

Analysis of histological frequency and pediatric cancer in Rondônia, Western Amazonia (Brazil)

Carlos Alberto Paraguassú-Chaves¹, Rafael Ayres Romanholo², Laurindo Pereira de Souza³, Rodrigo Rodrigues Aguiar⁴, Fabrício Moraes de Almeida⁵

¹Doctor of Health Sciences - Universidade de Brasília (UnB), Brazil; Post-Doctor in Health Sciences - UnB and by Università Degli Studi D'Aquila - IT. Professor at Universidade Federal de Rondônia, Brazil.

²Master, Professor at the Federal Institute of Rondônia, Brazil. Student of the Graduate Program in Regional Development and Environment – Universidade Federal de Rondônia, Brazil.

E-mail: rafael.ayres@ifro.edu.br

³Master of Health Science at IAMSPE/SP, Brazil. PhD student at IAMSPE/SP-Brazil. Professor at FACIMED/Rondônia, Brazil. Coordinator of the Multiprofessional Residency Program in Intensive Care at Hospital Regional de Cacoal (HRC) / Rondônia, Brazil. E-mail: laurindosorrisox@hotmail.com

⁴BSc in Nursing - Universidade Federal de Rondônia, Brazil.

Pediatric Nucleus' Coordinator at Hospital Regional de Cacoal (HRC) /Rondônia, Brazil.

E-mail: aguiar-rr@hotmail.com

⁵PhD in Physics - Universidade Federal do Ceará (UFC), with post-doctorate in Scientific Regional Development (DCR/CNPq). Researcher of the Doctoral and Master Program in Regional Development and Environment (PGDRA). Leader of line 2 — Technological and Systemic Development, and Researcher at GEITEC — Universidade Federal de Rondônia, Brazil.

E-mail: dr.fabriciomoraes001@gmail.com

Abstract— Objective: Describe the histological and cancer frequency in children and adolescents attended at the Hospital de Base Dr. Ary Pinheiro and the Hospital de Barretos / Rondônia, Western Amazonia, in the years 2014 and 2015. **Method:** This is a descriptive, quantitative and transverse study. We used a structured instrument containing a series of variables, such as gender, age, histological types, more frequent neoplasms, lymphomas, leukemias, among others. We asked The Comitê de Ética em Pesquisa em Seres Humanos (Research Ethics Committee) to dispense the Informed Consent Form because the study did not require intervention on the patient or collection of biological material, and no possibility of constraints on patients and their relatives. **Results:** From 75 cases, 32 (42.7%) were female and 43 (57.3%) were male. Regarding the distribution of patients according to the age group, 21 (28.0%) were younger than 4 years, 12 (16.0%), 5 to 9 years, 17 (22.6%) from 10 to 14 and 25 (33.4%) from 15 to 19. The most frequent histological types by gender were leukemias of myeloproliferative diseases and myelodysplastic diseases with 30% and 50% new cases in the period, followed by lymphomas and reticuloendothelial neoplasms with 16.65% and 20, 0% of the histological types in the period. Leukemia in the hematopoietic and reticuloendothelial system (C42) is the most frequent cancer in both, female and male gender, with 47.5% of cancers in the biennium. The second group

of cancers in children from 0 to 19 years old and location of the primary tumor is the encephalon carcinoma (C71), with 11.25% of the new cases. **Conclusions:** The results presented with their proper nuances are in agreement with the data of studies carried out in Brazil and in other countries.

Keywords—Childhood cancer. Pediatric cancer. Neoplasms. Rondônia. Western Amazonia.

I. INTRODUCTION

Pediatric cancer is a major public health concern. According to the National Cancer Institute (INCA) (2014), pediatric cancer is the second leading cause of proportional mortality in the age group 1 to 19 years old. It is studied and classified by the International Classification of Childhood Cancer (ICCC). Currently, it uses the ICCC with the new morphological classifications proposed in ICD-O3 [2].

