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(62) 3285-6111 | comunicacao@amg.org.br

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INDEX

EFFICIENT CONNECTION WITH THE MEDICAL COMMUNITY

In the second edition of 2024 of the Revista Goiana de Medicina (Goianian Medical Journal), the official publication of the Goiás Medical Association (AMG), the Faculty of Medicine of the Federal University of Goiás (FM/UFG), and the Goianian Academy of Medicine (AGM), we reaffirm our commitment to disseminating original and relevant scientific works that strengthen the advancement of medical knowledge in Goiás.

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We invite you to be part of these pages that value and promote medical excellence in Goiás.

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SCIENTIFIC ARTICLE - ORIGINAL ARTICLE

FAMILY AND COMMUNITY MEDICINE: SUPPORT FOR HIV CONTROL IN GOIÁS

LORENA PIMENTEL RODRIGUES[1]; THAYNARA LUDVIG NAVES[2]

1. Resident in Medicine and Community at UniEvangélica - Anápolis - GO - Brazil
2. Preceptor at UniEvangélica - Anápolis - GO - Brazil

ABSTRACT

Introducion: HIV is a virus that attacks the immune system, destroying CD4 cells, which play a crucial role in defending the body against infections. By weakening this system, HIV increases the body's vulnerability to various opportunistic diseases, such as tuberculosis and certain types of cancer. **Objective:** To provide an overview of HIV infection in the state of Goiás and evaluate the role of Family and Community Medicine in supporting the control of HIV infection. **Methods:** This is a descriptive and ecological study that used secondary data from the Notifiable Diseases Information System (Sinan). **Results:** HIV infection remains a major challenge in the state of Goiás, reflecting national and global trends. Between 1984 and 2022, 25,140 AIDS cases were reported in Goiás, with a significant focus on vulnerable populations, particularly in the 25 to 29 and 30 to 34 age groups, reflecting the predominantly sexual transmission pattern of the disease. Additionally, there is a significant gender disparity, with 68.8% of cases in men, suggesting greater vulnerability in this group due to HIV-related risk behaviors. Demographic and social characteristics, such as education level and race, also influence the epidemic profile, with individuals with incomplete primary education and those identifying as mixed race (parda) being the most affected. **Conclusion:** The analysis of AIDS data in both the state of Goiás and the municipality of Anápolis reveals that the disease remains a significant public health issue, particularly among men and young adults. Although most cases are associated with heterosexual exposure, the presence of cases among LGBT populations and intravenous drug users is notable. The continuous increase in cases over the years, both in Goiás and Anápolis, highlights the urgent need to maintain and intensify preventive efforts, health education on HIV/AIDS, and the implementation of public policies aimed at reducing inequalities in access to care. In Anápolis, the number of cases has remained high in recent years, emphasizing the need for ongoing interventions, including expanded testing, early diagnosis, and effective treatment. Awareness campaigns, increased testing, and the impact of the COVID-19 pandemic likely influenced recent data fluctuations. Family and Community Medicine has a central role to play in strengthening primary care, promoting prevention, early diagnosis, and treatment adherence. Investing in the training of these professionals, especially regarding PrEP and stigma reduction, can contribute to a more effective response to HIV in the state and, more broadly, in Brazil.

Keywords: HIV, Goiás, Education, Prevention.

INTRODUCTION

The Acquired Immunodeficiency Syndrome (AIDS) was first recognized in the summer of 1981, when doctors observed an increase in cases of young homosexual men suffering from opportunistic infections and rare cancers, such as Kaposi's sarcoma. These men experienced a rapid decline in health, developing lesions and becoming emaciated, characteristics that surprised the medical community and instilled fear in the gay community as cases multiplied. This initial scenario became known as the "gay plague," a term that later proved to be inappropriate, as the causative virus, HIV (human immunodeficiency virus), affects individuals of all sexual orientations and genders and is transmitted through means beyond sexual contact.[1]

HIV is a virus that attacks the immune system, destroying CD4 cells, which play a crucial role in the body's defense against infections. By weakening this system, HIV increases the body's vulnerability to a range of opportunistic diseases, such as tuberculosis and certain types of cancer. When left untreated, HIV can progress to AIDS, the advanced stage of the infection in which the immune system is severely compromised. The World Health Organization (WHO) defines Advanced HIV Disease (AHD) as a CD4 cell count of less than 200 cells/mm³ or the presence of severe conditions classified in stages 3 or 4 of the infection.[2]

The transmission of HIV occurs primarily through contact with bodily fluids, such as blood, semen, vaginal secretions, and breast milk, with unprotected sexual intercourse being the main route of infection. Additionally, the virus can be transmitted through the sharing of contaminated needles during injectable drug use, and via vertical transmission, when the virus passes from mother to child during pregnancy, childbirth, or breastfeeding. Despite the existence of effective treatment with antiretroviral therapy (ART), which can reduce viral load to undetectable levels and prevent transmission, HIV remains one of the major global public health issues.[2]

In 2023, approximately 39.9 million people were living with HIV, with 65% of this total concentrated in the African Region[2]. The virus has claimed around 42.3 million lives since the onset of the pandemic. In Brazil, between 2007 and 2023, there were 489,594 reported cases of HIV infection, with the highest incidence in the Southeast region, followed by the Northeast and South regions. Men represent the majority of cases, with an increasing male-to-female ratio over time, particularly among young people aged 15 to 24. The prevalence of infections in reproductive-age women is also concerning, highlighting the need for interventions aimed at preventing vertical transmission.[3]

Regarding sexual transmission, oral sex presents a relatively low risk of contamination compared to other sexual practices, such as vaginal and anal sex. However, patients should be informed that the possibility of orogenital transmission still exists. Acute HIV infection, which occurs shortly after acquiring the virus, typically manifests with nonspecific symptoms such as fever, sore throat, and skin rashes, making early diagnosis challenging since these symptoms can be easily confused with other common infections, such as the flu. The acute phase, known as acute retroviral syndrome, represents a period during which viral replication is intense, making the individual highly contagious, although often asymptomatic.[4,5]

Family and Community Medicine plays a central role in the comprehensive and continuous care of populations, especially in regions where access to specialized services may be limited. In the state of Goiás, primary health care, promoted by this specialty, has the potential to be a strategic tool in controlling HIV infection, considering the increase in cases in recent years and the need for effective interventions in prevention, early diagnosis, and adherence to antiretroviral treatment. The proximity of family physicians to communities allows for a more personalized and humanized approach, promoting health education, reducing stigma, and providing ongoing support to patients living with HIV.

Therefore, the objective of this study is to provide an overview of HIV infection in the state of Goiás and to evaluate the role of Family and Community Medicine in supporting the control of HIV infection.

METHODOLOGY

This is a descriptive and ecological study that utilized secondary data from the Notification Disease Information System (SINAN), which is primarily fed by the notification and investigation of cases of diseases and conditions listed in the national list of mandatory notification diseases (Consolidation Ordinance No. 4, September 28, 2017, Annex). Its effective use allows for the dynamic diagnosis of the occurrence of an event in the population, providing support for causal explanations of mandatory notification diseases, as well as indicating risks to which individuals are exposed, thereby contributing to the identification of the epidemiological reality of a specific geographic area.

These reports are generated using the statistical tabulation application Tabnet, developed by the Ministry of Health and available on the electronic portal of the Department of Informatics of the Unified Health System (DATASUS – http://tabnet.datasus.gov.br). The indicators regarding HIV infections are presented in an aggregated manner, covering age group, sex, race, education, municipality, and exposure.

The data were extracted from October 1 to 8, 2024, using the Tabnet tabulation application. Regarding research ethics,

Table 1 - Frequency by Year of Diagnosis in Goiás from 1984 to 2022

Year of diagnosis	Frequency
TOTAL	25.140
1984	1
1985	5
1986	8
1987	48
1988	63
1989	63
1990	83
1991	140
1992	202
1993	232
1994	308
1995	437
1996	370
1997	537
1998	462
1999	444
2000	649
2001	753
2002	833
2003	812
2004	825
2005	806
2006	795
2007	823
2008	794
2009	908
2010	949
2011	1.003
2012	1.092
2013	1.066
2014	992
2015	1.071
2016	1.001
2017	1.019
2018	1.057
2019	1.132
2020	936
2021	1.157
2022	1.264

Data provided by the Department of Informatics of the Unified Health System (DATASUS)[6]

Table 2 - Frequency by Age Group according to Year of Diagnosis in Goiás from 1984 to 2022

Year of diagnosis	< 5 years	5-12	13-19	20-24	25-29	30-34	35-39	40-49	50-59	60 and more	Total
TOTAL	289	91	621	2,806	4,359	4,547	3,992	5,212	2,253	970	25,140
1984	0	0	0	0	0	1	0	0	0	0	1
1985	0	0	1	0	2	2	0	0	0	0	5
1986	0	1	0	0	2	2	3	0	0	0	8
1987	1	1	1	17	4	14	6	2	1	1	48
1988	0	2	5	13	14	10	8	9	2	0	63
1989	1	2	3	15	14	11	11	3	3	0	63
1990	2	1	0	12	12	23	15	9	5	4	83
1991	5	2	5	23	28	27	19	20	5	6	140
1992	6	1	14	28	63	36	28	20	6	0	202
1993	3	0	10	31	59	40	38	34	12	5	232
1994	7	0	10	44	81	66	33	55	7	5	308
1995	11	2	14	51	96	96	71	70	19	7	437
1996	14	0	5	44	82	77	66	59	16	7	370
1997	22	3	21	69	136	106	78	78	22	2	537
1998	19	0	8	48	105	92	76	80	22	12	462
1999	13	2	9	53	80	107	79	64	26	11	444
2000	14	3	12	57	140	157	101	123	34	8	649
2001	22	5	19	77	137	165	117	156	45	10	753
2002	22	4	14	77	124	186	156	180	58	12	833
2003	11	8	14	72	147	164	152	174	56	14	812
2004	20	7	17	80	138	140	163	172	65	23	825
2005	10	9	16	79	120	164	149	163	70	26	806
2006	5	4	15	71	137	157	141	176	61	28	795
2007	5	5	17	65	136	162	146	183	71	33	823
2008	2	6	11	60	123	159	140	195	66	32	794
2009	5	2	21	89	126	155	145	225	105	35	908
2010	6	5	18	65	158	174	163	238	91	31	949
2011	4	1	19	111	139	183	174	240	90	42	1.003
2012	8	2	30	129	152	191	155	271	96	58	1.092
2013	10	0	28	119	176	180	177	216	116	44	1.066
2014	5	2	20	128	153	153	168	214	92	57	992
2015	6	0	29	122	158	172	152	254	143	35	1.071
2016	6	3	29	109	158	164	148	211	120	53	1.001
2017	6	2	30	130	171	146	146	212	104	72	1.019
2018	4	3	36	137	142	167	171	217	134	46	1.057
2019	9	0	29	155	192	155	164	245	116	67	1.132
2020	0	1	16	116	176	177	114	188	98	50	936
2021	1	1	41	161	223	171	147	213	128	71	1.157
2022	4	1	34	149	255	195	172	243	148	63	1.264

Data provided by the Department of Informatics of the Unified Health System (DATASUS)[6]

Table 3 - Frequency by Gender according to Year of Diagnosis in Goiás from 1984 to 2022

Year of diagnosis	Male	Female	Blank	Total
TOTAL	17.286	7.849	5	25.140
1984	1	0	0	1
1985	4	1	0	5
1986	8	0	0	8
1987	42	6	0	48
1988	58	5	0	63
1989	55	8	0	63
1990	70	13	0	83
1991	112	28	0	140
1992	166	36	0	202
1993	180	52	0	232
1994	225	83	0	308
1995	339	98	0	437
1996	256	114	0	370
1997	368	169	0	537
1998	335	127	0	462
1999	283	161	0	444
2000	409	240	0	649
2001	437	316	0	753
2002	511	322	0	833
2003	497	315	0	812
2004	514	311	0	825
2005	478	327	1	806
2006	472	323	0	795
2007	516	306	1	823
2008	490	304	0	794
2009	570	337	1	908
2010	642	306	1	949
2011	683	320	0	1,003
2012	727	365	0	1,092
2013	729	337	0	1,066
2014	707	285	0	992
2015	748	323	0	1,071
2016	747	254	0	1,001
2017	744	275	0	1,019
2018	788	269	0	1,057
2019	836	296	0	1,132
2020	714	222	0	936
2021	882	274	1	1,157
2022	943	321	0	1,264

Data provided by the Department of Informatics of the Unified Health System (DATASUS)[6]

Table 4 - Frequency by Race/Color according to Year of Diagnosis in Goiás from 1984 to 2022

Year of diagnosis	White	Black	Asian	Brown	Indígenous	Unknown	Total
TOTAL	3,122	845	105	8,318	23	12,727	25,140
1984	0	0	0	0	0	1	1
1985	0	0	0	1	0	4	5
1986	0	0	0	0	0	8	8
1987	1	1	0	3	0	43	48
1988	0	0	0	0	0	63	63
1989	0	0	0	0	0	63	63
1990	0	0	0	0	0	83	83
1991	0	0	0	0	0	140	140
1992	0	0	0	0	0	202	202
1993	0	0	0	1	0	231	232
1994	2	0	0	0	0	306	308
1995	0	0	0	5	0	432	437
1996	1	1	0	4	0	364	370
1997	3	0	0	6	0	528	537
1998	4	0	0	2	0	456	462
1999	4	0	0	5	0	435	444
2000	89	14	7	93	3	443	649
2001	127	16	4	117	1	488	753
2002	74	26	2	155	0	576	833
2003	120	34	1	287	1	369	812
2004	118	42	4	329	0	332	825
2005	130	40	2	312	0	322	806
2006	136	26	2	338	0	293	795
2007	149	29	3	355	0	287	823
2008	166	38	4	337	1	248	794
2009	170	34	2	412	1	289	908
2010	173	24	5	459	2	286	949
2011	144	37	3	466	2	351	1,003
2012	186	50	5	521	3	327	1,092
2013	216	48	8	480	2	312	1,066
2014	165	37	2	448	0	340	992
2015	143	52	6	348	2	520	1,071
2016	114	48	4	376	0	459	1,001
2017	114	49	1	407	0	448	1,019
2018	131	46	11	401	1	467	1,057
2019	143	44	14	409	1	521	1,132
2020	80	37	6	365	2	446	936
2021	117	39	5	415	1	580	1,157
2022	102	33	4	461	0	664	1,264

