

# Anemia as the cause of clinical inability of candidates to blood donation for a hemotherapy and hematology center in the state of Maranhão, Brazil

*Anemia como causa da inaptidão clínica em candidatos a doação de sangue em um Centro de Hemoterapia e Hematologia, Maranhão, Brasil*

Gabriele Pereira Rocha<sup>1</sup>, Aleksandro Ferreira dos Santos<sup>2</sup>, Isabelle Christine Vieira da Silva Martins<sup>3</sup>, Jorvana Stanislav Brasil Moreira<sup>3</sup>, Jeane Lorena Lima Dias<sup>3</sup>, Luciana Pereira Pinto Dias<sup>4</sup>, Michel Garcia Maciel<sup>5</sup>, Maria Bethânia da Costa Chein<sup>6</sup>, Maria Tereza Borges Araújo Frota<sup>5</sup>

## ABSTRACT

**Objective:** To evaluate anemia as a cause of clinical disability in blood donors in the state of Maranhão- Brazil. **Methods:** This study addresses a time series of prevalence of anemia among blood donor candidates. Secondary data were collected from the Information System of the Blood Center of Maranhão. Donor candidates were treated between 2001 and 2010. Statistical analysis was performed with Epi Info version 6.04d. **Results:** The proportion of clinical disability was 16.8% (n = 1,672) and 63.27% (n = 6,198) consisted of men. Considering the unfit group, anemia was the second most frequent cause with 16.68% (n = 16,729). In men, drug use was the most frequent cause of inability (90.94%, n = 650) and anemia was the last cause with 28.76% (n = 458). In women, anemia was the major cause of clinical inability (71.24%, p = 0.000). **Conclusion:** Anemia is an important cause of inability, and in women it is the first one.

**Key words:** Blood Donors. Hemotherapy Service. Anemia.

## RESUMO

**Objetivo:** Avaliar a anemia como causa de inaptidão clínica de candidatos a doação de sangue no estado do Maranhão. **Métodos:** Este estudo trata de uma série temporal da prevalência de anemia entre os candidatos doadores de sangue. Foram coletados dados secundários do Sistema de Informação do Hemocentro do Maranhão. Os candidatos a doação foram atendidos entre os anos de 2001 e 2010. A análise estatística foi realizada com Epi Info versão 6.04d. Os dados foram considerados estatisticamente significativos quando  $p < 0,05$ . **Resultados:** A proporção de inaptidão clínica foi de 16,8% (n=1,672) sendo desses 63,27% (n=6,198) eram homens. Considerando-se o grupo de inaptos, a anemia foi a segunda causa mais frequente com 16.68% (n= 16,729). Nos homens,

1. Pós Graduação em Ciência da Nutrição, Universidade Federal de Viçosa, Viçosa, MG, Brazil.
2. Universidade CEUMA; Programa de Pós Graduação em Ciências da Saúde
3. Faculdade de Nutrição, Universidade Federal do Pará, Belém, PA, Brazil.
4. Universidade CEUMA; Programa de Pós Graduação em Saúde do Adulto, Universidade Federal do Maranhão (UFMA). São Luís, MA, Brasil.
5. Departamento de Ciências Fisiológicas, UFMA
6. Programa de Pós Graduação em Saúde do Adulto, UFMA.

CORRESPONDÊNCIA:  
CEUMA - University Renascença Campus,  
Coordination of the Course of Nutrition, Renascença II,  
65075-120 - São Luís, Maranhão, Brazil

Recebido em 07/02/2018  
Aprovado em 29/08/2018

o uso de drogas foi a causa mais frequente de inaptidão (90.94%; n= 650) e a anemia foi a última causa com 28.76% (n=458). Em mulheres a anemia representou a maior causa de inaptidão clínica (71.24%; p=0,000). **Conclusão:** A anemia configura-se como causa importante de inaptidão, principalmente em mulheres, sendo a primeira.

