked distances that were above the median (> 369 meters) presented PASP levels similar to those below the median (87 ± 25 mm/Hg *vs*. 88 ± 30 mmHg; p = 0.91), suggesting that the pressure level is not determinant for the FC. Regarding the other clinical characteristics, individuals in the group above the median at the 6MWT were younger than the others (39±13 yrs *vs*. 52±18 yrs; p= 0.02), whereas the gender distribution, time of symptoms, use of sildenafil and hemoglobin saturation were similar in the two groups (Table 4). Thus, age and schistosomatic etiology were significant predictors of FC. The logistic regression analysis shows that the schistosomatic etiology is a predictor of the 6MWT outcome above the median (p = 0.043), regardless of the age. Similarly, age shows a trend toward independent prediction (p = 0.056).

Discussion

The present is the first Brazilian study to systematically evaluate, using pre-determined diagnostic criteria, the prevalence of the different etiologies of PH in a reference center. There are two main findings regarding this question: 1) the most frequent etiological classification is the idiopathic one, with a specific cause being found in 58% of the patients; 2) the specific cause with the highest prevalence is schistosomiasis, which is highly relevant information for the public health system. When the influence of the etiology on the severity of the disease was assessed, it was observed that higher levels of pulmonary pressure are present in patients with congenital cardiopathy, probably due to a longer time of disease. Additionally, patients with schistosomiasis presented better FC when compared to the other etiologies.

The prevalence of schistosomiasis in 25% of the cases constitutes important epidemiological information. This

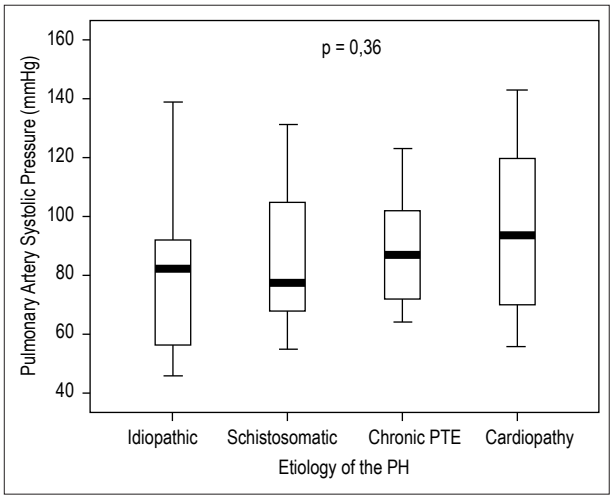

Figure 2. - Box-plots of PASP measurements evaluated by echocardiogram in each etiological group, demonstrating similar distribution of values among the groups. P value was calculated by analysis of variance (ANOVA).

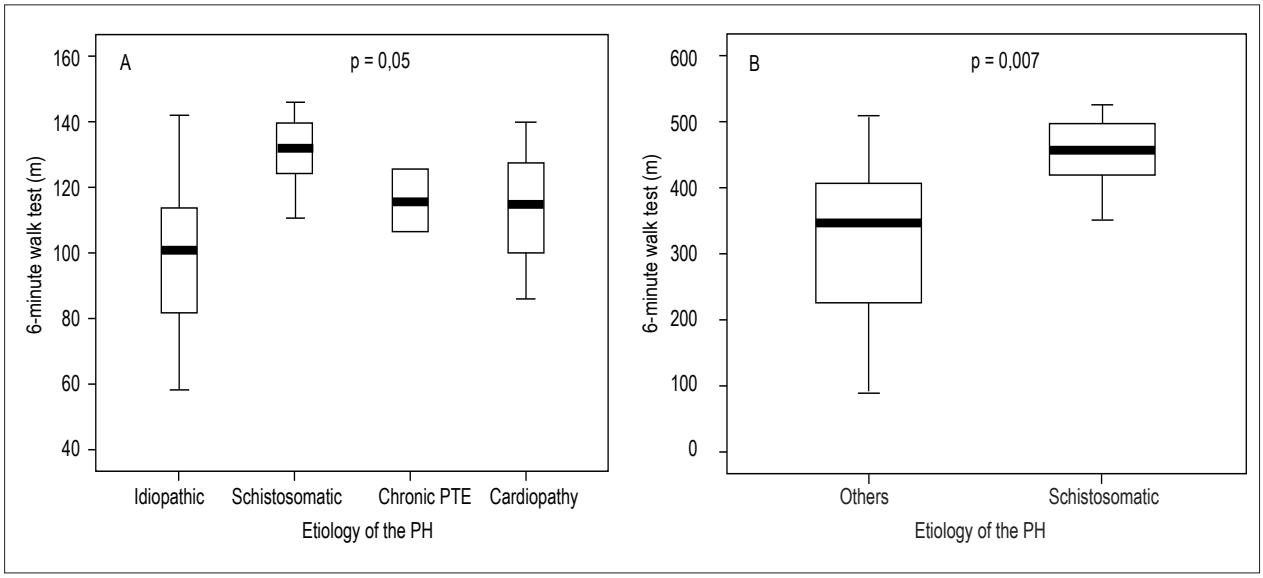

Figure 3 - A: Box-plots of MPAP measurements evaluated by right cardiac catheterism among the causes PH. P value was calculated by ANOVA. Figure 3B: Box-plots of the MPAP measurements of patient with congenital cardiopathy compared to the other etiologies. P value was calculated by Student's t test.