Data provided by the Department of Informatics of the Unified Health System (DATASUS)[6]

Table 5 - Frequency by Education Level according to Year of Diagnosis in Goiás from 1984 to 2022

Year of diagnosis	Illiterate	Incomplete 1st to 4th grade	Complete 4th grade	Incomplete 5th to 8th grade	Completed Elementary education	Incomplete High School	Complete High School	Incomplete Higher education	Complete Higher education	Not applicable	Total
TOTAL	276	1,111	370	3,786	798	2,067	1,954	473	1,361	219	12,415
1984	0	0	0	0	0	0	0	0	1	0	1
1985	0	0	0	0	0	1	0	0	3	0	4
1986	1	1	0	0	0	2	0	0	3	0	7
1987	0	1	0	5	0	4	2	0	11	0	23
1988	1	0	0	4	0	15	0	0	15	1	36
1989	0	3	0	11	0	6	0	0	8	2	30
1990	1	3	0	16	0	13	1	0	20	3	57
1991	3	7	0	29	0	18	0	0	14	3	74
1992	3	7	0	43	0	44	0	0	17	6	120
1993	9	3	0	42	0	14	0	0	20	5	93
1994	6	14	0	77	0	36	1	0	11	7	152
1995	11	6	1	117	1	52	0	0	33	8	229
1996	7	18	0	80	1	45	1	0	20	13	185
1997	16	59	1	87	1	61	1	0	24	23	273
1998	14	69	0	76	1	51	2	0	28	11	252
1999	14	73	0	67	1	57	2	1	31	9	255
2000	6	106	0	152	2	96	3	0	23	11	399
2001	13	87	1	198	3	126	3	1	33	18	483
2002	10	54	2	146	2	159	6	1	28	12	420
2003	8	33	3	255	2	136	9	2	51	9	508
2004	6	25	4	268	4	147	6	3	51	17	531
2005	7	23	3	213	6	112	21	2	83	12	482
2006	7	12	4	247	13	103	13	0	39	4	442
2007	6	20	10	198	52	48	84	12	24	4	458
2008	8	27	16	146	64	45	100	19	35	1	461
2009	6	48	22	138	51	46	88	19	46	2	466
2010	2	27	13	159	65	42	78	24	37	2	449
2011	7	49	23	108	58	41	101	35	54	1	477
2012	8	38	28	133	61	48	149	43	45	3	556
2013	10	37	44	120	60	51	137	34	70	7	570
2014	17	46	36	108	53	41	125	35	56	4	521
2015	12	24	25	77	42	44	107	28	36	4	399
2016	7	30	7	59	35	41	85	25	33	6	328
2017	12	39	24	61	42	28	78	28	51	3	366
2018	8	33	25	61	37	41	127	32	58	2	424
2019	12	22	29	81	53	63	158	39	68	2	527
2020	3	14	14	55	24	59	136	25	58	1	389
2021	7	27	17	83	35	65	158	28	56	0	476
2022	8	26	18	66	29	66	172	37	67	3	492

Data provided by the Department of Informatics of the Unified Health System (DATASUS)[6]

Table 6 - Frequency by Hierarchical Exposure Category according to Year of Diagnosis in Goiás from 1984 to 2022

Year of diagnosis	Homosexual	Bisexual	Heterosexual	IDU	Hemophiliac	Transfusion	Vertical Transmission	Unknown	Total
TOTAL	3,369	1,006	9,354	1,041	36	21	289	10,024	25,140
1984	1	0	0	0	0	0	0	0	1
1985	0	1	1	2	0	0	0	1	5
1986	3	4	0	0	1	0	0	0	8
1987	14	12	6	12	2	0	1	1	48
1988	22	13	15	7	5	0	0	1	63
1989	9	11	23	13	2	0	1	4	63
1990	27	10	30	8	1	1	1	5	83
1991	26	18	46	35	1	1	3	10	140
1992	37	40	79	19	2	1	5	19	202
1993	38	19	90	41	2	0	2	40	232
1994	51	27	129	52	1	2	6	40	308
1995	74	28	209	47	1	4	11	63	437
1996	50	14	196	52	3	0	7	48	370
1997	81	43	293	58	4	1	22	35	537
1998	78	25	235	72	3	0	18	31	462
1999	64	35	249	45	1	0	16	34	444
2000	65	50	342	54	0	0	13	125	649
2001	69	44	400	42	0	1	20	177	753
2002	75	33	394	48	0	0	15	268	833
2003	55	33	416	40	0	1	11	256	812
2004	68	42	395	31	0	3	17	269	825
2005	79	37	364	27	0	1	10	288	806
2006	63	19	361	25	0	0	3	324	795
2007	100	46	347	28	1	1	9	291	823
2008	95	32	357	21	1	0	4	284	794
2009	114	34	377	19	0	0	4	360	908
2010	121	31	349	18	1	0	6	423	949
2011	136	35	335	11	0	0	7	479	1.003
2012	164	27	416	17	0	1	4	463	1.092
2013	207	32	365	15	0	1	8	438	1.066
2014	159	22	328	39	0	0	7	437	992
2015	116	25	317	20	2	0	5	586	1.071
2016	139	18	225	14	0	0	13	592	1.001
2017	133	19	309	26	1	0	6	525	1.019
2018	161	17	288	26	1	2	11	551	1.057
2019	168	21	310	19	0	0	6	608	1.132
2020	155	23	226	8	0	0	6	518	936
2021	159	29	270	15	0	0	4	680	1.157
2022	193	37	262	15	0	0	7	750	1.264

Data provided by the Department of Informatics of the Unified Health System (DATASUS)[6]

Table 7 - Frequency by Year of Diagnosis in the Municipality of Anápolis, Goiás from 1985 to 2022

State Residency	1985	1987	1989	1990	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
TOTAL	1	2	4	1	2	4	5	6	4	8	18	27	33	37	38	35	32	33	35	37	46	38	59	56	46	45	35	35	26	52	30	47	50	927
Anápolis	1	2	4	1	2	4	5	6	4	8	18	27	33	37	38	35	32	33	35	37	46	38	59	56	46	45	35	35	26	52	30	47	50	927

Data provided by the Department of Informatics of the Unified Health System (DATASUS)[6]

according to the resolution of the National Health Council No. 674, dated May 6, 2022, and since this study involves the evaluation of publicly available secondary data, it was not necessary to obtain approval from Plataforma Brasil.

RESULTS

The collected data shows the evolution of AIDS cases identified in the state of Goiás, Brazil, from 1984 to 2022. The total number of cases over this period was 25,140, with a notable increase over the decades, especially starting from the 1990s. The highest number of cases was recorded in 2022, with 1,264 cases during the post-pandemic period of Covid-19.

DISCUSSION

The HIV infection continues to be a significant challenge in the state of Goiás, reflecting national and global trends. Recent data reveal a steady increase in the number of AIDS cases diagnosed, especially among vulnerable populations, with a total of 25,140 cases in Goiás between 1984 and 2022 and 927 cases in the municipality of Anápolis from 1985 to 2022. The age groups with the highest number of cases include individuals aged 25-29 and 30-34, with 4,359 and 4,547 cases, respectively. These are groups in their productive and sexually active years, reflecting the epidemiological pattern of AIDS as a sexually transmitted disease. Cases in children under 5 years are less frequent, with only 289 cases recorded, likely due to vertical transmission (from mother to child).

The majority of cases were identified in men, with 17,286 cases (68.8%), predominantly in the brown population (33.1%, with 8,318 cases) and those with incomplete elementary education (3,786 cases). Educational attainment appears to have a significant correlation with the number of cases, as individuals with higher education (completed higher education) have fewer recorded cases (1,361 cases), indicating that educational level may influence awareness and access to prevention measures.

The category of heterosexual exposure was the most prevalent, with 9,354 cases, and cases involving injection drug users (IDU) totaled 1,041 cases, an important category for harm reduction policies.

In recent years (2021 and 2022), there was an increase in the number of cases, with 1,157 and 1,264 respectively. This increase may reflect changes in testing policies, increased awareness, or even the impacts of the COVID-19 pandemic on public health dynamics.

The analysis of data on the municipality of Anápolis regarding AIDS cases diagnosed between 1985 and 2022 reveals that in recent years, specifically in 2020 and 2021, the number of cases remained high with 30 and 47 cases respectively, despite a slight decrease in 2020 (possibly related to the COVID-19 pandemic and changes in access to health services). In 2022, there was again an increase to 50 cases, suggesting a return to levels seen before the pandemic.

The recognition and diagnosis of acute infection with the human immunodeficiency virus (HIV) in the primary care setting present an opportunity for patient education and health promotion. The symptoms of acute HIV infection are nonspecific (e.g., fever, malaise, myalgia, rash), making misdiagnosis common. Since a wide range of conditions can produce similar symptoms, diagnosing acute HIV infection requires a high index of suspicion, a thorough assessment of HIV exposure risk, and appropriate laboratory testing related to HIV. The HIV RNA viral load test is the most useful diagnostic test for acute HIV infection, as HIV antibody test results are generally negative or indeterminate during acute infection. After confirming the diagnosis of acute HIV infection, physicians should discuss effective transmission risk reduction strategies with patients.[5]

Training family physicians in HIV/AIDS with better knowledge, learning, and management of HIV/AIDS is essential, as demonstrated by a longitudinal study from the University of Minnesota, which integrated 18 modules on HIV into the residency curriculum. The intervention resulted in increased knowledge, confidence, and intent to treat HIV-positive patients, as well as an increase in the number of HIV tests conducted.[7]

These approaches are fundamental to improving the early detection of HIV, promoting voluntary testing, and reducing the burden of the disease.

Another important factor is the education of healthcare professionals about pre-exposure prophylaxis (PrEP), which is a promising strategy for HIV prevention. A study conducted in the United States revealed that residents in areas with more training in PrEP exhibited greater competence in prescribing this medication, which is crucial for prevention in at-risk populations[8]. The training of family physicians to work with PrEP is especially important in areas like Goiás, where the HIV epidemic persists among vulnerable groups. Thus, strategies like the "PrEP-Pro" program, tested in Alabama, can serve as a model for implementation in Goiás, focusing on the ongoing education of healthcare professionals and greater integration with the community.[9]

The stigma associated with HIV in Goiás, as in other regions, continues to be a significant barrier to treatment and prevention. Studies show that stigma negatively impacts treatment adherence and the seeking of healthcare services, exacerbating the spread of the virus.[9] To address this issue, Family and Community Medicine (MFC) plays an important role, as evidenced by successful community interventions in other contexts, such as in Kenya. The case report from Kaloleni demonstrated that family physicians can lead initiatives to combat stigma through actions such as community awareness and the formation of support groups, improving access to care and the reception of patients with HIV.[10]

The education and awareness of family physicians can contribute to the reduction of stigma. In a study conducted in Turkey, although family physicians had basic knowledge about the relationship between risky sexual behavior and HIV infection, they still lacked information about other at-risk groups, indicating the need for greater educational focus.[11] With proper training and support, family physicians in Goiás can be empowered not only to identify and treat HIV but also to educate their communities and combat the stigma associated with the disease.

CONCLUSION

The analysis of data on AIDS in both the state of Goiás and the municipality of Anápolis reveals that the disease continues to be a significant public health problem, particularly among men and young adults. While the majority of cases are associated with heterosexual exposures, it is noteworthy that there are cases among LGBT populations and injection drug users.

The continuous increase in cases over the years, both in Goiás and Anápolis, highlights the urgency of maintaining and intensifying preventive efforts, health education on HIV/AIDS, and the implementation of public policies aimed at

reducing inequalities in access to care.

In Anápolis, the number of cases has remained high in recent years, highlighting the need for ongoing interventions, including expanded testing, early diagnosis, and effective treatment. Awareness campaigns, increased testing, and the impact of the COVID-19 pandemic have likely influenced the fluctuations in the most recent data.

Family and Community Medicine has a central role to play in strengthening primary care by promoting prevention, early diagnosis, and treatment adherence. Investing in the training of these professionals, especially regarding PrEP and stigma reduction, can contribute to a more effective response to HIV in the state and, more broadly, in Brazil

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LORENA PIMENTAL RODRIGUES - http://lattes.cnpq.br/1906927285799547 - https://orcid.org/0009-0003-9478-8029

THAYNARA LUDVIG NAVES - http://lattes.cnpq.br/7288014072314977- https://orcid.org/0000-0002-1017-7235

MAILING ADDRESS:

LORENA PIMENTAL
Av. Universitária Km. 3,5 - Cidade Universitária - Anápolis - GO, Brasil.
E-mail: Lorenpimentel_@hotmail.com

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SCIENTIFIC ARTICLE - CASE REPORT

ANESTHESIA FOR KEARNS SAYRE SYNDROME: CASE REPORT

MATEUS FERREIRA DE SIQUEIRA E SILVA[1]; DIRCEU CASTRO PACHECO[1]; GUSTAVO SIQUEIRA ELMIRO[1]; GIULLIANO GARDENGHI[1,2]

1. Centro de Ensino e Treinamento da Clínica de Anestesia (CET - CLIANEST) - Goiânia - GO - Brazil
2. Hospital ENCORE, Aparecida de Goiânia - GO - Brazil

ABSTRACT

Introducion: Kearns-Sayre syndrome (KSS) is a very rare multisystem mitochondrial disease that occurs before the age of 20 and is characterized by a typical clinical triad: progressive external ophthalmoplegia with ptosis, pigmentary retinopathy and cardiac conduction abnormalities, including heart block. Other clinical manifestations may also include muscle weakness, symptoms of neurological dysfunction such as cerebellar ataxia, impaired intellectual and cognitive function, sensorineural hearing loss and neuropathy, various endocrine abnormalities, nephropathy, and dental anomalies. **Case Report:** Female patient, 62 years old, with heart disease using a bicameral pacemaker, type II diabetic, sedentary, with KSS, was admitted in Goiânia, Goiás on 05/06/2024 after desaturation and decreased level of consciousness, being diagnosed with pneumonia in the emergency room. She was intubated and maintained on mechanical ventilation until May 16th and then a tracheostomy (TQT) was performed. After the TQT, the patient was already in the infirmary bed (with TQT in a tent) where the patient's pulmonary investigation was continued with bronchoscopy under light sedation (midazolam, propofol and fentanyl). After the procedure, the patient was kept in the post-anesthesia recovery room for approximately sixty minutes and taken to the infirmary bed. Approximately six hours after bronchoscopy, the patient began to experience desaturation, cyanosis of the extremities and central region, and a lower level of consciousness. She was taken to the ICU and maintained on BIPAP support. Bronchoscopy result was negative. During her stay in the ICU, she was diagnosed with two bacterial pneumonias and one viral pneumonia due to Influenza A. The TQT was changed on 06/04/24 and 06/17/24. On 06/19/24, the patient underwent gastrostomy under light sedation using fentanyl 15 mcg, midazolam 3 mg, ketamine 5 mcg without complications and was subsequently sent to the ICU, where she remained without adverse events. **Discussion:** KSS is a rare mitochondrial disease that is difficult to diagnose early. Little is known about the behavior of the disease in the face of surgical procedures, which is why it is a challenge. In patients diagnosed with KSS, toxic mitochondrial medications should be avoided, such as propofol, aminoglycosides, linezolin, metformin and nucleoside analogues.