**Palavras-chave:** Doadores de Sangue. Serviço de Hemoterapia. Anemia.

## INTRODUCTION

Blood transfusion becomes vital in several situations, such as, victims of car accidents, patients with large burns, hemophilia, anemia, patients with bleeding problems and other emergencies. Transfusions are performed to increase the blood's ability to carry oxygen, restoring blood volume in the body, improving immunity or to fix bleeding disorders.<sup>1</sup>

In Brazil, every blood donation should be altruistic, voluntary and, direct or indirectly, non-paid, as well as donor anonymity should be guaranteed.<sup>2</sup> To be considered able donate, it is necessary thorough clinical trial, and that it had been submitted to serological screening.<sup>3</sup>

Some studies found anemia as cause of disability among clinical candidates for blood donation in female candidates.<sup>3,4,5</sup> Anemia is of the major public health problems in the world, and among its symptoms there are tiredness, dizziness, brittle nails and hair.<sup>6</sup>

In an agreement made between Brazil and the United Nations it had decided the decrease of the prevalence of anemia because of iron deficiency until 2003 in 1/3 of levels of women in reproductive ages and children<sup>7</sup> as well, but the studies show a diverse direction.<sup>8,9</sup> The National Demographic and Health survey for Children and Women (PNDS) showed anemia in 29.4% of Brazilian women. In the Northeastern region in Brazil, 40% of the women was in reproductive age.<sup>10</sup>

Thus, this study aims to evaluate the importance of anemia as a cause of clinical disability for blood donation in Maranhão from the years of 2001 to 2010.

## METHODS

This is a time series of the prevalence of anemia among prospective blood donors from the

Center of Hemotherapy and Hematology (HEMOMAR - Maranhão), which is the institution that is responsible for public policy of blood and blood products in the state of Maranhão.

The project was approved by the Ethics Committee in Research from the Health Department in the State of Maranhão (SES) and the Federal University of Maranhão (UFMA) (Protocol n.545548).

The study population was composed of candidates for blood donation (CDS) who attended HEMOMAR in the capital of the state of Maranhão, São Luís and in the six Hemotherapy Centers located in the state, from 2001 to 2010.

Candidates were classified as clinical able (CA), when after clinical screening they were eligible to donate blood, or clinical unable (CU), when considered unable after this screening. These could be temporary (TCU), when the screening requirements were not actually present, but with the possibility for future donation, or permanent (PCU), when inability for donation was considered to be definitive.

The sample was composed only by TCU and PCU individuals, from 18 to 60 years of both genders, totalizing 971 candidates for blood donation. Information was gathered, secondarily, through Information System Reports from HEMOMAR, during the evaluated period.

Determination of hemoglobin concentration (Hb) or hematocrit (Ht) is some of the criteria laid down in the selection of candidates for blood donation in order to detect and exclude candidates by using the determinant "anemia".<sup>11</sup> The minimum acceptable level values are Hb: 12.5 g / dL or hematocrit: 38% for women and Hb: 13.0 g / dL or hematocrit: 39% for men.<sup>12</sup>

The profile for blood donation was analyzed by gender, as well as, the prevalence of causes of clinical disability. In the period from 2001 to 2010, the main reasons for non-donation were,

anemia, hypertension, hypotension, alcoholism, Sexually Transmitted Diseases (STD), drug use, hepatitis, Chagas disease, malaria and others.

These data were organized into spreadsheets using the software Microsoft Office Excel version 2007 to measure the frequency of variables, mean and standard deviation. Statistical analysis was performed using Epi Info version 6.04d. For the association of frequency distribution between diseases and the years of evaluation, the Chi-Square Test was used. Data were considered statistically significant when  $p < 0.05$ .

## RESULTS

From 2001 to 2010, there were recorded in the blood bank of Maranhão 58,345 blood donors, and 16.8% ( $n = 9,797$ ) were considered clinically unable. Of the total candidates, 63.27% ( $n = 6,198$ ) were men who had been considered clinically unable, and 36.73% ( $n = 3,598$ ) of females.