Childhood and adolescent cancer (children and adolescents aged from 0 to 19 years old) is a set of diseases that has its own characteristics, mainly in relation to histopathology and clinical behavior. It is considered a rare disease, corresponding between 1% and 3% of all malignant tumors in most populations. Faced with these challenges, it is necessary that it be studied separately from those that affect adults.

This group of neoplasms presents, mostly short periods of latency, are more aggressive, grow rapidly, but

respond better to treatment and are considered of good prognosis. The classifications used for this disease group are based on morphology, unlike those used for tumors in adults [3]. For didactic purposes, we adopted in this paper the recognition of the distinction according to age, childhood cancer (children aged 0 to 14) and adolescent cancer (15-19 years old).

Among childhood and adolescent cancers, leukemia is the most common in majority populations (25% to 35%). In developed countries, lymphomas are the third most common type of cancer. In developing countries, this type corresponds to the second place, leaving behind only the leukemias. CNS tumors occur mainly in children younger than 15 years, with a peak at the age of 10.

It is estimated that this group, being the most frequent solid tumor in the pediatric age range, represents about 8% to 15% of pediatric neoplasms. Embryonal tumors together with retinoblastoma, neuroblastoma and Wilms tumor account for approximately 20% of all childhood and adolescent tumors and will rarely occur in other age groups. Carcinomas represent less than 5% of childhood tumors, being the most frequent type in adults [3] and [4].

For the study the following guiding question was raised: is there a high and significant frequency of cancer in children and adolescents attended at the Hospital de Base Dr. Ary Pinheiro and Hospital de Barretos / Rondônia, in the Western Amazon?

Thus, the present study aimed to describe the histological and cancer frequency in children and adolescents attended at the Hospital of Base Dr. Ary Pinheiro and Hospital of Barretos / Rondônia, in Western Amazon, in the years 2014 and 2015.

II. METHODS

The methodological design followed the characteristics of a documentary, transversal and descriptive study, based on the raw data produced in the sector, similar to that recommended by Paraguassú-Chaves [4]. The primary data were organized by the Hospital Nucleus of Epidemiology (NHE) of the Hospital de Base Dr. Ary Pinheiro from the medical diagnoses in the hospital mentioned above and the Hospital de Barretos in Rondônia, "Barretinho", in the period of 2014 and 2015.

Thus, a structured instrument was used to collect data containing variables related to gender, age, marital status, schooling, skin color, occupation, city of origin, cities of other states, place of birth, origin the first treatment, findings and medical approach, treatment received, histological types, the most frequent neoplasms, lymphomas and leukemias, among others.

These data were inserted into the statistical platforms, revised, (re) classified, (re) interpreted, (re) analyzed and correlated according to analytical and descriptive methods, using frequency distribution and proportional percentages in statistical representations.

We asked The Comitê de Ética em Pesquisa em Seres Humanos (Research Ethics Committee) to dispense the Informed Consent Form because the study did not require intervention on the patient or collection of biological material, and no possibility of constraints on patients and their relatives.

III. RESULTS

In the years 2014 and 2015, 75 new cases of childhood and adolescent cancer were diagnosed. Of these, 32 (42.7%) in females and 43 (57.3%) in males, predominating the age range of 15-19 with 33.33%.

Table.1: Distribution of cancer in children, by age range and gender, between 2014 and 2015 in Rondônia / Brazil-2018.

Variables	Female		Male		Total	
	af	rf	af	rf	af	rf
00 - 04	7	21.9	14	32.56	21	28
05 - 09	5	15.6	7	16.28	12	16
10 - 14	6	18.75	11	25.58	17	22.67
15 - 19	14	43.75	11	25.58	25	33.33
Total	32	100.0	43	100.0	75	100.0

Source: RHC / NHE / HBAP / RO / 2014

af: absolute frequency; rf: relative frequency

The most frequent histological types between 2014 and 2015 by gender were leukemias of myeloproliferative diseases and myelodysplastic diseases with 29 (41.4%) cases, being highlighted the

male gender with 20 (50%) among the 11 histological types presented in table 02.