Keywords: Chronic Progressive external ophthalmoplegia, Kearns-sayre syndrome, Propofol.

INTRODUCTION

Kearns-Sayre syndrome (KSS) is a very rare multisystemic mitochondrial disease that occurs before the age of 20 and is characterized by a typical clinical triad: progressive external ophthalmoplegia with ptosis, pigmentary retinopathy, and cardiac conduction abnormalities, including heart block[1,2]. Other clinical manifestations may include muscle weakness, dysfunction such as cerebellar ataxia, impaired intellectual and cognitive function, sensorineural hearing loss, and neuropathy, along with various endocrine abnormalities, nephropathy, and dental anomalies[1,3,4.]

Mitochondrial disorders result from mutations in mitochondrial DNA (mtDNA) or nuclear DNA (nDNA). Each human cell, except mature cells, contains between 500 to 6.000 mitochondria, and each mitochondrion contains one to fifteen copies of mitochondrial DNA[5,6]. The number of mtDNA copies differs significantly between cell types and tissues and depends on energy demands. During reproduction, only maternal mitochondria are inherited. Mitochondrial DNA is a double-stranded molecule of 16 kilobases that encodes 13 proteins essential for oxidation/phosphorylation, 22 types of tRNA, and 2 types of rRNA[7].

Chronic Progressive External Ophthalmoplegia (CPEO) is the most common manifestation of mitochondrial diseases and is characterized by progressive, symmetrical bilateral changes, ptosis, and reduced ocular motility. CPEO can be isolated or accompanied by a clinical picture characteristic of systemic involvement in mitochondrial dysfunction (CPEO plus syndrome). The global prevalence of CPEO is unknown; however, the incidence of CPEO is 1–2 per 100.000. In the UK cohort database, the estimated prevalence of CPEO recorded was 1 in 30.000[8].

In 90% of cases, Kearns-Sayre Syndrome (KSS) is caused by large-scale, spontaneous, heteroplasmic mitochondrial DNA (mtDNA) deletions that occur at the germline level during embryonic development, ranging from 1.1 to 10 kb[9,10]. Rarely, point mutations, single nucleotide deletions, mtDNA duplications, as well as exclusions or multiple mtDNA deletions and nuclear gene defects predisposing to multiple deletions are identified as causative of KSS[11,12]. The mtDNA rearrangements typically affect the coding of respiratory chain protein genes and a large number of various tRNAs. These rearrangements impair oxidative phosphorylation, resulting in reduced energy production in mitochondria and leading to dysfunction of many tissues, especially those with high energy demands[4,12].

Considering our experience in anesthetizing a patient with Kearns-Sayre Syndrome (KSS), the objective of this study is to gather data from the literature on KSS related to procedures performed by fellow anesthesiologists and their respective experiences, as well as the adverse effects of commonly used anesthetic drugs in the context of the patient's condition.

CASE REPORT

Female patient, 62 years old, with a history of heart disease and a bicameral pacemaker, type II diabetes, sedentary lifestyle, and Kearns-Sayre Syndrome, was admitted to a hospital in Goiânia on 05/06/2024 after desaturation and decreased level of consciousness. She was diagnosed with pneumonia in the emergency room. The patient was intubated and remained on mechanical ventilation until 05/16, at which point a tracheostomy was performed. The patient progressively improved with respiratory recovery and was discharged to the ward.

In the hospital room, the patient was under a tracheostomy with oxygen support via a tent, and the pulmonary investigation was ongoing with the performance of a bronchoscopy under light sedation (midazolam, propofol, and fentanyl). After the procedure, the patient was maintained in the post-anesthesia recovery room for about sixty minutes and then transferred back to the hospital room. About six hours after the bronchoscopy, the patient started showing desaturation, cyanosis of the extremities and centrally, and a decrease in the level of consciousness.

She was transferred back to the ICU and maintained on non-invasive ventilation support with two levels of pressure (Bilevel). The result of the bronchoscopy was negative. During her hospitalization in the ICU, she was

diagnosed with two bacterial pneumonias and one viral pneumonia caused by Influenza A. The tracheostomy was changed on 06/04/2024, and 06/17/2024.

During her hospitalization, 06/19/2024, the patient underwent a gastrostomy under light sedation using 15 mcg of fentanyl, 3 mg of midazolam, and 5 mcg of ketamine, without any complications. She was subsequently transferred to the ICU, where she remained without adverse events.

DISCUSSION

A 50-year-old female patient with uterine cancer undergoing radiotherapy developed radiation cystitis and ureLittle is still known about Kearns-Sayre Syndrome (KSS) in the context of surgical procedures, making it a challenge for anesthesiologists. In our case report, two different procedures were performed with different sedations. In the first procedure, for the bronchoscopy, the sedation used included fentanyl, propofol, and midazolam. In the second sedation, for the gastrostomy, fentanyl, midazolam, and ketamine in low doses were used.

Kearns-Sayre Syndrome (KSS) is a multisystem mitochondrial disease, and patients should be advised about medications that are toxic to the mitochondria, such as metformin, propofol, valproic acid, aminoglycosides, linezolid, and treatments with nucleoside analogs[13,14].

According to our case report, it is likely that the use of propofol during the first sedation led to central cyanosis, desaturation, and a decrease in the level of consciousness. Although the use of propofol is generally discouraged in patients with Kearns-Sayre Syndrome (KSS) due to mitochondrial dysfunction, Maddali et al. used propofol continuously for sedation in a 14-year-old patient undergoing permanent pacemaker implantation[15]. In that report, the patient did not experience complications from propofol use, unlike in our case.

The discouragement of using mitochondrial-toxic drugs is unanimous[4,11-14]. However, adverse effects such as propofol infusion syndrome are reported at very high concentrations, resulting in lactic acidosis[14].

Propofol can also disrupt the mitochondrial permeability transition pore, leading to a decrease in mitochondrial membrane potential and subsequent apoptosis. Additionally, the inhibition of free fatty acid uptake into the mitochondria may be a causal factor for propofol infusion syndrome. Therefore, it has been suggested that propofol may be toxic to mitochondria, and patients with mitochondrial disorders should not receive propofol in high doses for extended periods[16].

Thus, after reviewing the literature and the experiences of each author regarding anesthetic procedures, we cannot conclusively state that the complications in our patient during the first sedation were caused by propofol. However, based on the literature, we recognize that drugs causing mitochondrial damage should be avoided. Due to the lack of randomized clinical trials on Kearns-Sayre Syndrome (KSS), we maintain the recommendation to avoid drugs with unknown pharmacodynamic effects.

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MATEUS FERREIRA DE SIQUEIRA E SILVA - http://lattes.cnpq.br/9487795557278238 - https://orcid.org/0000-0001-7977-484X

DIRCEU CASTRO PACHECO - http://lattes.cnpq.br/9259558054810108 - https://orcid.org/0009-0009-5316-482X

GUSTAVO SIQUEIRA ELMIRO - http://lattes.cnpq.br/4765163399934337 - https://orcid.org/0000-0003-2113-8757

GIULLIANO GARDENGHI - http://lattes.cnpq.br/1292197954351954 - https://orcid.org/0000-0002-8763-561X

MAILING ADDRESS:
GIULLIANO GARDENGHI
CLIANEST - Rua T-32, 279 - Setor Bueno, Goiânia - GO - Brasil
E-mail: coordenacao.cientifica@ceafi.edu.br

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HEADACHE WITH WARNING SIGNS ASSOCIATED WITH SUBDURAL HEMATOMA POST-SPINAL ANESTHESIA: A CASE REPORT OF A RARE COMPLICATION

LUIZ EDUARDO MARTINS FREIRE[1]; MARIA RIBEIRO TOLEDO PIZA[1]; LUIZ HENRIQUE RIBEIRO MOTTA[2]

1. Pontifícia Universidade Católica of Goiás - Goiânia - GO - Brazil
2. Universidade de Rio Verde, Campus Aparecida de Goiânia - GO - Brazil

ABSTRACT

Introducion: Post-spinal anesthesia headache is a common complication, but the occurrence of a subdural hematoma is rare and may present with warning signs that require immediate attention. **Objectives:** The objective of this report is to present a case of headache with warning signs associated with a subdural hematoma, diagnosed after spinal anesthesia performed with a fine-gauge needle and a single puncture, emphasizing the importance of early recognition and appropriate management of this rare complication. **Case Report:** A 50-year-old female patient with uterine cancer, undergoing radiotherapy, developed actinic cystitis and urethrorrhagia without hemodynamic or hematimetric alterations. She underwent spinal anesthesia for intra-vesical cauterization using a 27G Quincke needle with a single puncture. The surgical procedure was uneventful. After 48 hours, she developed a sudden onset of severe bilateral occipital headache (8/10), associated with nausea and vomiting. This was interpreted as a post-dural puncture headache (hypotension) and was treated with fluids, caffeine, and analgesics by the medical team. She returned to the emergency department 13 days later with a worsening headache, decreased level of consciousness, and dense brachiocrural hemiparesis on the left side. A cranial CT scan revealed a chronic right frontoparietal subdural hematoma with mass effect and midline shift. She was taken to the operating room for hematoma drainage. After trepanation, hypertensive hematoma drainage was observed. The procedure was uneventful, and the patient remained hospitalized for 5 days for monitoring and was discharged with complete recovery from deficits. **Discussion:** This case highlights the importance of differentiating benign headaches from serious secondary conditions. We reviewed the literature on the incidence, pathophysiology, and management of post-spinal anesthesia subdural hematomas. However, intracranial subdural hematoma constitutes a rare complication, with an incidence ranging from 1:500.000 to 1:1.000.000. The pathophysiological mechanism remains uncertain, though the leading hypothesis suggests that the loss of cerebrospinal fluid through the needle puncture causes a volumetric and pressure decrease in the dynamics of the closed circulatory system, leading to gravity-dependent brain displacement. This results in traction of cerebral structures and rupture of bridging veins. Consequently, the case illustrates a rare complication with nonspecific

symptoms, making the early diagnosis of subdural hematoma challenging, which, if neglected, can result in a fatal outcome. This case emphasizes the importance of distinguishing benign headaches from serious secondary conditions. We review the literature on the incidence, pathophysiology, and management of subdural hematomas following spinal anesthesia. Conclusion: Early recognition of warning signs in patients with headaches following spinal anesthesia is crucial to prevent adverse outcomes. Subdural hematoma should be considered in the differential diagnosis of headaches with warning signs.

Keywords: post-dural puncture headache, subdural hematoma, neuroimaging, signs and symptoms.

INTRODUCTION

Certain complications of lumbar punctures are well-known and documented, such as low back pain, radicular injuries, abscesses, and meningitis. However, chronic subdural hematoma following spinal anesthesia is a rare condition, with only 33 cases reported in the literature.[1] The exact prevalence is unknown, but the rarity of cases suggests an exceptionally low occurrence, with an estimated incidence of 1 in 500,000 to 1.000.000 people.[2] The initial presentation can be nonspecific, such as headache, which often leads to diagnoses and treatments that do not address the underlying severity.

This case underscores the importance of recognizing warning signs in patients presenting with post-spinal anesthesia headache, highlighting the need for careful neurological evaluation and, when indicated, the use of neuroimaging to identify potential serious complications. Early intervention, such as the performed surgical drainage, can be crucial for the complete recovery of neurological deficits.

Therefore, the objective of this paper is to report the case of a subdural hematoma following spinal anesthesia performed with a fine-gauge needle and single puncture, emphasizing that characterizing the headache is essential for the early diagnosis of this potentially fatal complication.

MATERIALS AND METHODS

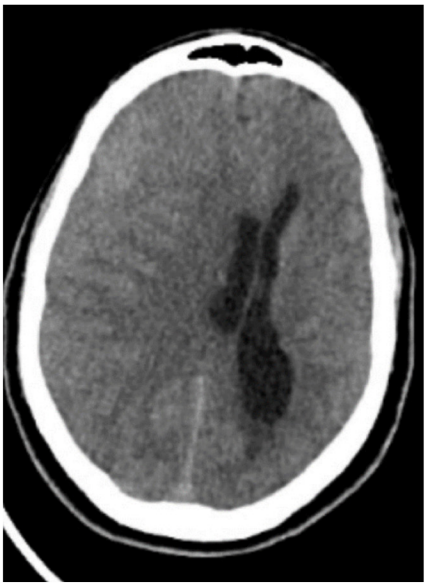
This is a case report study. A detailed analysis of the patient's medical record and clinical observations was conducted. Informed consent was obtained from the patient for the use of data in the case report, ensuring confidentiality and anonymity. The study was conducted in accordance with ethical guidelines and applicable regulations for medical case reports.

CASE REPORT

A 50-year-old female patient with uterine cancer undergoing radiotherapy developed radiation cystitis and urethrorrhagia, with no hemodynamic or hematimetric changes. She underwent spinal anesthesia for intravesical cauterization using a 27G Quincke needle and single puncture. The surgical procedure was uneventful. After 48 hours, she presented with a sudden onset of severe bilateral occipital headache (8/10 intensity), accompanied by nausea and vomiting. This was interpreted as post-puncture headache due to cerebrospinal fluid hypotension and was treated with fluids, caffeine, and analgesics by the internal medicine team.