The causes of medical inability to donating blood, anemia is the third most frequent cause. The mean average was 16.68% ( $n = 16,729$ ), after "Others" (50.72%;  $n = 50,002$ ) and "risk behavior for STDs" (20.28%;  $n = 19,397$ ), representing the first and second reason, respectively. The option "Others" refers to candidates who, for some reason, were not considered able and do not meet the criteria from the Ministry of Health<sup>11</sup>, with high clinical relevance in the selection of candidates for blood donation, for example, high temperature, hypotension, cold, underweight, use of certain drugs, among other process. Thus, if considering only the cases that have the exact specification, the option "anemia" becomes the second leading cause, with statistical significance ( $p = 0.000$ ).

The proportions of causes of clinical disability in men, was "Drug Use" (90.94%;  $n = 650$ ), "Risky Behavior for STDs" (82.64%;  $n = 15,965$ ) and "Alcoholism" (75.73%;  $n = 169$ ). Anemia is the last cause of disability (28.76%;  $n = 4,580$ ) (Table 1).

In women, anemia represents the major cause of disability (71.24%;  $n = 12,149$ ) ( $p = 0.000$ ), followed by "hypotension" (52.36%;  $n = 707$ ) and "Chagas Disease" (35.17%;  $n = 16$ ) (Table 1).

The temporal trends according to the total sample, showed low changes in the rates of

prevalence of anemia among causes of clinical disability for blood donation, except for in 2004, when it reached 21.36% ( $n = 2,401$ ); rate numbers dropped in 2007 (14.74%;  $n = 1,275$ ), but rose in 2008 and reached its peak in 2010 (21.70%;  $n = 2,781$ ) (Figure 1).

The prevalence of anemia among candidates take divergent characteristics, according to the individual's sex. In men, these values decreased to reach the lowest percentage in 2008; in the following year, it increased again and in 2010, it showed a decrease. In women, the trend in the prevalence of anemia showed increasing values until 2008; in the following year evidences fell and rose again in 2010 (Figure 2).

## DISCUSSION

The rate of clinical disability of candidates for blood donation in the state of Maranhão was 16.8%, below the average of the Northeastern region (20.3%). In 2011, the national average in 2011 was of 16.3%.<sup>13</sup>

The large number of unable male candidates can be explained by the high demand for hemotherapy centers; in addition, there is a minimum range of donations in both sexes; regarding men, the interval is shorter than for women- two and three months respectively.

Another possible cause that has been identified in this study, refers to sexual behavior. In a year, people have at least three partners, and with many sexual relationships, but they do not have any sexual education on health, prevention, etc., making these people more susceptible to STDs.<sup>14</sup>

A research from the Ministry of Health in Maranhão (2010), showed rates of blood donation accounted for approximately one third of the ideal number of donors.<sup>15</sup>

The results of this study indicate anemia as the second leading cause for clinical inability for blood donation (16.68%  $\pm$  2.85). Other studies showed anemia as a major cause of disability, among which 17.76%<sup>3</sup> and 10.4%<sup>5</sup>, showed high prevalence, especially among women candidates for donation, in the range of 19.3% and 56.15%, respectively.<sup>16</sup> In another study there was a prevalence of 80% of women that reported a history of anemia.<sup>17</sup>

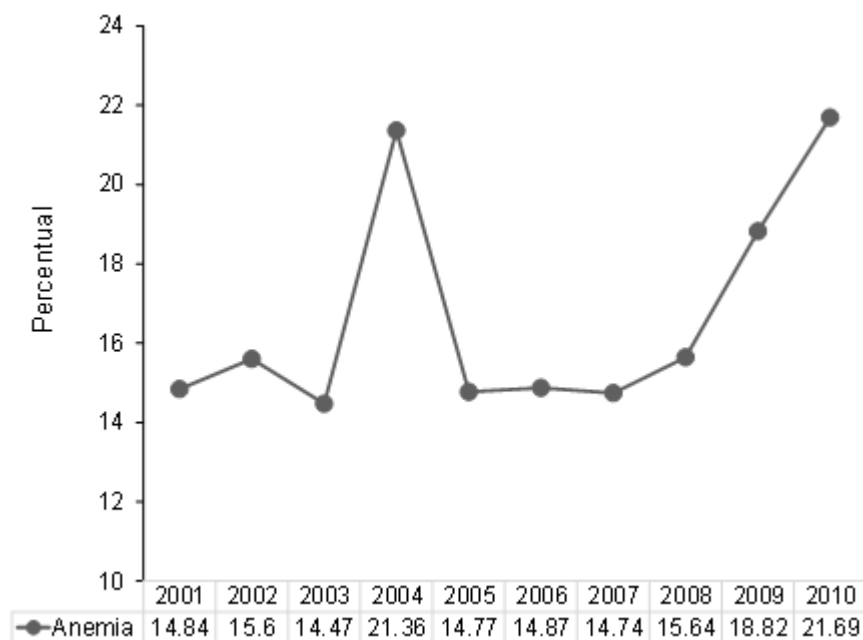
**Table 1**  
Clinical causes of disability for blood donation. Maranhão, 2001-2010.