It was found that lymphomas and reticuloendothelial neoplasms occupy the second position

with 13 (18.6 %) cases throughout the biennium studied. In addition, tumors of the central nervous system (CNS) with 5 (7.1%) cases, followed by bone and kidney tumors. Renal tumors were more frequent in the female gender with 3 cases, whereas the male

gender remains the carcinomas and other malignant epithelial neoplasms with 4 (10%) of the new cases.

In addition, other major histological types are malignant neoplasms and unspecified (4, 3%), as shown in Table 2.

Table.2: Distribution of the most frequent types of cancer in the age range 0-19 years, depending on the gender, between 2014 and 2015, Rondônia / Brazil.

Histological Type	Female		Male		Total	
	n	%	n	%	n	%
Leukemias, myeloproliferative diseases and myelodysplastic diseases	9	30,0	20	50,0	29	41,4
Reticuloendothelial lymphomas and neoplasms	5	16,6	8	20,0	13	18,6
CNS and miscellany of intracranial and intraspinal neoplasms	4	13,33	1	2,5	5	7,1
Malignant bone tumors	2	6,66	3	7,5	5	7,1
Renal tumors	3	10,0	1	2,5	4	5,8
Carcinomas and other epithelial malignancies	1	3,33	4	10,0	5	7,1
Tumors of the sympathetic nervous system	1	3,33	1	2,5	2	2,9
Soft-tissue sarcomas	1	3,33	1	2,5	2	2,9
Neoplasms of germ cells, trophoblastic and other gonadal	1	3,33	0	0,0	1	1,4
Retinoblastoma	1	3,33	0	0,0	1	1,4
Other malignant and unspecified neoplasms	2	6,66	1	2,5	3	4,3
TOTAL	30	100,0	40	100,0	70	100,0

Source: RHC / NHE / HBAP / RO / 2014

For the current research was considered the International Classification of Diseases ICD-10, in view of all records of the database used to be classified for medical diagnosis. Thus, the leukemia of the hematopoietic and reticuloendothelial system classified by ICD 10 as (C42) is the most frequent cancer in both genders with 38 (47.5%), being almost 3 times more in the male gender with 28 cases.

The second more common group of cancers in children between 0 and 19 in both genders are

the encephalon carcinoma (C71) with 9 cases, and secondary and unspecified malignant neoplasm of lymph nodes (C77) with 9 cases.

Also among the cancers recorded by ICD-10 are the malignant neoplasm of bone and articular cartilage of other and unspecified sites (C41), followed by malignant neoplasm of thyroid gland (C73) and other cancer with rust 1 to 3 cases as shown in table 3.

Table.3: Distribution of the most frequent histological types at the age of 0 to 19 years, according to the gender, between 2014 and 2015, Rondônia / Brazil.

Location of primary tumor	ICD-10	Female		Male		Total	
		af *	rf *	af *	rf *	af *	rf *
Hematopoietic and reticuloendothelial system	C42	10	37	28	52,9	38	47,5
Brain	C71	5	18,6	4	7,5	9	11,25
Lymph nodes (lymph nodes)	C77	2	7,4	7	13,2	9	11,25

Kidney	C64	2	7.4	1	1, 9	3	3.75
Placenta	C58	2	7.4	0	0.0	2	2.5
bone and articular cartilage of other and unspecified sites	C41	2	7.4	3	5.7	5	6.25
Connective tissue, subcutaneous tissue and other soft tissues	C49	1	3.7	2	3.7	3	3.75
Thyroid gland	C73	1	3.7	3	5.7	4	5
bone and articular cartilage of limbs	C40	1	3.7	1	1.8	2	2.5
Skin	C44	0	0.0	3	5.7	3	3.75
thymus	C37	0	0.0	1	1, 9	1	1.25
Eyes and attachments	C69	1	3.7	0	0.0	1	1.25
TOTAL		27	100.0	53	100.0	80	100.0

Source: RHC / NHE / HBAP / RO / 2014

* af: absolute frequency; * rf: relative frequency

Acute myeloid leukemias are the histological types more relevant in the retrospective period revised with absolute frequency of 18 cases and relative frequency of 18.4%, distributed by gender.