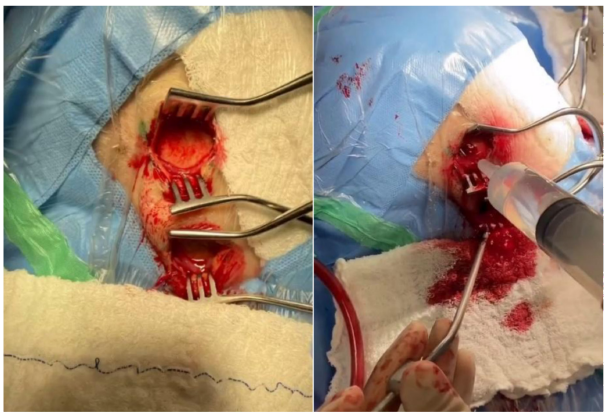
She returned to the emergency department 13 days later with worsening headache, decreased level of consciousness, and dense brachiocrural hemiparesis on the left side. A cranial CT scan (Figure 01) revealed a right frontoparietal chronic subdural hematoma with mass effect and midline shift.

Figure 01: Non-contrast cranial CT (Axial view) – showing an acute-on-chronic right subdural hematoma. Source: Personal archive 03/2023.



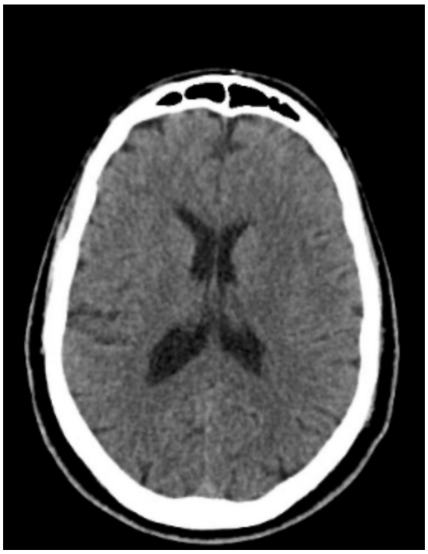
Assessed by the on-call neurosurgery team in the emergency department, the surgical approach was discussed with the patient and her family. She was taken to the operating room for hematoma drainage. Two burr holes were made (right frontal and right parietal). After trepanation and durotomy, a pressurized, chronic hematoma drained out (Figure 02). The cavity was thoroughly irrigated with 0.9% saline solution. The procedure was uneventful, with adequate brain re-expansion observed at the end.

Figure 02: Right frontal and parietal burr holes. Thorough cavity irrigation. Source: Personal archive – 03/2023



The patient remained hospitalized for 5 days for monitoring and was discharged with complete improvement of the deficits. In an outpatient follow-up visit 15 days after hospital discharge, she remained without deficits and showed significant improvement in the headache. A postoperative control CT scan (Figure 03) was performed 3 months after surgery, showing no residual signs of intracranial bleeding.

Figure 03: Control cranial CT scan – 3 months post-surgery (Axial view – without contrast).
Source: Personal archive – 06/2023.



DISCUSSION

The case of a 50-year-old patient with a history of uterine cancer undergoing radiotherapy, who developed radiation cystitis and urethrorrhagia, clearly and concerningly illustrates the potential complications of spinal anesthesia. The development of post-dural puncture subdural hematoma (PDPSDH) is a rare and severe complication of spinal anesthesia, with an estimated incidence of 1 in 500,000 to 1.000.000 people[2], especially in obstetric patients, who often present with post-dural puncture headache (PDPH) as a common manifestation.[3] While PDPH is mostly self-limiting and benign, progression to a subdural hematoma represents a significant risk for morbidity and mortality, requiring prompt attention and early intervention.[4]

The primary etiology of PDPSDH is intracranial hypotension resulting from continuous cerebrospinal fluid (CSF) leakage through the dural defect, which can lead to rupture of the bridging veins and subsequent formation of a subdural hematoma5. The transformation of postural headache, typical of PDPH, into a non-postural headache, accompanied by neurological symptoms such as vomiting, seizures, cognitive changes, or focal neurological signs, should be considered an important warning sign for the development of a subdural hematoma.[6]

Computed tomography (CT) is often the first imaging modality used to diagnose subdural hematoma due to its availability and rapid detection capability.[7] However, magnetic resonance imaging (MRI) may be more effective in subacute and chronic stages, where differentiation between hematoma and brain tissue can be challenging on CT.[8] The management decision for PDPSDH should be based on the extent of the hematoma, presence of

neurological impairment, and associated symptoms.[9] Small subdural hematomas can be managed conservatively with strict monitoring, while larger hematomas or those associated with progressive neurological deficits require surgical intervention.[10]

The differentiation between PDPH and PDPSDH is crucial, as inadequate or delayed treatment can result in significant adverse outcomes.[11] Early and thorough evaluation, using the guidelines from the International Headache Society to identify warning signs, is essential to prevent severe complications. Alarm signs include sudden or severe onset of headache, change in pain characteristics, advanced age, history of cancer, papilledema, signs of central nervous system infection, focal neurological signs, and a history of immunosuppression.[12] The presence of these signs should prompt further investigation to ensure early identification and appropriate management of complications.[13,14]

CONCLUSION

Headache with warning signs after spinal anesthesia should be thoroughly investigated, especially in obstetric patients, due to the risk of complications such as subdural hematoma. The transformation of a postural headache into a non-postural one, associated with other neurological symptoms, is a critical indicator for suspecting PDPSDH. The reported clinical experience demonstrates that early recognition and timely surgical management can result in complete recovery, even in cases of severe complications such as subdural hematoma.

Furthermore, this case also illustrates the complexity of differentiating between PDPH and PDPSDH, especially in patients with additional risk factors, such as prior radiotherapy treatment. Management of PDPSDH should be individualized, with options ranging from careful observation in cases of small hematomas to surgical intervention in more severe cases.

Ultimately, awareness of this complication and readiness for diagnostic investigation are essential for the safety and well-being of patients undergoing spinal anesthesia.

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LUIZ EDUARDO MARTINS FREIRE - http://lattes.cnpq.br/2273033115809464 - https://orcid.org/0009-0008-0381-6896

MARIA RIBEIRO TOLEDO PIZA - http://lattes.cnpq.br/9822470149541417 - https://orcid.org/0009-0000-9417-6020

LUIZ HENRIQUE RIBEIRO MOTTA - http://lattes.cnpq.br/8442935850378284 - https://orcid.org/0009-0002-0046-5492

MAILING ADDRESS:

LUIZ EDUARDO MARTINS FREIRE
Rua Grão Pará 570 - Santa Efigênia - apt 803 - Ed. Terezinha Isaira - Belo Horizonte- MG - Brazil
E-mail: luiz-motta@hotmail.com

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SCIENTIFIC ARTICLE - CASE REPORT

DOUBLE DEMENTIA: THE ASSOCIATION BETWEEN NORMAL PRESSURE HYDROCEPHALUS AND SEMANTIC DEMENTIA

LEONARDO FERREIRA CAIXETA[1]; GABRIELA DAMASCENO SILVA[2]; CIRO MENDES VARGAS[3]; YANLEY L NOGUEIRA[4]; IRON DANGONI FILHO[5]; VICTOR DE MELO CAIXETA[6]

1. Psychiatrist and Full Professor of Neuropsychiatry at the Faculty of Medicine of the Federal University of Goiás - FM-UFG, Director of CERNE – Center of Excellence in Neuropsychiatry at the Hospital das Clínicas of FM-UFG
2. Psychiatry resident at Hospital ASMIGO
3. Psychiatrist and Professor of Internal Medicine at the Faculty of Medicine of the Federal University of Goiás - FM-UFG
4. Psychiatrist, Master's student in the Health Sciences Graduate Program at the Faculty of Medicine of the Federal University of Goiás - FM-UFG
5. Neurologist, Master's degree holder in the Health Sciences Graduate Program at the Faculty of Medicine of the Federal University of Goiás - FM-UFG
6. Psychiatrist and Assistant Professor of Psychiatry at the Faculty of Medicine of the Federal University of Goiás - FM-UFG

ABSTRACT

Semantic Dementia (SD), which belongs to the group of Frontotemporal Lobar Degenerations, usually presents in the pre-senile stage, with no well-established risk factors. Normal Pressure Hydrocephalus (NPH) has been associated with neurodegenerative diseases; however, there are no descriptions in the literature regarding the association between SD and NPH. In this report, we present the case of a patient with congenital NPH and moderate intellectual disability who progressed to SD, highlighting the overlap of symptoms from both entities.

Keywords: Co-pathology, Temporal variant frontotemporal dementia, Semantic dementia, Frontotemporal lobar degeneration, Idiopathic normal pressure hydrocephalus.

INTRODUCTION

Semantic Dementia, also known as the temporal variant of Frontotemporal dementia, is a primary neurodegenerative disease within the group of Frontotemporal Lobar Degenerations, and is associated with asymmetric temporal atrophy.[1] It was initially described in patients with primary progressive aphasia, where they exhibit impairments in semantic memory, losing the meaning of words while preserving fluency.[1] Typically, symptom onset occurs in the pre-senile stage, around the age of 60, with no specific risk factors associated with the pathogenesis of Semantic Dementia.[2,3]

Although hydrocephalus is a common imaging finding in dementias secondary to cortical atrophy, Normal

Pressure Hydrocephalus (NPH) as a nosological entity, with its own symptoms and causes, either congenital or acquired, is described as a cause of cognitive decline.

NPH presents with the triad of gait disturbance, cognitive impairment, and urinary incontinence. The most common comorbidities in patients with NPH are hypertension, Alzheimer's disease (AD), and vascular dementia.[4,5]

In NPH, beta-amyloid plaques and hyperphosphorylated tau protein inclusions are frequently identified in the frontal cortex, but the association of NPH with dementias from the Frontotemporal Lobar Degeneration (FTLD) group is not well described in the literature.[6]

As Semantic Dementia is rarely associated with NPH, we present this case in which the patient exhibits NPH, moderate mental retardation, alcohol abuse, multiple traumatic brain injuries (TBI), and the current outcome of Semantic Dementia.

CASE REPORT

IPJ, 68 years old, with a history of congenital hydrocephalus, moderate mental retardation, and inability to read and write.

At 13 years old, she started alcoholism with a preference for distilled spirits and an uncertain volume. She left her hometown at 38, leaving her children and husband, and spent 10 years as a homeless person in Rio de Janeiro. Throughout her life, she had several traumatic brain injuries (TBIs) secondary to alcohol consumption, requiring a decompressive craniectomy in 2010.

The family started noticing behavioral and cognitive changes in the patient at 54 years old, when she began wandering, increased alcohol consumption, and heteroaggressiveness. She was then admitted to a psychiatric hospital for 16 days. At 65, the children noticed spatial disorientation, prosopagnosia, Capgras syndrome, deficits in working memory, and episodic memory. Additionally, the patient became more irritable, with a low tolerance for frustration, suicidal ideation, and disgust behavior. At 66, family members described hyperorality, with reports that the patient ate all the food found around the house.

In the course of the illness, the patient showed improvement in irritability and suicidal ideation after starting sodium valproate. The return of disgust and improvement in episodes of mood elevation occurred after starting periciazine. She still has spatial and temporal disorientation, working memory deficits, and partially impaired episodic and autobiographical memory. Her speech is perseverative, focusing on returning to her hometown, and she continues to have prosopagnosia. She has adequate sleep, but still suffers from urinary and fecal incontinence, choking episodes, slowed gait, and motor rigidity. She does not have independence for performing instrumental activities or activities of daily living.

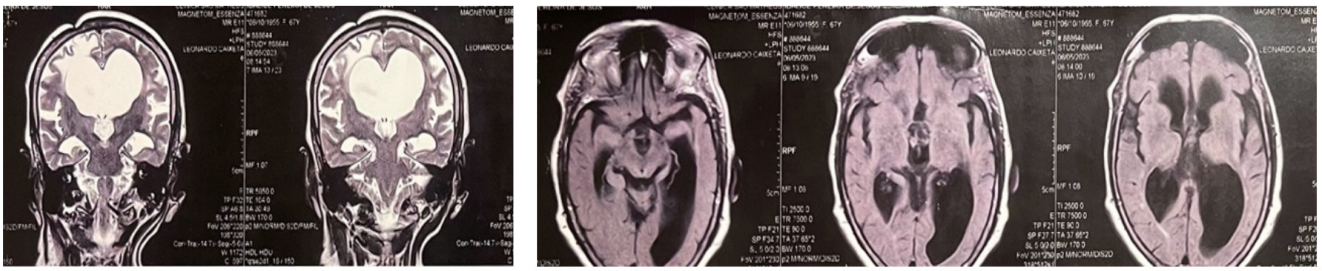

Figure 1 - Asymmetric hydrocephalus (more prominent in the left hemisphere), associated with degenerative atrophy in the temporal regions, also more pronounced in the left hemisphere.

DISCUSSION

Idiopathic normal pressure hydrocephalus has a complex multifactorial pathogenesis and is associated with Alzheimer's disease in many patients. To date, it is unknown whether a similar association exists with the temporal variant of frontotemporal lobar degeneration.[6] Our case represents the first reported association between semantic dementia (SD) and normal pressure hydrocephalus (NPH), as far as we know. Although semantic dementia does not have established risk factors associated with its pathogenesis, it is known that in the presence of intellectual disability, there is reduced cognitive reserve, which may be associated with the earlier onset of symptoms in our case, observed by the family at least 6 years earlier than the average age described in the literature.

A recent study reported that the prevalence of idiopathic normal pressure hydrocephalus was much higher in the group of patients with the behavioral variant of frontotemporal lobar degeneration than in the group of patients with Alzheimer's disease (7.25% vs. 1.1%, respectively, P = 0.02). The authors also demonstrated that patients with a dual diagnosis share common clinical and paraclinical features of both idiopathic normal pressure hydrocephalus and the behavioral variant of patients with frontotemporal lobar degeneration, including the effectiveness of cerebrospinal fluid shunting in real-world experience. Overall, the results of these authors suggest a link between these two conditions and encourage neuropsychiatrists to consider idiopathic normal pressure hydrocephalus in patients with the behavioral variant of frontotemporal lobar degeneration in the presence of gait disturbances; the benefit/risk ratio could indeed favor shunt surgery for selected patients with this recently described entity.[7]

In patients with Semantic Dementia (SD), there are typically alterations in semantic memory, with the loss of words such as names of people or places. There is also difficulty in recognizing faces of people, even those who are close or have daily interactions. As the disease progresses, concepts are lost, and the difficulty in naming and recognition becomes increasingly intense.

