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Brazilian pediatric research groups, lines of research, and main areas of activity☆

Priscila H.A. Oliveira[a,*], Mariana G. Pinheiro[a], Larissa A. Isquierdo[a], Ricardo Sukiennik[a], Lucia C. Pellanda[a,b]

[a] *Universidade Federal de Ciências da Saúde de Porto Alegre (UFCSPA), Porto Alegre, RS, Brazil*
[b] *Instituto de Cardiologia, Fundação Universitária de Cardiologia, Porto Alegre, RS, Brazil*

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Abstract
Objectives: The Brazilian scientific production in the pediatrics field has been increasing significantly. It is important to identify the distribution and activity of these groups in the country and the main study areas, contributing with data for better resource allocation by institutions.
Methods: An active research was conducted in the National Council of Technological and Scientific Development (Conselho Nacional de Desenvolvimento Científico e Tecnológico [CNPq]) website, using as filters the macro area of the research group (Health Sciences), the area (Medicine), and descriptors related to pediatrics. Research lines and main area of pediatric research groups were classified according to the subject predominantly studied by each group. The scientific production of the leader of the pediatric research group between 2011 and 2014 was also analyzed.
Results: Most pediatric research groups in Brazil have more than five years of activity and are concentrated in the Southeast and South regions of the country; São Paulo, Rio Grande do Sul, and Minas Gerais are the states with most groups. Of the 132 specific pediatric research groups analyzed, 14.4% have lines of research in multiple areas and 11.4% in child and adolescent health. Among the 585 lines of research of these groups, the most prevalent areas were: oncology, infectious diseases, epidemiology, and gastroenterology.
Conclusions: The pediatric research groups in Brazil have relevant scientific production, including works published in international publications, and are concentrated in regions with higher socioeconomic index. Most groups registered in CNPq started their activity in the last five years (46%), reflecting the recent growth of scientific production in this area.

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* Corresponding author.
E-mails: priscilaraujo_@hotmail.com, priscilaraujoh@gmail.com (P.H.A. Oliveira).

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PALAVRAS-CHAVE
Pediatria;
Pesquisa;
Grupos de pesquisa;
Linha de pesquisa

Grupos e linhas de pesquisa pediátrica no Brasil e suas principais áreas de atuação

Resumo
Objetivos: A produção científica brasileira na área da pediatria vem aumentando significativamente. Diante deste quadro, é importante identificar a distribuição e atividade destes grupos no país e as principais áreas estudadas, contribuindo com dados para que as instituições possam alocar melhor seus recursos.
Métodos: Foi realizada pesquisa ativa no site do Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq), utilizando como filtros a grande área do grupo - Ciências da Saúde, área–Medicina e descritores relacionados à pediatria. Posteriormente foram classificadas as linhas de pesquisa e área de atuação principal dos grupos de acordo com os temas prevalentemente estudados. Avaliou-se também a produção científica entre 2011 e 2014 dos coordenadores dos grupos de pesquisa pediátrica pelo currículo Lattes.
Resultados: A maioria dos grupos de pesquisa pediátrica do Brasil possui mais de cinco anos de atividade e estão concentrados nas regiões Sudeste e Sul do país, sendo São Paulo, Rio Grande do Sul e Minas Gerais, os principais Estados. Dos 132 grupos específicos de pesquisa pediátrica cadastrados, 14,4% têm linhas de pesquisa em múltiplas áreas e 11,4% em saúde da criança e do adolescente. Entre as 585 linhas de pesquisa desses grupos, são predominantes as áreas: oncologia, infectologia, epidemiologia e gastroenterologia.
Conclusões: Os grupos de pesquisa pediátrica do Brasil têm produção relevante, inclusive internacional, e estão concentrados nas regiões de maior índice socioeconômico. Grande parte dos grupos cadastrados no CNPq entraram em atividade nos últimos cinco anos (46%), evidenciando crescimento recente da produção científica nesta área.