Next comes the Lymphoblastic Leukemia of Precursor Cells, with an absolute frequency of 20 cases and a relative frequency of 15.3%, distributed in both genders, a greater tendency is observed in the male gender in this histological type. Among all lymphomas, the malignant lymphoma, NOS or diffuse is the first place in this histological class with an absolute frequency of 18 cases and a relative frequency of 13.9%.

Hodgkin's Lymphoma Mixed Cellularity rank second among the most frequent histological types in the biennium 2014-2015 and with greater incidence in the male gender. Chronic lymphocytic leukemias are the third place among the most frequent types with absolute frequency of 10 cases and relative frequency of 7.7%.

Other histological types are the plasmocyte tumors -973 and chronic myeloid leukemia, matched by the same absolute frequency in both genders in the biennium, followed by Burkitt cell leukemia with 05 cases in total.

Table.4: Proportional distribution of lymphomas and leukemias, by gender, according to the histological type - ICD-03 between the years 2014 -2015, Rondônia / Brazil.

Lymphomas and Leukemias	Female		Male		Total	
	fa	fr	fa	fr	fa	fr
Acute Myeloid Leukemia, NOS	8	17.1	16	19.2	24	18.4
Lymphoblastic Leukemia of Precursor Cells, NOS	5	10	15	18	20	15.3
Malignant Lymphoma, NOS or Diffuse (959)	10	21.3	8	9.7	18	13.9
Hodgkin's Lymphoma Mixed Cellularity or Lymphocytic Depravity	4	8.5	9	10.9	13	10
Chronic Lymphocytic Leukemia of B Cell / Lymphocytic Lymphoma	4	8.5	6	7.2	10	7.7
Hodgkin's Lymphoma, Nodular Sclerosis	0	0.0	2	2.4	2	1.5
Large B-cell Lymphomas or Burkitt's Lymphoma (968)	1	2.2	3	3.7	4	3.1
Small B-Cell Lymphoma	1	2.2	2	2.4	3	2, 4
Mature B-cell Lymphoma	1	2.2	0	0.0	1	0.8
Tumors of Plasmocytes (973)	2	4.3	6	7.2	8	6.1
Leukemia NOS (980)	0	0.0	1	1.2	1	0.8
Acute Leukemia, NOS	0	0.0	0	0.0	0	0.0
Lymphoid Leukemia, NOS (982)	0	0.0	2	2.4	2	1.5
Burkitt's Cell Leukemia	2	4.3	3	3.7	5	3.9
Acute Myeloid Leukemia Type M6	1	2.2	0	0.0	1	0.8
Chronic Myeloid Leukemia, NOS	4	8.5	4	4.8	8	6, 1

Acute Monocytic Leukemia	1	2.2	0	0.0	1	0.8
Acute Myeloid Leukemia with Multiline Dysplasia	0	0.0	2	2.4	2	1.5
Acute Leukemia, Biphenotypic	0	0.0	0	0.0	0	0.0
Lymphoblastic Leukemia of Precursor Cells Type B	0	0.0	2	2.4	2	1.5
Myeloid Leukemia, NOS	2	4.3	0	0.0	2	1.5
Leukemia Cell Type	0	0.0	1	1.2	1	0.8
Acute Myeloid Leukemia T	0	0.0	1	1.2	1	0.8
Acute Myeloid Leukemia with Abnormality	1	2.2	0	0.0	1	0.8
Total	47	100	83	100	130	100

Source: RHC / NHE / HBAP / RO / 2014

IV. DISCUSSION

The studies published in important international journals such as *Epidemiology of childhood cancer "Cancer Treat Rev"*, *Cancer Incidence and Survival among Children and Adolescents "Bethesda: National Cancer Institute"*; and *Cancer incidence among children and adolescents in the United States "Pediatrics"*, report a higher incidence of cancer in general in males. On the other hand, there was no statistically significant difference in relation to this variable in the study in Rondônia. As described in the literature, there was a higher frequency in males with 43 cases.