In the patient IPJ, the onset of symptoms began with behavioral changes, such as wandering and aggressiveness, which may be associated with mood alterations and the fragility of frontal cognitive functions already affected by neurodevelopment, such as impulse control. Only after the age of 65 did the family manage to identify prosopagnosia and loss of disgust, which would be symptoms specifically related to semantic memory, but they also indicate significant cortical impairment. Today, just 3 years after the family's report, the patient already exhibits prosopagnosia for close relatives, severe anomia hindering communication, and topographic disorientation, which distinguishes this case from the typically more gradual progression of Semantic Dementia.

Throughout the patient's life history, only cognitive impairment secondary to NPH (Normal Pressure Hydrocephalus) was described. It was only in later years that the onset of gait disturbance and urinary incontinence appeared, coinciding with the worsening of the dementing syndrome, without corresponding new lesions in the white matter that would justify this deterioration.

In IPJ, there are confounding factors regarding the origin of the symptoms. Alcoholism and multiple TBIs (traumatic brain injuries) may have worsened the pre-existing neuronal damage and contributed to a reduction in cortical mass. Just as mood changes worsened symptoms such as aggression, irritability, reduced impulse control, and suicidal ideation, these symptoms were partly alleviated or resolved with the use of Valproic Acid.

In the T2 and T2 FLAIR MRI images, we observe significant ventriculomegaly and bitemporal atrophy, both

changes being more pronounced on the left side, with the temporal atrophy predominantly in the anterior region.

These exams accurately reflect the progression of the neurological lesions described in the report, where a disease causing neuroinvolution affects a brain with cortical reduction due to a neurodevelopmental alteration.

A cohort study identified the underlying expansion of the C9ORF72 gene (associated with some forms of familial frontotemporal dementia, FTLD) in patients with normal pressure hydrocephalus (NPH), providing evidence of a potential comorbidity between NPH and the FTLD-ALS spectrum.7 These authors suggest that the analysis of C9ORF72 expansion should be considered for patients with probable NPH presenting with frontal atrophy and personality changes or other severe psychiatric symptoms.[7,8]

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LEONARDO FERREIRA CAIXETA - http://lattes.cnpq.br/9536747113677509 - https://orcid.org/0000-0002-5736-9058

GABRIELA DAMASCENO SILVA - http://lattes.cnpq.br/3923250827555532 - https://orcid.org/0000-0002-1698-9197

CIRO MENDES VARGAS - http://lattes.cnpq.br/2356866259871576 - https://orcid.org/0000-0002-1904-5888

YANLEY L NOGUEIRA - http://lattes.cnpq.br/1045762578931468 - https://orcid.org/0000-0003-1682-2714

IRON DANGONI FILHO - http://lattes.cnpq.br/5613534767423039 - https://orcid.org/0000-0003-2822-4033

VICTOR DE MELO CAIXETA - http://lattes.cnpq.br/9968280872364556 - https://orcid.org/0000-0003-2433-3128

MAILING ADDRESS:

LEONARDO FERREIRA CAIXETA
5ª Avenida, s/n - Setor Leste Universitário - Goiânia - GO - Brazil
E-mail: leonardocaixeta@ufg.br

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SCIENTIFIC ARTICLE - REVIEW ARTICLE

ALCOHOLIC CARDIOMYOPATHY: A CASE REPORT

JORDANA DE PAULA MOURA[1]; JORGE TADEU NABUTH[2]; LEONARDO MOURA[3]

1. Cardiology Resident at UniEvangélica - Goiânia, GO, Brazil
2. Professor at UniEvangélica - Goiânia, GO, Brazil
3. Olavo Schermer Hospital - Palmeiras de Goiás, GO, Brazil

ABSTRACT

Introducion: Alcoholic cardiomyopathy is a type of acquired dilated cardiomyopathy associated with excessive and prolonged alcohol consumption. There are two phases: the preclinical phase and the symptomatic phase (characterized by signs and symptoms of heart failure). The diagnosis is often made at a later stage, with significant impairment of overall systolic function. **Objective:** To report the clinical case of a patient with alcoholic cardiomyopathy. **Case Report:** A 62-year-old male patient, hypertensive, with a history of hospitalization for upper gastrointestinal bleeding, presented for consultation to adjust antihypertensive medication. No significant changes were observed in the semiological examination. Upon physical examination, left heart cavity dilation and an ejection fraction of 34% were detected. Following this, a cardiac magnetic resonance imaging was requested, which confirmed the diagnosis of dilated cardiomyopathy, likely of alcoholic etiology, and an implantable cardioverter-defibrillator (ICD) was recommended. **Final considerations:** Dilated cardiomyopathy is a disease with a significant impact on morbidity, mortality, and patients' quality of life, and its early diagnosis is essential for preventing or slowing the progression of the disease. Patient education on the adverse effects associated with excessive alcohol consumption is crucial for preventing the development of this pathology and/or the progression of heart failure.

Keywords: Alcohol; Alcoholic cardiomyopathy; Heart failure.

INTRODUCTION

Alcoholic cardiomyopathy, formerly known as alcoholic heart muscle disease, is a type of acquired dilated cardiomyopathy that occurs in two distinct phases: an initial preclinical phase and a symptomatic phase, characterized by excessive and prolonged alcohol consumption.[1]

During the progression of cardiac dysfunction, certain signs of abnormality can be identified before it becomes clinically evident. Detecting these signs is crucial because, in this preclinical/asymptomatic phase, early cessation of alcohol consumption can reverse left ventricular (LV) dysfunction.[2] In asymptomatic patients, based on the duration of alcohol use, the following echocardiographic findings may be observed: after 5 to 9 years of consumption, an increase in LV volume and prolonged isovolumic relaxation time; after 10 to 15 years, an increase in LV mass and deceleration time; and after 16 to 28 years, an increase in the peak A-wave velocity and a decreased E/A wave peak ratio.[3] Other studies also commonly show echocardiographic findings of diastolic dysfunction in asymptomatic patients.[4]

The exact prevalence of alcoholic cardiomyopathy remains to be determined.[5] However, alcoholic cardiomyopathy accounts for 21 to 36% of non-ischemic dilated cardiomyopathy (DCM) cases in Western societies, and without alcohol abstinence, it has an approximate 4-year mortality rate of 50%6. In the United States, alcoholic cardiomyopathy is the most common cause of non-ischemic dilated cardiomyopathy, representing 3.8% of all cardiomyopathies.[7]

In alcoholic cardiomyopathy, two distinct phases are recognized in the disease's natural progression: an initial preclinical/asymptomatic phase, characterized by left ventricular (LV) dilation, with or without diastolic dysfunction, and a second clinical phase, presenting classic symptoms of heart failure (HF), such as dyspnea, orthopnea, edema, nocturia, and tachycardia. HF symptoms may result from initial diastolic dysfunction or later systolic dysfunction. In advanced stages, when the risk of developing atrial fibrillation (AF) increases, there is a possibility of thrombus formation in the dilated atria.[8]

A key factor in identifying alcoholic cardiomyopathy is a history of chronic excessive alcohol consumption, along with a range of cellular, histological, and structural changes in the myocardium that may be present in these individuals.[9]

In clinical practice, echocardiography is the primary imaging test used to monitor cardiac function, while other tests, such as electrocardiography and magnetic resonance imaging, may also be utilized. In patients with alcoholic cardiomyopathy, the echocardiogram may show a dilated left ventricle, with increased diastolic and systolic dimensions and a reduced ejection fraction. Early detection of these echocardiographic signs, which indicate cardiac abnormality, can lead to earlier treatment and, consequently, a better prognosis.[10]

Endomyocardial biopsy remains the gold standard for diagnosing many cardiac conditions, both primary and secondary. However, while there are indeed pathologies such as amyloidosis and cardiac sarcoidosis that can be definitively diagnosed by cardiac biopsy, other etiologies display less specific histopathological features, so their definitive diagnosis is not histological.[11]

In treating individuals with alcoholic cardiomyopathy (ACM), two main objectives should be considered: preventing further damage to the heart muscle by stopping alcohol consumption and reducing cardiac dilation.[12] Total alcohol abstinence is necessary, and additional measures include promoting proper nutritional habits, smoking cessation, and other healthy practices. Thus, ACM treatment follows the standardized heart failure (HF) treatment regimen, including ACE inhibitors, beta-blockers, diuretics, and digitalis, along with anticoagulants when appropriate.[13]

In light of this, the overall objective of this study is to analyze the national and international scientific production indexed in the databases LILACS, SciELO, and PubMed, to report the clinical case of a patient with alcoholic cardiomyopathy.

CASE REPORT

A 62-year-old male patient from Nova Veneza, GO, attended a private consultation for medication adjustment for hypertension on June 5, 2024.

He had a history of hospitalization 7 years before due to hematemesis associated with abdominal pain. However, there was no history of the use of potentially ulcerogenic medications, gastritis, H. pylori infection, peptic ulcer disease, malignancy, angiodysplasia, aortoenteric fistula, or gastroenteric anastomosis. An important factor was his alcohol consumption since his youth.

Upon physical examination, the patient weighed 83 kg; his height was 1.70 m, resulting in a BMI of 28.7 kg/m². Respiratory rate was normal, heart rate was 70 bpm, and blood pressure was 110/80 mmHg. In the cardiovascular examination, the heart rhythm was regular, with normal heart sounds present in two beats, and no murmurs; the abdomen was flat, with present bowel sounds, tympanic, non-tender, and without signs of portal hypertension. No edema was observed in the lower limbs, and the calves were free. He reported alcohol consumption of 200 ml of distilled spirits daily from ages 30 to 50, after which his intake increased to 2 liters of beer per day. He has a

history of systemic arterial hypertension and is taking captopril 25 mg once daily. He denied smoking, illicit drug use, and engaging in physical activity.

Laboratory tests conducted on May 6, 2024, revealed the following results: hemoglobin 13 g/dL, hematocrit 40.3%, leukocytes 11 k/uL (56.2% neutrophils, 1% basophils, 29% lymphocytes, 12.7% monocytes), glucose 85 mg/dL; hemoglobin A1c of 5.7%; creatinine 1.1 mg/dL; potassium 3.6 mEq/L; urinalysis: specific gravity 1.025, proteinuria 15 mg/L, sediment: leukocytes 3,000/mL, erythrocytes 1,000, hyaline casts 0/mL. TSH was 0.7 U/L; free T4 was 6 µg/L; NT-pro BNP was 759 pg/mL; total cholesterol was 148 mg/dL; HDL was 35 mg/dL; LDL was 101 mg/dL; and triglycerides were 62 mg/dL. The serology for Chagas disease was negative.

The transthoracic echocardiogram conducted on May 6, 2024, revealed an aortic diameter of 37 mm, a left atrium measuring 42 mm, a left ventricle diastolic diameter of 62 mm, and a systolic diameter of 53 mm, with a significantly reduced left ventricular ejection fraction of 30%. There were no valvular abnormalities. Thus, a moderately enlarged left atrium was observed, with the left ventricle showing mild eccentric myocardial hypertrophy and significant impairment of systolic function.

The 24-hour Holter monitor conducted on May 6, 2024, revealed a regular rhythm, with a PR interval within normal limits, interventricular conduction disturbance with a QRS complex duration of 170 ms, and the presence of isolated supraventricular ectopic beats. No pauses were observed.

Based on this, the presence of heart failure with reduced ejection fraction (HFrEF) was evidenced. To complement the diagnosis, a cardiac magnetic resonance imaging (MRI) was requested to assess for fibrosis and myocardial viability to elucidate the etiology of the heart failure, and the patient was advised to cease alcohol consumption. Captopril was also discontinued, and the following medications were initiated: Forxiga 10 mg, losartan 50 mg, spironolactone 25 mg, Concardio 1.25 mg, and amiodarone 200 mg.

At the follow-up on June 18, 2024, the MRI revealed a left ventricle with significantly increased dimensions and important global systolic dysfunction, with the presence of septal dyssynchrony, as well as faint linear basal septal mesocardial fibrosis (non-ischemic pattern), which is frequently found in dilated cardiomyopathy. A small late enhancement in the inferior junction was also noted, which is often seen in right chamber overload. Therefore, an implantable cardioverter-defibrillator (ICD) implantation was requested to prevent sudden death in patients with heart failure and reduced ejection fraction of non-ischemic etiology.

DISCUSSION

According to epidemiological data, alcoholic cardiomyopathy is one of the main non-ischemic etiologies of heart failure in the Western world[14]. The development of alcoholic cardiomyopathy appears to be related to the amount of alcohol consumed daily and the duration of the period of alcohol abuse. Although the exact quantity and duration of abuse are not well defined, a consumption exceeding 80 g/day for at least 5 years is associated with an increased risk of developing cardiomyopathy.[15]

The prevalence of alcoholic cardiomyopathy is higher in men due to the greater prevalence of alcoholism in the male sex[16], as observed in the above report. However, women reach a higher blood alcohol concentration than men for the same amount of alcohol consumed.[17]

A history of chronic alcohol abuse in the absence of other etiologies of dilated cardiomyopathy suggests a diagnosis of alcoholic cardiomyopathy. The findings on chest radiography are similar to those seen in other causes of cardiomyopathies, such as cardiomegaly, pulmonary congestion, and pleural effusion.[18] The electrocardiogram (ECG) is also non-specific and may show ST segment and T wave changes, low voltage in the presence of significant fibrosis, bundle branch blocks, and cardiac arrhythmias. Biomarkers, such as natriuretic peptides and high-sensitivity troponins, may be elevated and should be interpreted similarly to other etiologies of heart failure. The

echocardiogram can help exclude other causes of heart failure and define the phenotypic pattern of hypertrophy, dilation, diastolic dysfunction, or left ventricular systolic dysfunction, which may precede the onset of symptoms. Cardiac magnetic resonance imaging may reveal areas of late enhancement, indicating myocardial fibrosis.[19]
Abstinence from alcohol is fundamental in the treatment of alcoholic cardiomyopathy. Heart failure syndrome should be managed similarly to other etiologies. Therefore, beta-blockers, angiotensin-converting enzyme inhibitors or angiotensin receptor blockers, spironolactone, and diuretics for cases of congestion are indicated.[20]
In certain groups with heart failure, such as our patient, it has been shown that an implantable cardioverter-defibrillator (ICD) can prolong patient survival. It may be indicated to prevent sudden death in patients with heart failure and reduced ejection fraction (HFrEF) who have left ventricular dysfunction due to anterior myocardial infarction (MI) with an ejection fraction (EF) of 30-40% or less; those with sustained ventricular tachycardia (VT) that is hemodynamically unstable; those with cardiac arrest due to VT/fibrillation ventricular (VF) from a non-reversible cause and EF ≤ 35%; and those with spontaneous VT with hemodynamic compromise or syncope, also from a non-reversible cause and EF ≤ 35%.[21] Important to note that an ICD should not be indicated for patients with a life expectancy of less than one year.[22]

FINAL CONSIDERATIONS

Alcoholic dilated cardiomyopathy is a myocardial dysfunction that causes heart failure, characterized by predominant ventricular dilation and systolic dysfunction. The symptoms include dyspnea, fatigue, and peripheral edema. The diagnosis is clinical and is supplemented by tests such as transthoracic echocardiography and cardiac MRI. The treatment is directed at the cause of heart failure (HF). Among the pharmacological therapies, we can mention angiotensin-converting enzyme (ACE) inhibitors, beta-blockers, aldosterone receptor blockers, angiotensin II receptor blockers, neprilysin inhibitors, sodium-glucose cotransporter 2 (SGLT2) inhibitors, hydralazine/nitrates, as well as diuretics. Furthermore, when ventricular dysfunction is significant, cardiac resynchronization therapy and implantable cardioverter-defibrillator (ICD) are indicated.