Cause of disability	2001		2002		2003		2004		2005		2006		2007		2008		2009		2010		Median (%)	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)		
<b>Anemia*</b>																						
Male	165	(40.05)	507	(37.22)	556	(36.99)	859	(35.78)	471	(28.67)	312	(24.78)	272	(21.33)	367	(19.36)	510	(23.21)	561	(20.17)	458	(28.76)
Female	247	(59.95)	855	(62.78)	947	(63.01)	1,542	(64.22)	1,172	(71.33)	947	(75.22)	1,003	(78.67)	1,529	(80.64)	1,687	(76.79)	2,220	(79.83)	1,214	(71.24)
Subtotal	412		1,362		1,503		2,401		1,643		1,259		1,275		1,896		2,197		2,781		1,672	(16.68)
<b>Hypertension</b>																						
Male	53	(59.55)	233	(71.91)	250	(69.25)	288	(71.29)	305	(67.33)	358	(72.62)	232	(69.67)	322	(70.61)	395	(72.34)	249	(70.54)	268	(69.51)
Female	36	(40.45)	91	(28.09)	111	(30.75)	116	(28.71)	148	(32.67)	135	(27.38)	101	(30.33)	134	(29.39)	151	(27.66)	104	(29.46)	112	(30.49)
Subtotal	89		324		361		404		453		493		333		456		546		353		381	(3.89)
<b>Hypotension</b>																						
Male	17	(44.74)	77	(62.10)	92	(46.23)	83	(53.55)	121	(50.84)	57	(46.72)	54	(47.37)	68	(49.28)	44	(37.61)	46	(38.02)	65	(47.64)
Female	21	(55.26)	47	(37.90)	107	(53.77)	72	(46.45)	117	(49.17)	65	(53.28)	60	(52.63)	70	(50.72)	73	(62.39)	75	(61.98)	707	(52.36)
Subtotal	38		124		199		155		238		122		114		138		117		121		136	(1.41)
<b>Alcoholism</b>																						
Male	47	(95.92)	155	(82.01)	160	(78.43)	220	(76.66)	269	(76.20)	184	(69.17)	178	(72.36)	139	(68.14)	183	(72.62)	158	(65.83)	169	(75.73)
Female	2	(4.08)	34	(17.99)	44	(21.57)	67	(23.34)	84	(23.80)	82	(30.83)	68	(27.64)	65	(31.86)	69	(27.38)	82	(34.17)	597	(24.27)
Subtotal	49		189		204		287		353		266		246		204		252		240		229	(2.33)
<b>SDT<sup>e</sup></b>																						
Male	598	(87.94)	1710	(88.92)	2218	(84.82)	1860	(84.74)	1867	(82.87)	1372	(82.75)	1269	(79.46)	1757	(79.04)	1737	(78.17)	1577	(77.65)	1,596	(82.64)
Female	82	(12.06)	213	(11.08)	397	(15.18)	335	(15.26)	386	(17.13)	286	(17.25)	328	(20.54)	466	(20.96)	485	(21.83)	454	(22.35)	343	(17.36)
Subtotal	680		1923		2615		2195		2253		1658		1597		2223		2222		2031		1,939	(20.28)
<b>Drugs use</b>																						
Male	22	(88.00)	124	(95.38)	98	(81.67)	75	(92.59)	80	(98.77)	49	(90.74)	37	(88.10)	40	(93.02)	78	(90.70)	47	(90.38)	65	(90.94)
Female	3	(12.00)	6	(4.62)	22	(18.33)	6	(7.41)	1	(1.23)	5	(9.26)	5	(11.90)	3	(6.98)	8	(9.30)	5	(9.62)	6	(9.06)
Subtotal	25		130		120		81		81		54		42		43		86		52		71	(0.76)