The most frequent histological types were leukemias of myeloproliferative diseases and myelodysplastic diseases, with a total frequency of 41.4% of new cases in the biennium studied.

The reticuloendothelial lymphomas and neoplasms were the most common histologic types representing 18.8%, followed by CNS tumors and a miscellany of intracranial and intraspinal neoplasms, malignant bone tumors, carcinomas with 7.1% of new cases respectively during the studied period. These findings corroborate those found by Paraguassú-Chaves et al. (2017).

However, when the results are compared to the national study of the RCBP and other states and other regions of Brazil, they may appear in order of frequency with small variations. That is shown by some studies like the *Clinical-Demographic Profile of the Patients Served at the Attended in the Oncology Service of the Hospital de Clínicas de Porto Alegre (Da Luz, 2011)* and *Cancer incidence among children and adolescents in Brazil: first report of 14 population-based cancer registries (De Camargo et al. 2010)*.

In the present study leukemia in the hematopoietic and reticuloendothelial system (C42), is the most frequent neoplasm in both, female gender with 37%, and the male, with 52.9 % of cancers in the biennium.

In the same place of the research, the studies of Paraguassú-Chaves et al. (2015a), for the year 2013, had

already found the similar results without statistically difference. Kaatsch [7] in *Epidemiology of Childhood Cancer*, had already pointed that leukemias are the most common pediatric cancer type in the world and correspond to 34.1% of all childhood cancers until the age of 15, followed by CNS tumors (22.6%) and lymphomas (11.5%).

"Cancer incidence among children and adolescents in Brazil: first report of 14 population based cancer registries", a national study that collected 14 population-based cancer registries (RCBP), showed that Goiânia, Manaus, and Curitiba were the three capitals of Brazil with the largest population incidence rates for leukemia (De Camargo, 2010).

The study "Pediatric cancer: analysis of a hospital registry", indicates that in studies performed in hospital services in the states of Santa Catarina and Rio Grande do Sul, show a incidence of 36.6% and 26.9%, respectively, for leukemia (Silva, Pires and Nassar, 2002).

Among all childhood malignancies, leukemias are the most frequently diagnosed and are responsible, in most populations, for 25% to 35% of all pediatric malignancies according to Parkin et al. (1998).

In most countries, this type of neoplasia most frequently affects children under the age of five. Acute lymphocytic leukemia (ALL) is the most common of the leukemias, corresponding to 75% - 80% of all leukemias in white populations in North America, Oceania and Europe [10]. In the same regions, acute non-lymphocytic leukemia (ANLL) represents 15% to 17% of cases. Not common in childhood, chronic myeloid leukemia (CML) rarely exceeds the proportion of 4% [11]. In the study in Goiânia, from 1989 to 1996, these frequencies were 66% for ALL, 20% for ANLL and 1.4% for CML [12].

The second group of cancers in children between 0 and 19 years old and the location of the primary tumor in the biennium is the encephalon carcinoma (C71), with 11,25 % of new cases. For the 2 years of study in Rondônia, the lymph nodes (C77) best represent the second group of cancers with 11.25 %

and with relative frequency more representative in the masculine gender, 13.2 %.

In Brazil, lymphomas appear as the second most frequent neoplasm in childhood [6]. In the present study, it was also the second most frequent neoplasm, and is second only to leukemias. This corroborates the findings of Paraguassú-Chaves [3].