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JORDANA DE PAULA MOURA - http://lattes.cnpq.br/6355488699640230 - https://orcid.org/0009-0000-4245-1457

JORGE TADEU NABUTH - http://lattes.cnpq.br/6637431019843256 - https://orcid.org/0009-0000-2860-3581

LEONARDO MOURA - http://lattes.cnpq.br/6981984245986030 - https://orcid.org/0009-0001-3972-3965

MAILING ADDRESS:

JORDANA DE PAULA MOURA
Rua Luiz Gonzaga Rodrigues, 672, Palmeiras de Goias - GO, Brazil.
E-mail: jordana_paula17@hotmail.com

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SCIENTIFIC ARTICLE - REVIEW ARTICLE

CONGENITAL NEUROTOXOPLASMOSIS IN A NEWBORN SON OF A MOTHER WITH REINFECTION BY TOXOPLASMA GONDII: A CASE REPORT

BRUNNA LUIZA DE ÁVILA[1]; LETICIA FERNANDES FRAGA RABAHI[1]; ROBERTA RASSI ALMEIDA[1]; TALITA DE TOLEDO LIMA[1]; GRASIANE BESSA TINELLI[1]

1. Hospital e Maternidade Dona Íris, Goiânia, Goiás.

ABSTRACT

The article describes a rare case of congenital neurotoxoplasmosis in a newborn born to an immunocompetent mother, an illicit drug user and exposed to syphilis, with reactivation of the disease during pregnancy.

Keywords: Congenital neurotoxoplasmosis, Reinfection, Congenital infections

INTRODUCTION

Congenital toxoplasmosis is an infection caused by the protozoan Toxoplasma gondii[1], which can be transmitted from mother to fetus during pregnancy. Although the infection is more commonly associated with mothers who have never had the disease before, meaning they do not have protective antibodies against the parasite, cases of congenital toxoplasmosis have also been reported in immunocompetent mothers who were previously infected with the protozoan.[2]

After primary maternal infection with T. gondii during pregnancy, the parasite has the ability to penetrate the fetus's bloodstream through the placenta. Placental transmission occurs less frequently when the infection is acquired before the tenth week of gestation and is extremely rare when the infection occurs even before conception. Without treatment, the incidence rate of fetal infection is approximately 10% to 15% if the infection occurs in the first trimester, 30% in the second trimester, and 60% in the third trimester.[3]

Early maternal infection (during the first and second trimesters) can result in severe congenital toxoplasmosis, including fetal death and miscarriage. On the other hand, late maternal infection (during the third trimester) usually results in subclinical toxoplasmosis in newborns. In these cases, the infection initially goes unnoticed, but these babies may develop chorioretinitis and other complications later in life.[1] Acute infection is followed by the formation of cysts in chronic infection and is associated with an

immune response that typically provides protection against reinfection. This chronic infection is characterized by stable levels of specific IgG. In immunocompetent mothers who were immunized against toxoplasmosis before conception, immune mechanisms prevent the transmission of infection to their fetuses.

Congenital toxoplasmosis that occurs due to the reactivation of a chronic infection in pregnant women with a competent immune system is considered rare. The reported cases associate a possible decrease in cellular response during pregnancy, which may affect the control of the parasites and the clinical development of the infection in the mother, thereby increasing the risk of vertical transmission[2], as well as a new infection by a different strain.[4,5]

The clinical characteristics of congenital toxoplasmosis in newborns of immunocompetent mothers can vary. In some cases, the infection may be asymptomatic in both the mother and the fetus. However, in other cases, the infection can lead to severe complications in the fetus, including intrauterine growth retardation, microcephaly, ocular lesions, cerebral calcifications, and neurological dysfunction.[6]

The objective of this article is to report a case of congenital toxoplasmosis resulting from reinfection in an immunocompetent mother diagnosed in a public hospital in Goiás, along with a literature review on the topic.

CASE REPORT

A.V.A. was born on March 17, 2023, via cesarean section due to oligohydramnios and intrauterine growth restriction (IUGR), with a gestational age of 37 weeks and 1 day calculated by first-trimester ultrasound.

The mother, 39 years old, had four previous pregnancies with no miscarriages (G4P4A0), completed high school, and was a homemaker. She had eight prenatal consultations. The patient reported being a user of illicit drugs (marijuana and crack), with the last use occurring 24 hours before delivery, and she was occasionally homeless. The following serologies were performed on September 15, 2022: Anti-HIV: non-reactive, Treponemal Syphilis: reactive, VDRL: reactive 1/2, and serology for Toxoplasmosis with IGM - non-reactive and IGG - reactive. Regarding syphilis, she stated that she had been treated in a previous pregnancy three years ago and had not received treatment during the current pregnancy. At the maternity ward, she presented VDRL - non-reactive, Rapid Test for Syphilis - reactive, and Rapid Test for HIV - non-reactive.

The newborn had a birth weight of 1830 grams, a length of 45 cm, and a head circumference of 29 cm. After birth, he developed respiratory distress and was transferred to the Care Room, requiring ventilatory support with Hood at 30% for about 17 hours. At 41 hours of life, he was transferred to the Rooming-In facility, on an oral diet via bottle, as the mother refused to breastfeed. On the third day of life, due to changes in the blood count (leukopenia and thrombocytopenia), associated with refractory hypoglycemia and untreated maternal urinary tract infection at the time of delivery, empirical treatment for neonatal sepsis with ampicillin and gentamicin was initiated.

An echocardiogram was also performed, revealing an interatrial septum and a patent foramen ovale, with a slight left-to-right shunt; conclusion: patent foramen ovale. An ultrasound of the kidneys and urinary tract showed no abnormalities, and a transfontanelle ultrasound revealed a hyperechoic image

with slight acoustic attenuation measuring 0.3 cm, indicating intraparenchymal calcification. Following this finding on the transfontanelle ultrasound, an investigation of congenital infections was initiated, and serologies for the mother/newborn pair were requested.

On the fourth day of life, the newborn was hypochromic, developing petechiae and cyanosis in the upper limbs and perioral area. He was transferred back to the Care Room for monitoring and then moved to the Intermediate Care Unit (ICU).

The serological tests for the mother/newborn pair confirmed the infection by T. gondii. The mother had reactive anti-Toxoplasma IgM (9.727) and reactive anti-Toxoplasma IgG (422.31) through the chemiluminescence technique, while the newborn had reactive anti-Toxoplasma IgM (29.998) and reactive anti-Toxoplasma IgG (1582.55). The fundoscopic examination revealed an active ocular lesion in the macula/optic nerve region. A cerebrospinal fluid (CSF) collection was performed on March 22, 2023, showing low cellularity, so a differential count was not conducted; glucose: 32 mg/dL, protein: 321 mg/dL.

In light of the situation, treatment was initiated on the fifth day of life with pyrimethamine 1 mg/kg/day once daily, sulfadiazine 100 mg/kg/day every 12 hours, folinic acid 10 mg three times a week, and prednisolone 1 mg/kg/day due to ocular involvement.

A cranial tomography was also performed, which showed hypodensity without mass effect in the symmetric and bilateral cortical/subcortical frontal/parietal/temporal regions, with intermixed granulomatous calcifications. There were also ependymal calcifications as shown in Figures 1 and 2.

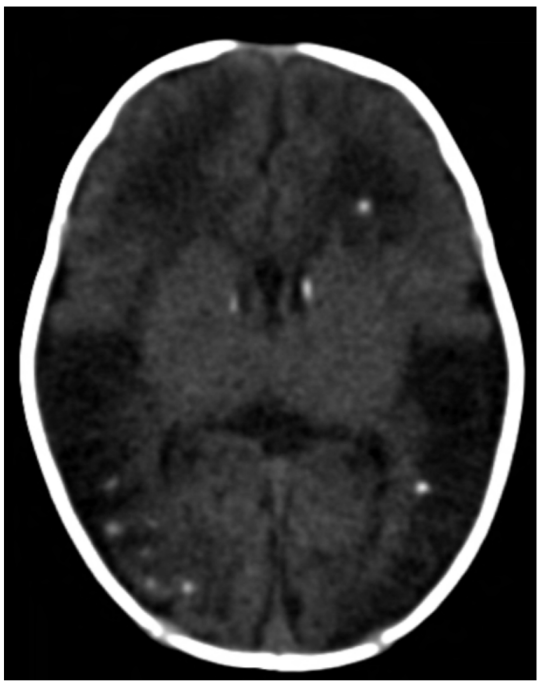

Figure 1

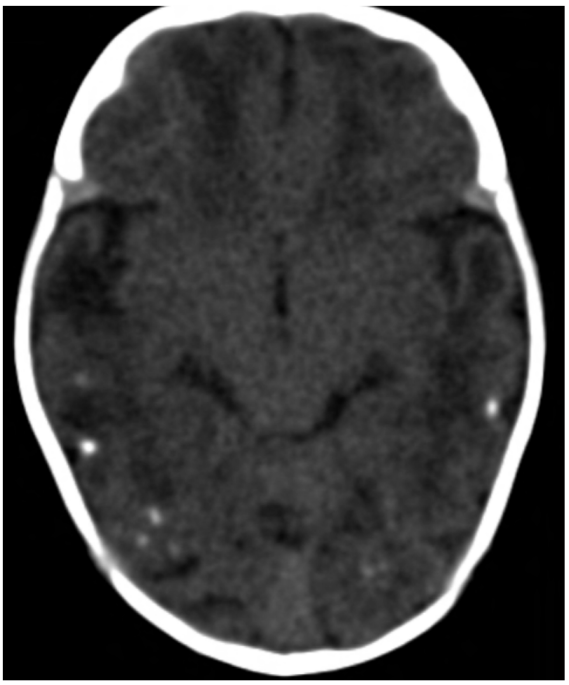

Figure 2

The patient continues to be monitored on an outpatient basis with a team of pediatrics, ophthalmology, and pediatric infectious diseases. She is experiencing significant delays in growth and neuropsychomotor development

Table with Description of Fundoscopy Findings in the Child During Treatment:

Date	Result
03/21/2023	Active lesion (ocular/in macula/nerve)
04/17/2023	OD: macular and mid-peripheral chorioretinitis, ROP, and Zone II OS: optic neuritis, macular and mid-peripheral chorioretinitis, hemorrhage, ROP, and Zone II.
04/27/2023.	OD: macular and mid-peripheral chorioretinitis, ROP, and Zone II OS: worsening optic neuritis, active significant hemorrhagic macular chorioretinitis, mid-peripheral chorioretinitis, hemorrhage, ROP, and Zone II.
05/02/2023	OD: ROP with Zone III avascular, chorioretinitis healing with macular involvement, OD with adequate coloration. OS: ROP with Zone III avascular, inferior nasal ORVCR with subretinal hemorrhage in the macular retinitis area and slight improvement in optic neuritis.
05/09/2023	OD: maintained retinitis OS: improvement of ORCVR in the inferior quadrants and improvement in optic neuritis.
05/16/2023	OD: retinitis healing OS: improvement of retinal vascular occlusion: sequelae of ORVCR in the inferior quadrants and improvement in optic neuritis.
05/30/2023	OD: retinitis healing, physiological, extensive macular scar OS: improvement of ORCVR in the inferior quadrants and improvement in optic neuritis, however, pallor of OD and slight blurring still at the temporal border.
06/13/2023	OD: healed retinitis, physiological, extensive macular scar OS: improvement of ORCVR in the inferior quadrants and improvement in optic neuritis, however, pallor of OD with resolution of the temporal border blurring.

Table 1: Source Authors

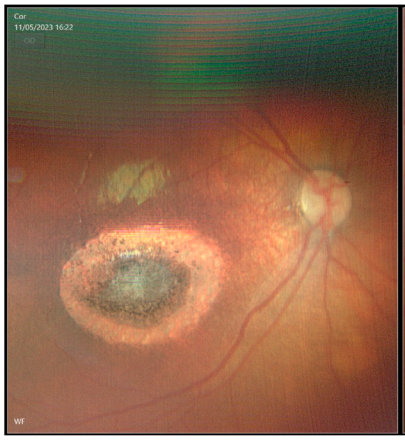

Figure 1: Right eye fundus examination showing chorioretinitis scar in the posterior pole in the paramacular area.

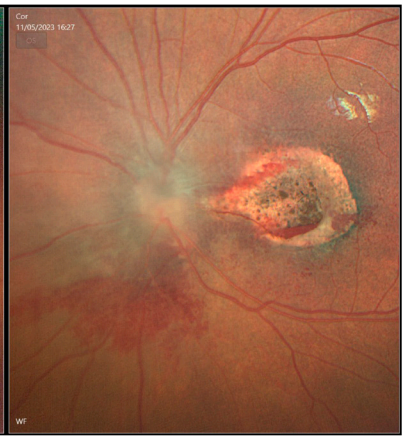

Figure 2: Left eye retinography: evidence of retinal venous occlusion due to papilledema and active chorioretinitis lesion in the macular region.