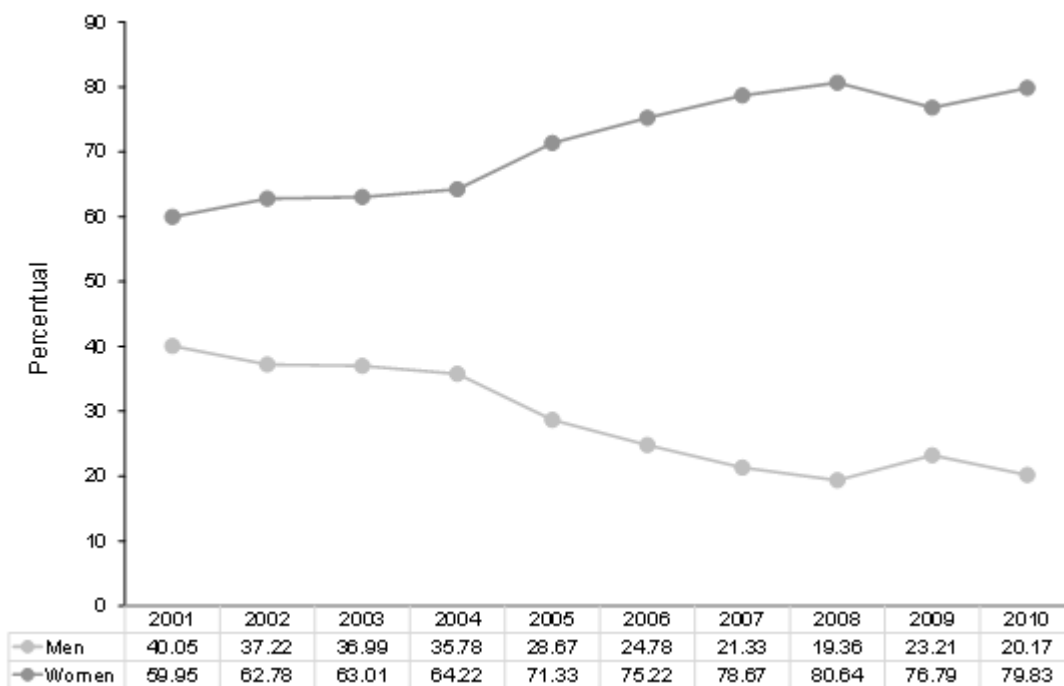
(continuação) **Table 1**  
Clinical causes of disability for blood donation. Maranhão, 2001-2010.