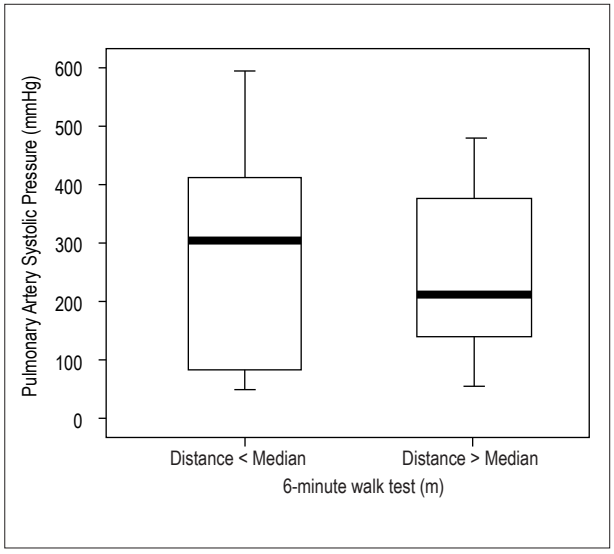

Figure 4 - Panel A: Box-plots of the 6MWT compared among the etiological groups, showing a better functional capacity in the group with schistosomatic etiology. P value was calculated by ANOVA. Panel B: Box-plots of the comparison of the distance walked between the group with schistosomatic cause and the other, grouped, etiologies. P value was calculated by Student's t test.

Table 2 - Clinical and demographic characteristics in the two groups dichotomized by the median of the pulmonary artery systolic pressure.

	Pulmonary Artery Systolic Pressure		
Clinical Characteristics	Value < median	Value ≥ median	p value
Age (years)	51 ± 14	42 ± 16	0.05
Female sex	62%	70%	0.54
Time of disease (mos.)	50 ± 34	84 ± 103	0.17
Sildenafil use	76%	81%	0.65
Hb saturation (%)	94 ± 6	92 ± 7	0.23
Hemoglobin (mg/dl)	14 ± 3	15 ± 3	0.63

Hb - hemoglobin

Table 3 - Clinical characteristics compared with the mean pulmonary artery pressure according to the median.

	Mean Pulmonary Artery Pressure (n=27)		
Clinical Characteristics	Value < median	Value ≥ median	p Value
Frequency	12	15	
Age (mean)	47 ± 12	42 ± 14	0.32
Time of disease (mos.)	51 ± 36	131 ± 117	0.03
Female sex	50%	80%	0.26
Hb saturation (%)	93 ± 7	91 ± 7	0.51
6MWT (meters)	376 ± 138	376 ± 129	1.0
Functional Class III-IV	58%	60%	0.68
Serum Hb (mg/dl)	15 ± 1.5	16 ± 2.3	0.66
Sildenafil use	83%	100%	0.02

Hb - hemoglobin; 6MWT - six-minute walk test.

Table 4 - Clinical and demographic characteristics according to the 6-minute walk test dichotomized by the median.

	Distance at the 6-Minute Walk Test (n= 27)		
Clinical Characteristics	Value < median	Value ≥ median	p Value
Age (yrs)	52 ± 13	39 ± 13	0.02
Female sex	11 (79%)	10 (67%)	0.47
Time of disease (months)	66 ± 83	84 ± 92	0.59
Sildenafil use	12 (86%)	13 (87%)	0.94
PASP Echo (mmHg)	86 ± 22	85 ± 20	0.88
Invasive MPAP (mmHg)	55 ± 11	60 ± 16	0.51
Hb Saturation (%)	93 ± 6	95 ± 2	0.16
Hemoglobin (mg/dl)	15 ± 1	14 ± 2	0.17

PASP - pulmonary artery systolic pressure; MPAP - mean pulmonary artery pressure; Hb: hemoglobin.

finding suggests that, in our country, it is necessary to request an abdominal US for all patients with PH of unknown cause. Our frequency of schistosomiasis is in agreement with the 30% found by Lapa and cols.[5], who describe the characteristics of patients with PAH in two centers (University of Sao Paulo and Federal University of Sao Paulo), using ultrasonography, rectal biopsy and parasitological examination of stool for the diagnosis of *Schistosoma mansoni* infestation. The use of US in the diagnosis of the chronic form of hepatosplenic schistosomiasis has been broadly documented in the literature[7,8,10,22], whereas the parasitological examination of stool has limited value in this situation[12,23]. The rectal or bladder biopsies are invasive diagnostic procedures reserved for cases of acute infection with no confirmation of the presence of eggs in the stool or urine[12,23]. These data justify the non-inclusion of the rectal biopsy and the parasitological examination of stool in our assessment. It is worth mentioning that 72% of the patients with negative US presented positive epidemiology for schistosomiasis, demonstrating the low specificity of the epidemiological information for the diagnosis of the schistosomatic etiology in our country.