DISCUSSION

It was believed that primary maternal infection with T. gondii protected against reinfection; however, several cases of reinfection have been reported in previously infected mothers. The described cases suggest a possible association with a decrease in cellular response during pregnancy, which can affect parasite control and the clinical development of the infection in the mother, thus increasing the risk of vertical transmission.[2,7]

In addition, cases resulting from a new infection have been described, in which IgM and, especially, IgA antibodies were detected due to the immune response of the gastrointestinal tract to the ingestion of T. gondii oocysts. [8,9,10] Reinfection is accompanied by an intense immune response, often characterized by increased levels of IgG and the presence of IgM antibodies. In an immunocompetent pregnant woman with a serological history indicative of latent infection (absence of IgM and IgA, and low levels of IgG), the detection of serological markers of acute toxoplasmosis (presence of IgM and/or IgA and elevated levels of IgG) suggests the occurrence of reinfection, which may result in transmission to the fetus.[11]

The hypothesis of reinfection is supported by experimental studies conducted with chronically infected animals, which observed that they can produce offspring with congenital infection when reinfected with different strains of the parasite.[4] Another study by Gaballah et al. simulated the impact of reinfection in mice experimentally infected with a lethal strain of T. gondii after primary infection with a non-virulent genotype. The results highlighted that mice with chronic toxoplasmosis developed acute disease when reintroduced to another virulent strain. Therefore, it suggests that chronic infection with T. gondii does not prevent reinfection nor does it preclude the colonization of the brain with tissue cysts after superinfection by virulent strains. This explains the possibility of congenital toxoplasmosis in immunocompetent pregnant women when reinfected with a virulent strain of T. gondii.[5]

Recently, naturally mixed infections in humans have been observed, resulting from simultaneous or sequential exposure to parasites of different genotypes. However, it is still unclear whether the protection conferred by primary infection is genotype-specific.[12]

Gavinet et al. reported a case of congenital infection in an immunocompetent mother, in which the serological investigation conducted early during pregnancy indicated a chronic infection by T. gondii. Sequential serological tests showed the emergence of IgM and IgA antibodies, as well as an increase in IgG antibody titers, suggesting the possibility of reinfection.[11]

Hennequin et al. and Kodjikian et al. described cases of toxoplasmosis in which chronically infected mothers transmitted the infection to their children, with the diagnosis being made early in the neonatal period. Upon retrospectively analyzing maternal blood samples, an increase in IgG antibody levels and the emergence of IgA antibodies were observed in both cases. There was no compromise of the mothers' immune systems in either case, and no evidence of reactivation during pregnancy was found, suggesting that reinfection was the most likely explanation.[10,13]

Silveira et al. describe a case of congenital toxoplasmosis diagnosis through routine screening in a mother who was already infected 20 years before pregnancy. In this case, the possibility of reinfection by the same strain or by a different strain of the parasite was raised. According to the literature, reinfection may be associated with exposure to a large number of parasites, a more virulent strain, or a parasite of a different genotype.[2]

Lebas et al. describe a severe case of congenital toxoplasmosis in a woman who was infected before pregnancy, suggesting that she may have been infected by a different strain of the parasite, corroborating the hypothesis of Silveira et al. regarding the possibility of reinfection.[8]

The clinical characteristics of congenital toxoplasmosis in immunocompetent mothers can vary. In some cases, the infection may be asymptomatic in both the mother and the fetus. However, in other cases, the infection can lead to severe complications in the fetus, including intrauterine growth retardation, microcephaly, ocular lesions, cerebral calcifications, and neurological dysfunction. Additionally, congenital toxoplasmosis in immunocompetent mothers may present an increased risk of recurrence in subsequent pregnancies.[6]

The diagnosis of congenital toxoplasmosis in immunocompetent mothers is based on a combination of methods. Serology is an important method, as the detection of specific IgM and IgG antibodies for Toxoplasma gondii can indicate a recent or past infection. Additionally, amniotic fluid samples can be collected to detect the parasite's DNA using the Polymerase Chain Reaction (PCR) technique. Obstetric ultrasound also plays a significant role in detecting fetal anomalies.[1,14]

The treatment of congenital toxoplasmosis in immunocompetent mothers generally involves the administration of antiparasitic medications, such as spiramycin, during pregnancy. The aim of spiramycin is to reduce the risk of parasite transmission to the fetus. However, the efficacy of treatment in immunocompetent mothers is debated, as spiramycin does not cross the placenta in adequate amounts to treat fetal infection. In more severe cases, where fetal infection is confirmed, the use of more potent medications, such as pyrimethamine and sulfadiazine, may be necessary, in conjunction with spiramycin.[1,15]

The clinical outcome of congenital toxoplasmosis in immunocompetent mothers can vary widely. Some newborns may have permanent sequelae, such as neurological, visual, and auditory problems. Others may have a more favorable clinical course, with little or no evident clinical manifestation. The prognosis may also depend on the timing of the infection during pregnancy and the promptness of diagnosis and treatment.[16]

CONCLUSION

In conclusion, this case report of congenital toxoplasmosis in an immunocompetent mother highlights the possibility of reinfection with Toxoplasma gondii during pregnancy and the clinical challenges associated with this condition. The reviewed literature also reveals the existence of similar cases where previously immune mothers develop a new infection, resulting in the vertical transmission of the parasite to the fetus.

The diagnosis of congenital toxoplasmosis cannot be dismissed solely based on a previous maternal infection, and the means to document this diagnosis should be promptly employed in the presence of clinical features of fetopathy, considering the urgency of specific treatment.

Congenital toxoplasmosis can vary in severity and present a wide range of clinical manifestations, from asymptomatic cases to severe complications such as intrauterine growth retardation, microcephaly, ocular lesions, cerebral calcifications, and neurological dysfunction. Maternal infection occurring early, especially during the first and second trimesters, tends to be more severe and is associated with higher rates of fetal morbidity, including fetal death and miscarriage.

The proper detection of congenital toxoplasmosis requires a multidisciplinary approach, involving maternal and neonatal serological tests, imaging studies such as ultrasound and cranial tomography, as well as careful ophthalmological evaluation of the newborn. Early treatment with antiparasitic medications, such as pyrimethamine and sulfadiazine, is essential to control the infection and prevent future complications.

It is important to emphasize that congenital toxoplasmosis in immunocompetent mothers is considered a rare condition, but it warrants clinical attention and greater awareness regarding prevention methods. Conducting appropriate serological tests during prenatal care, especially in endemic areas, can identify pregnant women susceptible to infection and enable appropriate preventive interventions, such as avoiding the consumption of raw or undercooked meat and promoting proper hygiene measures to reduce exposure to the parasite.

In summary, congenital toxoplasmosis in immunocompetent mothers represents a significant clinical challenge. Understanding the mechanisms of reinfection, as well as implementing appropriate prevention and treatment strategies, are crucial for minimizing the adverse effects of this disease and improving clinical outcomes for affected newborns. The dissemination of knowledge about this condition through case studies and literature reviews is essential to provide up-to-date information to healthcare professionals and promote public awareness of congenital toxoplasmosis.

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BRUNNA LUIZA DE ÁVILA - http://lattes.cnpq.br/3536902810515778 - https://orcid.org/0009-0009-0099-8396

LETICIA FERNANDES FRAGA RABAHI - http://lattes.cnpq.br/7989137908504433 - https://orcid.org/0000-0002-9068-2361

ROBERTA RASSI ALMEIDA - http://lattes.cnpq.br/0142747274189417- https://orcid.org/0009-0007-0400-4147

TALITA DE TOLEDO LIMA - http://lattes.cnpq.br/9290846081759086 - https://orcid.org/0000-0003-3658-2148

GRASIANE BESSA TINELLI - http://lattes.cnpq.br/6337433274020291 - https://orcid.org/0009-0002-5564-894X

MAILING ADDRESS:

GRASIANE BESSA TINELLI
Alameda Emílio Póvoa, 165 - Vila Redenção, Goiânia - GO, Brasil, CEP: 74845-250
E-mail: dra.grasianetinelli@gmail.com

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SCIENTIFIC ARTICLE - CASE REPORT

FETAL MYELOMENINGOCELE REPAIR: CASE REPORT

WALDEMAR NAVES DO AMARAL[1] ; MARIANA MÉRIDA DE SOUZA[2]; NICOLAS FELIPE MACHADO[3]; PAULO RONALDO JUBÉ RIBEIRO[4]

1. Professor in the Department of Gynecology and Obstetrics, Faculty of Medicine, Federal University of Goiás, Goiânia - Goiás, Brazil
2. Medical Student, Faculty of Medicine, Federal University of Goiás, Goiânia - Goiás, Brazil
3. Medical Student, Faculty of Medicine, Federal University of Goiás, Goiânia - Goiás, Brazil
4. Coordinator of the Pediatric Neurosurgery Subarea Service at Hospital das Clínicas (HC) and the Faculty of Medicine, Federal University of Goiás (UFG-GO), Goiânia, Goiás, Brazil

ABSTRACT

Neural tube defects are common in fetal life, particularly those involving neural tube closure, and are often associated with deficiencies in essential nutrients, such as folic acid and vitamin B12. Among the main malformations, myelomeningocele stands out as the most severe form of spina bifida. The purpose of this article is to report the surgical treatment of a 26-week pregnant patient with a fetus diagnosed with myelomeningocele, who was monitored in the malformed fetus outpatient clinic and underwent correction via laparotomy. The surgery was successful, and the newborn was in good general condition without neurological injuries. Early diagnosis should be made during prenatal care, as early correction in the second trimester of pregnancy can be effective in reducing possible motor sequelae. The treatment approaches are laparotomy, the traditional method, and fetoscopy, a newer and less invasive technique.

Keywords: Fetal surgery, Intrauterine surgery, Meningocele surgery.

INTRODUCTION

Neural tube defects are among the most common issues during fetal life, particularly those involving neural tube closure, which involve the failure of the spine or head of the fetus to close properly. During fetal development, the human spine undergoes a process of posterior vertebral closure which, in certain circumstances, does not occur correctly. A deficiency in essential elements, such as folic acid and vitamin B12, especially during the periconceptional phase—the period close to conception—can impair this closure process, resulting in severe defects.

Neural tube defects (NTDs) are serious congenital malformations that affect the central nervous system and spine, resulting from a failure in neural tube closure during development. The most common NTDs include anencephaly, spina bifida, and encephalocele.[1] Anencephaly is characterized by a partial or complete absence of skull bones with minimal brain remnants. Spina bifida occurs when the vertebrae do not fully close over the neural tube, exposing the spinal cord and nerves, and is compatible with survival.[2] Encephalocele involves a protrusion of

the brain and/or its membranes through the skull.[2]

Maternal folic acid deficiency before and during early pregnancy is one of the most common and preventable risk factors.[3,4] Folic acid supplementation is an effective primary prevention strategy, and mandatory food fortification with folic acid has been implemented in several countries to reduce the incidence of NTDs.[4] Furthermore, prenatal diagnosis through ultrasound and molecular markers is crucial for early detection and for implementing treatment strategies.[5]

These defects can have significant consequences on an individual's life, including neurological, motor, and cognitive impairments. Among the most common effects are hydrocephalus, motor difficulties in the lower limbs (including congenital clubfoot), and complications in bowel and bladder control. The impairment of these functions results in conditions such as urinary and fecal incontinence, as well as impaired glycemic control, directly impacting the patient's quality and longevity.

The estimated global prevalence of NTDs is around two cases per 1,000 births, with significant variations.[4,6] Effective prevention of NTDs requires awareness of the importance of folic acid supplementation and the implementation of public health policies to ensure fortification.[4]

CASE REPORT

A 26-week pregnant patient, followed in the malformed fetuses outpatient clinic at the Hospital das Clínicas of the Federal University of Goiás (HC-UFG), presented with a suspected diagnosis of myelomeningocele (MMC) in the lumbar region during prenatal consultations. To confirm the diagnosis, a pelvic MRI was requested, as shown in Figure 1. Following the diagnosis, the treatment was carried out by the surgical team at HC-UFG, coordinated by Dr. Waldemar Naves do Amaral. The surgery was performed by him, along with the neurosurgery team. The chosen access route for correction was laparotomy through the maternal abdominal wall, followed by exposure of the spine and correction.

The surgery progressed successfully, without complications, and the patient maintained good progress throughout the pregnancy. The delivery occurred safely, with the newborn in good general condition, showing proper healing of the spine and no signs of motor impairment in the lower limbs, Figure 4. Currently, the newborn has mild hydrocephalus, with no indication for surgical interventions.