Cause of disability	2001		2002		2003		2004		2005		2006		2007		2008		2009		2010			
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	Median (%)	
<b>Hepatitis</b>																						
Male	67	(87.01)	164	(78.10)	146	(71.57)	153	(70.51)	179	(65.81)	80	(69.57)	118	(67.82)	127	(59.91)	107	(65.64)	91	(64.08)	123	(70.00)
Female	10	(12.99)	46	(21.90)	58	(28.43)	64	(29.49)	93	(34.19)	35	(30.43)	56	(32.18)	85	(40.09)	56	(34.36)	51	(35.92)	55	(30.00)
Subtotal	77		210		204		217		272		115		174		212		163		142		178	(1.91)
<b>Chagas Disease</b>																						
Male	11	(91.67)	21	(56.76)	35	(55.56)	41	(56.16)	63	(67.74)	21	(58.33)	17	(58.62)	19	(65.52)	23	(76.67)	19	(61.29)	27	(64.83)
Female	1	(8.33)	16	(43.24)	28	(44.44)	32	(43.84)	30	(32.26)	15	(41.67)	12	(41.38)	10	(34.48)	7	(23.33)	12	(38.71)	16	(35.17)
Subtotal	12		37		63		73		93		36		29		29		30		31		43	(0.44)
<b>Malaria</b>																						
Male	51	(86.44)	202	(73.72)	129	(72.47)	92	(69.70)	103	(69.13)	73	(62.93)	76	(67.26)	96	(70.07)	89	(66.42)	84	(56.00)	99	(69.41)
Female	8	(13.56)	72	(26.28)	49	(27.53)	40	(30.30)	46	(30.87)	43	(37.07)	37	(32.74)	41	(29.93)	45	(33.58)	66	(44.00)	44	(30.59)
Subtotal	59		274		178		132		149		116		113		137		134		150		144	(1.56)
<b>Other</b>																						
Male	950	(71.16)	2983	(71.76)	3325	(67.32)	3716	(70.19)	3779	(67.61)	2884	(66.38)	3090	(65.38)	4410	(65.06)	3740	(63.13)	4381	(63.36)	3,325	(67.14)
Female	385	(28.84)	1174	(28.24)	1614	(32.68)	1578	(29.81)	1810	(32.39)	1461	(33.62)	1636	(34.62)	2368	(34.94)	2184	(36.87)	2534	(36.64)	1,674	(32.86)
Subtotal	1335		4157		4939		5294		5589		4345		4726		6778		5924		6915		5,002	(50.72)
<b>Total Unable</b>	2776		8730		10386		11239		11124		8464		8649		12116		11671		12816		9,797	(16.82)
<b>Total Able</b>	14423		40307		44075		45476		52490		48969		54125		60720		60682		64212		48,547	(83.18)
<b>Total (Unable+ Able)</b>	17199		49037		54461		56715		63614		57433		62774		72836		72353		77028		58,345	(100)

Source: HEMOPROD. \*Statistically significant (p < 0.05). †STD: Sexually Transmitted Diseases.



**Figure 1:** Time trends of percentage of anemia as a cause of clinical disability for blood donation, Maranhão, 2001-2010. Source: HEMOPROD.



**Figure 2:** Time trends of anemia as a cause of clinical disability for blood donation, according to gender. Maranhão, 2001-2010. Source: HEMOPROD, 2013.

These results are important when there are demographic (age) and social (urban violence, car accidents and others) changes that increase the demand for blood transfusions<sup>4</sup>. Therefore, high rates of clinical and serological disability can result in deficits in the stocks, with adverse consequences for the population.<sup>18</sup>

The World Health Organization<sup>19</sup> estimates that two billion people worldwide are anemic and approximately 90% of the causes is because of the deficiency of iron. This lack can be triggered by various factors that determine the negative iron balance and increased need, great loss, iron malabsorption of food and iron-deficient diets.<sup>20</sup> However, several studies have identified risk factors for anemia, as socioeconomic determinants, for example, family income, gender, schooling, housing, and housing conditions.<sup>9</sup>

The National Sanitary Surveillance Agency,<sup>21</sup> used clinical and hematological screening data that showed that 18% of all candidates for blood donation of Brazilian blood centers were excluded, and 14% of them because of anemia.

This rate was found to be even larger (41.27%) and anemia was identified as the main cause of disability among women (56.15%). Our data confirmed this analysis, since the anemia represented the first cause of clinical incapacity in females.<sup>16</sup> A study showed that out of 13,200 candidates for blood donation, 58,8% were women and 12,8% of them could not donate blood.<sup>6</sup>

In the study, 37% of those who searched for medical care after postponement, 64% of them had the confirmation of anemia.<sup>17</sup> The largest exclusions for donation in women are due to anemia, due to physiological factors such as the need for additional iron during reproductive life, especially during menstruation.<sup>22</sup>

All blood donors showed different behaviors in the temporal trends of anemia. This question showed an upward trend in female candidates whereas in men, prevalence decreased over the years. One of the limitations of this descriptive study is that there is no consistent data to elucidate the causal factors of the trend presented by this population. It does not seem to reflect a decrease in the prevalence of anemia in males, but it only increased the importance of other causes related to lifestyle for the inability to donate blood.