Introduction

The evolution of the scientific production volume in Brazil in recent years can be easily verified based on indicators created to monitor this growth, which has attained international recognition.[1,2] This scenario is associated with the modernization of research institutions and national funding agencies such as the National Council for Scientific and Technological Development (Conselho Nacional de Desenvolvimento Científico e Tecnológico [CNPq]) and the Coordination of Improvement of Higher Education Personnel (Coordenação de Aperfeiçoamento de Pessoal de Nível Superior [CAPES]), both responsible for investments in research and post-graduate programs in all 27 Brazilian states, in addition to state and institutional agencies.[3,4]

Between 1990 and 2004, Brazilian indexed articles increased by 404%, whereas in the number of articles related to pediatrics increased by 61%, which constitutes encouragement for the continued growth in the area of pediatrics.[5,6] Between 1984 and 2004, there was a 5.6-fold increase, i.e., more than three times the global increase (1.7-fold). In 2001, Brazil ranked 18th in the global ranking of Science and Technology.[7] Particularly in the fields of child and adolescent health, there is a growing increase in publications and citations of articles from Brazil. However, there are still barriers to conducting studies in this age group, a matter that hinders the formation of new researchers and the area growth.

In this context, the systematic evaluation of groups and lines of research, researchers, universities, and regions, is an activity that has been relevant for scientists and administrators. Furthermore, funding agencies for scientific production need methods to improve the distribution of resources and strategies regarding different organs, allowing for the restructuring of research in specific areas and the increase in scientific production in Brazil.

This study aims to describe the demographic characteristics and the topics studied by medical research groups of Brazil registered in CNPq that have pediatrics as their area of activity. This knowledge is important to identify active areas with greater growth potential and those that need more incentive and funding.

Methods

This study was conducted through an active search in the Brazilian Research Group Directory on the CNPq website between the months of March and April of 2013, using as filters the macro area of the research group (Health Sciences), and the area (Medicine). The search was also guided by the following descriptors: pediatrics, child, infantile, childhood, neonate, adolescence, child's health, neonatology, newborn, juvenile, young, perinatal, perinatology, fetal, infant, growth, puberty, and pubertal.

Microsoft Excel 2010 (Microsoft®, NY, USA) was used to assemble a database with data collected from the research groups: group name; whether it was certified by the institution; year of creation; date of the last update; group leaders; main area; institution; city; state; home page; effects of the group researches; number of researchers, technicians and students; and research lines.

Based on the created database, all groups that did not have any line of research related to pediatrics were excluded. Then, a screening was performed based on the titles of the research groups, and a separate table was created for those that did not have keywords related to pediatrics in their titles. Therefore, two tables are created: one containing groups with specific pediatrics names and another that included groups without specific names.

The lines of pediatric research of all groups were classified separately according to the area of activity. For this classification of research lines, two factors were taken into account: first, the name of the research group; secondly, each line of pediatric research had its title analyzed by the authors of the present study, and the areas of activity were determined through keywords contained in it.

Subsequently, the main areas of activity of the pediatric research groups in the country were classified according to their main subjects, as reported by the group. Activity areas were classified into large groups to facilitate graphical analysis. The following areas were grouped among pediatric specialties: cardiology, dermatology, imaging diagnosis, endocrinology, gastroenterology, gynecology, medical genetics, hematology, hepatology, homeopathy, sports medicine, infectious diseases, immunology, critical care, nephrology, fetal medicine, neonatology, ophthalmology, oncology, otolaryngology, pneumology, psychiatry, rheumatology, neurology, and urology. The broad group of general pediatrics included development and behavior, acute and chronic diseases, child care, and child and adolescent health. The multidisciplinary areas included primary care and collective health, oral diseases, health policies, multiple areas, and nutrition. Other groups could not be included in any of the aforementioned groups, such as epidemiology, medical education, quality of life, and bioethics.

The ''multiple areas'' classification had as criterion the group's involvement or line of research in more than two areas. The ''child and adolescent health'' classification included groups and lines of research that were related to different topics, such as: factors associated with morbidity and mortality of children and adolescents; safety; aspects of emotional, physical and intellectual care; and socioenvironmental factors. The ''epidemiology'' classification involved several areas, among them: oncology, pneumology, infectious diseases, cardiology, primary care, medical genetics, hematology, neonatology, neurology, nutrition, perinatology, psychiatry, and child and adolescent health. After the classification of all groups and lines, their quantitative and distribution analyses in Brazil were performed.