Lymphomas and leukemias distributed by gender, according to the 10 most frequent histological types, present a similar distribution in the studied period. Precursor cell lymphoblastic leukemia, NOS, is the most frequent leukemia. Shortly after, comes the leukemia from plasma cells (973), the acute myeloid leukemia, NOS, malignant lymphoma, NOS or Diffuse (959), leukemia NOS (980), Hodgkin's lymphoma mixed or lymphocytic depletion and leukemia chronic myeloid, NOS. These results are in agreement with those found in the Paraguassú-Chaves study [3].

The study "Cancer Incidence and Survival among Children and Adolescents: United States SEER Program 1975-1995" [13] and the study "Epidemiology of childhood cancer" [7] are similar to the present study, but they specify the frequencies of leukemias and lymphomas with more detail in some variables.

Leukemias are more frequent from 1 to 9 years old [13]. For the ALL subgroup, there is a peak between 2 and 3 years, which occurred in 66% of the cases analyzed in their study. Already in the studies of Kaatsch [7], lymphoma is practically non-existent in children under one year old, rare in children 1 to 4 years old, with higher frequencies in the following age ranges.

The study "Paediatric cancer in low-income and middle-income countries", shows that lymphomas were the second most frequent neoplasm, followed by retinoblastoma and CNS tumors [14].

Central nervous system (CNS) tumors represent the second most common diagnostic group in childhood, corresponding to 19% - 27% of neoplasms. Similar data were observed in Goiânia, with prevalence of 18.3% [12].

Lymphomas, following tumors of the central nervous system (CNS), are the third type of neoplasia of higher incidence in developed countries, covering 7% to 18% of cases of childhood neoplasia [10].

In developing countries, they generally rank second in incidence rates, as confirmed by the study recently conducted in Goiânia, which correspond to 18.3% of diagnosed childhood tumors [12]. However, there is great variability of lymphomas in histological terms when different regions are compared.

Approximately 45% of all lymphomas in children are represented by Hodgkin's lymphoma [15] and their incidence is usually more pronounced in populations with lower socioeconomic status, such as in Kuwait, Brazil and Costa Rica [9]. In Goiânia, for example, 44%

of the aforementioned lymphomas were Hodgkin's [10,16].

The research "The Childhood Cancer: Epidemiological Profile of Patients Referred to the Clinical Hospital of UFPR Pediatric Oncology Unit," by Hadas, Gaete and, Pianovski [17], corroborate with essential part of the findings in this study. In addition, the results found in the research are in accordance with the projection presented by Paraguassú-Chaves et al. (2015b).

V. FINAL CONSIDERATIONS

Therefore, the presented results with their due nuances are in agreement with the data of studies realized in Brazil and in other developed countries. In addition, it is recognized that more rigorous evaluation of these data may allow the identification of population groups at greater risk or with a worse prognosis. Thus, this study should serve as a basis for the systematization of data essential for the planning, execution and evaluation of actions to promote, prevent, control and treat childhood and adolescent cancer in Rondônia, as well as to establish priorities.