In the world, few studies have described the prevalence of the causes of PAH[3-5,24,25]. Particularly in Brazil, only Lapa and cols. have described the etiologies of PH[5]. In agreement with the findings of the present study, the description of the idiopathic form of the disease occurred in half of the cases. As it was a retrospective study (review of patients' files), the systematization of the etiological investigation and

the previous definition of the diagnostic criteria indicate an original aspect of our study. When comparing it with data from the international literature, it is noteworthy our peculiarity regarding the elevated presence of schistosomatic etiology.

In addition to the description of the etiological prevalence, we evaluated the determinants of severity, demonstrating a higher level of pulmonary pressure among the patients with cardiopathy submitted to an invasive measurement of the pulmonary pressure. These patients also presented a longer time of disease, probably due to the fact that this is a group of pathologies with progressive complications in individuals with severe cardiac alterations from birth. After adjusting for this variable, the association between elevated levels of pulmonary pressure in patients with congenital cardiopathy was no longer observed, indicating that the factor that primarily influences the magnitude of the hypertension is the time of the disease. In spite of higher pulmonary pressure, the patients with cardiopathies did not present a worse FC, suggesting that the chronicity of this condition allows the occurrence of adaptive mechanisms. Regarding the determinants of the clinical manifestation intensity, in addition to an inverse association with age, individuals presenting PH with schistosomatic etiology had an association with better performance at the 6MWT.

One can consider that it is not due to the fact that the patients with schistosomiasis are younger, as the multivariate analysis showed no association between this etiology and the 6MWT, regardless of age. It is possible that younger patients present physiological adaptation mechanisms to the alterations in pulmonary circulation, allowing a better functional performance in the early stages of the disease. The reason for a better performance of an individual with PH of schistosomatic etiology remains unclear and it needs to be investigated in future studies. No other FC predictor was identified in this sample, not even the pulmonary pressure value influenced the patients' level of limitation. It is worth mentioning that this observation can be applied only to individuals with severe PH, the population of our study. We cannot rule out a possible association between pressure and FC if individuals presenting a broader spectrum of pulmonary pressure values were evaluated.

Some limitations of the present study must be acknowledged: 1) the small sample size leads to broad confidence intervals in the estimate of etiological prevalence, that is, moderate precision. Such limitation reflects the small prevalence of PAH in the general population, which causes even large reference centers to lack large cohorts. Additionally, the fact that we identified only two predictors of severity might be related to the small sample size; 2) the prevalence found in a specific outpatient clinic does not necessarily reflect the prevalence in the general population, due to potential patients' reference biases. However, such biases might have been decreased by the requirement by the State Secretary of Health of the State of Bahia that individuals with PAH be registered in our outpatient clinic, so that the pharmacological treatment (sildenafil) can be offered by the public health system. On the other hand, in cases of rare diseases such as this, it is not feasible to describe the etiological prevalence based on representative samples of the general population and such limitation is an intrinsic condition of any study on PH; 3) of the total of 20 patients classified as idiopathic, six did not undergo all examinations used in the etiological definition of the disease. This might have overestimated the number of idiopathic individuals; however, even if these six patients had specific etiologies for the PH, the idiopathic etiology would still be the most frequent cause. Furthermore, the percentage of 42% classified as idiopathic is very close to that observed by Humpert et al[3] who, in a population of 674 patients with PAH, did not find a defined etiology in 264 (39%) of them; 4) contrarily to the cross-sectional characteristic of the present study, the best investigative model to evaluate determinants of severity would be a prospective cohort, aiming at identifying clinical event predictors, such as death; 5) the diagnosis of PH was defined by the echocardiogram, although the gold standard is the invasive measurement by cardiac catheterism. However, the echocardiogram presents satisfactory accuracy when compared to the data of right cardiac catheterism[16,26,27], making the possibility of diagnostic confirmation error in the present study unlikely.

Our sample consists of cases with severe hypertension and significant functional limitation, with a predominance of young adults and female gender. Such characteristics are in agreement with previous studies[3-5,24,25]. Thus, we believe to have contributed to establish an association between the PH and several comorbidities present in our country. Future studies with this population are mandatory, in the sense of defining important questions such as survival, impact of specific therapies for PH associated with these etiologies, as well as a better understanding regarding the physiopathological mechanisms in prevalent forms in our country, such as schistosomiasis.

Conclusions

Regarding the etiological prevalence of PH in our country, the idiopathic classification is the most prevalent one. Among the identifiable causes, schistosomiasis is the most prevalent one. Patients whose etiology is congenital cardiopathy present a higher level of pulmonary artery pressure, when compared to the other patients, probably due to a longer time of disease. No other predictors of pulmonary pressure levels were identified.

As for the FC, the schistosomatic etiology presents the best performance when compared to the others and the younger the patient, the better the FC. The level of pulmonary pressure does not influence FC.

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