To obtain data on the current activity of the selected groups, based on their scientific research production, a review of the Lattes curriculum of all groups' coordinators was performed using specific names of pediatric research, assessing production indicators between 2011 and 2014. A database was created using Microsoft Excel 2010 containing information grouped by state, informing the total number of researchers that coordinate pediatric research groups and the total number of full-text manuscripts published in journals during that period.

This study was approved by the Ethics Committee in Research of Fundação Universitária de Cardiologia of Rio Grande do Sul (UP 5011/14).

Results

The flowchart in Fig. 1 presents the study design. A total of 485 groups were retrieved from the CNPq database according to the specified criteria. These were divided into two subgroups, one containing only those with a specific title in pediatrics and the other containing groups without specific names. The latter was further refined according to research lines, excluding those whose subject was not related to pediatrics.

A general analysis of the groups classified as specific in pediatrics, showing the number of groups and research lines by state, mean number of researchers per group, number of students, time of activity, number of public and private institutions, and complete articles published in indexed journals is shown in Table 1.

Based on the analysis of the Brazilian regions, it was observed that most groups of pediatric research in Brazil have more than five years of activity (Fig. 2) and are concentrated in the Southeast (50%) and South (27%) regions of the country, with the states of São Paulo, Rio Grande do Sul, and Minas Gerais accounting for most of these groups.

Among the research groups with specific names in pediatrics, there was a predominance of those with pediatric specialty themes (n = 73, 56%). Groups included in the ''Others'' category (into which topics such as epidemiology, medical education, and bioethics were allocated) totaled three groups (2%). Regarding the sub-classification of these groups, there was a predominance of those involved in multiple areas, with 14.4%; followed by groups involved with child and adolescent health, with 11.4%; 5.3% in perinatology, gastroenterology, neonatology, and oncology; and 4.5% in cardiology and neurology.

The distribution of pediatric areas in research lines is shown in Table 2. In the 585 research lines of groups with specific names of pediatrics, it was observed that the area of oncology represented 8.21% of the lines of this group; infectious diseases represented 7.35%, and epidemiological research, 5.81%. Moreover, subdividing the line of epidemiology, it was observed that the theme oncology represented 14.7% of these lines, followed by infectious diseases and pneumology, with 11.8% each.

When analyzing the 85 groups without specific names of pediatrics, a total of 117 lines of pediatric research were observed: 21% comprised child and adolescent health; 18%, fetal medicine; and 14%, endocrinology.

Regarding the scientific activity of the research groups, the data collected from the information contained in the Lattes curriculum of the group coordinators demonstrated that, between 2011 and April and 2014, most researchers remained active (Table 1).

Discussion

The present study, based on the Research Group Directory of CNPq regarding the time of activity of pediatric research groups, reinforced the fact that the area has been growing in Brazil. Half of the research groups (46%) are recent, with less than five years of registration, and only 5% have been active in research for more than 30 years.