It is noteworthy that although the nutritional status was not evaluated, it is understood that anemia in the last thirty years in Brazil is the co-linear problem together with obesity and the referred main deficiency. Overweight / obesity and anemia may be associated with changes in food intake as a substrate of the food and nutritional transition in Brazil.

The priority of the International Organizations Agenda is the decrease of anemia in all groups of risk.<sup>22</sup> Specifically for women in reproductive age, there is a target for reducing by one third the prevalence of anemia. Accordingly, the temporal trend of rise of anemia as a cause of clinical disability coincides with the prevalence of anemia in the female population in Brazil.

The current dietary pattern is associated with increased incidence of non-communicable chronic diseases like diabetes, hypertension, cardiovascular disease, obesity and some types of cancer. On the other hand, diseases that result from caloric and micro nutritional eating habits, such as malnutrition, deficiency of vitamin A, anemia, have not been eradicated.<sup>23</sup>

Results showed a great number of voluntary donors, but unable to donate, with negative effect in the cases of anemia in future donors and it make them temporarily unable.

Probably, this study has been the only one that has been held in the public service of hemotherapy in Maranhão, that evaluated the causes of clinical inability for blood donation. The implementation of a consistent and routine system for verification could help the diagnosis in real time and to assess the donor's profile.

Thus, strategies to recruit blood donors need to consider that clinical disability exacerbates the problem of few donors. The establishment and enhancement of partnerships between the Hemocenter and the Municipal Health Department, the University and the community is essential to conduct joint activities. Campaigns directed to potential donors and for example, through the Family Health Strategy would be important tools to raise awareness and inform people about the work developed by the Hemocenter, about the importance of blood donation, but also to prevent clinical obstacles for voluntary donations, as anemia.

The women's group showed more disability due to anemia; therefore, public policies could be useful not only to decrease the prevalence of anemia, but the number of temporary clinical unable candidates, as well.

## CONCLUSION

Anemia has been responsible for considerable clinical disability rates among candidates for blood donation in the state of Maranhão, in all these years of evaluations; it is the second most frequent cause of disability, especially in women, alike the first one.