REFERENCES

- [1] Braga PE, Latorre MRDO, Curado M (2001). Câncer na infância: análise comparativa da incidência, mortalidade e sobrevida em Goiânia (Brasil) e outros países. Cadernos de Saúde Pública, São Paulo.
- [2] Braga, PEB (2000). Câncer na Infância: Tendências e Análise de Sobrevida em Goiânia (1989-1996). Dissertação de Mestrado, São Paulo: Faculdade de Saúde Pública, Universidade de São Paulo.
- [3] Da Luz JF. Perfil Clínico-Demográfico dos Pacientes Atendidos no Serviço de Oncologia Pe (2011)diátrica do Hospital de Clínicas de Porto Alegre: Período de jan/2000 a dez/2010 [dissertação]. Porto Alegre (RS): Universidade Federal do Rio Grande do Sul; 2011.
- [4] De Camargo B. et al. (2010). Cancer incidence among children and adolescents in Brazil: first report of 14 population based cancer registries. Int. J. Cancer. 2010; 126 (3):715-20.
- [5] INCA (2014). Instituto Nacional do Câncer. Particularidades do Câncer Infantil [Internet]. Rio de Janeiro: INCA; [quoted in 2014 Jan 30]. Available at: <http://www.inca.gov.br/conteudo_vie_w.asp?id=343>.
- [6] Greenberg RS, Shuster JL. (1985). Epidemiology of cancer in children. Epidemiologic Reviews,7:22-48.
- [7] Hada TC, Gaete AEG, Pianovski MAD (2014). Childhood cancer epidemiological profile of patients referred to the hospital de clínicas of UFP pediatric oncology unit. Câncer pediátrico: perfil

- epidemiológico dos pacientes atendidos no service de oncologia pediátrica do hospital de clínicas da UFPR. Rev. Med. UFPR 1(4):141-149 out/dez.
- [8] Kaatsch P.(2010). Epidemiology of childhood cancer. *Cancer Treat Rev.* jun; 36(4):277-85.
- [9] Latorre, MRDO, 2000. Epidemiologia dos tumores na infância. In: *Pediatria Oncológica* (B. Camargo & L. F. Lopes, org.), pp. 7-27, São Paulo: Lemar.
- [10] Magrath I, Steliarova-Foucher E, Epelman S, Ribeiro RC, Harif M, Li C-K, Kebudi R, Macfarlan SD, Howard SC. Paediatric cancer in low-income and middle-income countries. *Lancet Oncol.* 2013 Mar;14(3):e104–16.
- [11] Paraguassú-Chaves CA, Silveira EG, Beleza SC, Beleza LC (2017). Epidemiologia do câncer em Rondônia. AICSA, Porto Velho.
- [12] Paraguassú-Chaves CA, Silveira EG, Beleza SC, Beleza FC. (2015b). Perfil epidemiológico de Rondônia. 1ª Ed. Porto Velho, AICSA.
- [13] Paraguassú-Chaves CA, Silveira EG, Beleza SC, Beleza FC (2015a). Perfil epidemiológico do câncer em Rondônia: Amazônia brasileira. 1ª Ed. Porto Velho, AICSA.
- [14] Parkin DM.; Krámarova E; Draper GJ.; Masuyer E.; Michaelis J.; Neglia J.; Qureshi S. & Stiller CA. (ed.), (1998). *International Incidence of Childhood Cancer.* v. 2, IARC Scientific Publications 144. Lyon: International Agency for Research on Cancer/World Health Organization.
- [15] Ries LAG, Smith MA, Gurney JG, Linet M, Tamra T, Young JL, Bunin GR (et al) (1999). *Cancer Incidence and Survival among Children and Adolescents: United States SEER Program 1975-1995.* Bethesda: National Cancer Institute, SEER Program.
- [16] Sharp L.; Cotton A. & Little J., 1999. Descriptive epidemiology. In: *Epidemiology of Childhood Cancer* (J. Little, ed.), pp.10-66, IARC Scientific Publications 149. Lyon: International Agency for Research on Cancer/World Health Organization.
- [17] Silva DB, Pires MMS, Nassar, SM. (2002). Câncer pediátrico: análise de um registro hospitalar. *J Pediatr. set/out;78(5):409-14.*
- [18] Steliarova-Foucher E, Stiller C, Lacour B, Kaatsch P. (2005). *International Classification of Childhood Cancer, Third Edition.* Bull Am Cancer Soc. Abr 01; 103(7): 1457-67.
- [19] WHO (2016). World Health Organization. ICD-10 Version 2016. [internet]. [Visited on 2018 jun 26]. Available at <
<http://apps.who.int/classifications/icd10/browse/2016/en>>.