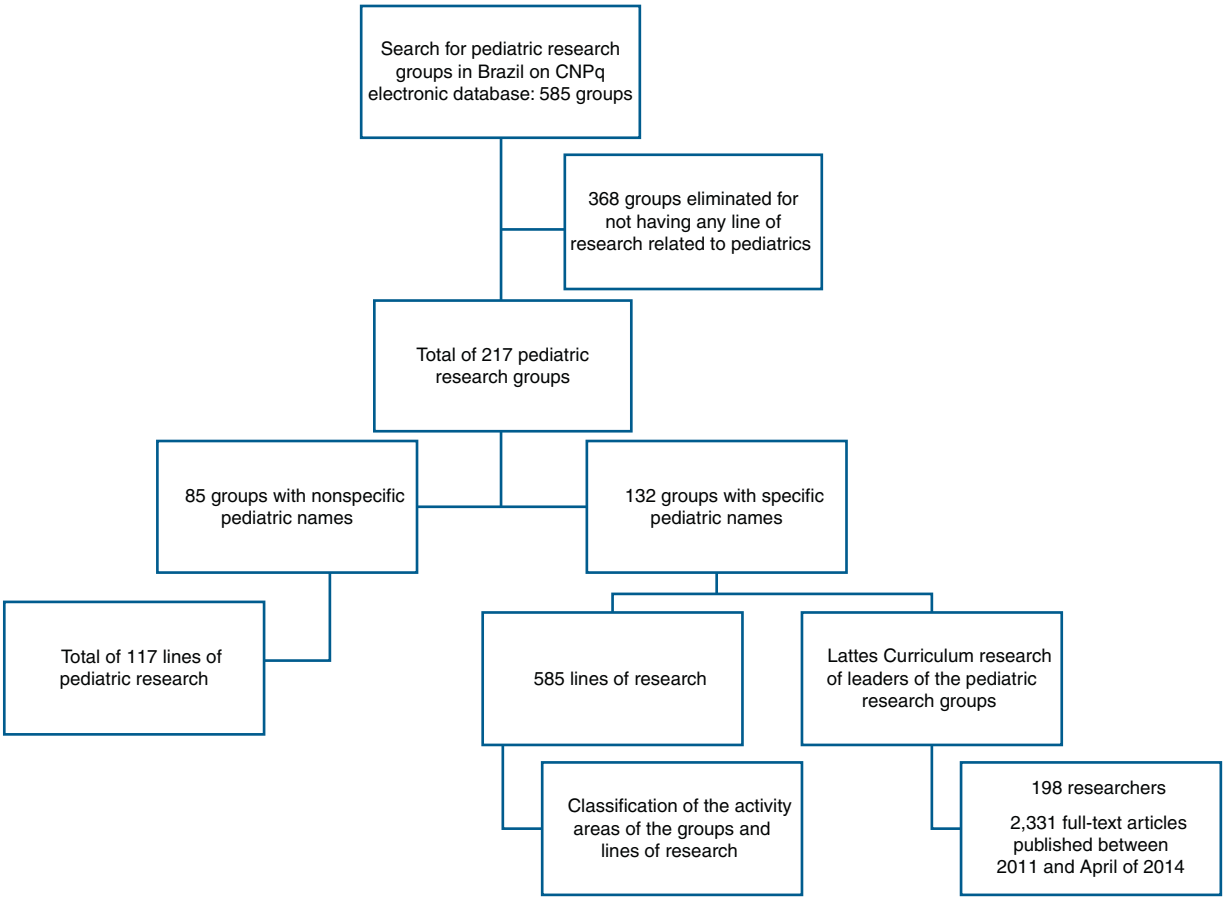

Figure 1 Study design.

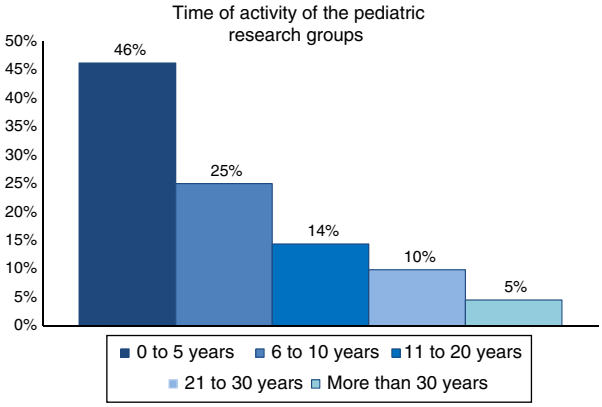

Figure 2 Time of activity of the pediatric research groups.

However, as expected, the situation of inequality experienced by the country also permeates the scientific scenario. Scientific research in the field of pediatrics is still concentrated in areas of higher socioeconomic index, in the South-Southeast regions. It is noteworthy that in the Southeast region, responsible for 50% of researches, approximately 25% correspond to the state of São Paulo; and in the South (27%), 24% correspond to the state of Rio Grande do Sul.

This distribution reflects political, historical, and social determinants that significantly contribute to accentuate the scenario of inequality in the country, far beyond the observed discrepancies in knowledge production. One of the negative consequences of this imbalance in research production is precisely the perpetuation of inequalities in the population's health, as strong research institutions can have a significant impact on the communities where they are located. The most extreme example is the neglected diseases, which receive fewer resources and less attention from researchers, perpetuating the cycle of unfavorable outcomes.