## REFERENCES

- 1- Pereima RSMR. Projeto Escola – Hemosc: Parceria entre saúde e educação na busca da doação de sangue como ato de solidariedade e cidadania. revista Linhas. 2008; 9:113-23.
- 2- BRASIL. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Atenção Especializada. Guia para uso de Hemocomponentes. (Série A. Normas e Manuais Técnicos). Brasília: Editora do Ministério da Saúde, 2010.
- 3- Rohr JI, Boff D, Lunkes DS. Perfil dos candidatos inaptos para doação de sangue no Serviço de Hemoterapia do Hospital Santo Ângelo- RS, Brasil. Rev Patol Trop. 2012; 41: 27-35.
- 4- Brener S, Caiaffa WT, Sakurai E, Proietti FA. Fatores associados à aptidão clínica para a doação de sangue: determinantes demográficos e socioeconômicos. Rev Bras Hematol Hemoter. 2008; 30:108-13.
- 5- Reuter CP, Pereira C, Renner JDP, Burgos MS, Reuter EM, Meinhardt FP, et al. Características demográficas e epidemiológicas de doadores aptos e inaptos clinicamente em um banco de sangue regional de Santa Cruz do Sul-RS. Cínergis. 2010; 11:35-41.
- 6- Camacho EC; Ferraz, RA; Cliquet, MG. Avaliação da frequência, investigação de causas e realização de tratamento da anemia em candidatas à doação de sangue visando o retorno das mesmas para doação. Rev Fac Ciênc Méd Sorocaba. 2014; 16:121-4.
- 7- World Health Organization (WHO). Iron deficiency anaemia. Assessment, prevention, and control. A guide for programme managers. Geneva: WHO/ UNICEF/UNU, 2001. 214p.
- 8- Pazzinato M, Herrero JCM. Prevalência de anemia e fatores associados em pacientes da cidade de Luiziana- PR. Rev Bras Anal Clin. RBAC. 2009; 41: 151-4.
- 9- Leal LP, Batista Filho M, Lira PIC, Figueiroa JN, Osório MM. Prevalência da anemia e fatores associados em crianças de seis a 59 meses de Pernambuco. Rev Saúde Publica. 2011; 45: 457-66.
- 10- BRASIL. Ministério da Saúde. Pesquisa Nacional de Demografia e Saúde da Criança e da Mulher – PNDS 2006: dimensões do processo reprodutivo e da saúde da criança/ Ministério da Saúde, Centro Brasileiro de Análise e Planejamento. Brasília, 2009.
- 11- Cançado RD, Chiattoni CS, Langhi DM. Deficiência de ferro em doadores de sangue. Rev Bras Hematol Hemoter. 2001; 23:108-9.
- 12- BRASIL. Portaria MS nº 1.353, de 13.06.2011. Aprova o Regulamento Técnico de Procedimentos Hemoterápicos. DOU 1 de 14.06.2011.
- 13- BRASIL. Ministério da Saúde. Secretaria de Atenção à Saúde. Coordenação-Geral de Sangue e Hemoderivados. Caderno de informação [recurso eletrônico]: sangue e hemoderivados: produção hemoterápica: Sistema Único de Saúde – SUS (serviços públicos e privados contratados): serviços privados não contratados pelo SUS. – 6. ed. – Brasília, 2013.
- 14- Vieira GNT, Sousa FES, Barbosa DOL, Almeida PC, Dodt RCM, Teles NSB. Triagem clínica do processo de doação de sangue: Análise da recusa dos doadores. Rev Enferm UFPE on line., 2015; 9(supl. 1):424-30.
- 15- BRASIL. Ministério da Saúde. Secretaria de Atenção à Saúde. Coordenação-Geral de Sangue e Hemoderivados. Caderno de informação [recurso eletrônico]: sangue e hemoderivados: produção hemoterápica: Sistema Único de Saúde – SUS (serviços públicos e privados contratados): serviços privados não contratados pelo SUS. – 5. ed. – Brasília, 2011.
- 16- Ramos VF, Ferraz FN. Perfil epidemiológico dos doadores de sangue do Hemonúcleo de Campo Mourão-PR no ano de 2008. SaBios: Rev. Saúde Biol. 2010; 5:14-21.
- 17- Annen K, Delaney M, Leitch D, Mast AE. The health implications of low hemoglobin deferral in infrequent blood donors. Transfusion. 2015; 55: 86-90.
- 18- Caram C, Castro MSM, Caiaffa WT, Oliveira CL, Proietti ABFCP, Almeida MCM et al. Distribuição espaço-temporal dos candidatos à doação de sangue da Fundação Hemominas, Belo Horizonte, MG, BR nos anos de 1994 a 2004. Cad Saúde Pública. 2010; 26: 229-39.
- 19- World Health Organization (WHO). Worldwide prevalence of anaemia 1993–2005.WHO Global Database on Anaemia. WHO Library Cataloguing-in-Publication Data, 2008.
- 20- Lopez A, Cacoub P, Macdougall IC, peyrin-Biroulet L. Iron deficiency anaemia. Lancet. 2016; 387:907-16.
- 21- Agência Nacional de Vigilância Sanitária (ANVISA). Relatório de produção da hemorrede em 2002: perfil sorológico dos doadores. Disponível em: <http://www.anvisa.gov.br>. Acesso em: 10 mar. 2016.
- 22- Cançado RD, Chiattoni CS. Anemia ferropênica no adulto – causas, diagnóstico e tratamento. Rev Bras Hematol Hemoter. 2010;32:240-6.
- 23- Cei M, ferretti A, Mumoli N. Patients with very severe anemia: a case series. Rev Bras Hematol Hemoter. 2017;39:285-7.