The study found difficulties to assess the specific scientific production of pediatric research groups, as this information is not available in the CNPq database. However, a way to indirectly evaluate the group activity was to collect information on the scientific production of the research group leaders through the Lattes Platform. Of the 2,331 articles published in journals between 2011 and April of 2014, 46.80% were produced in the State of São Paulo; 18.53%, in Rio Grande do Sul; and 14.58%, in Minas Gerais. The data demonstrate that the scientific production in pediatrics in the country follows the concentration of groups registered in CNPq, as the largest number of publications in this period occurred in the Southeast and South regions, which have the highest number of groups with specific names in pediatric research.

When analyzing the groups with specific names of pediatrics, it was observed that 14.4% of them were responsible

Table 1 Description of the pediatric research groups and number of publications[a] by their coordinators.

General analysis of the specific groups of pediatric research								
State	Groups	Lines of research	Mean number of researchers per group	Mean number of students per group	Mean number of years of activity	Public Institutions	Private Institutions	Full-text articles published in journals
AL	1	7	12	24	14	1	0	0
AM	1	3	6	25	4	1	0	3
BA	6	38	12.8	7.6	9.3	5	1	75
DF	3	8	8	5	5.3	3	0	23
MA	3	16	20	16.3	10.6	3	0	104
MG	18	82	8	5.6	13.5	17	1	340
MS	1	15	7	4	9	1	0	21
PA	6	9	3.5	1.8	5.1	6	0	4
PB	2	5	5.5	9.5	4.5	2	0	4
PE	6	21	7.8	9.5	8.8	5	1	101
PR	3	25	10	23.3	6.6	3	0	24
RJ	11	53	10.2	8	12.6	11	0	83
RN	1	6	7	13	13	1	0	3
RS	31	142	6.1	6.3	10.4	24	7	432
SC	1	5	5	4	4	0	1	2
SE	1	3	11	9	9	1	0	21
SP	37	147	7.2	8.5	15.6	33	4	1091
Total	132	585	7.8	7.9	11.7	117	15	2331

[a] Full-text articles published in journals by the leaders of the pediatric research groups between 2011 and March of 2014.

Table 2 Number of lines of pediatric research per area of activity.

Number of lines of pediatric research per area of activity			
Pediatric Specialties		General Pediatrics	
Cardiology	22	Development and Behavior	19
Dermatology	13	Acute and chronic diseases	9
Imaging diagnosis	4	Perinatology	21
Endocrinology	21	Child Care	19
Gastroenterology	33	Child and Adolescent Health	30
Gynecology	1		
Medical Genetics	18	TOTAL	98
Hematology	5		
Hepatology	3	Multidisciplinary	
Homeopathy	1	Primary Care and Collective Health	11
Infectology	43	Oral disease	2
Immunology	18	Health Policies	9
Sports Medicine	1	Multiple areas	0
Critical Care Medicine	8	Nutrition	20
Fetal Medicine	21		
Nephrology	11	TOTAL	42
Neonatology	23		
Neurology	33	Others	
Oncology	48	Bioethics	2
Otorhinolaryngology	5	Medical Education	3
Ophthalmology	13	Epidemiology	34
Psychiatry	15	Quality of life	7
Pneumology	23	TOTAL	46
Rheumatology	15		
Urology	1		
TOTAL	399		

for research in more than one area, showing a broader involvement. The opposite was observed in the lines of research that focused on one area; oncology was the main topic of most researches, 8.21%. It is noteworthy that the epidemiology classification included cardiology, oncology, infectious disease, pneumology, thus leaving these areas out of the statistics of specific areas.

The study also verified a discrepancy between the main clinical specialty studied in the pediatric research lines (oncology) and the apparent main cause of death in childhood in Brazil, which are conditions originating in the perinatal period (74%), according to Datasus 2011.[8] The large amount of research areas involved in oncology can be explained by the fact that this area is increasingly growing and is closely related with the development of drugs and other devices, which also contribute attract more public and private investment to the area. The incidence of neoplastic diseases is increasing, according to estimates of National Cancer Institute (Instituto Nacional do Câncer [INCA]) and the Ministry of Health; in 2014, Brazil will have approximately 576,000 new cases of cancer diagnosed.[9]

According to data from INCA, between 2001 and 2005, mortality due to cancer in Brazil was the fourth cause of death in boys; external causes, ill-defined causes, and causes related to the respiratory system were the three main causes. In girls, mortality from cancer was the fifth cause of death; external causes, causes related to the respiratory system, ill-defined causes, and infectious/parasitic diseases were the four main causes. In the age groups of 5-9 years and 10-14 years, neoplasms are the second cause of death among boys and girls; external causes are the main cause. The same situation occurs for girls between 15-18 years. This finding implies in a correlation between this death profile and the specific organization of health services, which brings new challenges to cancer care and the Brazilian Unified Health System (Sistema Único de Saúde [SUS]).[9]

It is also important to observe that the areas of primary care and collective health, with 11 lines of research in the multidisciplinary area (Table 2), accounted for a relatively small insertion when compared to specialties in general. The same trend was observed in the study ''The medical and biomedical research in Brazil'',[7] with lower rates of citation of the key words ''collective health''. These data demonstrate that the National Health Promotion Policy (Política Nacional da Promoção da Saúde [PNPS]),[10] which includes in its specific objectives (item I) the incorporation and implementation of actions to promote health, with emphasis on primary care, was not reflected in the pediatrics scientific production.

Moreover, according to DATASUS 2011,[8] causes of mortality related to the perinatal period, respiratory system, and parasitic infections constitute the main causes of death in the first year of life, also indicating a need for greater research in these specific areas.

Another point to be analyzed regarding these results is the importance of public institutions for the national scientific production. Public universities constitute the main institutional support for research and the training of researchers in Brazil.[11] This is due to the fact that, in Brazil, the university system has differentiated between a private system that focus on teaching and a public system in which research is encouraged, even if it is not implemented in all institutions.[12] As shown in the results (Table 1), over 85% of the pediatric research groups in Brazil are linked to public institutions. This also reflects the lack of partnerships with private institutions in the country, which could contribute to the production of knowledge, technology and innovation. Currently, investments in research by private companies in Brazil are very scarce, as they tend to concentrate on public universities, where research is already consolidated.[12]

Research in the area of pediatrics is an essential foundation for the improvement of child quality of life and should, in the long term, contribute to the prevention of several diseases in adults and the elderly. Despite the great importance of this area in future adult health, pediatrics still faces significant obstacles due to several ethical dilemmas that permeate research in this group. Researchers and ethics committees have to face the challenge of ensuring that the risks of studies in children are minimized. There are difficulties in the recruitment of children for participation in clinical trials, due to the reluctance of parents and also to the low prevalence of certain clinical conditions in each age group.

The difficulty in recruitment can also be observed in the field of neonatology, which has great importance in pediatric research, with 23 lines of research (Table 2), but has a known difficulty in performing randomized clinical trials for this very reason. Strategies to reduce this difficulty include the involvement of parents as partners and supporters of these trials, the establishment of research networks, the transformation of the number of patients recruited for these clinical trials into a performance indicator, and the distribution of resources for hospitals to include these data together with traditional indicators.[13]

Although limited by the classification criteria developed by the authors to more accurately define the areas related to each group and lines of pediatric research, and depend on the update of the Lattes platform researchers, the present study is relevant for future research and the restructuring of research in specific fields. Moreover, the study demonstrated that, while there is evidence of increased productivity and pursuit of Brazilian scientific maturity, there are still several difficulties to be addressed.

According to the results obtained in the present study, articles published in the health and adolescence areas are evidence of a scenario that should be celebrated. However, given the scarcity of resources in relation to the demands, which makes it difficult to conduct studies in pediatrics and to train new researchers, the present results may contribute to the discussion about the allocation of resources to areas of impact on the population health and attract funding from sources other than the government.

Conflicts of interest

The authors declare no conflicts of interest.

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