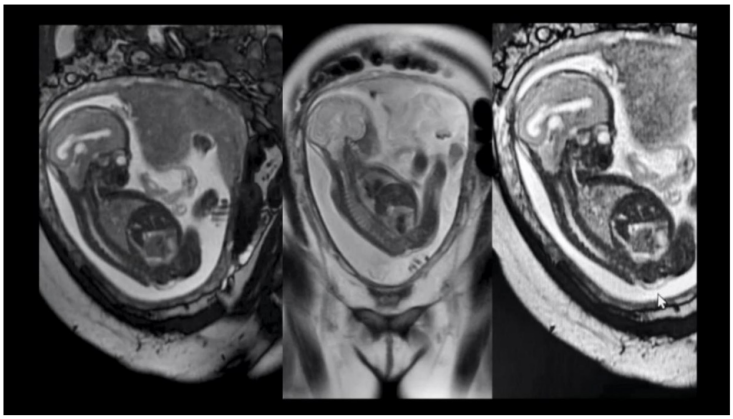

Figure 1: Pelvic MRI for the diagnosis of MMC

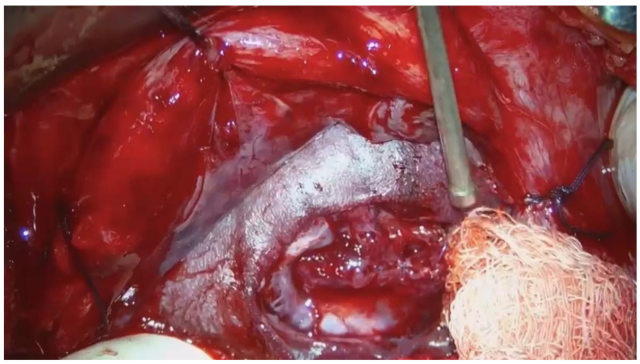

Figure 2: Exposure of MMC

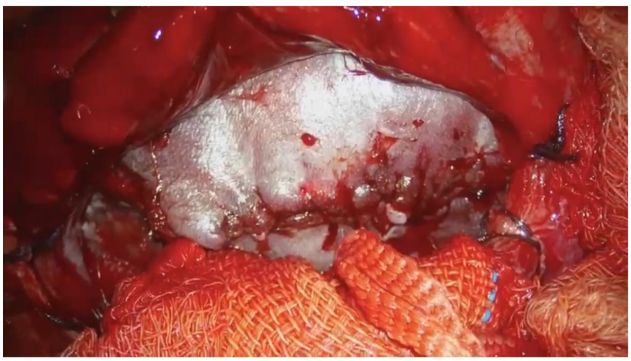

Figure 3: Surgical correction of MMC

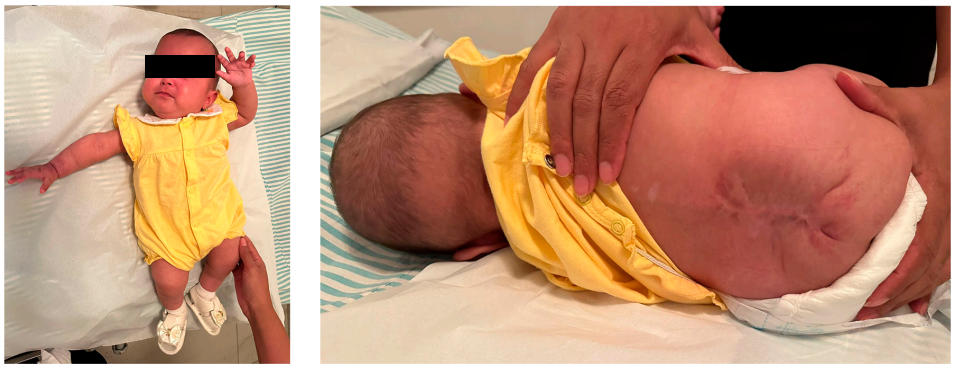

Figure 4: Postnatal outcome with proper healing of the myelomeningocele surgery

DISCUSSION

This study presents a case report aimed at describing the fetal treatment of the patient through laparotomy. MMC is the most severe form of open spina bifida and is one of the most common severe congenital malformations. Historically, MMC repair surgeries were performed postnatally, covering the exposed spinal cord and preventing infections, but still carrying the risks of neurological damage, hernia, and hydrocephalus associated with incomplete neurulation or mechanical and chemical trauma. Thus, prenatal closure has emerged as an excellent option, resulting in improved motor function, reduced hindbrain hernia, and decreased need for cerebrospinal fluid diversion.[7]

Fetal ultrasound is the primary diagnostic tool, often performed between 18 and 20 weeks of gestation. It is important to clearly define the location and size of the NTD and confirm whether it is open or closed. Additionally, it is possible to associate the condition with other abnormalities, so the exam for secondary findings, such as hydrocephalus, should be conducted, and fetal echocardiography should be considered. The measurement of acetylcholinesterase in amniotic fluid helps differentiate between open and closed NTDs and is a component of many preoperative evaluations for fetal closure.[8]

Genetic evaluation with amniocentesis should also be recommended, particularly for those considering fetal closure. The identification of genetic abnormalities in the fetus has important implications for counseling on prognosis, pregnancy management, and whether fetal closure of the NTD is an option. Fetal MRI may also be considered, particularly if there are unclear findings on ultrasound.[8]

The treatment is fetal intervention, which can be performed during pregnancy. There are two main approaches to correct these defects before birth: the traditional approach, which involves open surgery in the second trimester of pregnancy, and the more recent approach, fetoscopy, which is minimally invasive.

The surgery is performed between the 20th and 28th week of gestation. The procedure involves a laparotomy, where an incision is made in the pregnant woman's abdomen to access the uterus. A window is then created in the uterus, and the fetal spine is exposed with the help of ultrasound. The neurosurgery and obstetrics teams, working together, perform the correction of the meningocele, restoring the alignment of the spine and repairing the defect by placing a mesh, when necessary. This approach can reduce or even eliminate the sequelae associated with neural tube defects, reduce the need for ventriculoperitoneal shunting, and reverse the hindbrain hernia associated with Chiari II malformation, significantly improving the patient's quality of life after birth. However, the open maternal-fetal surgical approach is associated with a relatively higher risk for the patient, the pregnancy as a whole, and future pregnancies.[9]

In some cases, fetoscopy can be performed, a more recent and less invasive technique. Fetal repair of open spina bifida through fetoscopy minimizes maternal risks while providing similar neurosurgical outcomes for the fetus. The percutaneous approach avoids laparotomy and uterine exteriorization, and it is associated with a lower risk of anesthesia and better maternal post-surgical recovery.[10] Through a small access in the uterus, using a fetoscope, it is possible to visualize the lesion in the fetal spine and perform the correction with precision. This technique involves the insertion of small cameras and surgical instruments, with accesses no larger than 5 millimeters, minimizing risks for both the pregnant woman and the fetus. The correction can be performed by implanting meshes and repairing spinal hernias, with excellent long-term results.

CONCLUSION

MMC is a common severe congenital malformation associated with deficiencies in folic acid and vitamin B12. Early diagnosis, combined with appropriate interventional treatment, allows for resolution during the fetal stage. Currently, there are two main approaches for fetal myelomeningocele surgical correction: laparotomy, the traditional approach, and fetoscopy, a less invasive and more recent technique. This approach helps reduce the damage and sequelae derived from neural tube formation defects.

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WALDEMAR NAVES DO AMARAL - http://lattes.cnpq.br/4092560599116579 - https://orcid.org/0000-0002-0824-1138

MARIANA MÉRIDA DE SOUZA - http://lattes.cnpq.br/2153234290952755 - https://orcid.org/0009-0002-4544-4177

NICOLAS FELIPE MACHADO - http://lattes.cnpq.br/3862262066144040 - https://orcid.org/0000-0001-8333-1208

PAULO RONALDO JUBÉ RIBEIRO - http://lattes.cnpq.br/7820395800612498 - https://orcid.org/0000-0003-0114-0278

MAILING ADDRESS:

WALDEMAR NAVES DO AMARAL
Fértile Diagnósticos - Alameda Coronel Joaquim Bastos, nº 243 – Setor Marista - Goiânia - GO - Brasil
E-mail: waldemar@sbus.org.br

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SCIENTIFIC ARTICLE - REVIEW ARTICLE

ASSESSMENT OF PREOPERATIVE FRAILTY IN ADULTS UNDERGOING CARDIAC SURGERY

ESTEVAM BORGES LOPES[1]; ARTUR HENRIQUE DE SOUZA[2]; STANLLEY DE OLIVEIRA LOYOLA[1,2]; MATHEUS SILVA DE OLIVEIRA[1]; GABRIEL PEIXOTO NASCIMENTO[1]; GUSTAVO SIQUEIRA ELMIRO[1]; GIULLIANO GARDENGHI[1,2]

1. Clínica de Anestesia, Goiânia/GO, Brasil.
2. Hospital ENCORE, Aparecida de Goiânia/GO, Brasil

ABSTRACT

INTRODUCTION: The identification of preoperative frailty in patients undergoing cardiac surgery can be important for prognostic and postoperative recovery purposes, assisting in the conduct to be taken, such as pre-qualification, predicting perioperative risks, prudence in risks, prudence in more invasive therapies or procedures, and short- and long-term post-operative care needs. Objective: To estimate the prevalence of preoperative frailty of patients undergoing cardiac surgery, based on the 5 meters walking test. Methods: A retrospective study based on the institutional database of Encore Hospital, in which 91 adult patients who had undergone cardiovascular surgery were evaluated cardiovascular surgery, between the months of March 2019 and June 2023, being weighted the preoperative frailty of the patients by the 5 meters walking test. Results: 77 patients (84.6%) were the classification of non-frail in the pre-anesthetic evaluation, compared to 14 patients (15.4%) were considered frail, 13 of whom were aged 60 or over. were aged 60 or over. Conclusion: The presence of frailty is associated with a higher risk of morbidity, mortality and utilization of health services, demonstrating health services, demonstrating that the assessment of frailty should be explored in preoperative assessments for elective cardiac surgery.

Keywords: Frailty, Thoracic Surgery, Preoperative Period.

INTRODUCTION

The elderly population has a greater tendency to undergo surgeries and interventions of varying complexities, such as cardiovascular surgeries, oncological diseases, and musculoskeletal disorders. Elderly individuals also have a higher risk of falls[1]. Patients undergoing major thoracic surgery are mostly adults over 60 years of age[2]. In cardiac surgery, more than half of the patients are 75 years or older[3].

An aging society carries a range of concerns for patients undergoing surgery, including frailty in older adults, which may be associated with poorer outcomes following a medical procedure[4].

Frailty is defined by the Gerontological Society of America as an individual with diminished reserve and resistance to stressors[4]. Other definitions include frailty as an increased vulnerability to a stressful event, such as trauma or illness, which leads to poor resolution of homeostasis and increases the risk of complications and sequelae. Frailty results from an accelerated loss of functional reserve associated with aging. It is a complex and multidimensional syndrome that involves multiple physiological systems and leads to various phenotypes of frailty[2].

Identifying patients with frailty in the preoperative phase of cardiac surgeries can be important for prognostic purposes and postoperative recovery. It helps guide decisions such as prehabilitation, predicting perioperative risks, exercising caution with more invasive therapies or procedures, and determining short- and long-term postoperative care needs, such as admission to intensive care units[1,5].

However, the consensus on the best way to measure frailty or apply these instruments in clinical practice to predict outcomes remains undefined[6].

Frailty encompasses factors such as malnutrition, emaciation, weakness, slowness, and inactivity. Although frailty tends to increase with age, its assessment is measured through a variety of physical and cognitive tests, nutritional status, and functional decline, which are independent of age or any specific medical condition[3]. There are more than 20 validated tools for screening and measuring frailty, with important similarities, but no standardized assessment tool is defined. Consequently, these extensive scale options allow physicians to find one that suits their needs based on the type of surgery, their local population, and their resources. One of the most well-known tools is the Edmonton Frailty Scale (EFS), which is a multidimensional assessment designed to assist and facilitate the screening of elderly patients in a primary care setting. It includes subscales covering cognition, general health status, functional independence, social support, medication use, nutrition, mood, continence, and functional performance[1], classifying the patient as non-frail, vulnerable (at risk), or frail[2].

The Frail Scale was developed by the International Society for Nutrition and Aging and assesses 5 components: fatigue, resistance, ambulation, illness, and weight loss. The state of frailty is categorized as robust (0 points), pre-frail (1 to 2 points), and frail (3 to 5 points)[7].

The Society of Thoracic Surgeons (STS) incorporated gait speed measurement to assist physicians in identifying cardiac surgery patients at increased risk of adverse outcomes. This recommendation was based on a study by Afilalo et al.[8], which examined gait speed by measuring the time patients took to walk 5 meters. Patients who take more than 7 seconds to cover the 5 meters are classified as frail, while those who take up to 7 seconds are considered non-frail[9].

Considering the factors presented, the objective of this study was to estimate the prevalence of preoperative frailty in patients undergoing cardiac surgeries, based on the 5-meter walk test.

MATERIALS AND METHODS

This study was a retrospective analysis based on our institutional database at Hospital Encore located in Goiânia, Goiás. We evaluated 91 adult patients who underwent cardiovascular surgery at our institution between March 2019 and June 2023.

Preoperative frailty was assessed based on the measurement of patients' gait speed, specifically the time taken to walk 5 meters. A time greater than 7 seconds classified the patient as frail, whereas a time of 7 seconds or less was considered non-frail[9].

RESULTS

The study population consisted of 91 patients, with a minimum age of 29 years and a maximum age of 89 years, predominantly male (60.4%). The average age was 64.4 years (±12.5), the average weight was 76.1 kg (±13.3), and the average height was 1.7 m (±0.1) (Table 1).

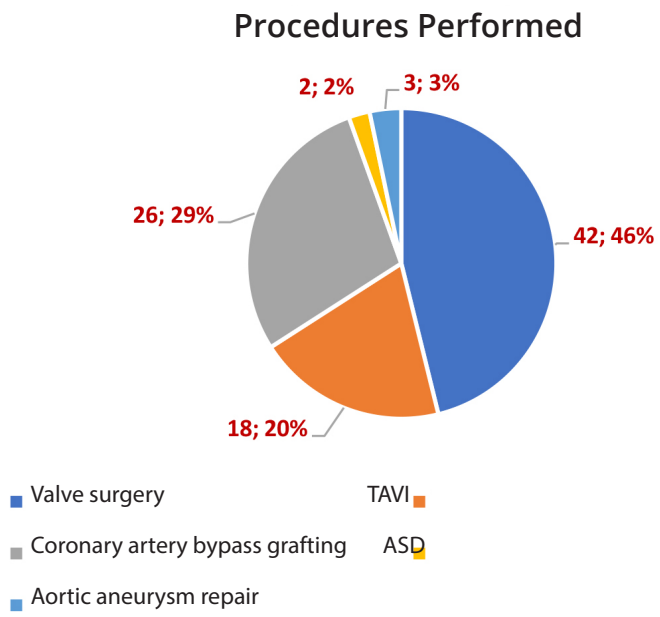
Table 1 - Anthropometric Characteristics of the Sample

Variable Value	(n = 91 patients)
Age (years)	64,4±12,5
Male, n(%)	55 (60.4%)
Female, n (%)	36 (39.6%)
Weight (kg)	76,1±13,3
Height (m)	1,7±0,1

%: percentage; kg: kilograms; m: meters. Data expressed as mean and standard deviation, and absolute frequency and percentage.

The patients underwent various cardiac surgeries, with the largest number undergoing valve surgery (42.46%). Other patients underwent coronary artery bypass grafting (26.29%), transcatheter aortic valve implantation (TAVI) (18.20%), atrial septal defect (ASD) correction (2.2%), and aortic aneurysm repair (3.3%) (Figure 1).

Figure 1. Procedures Performed

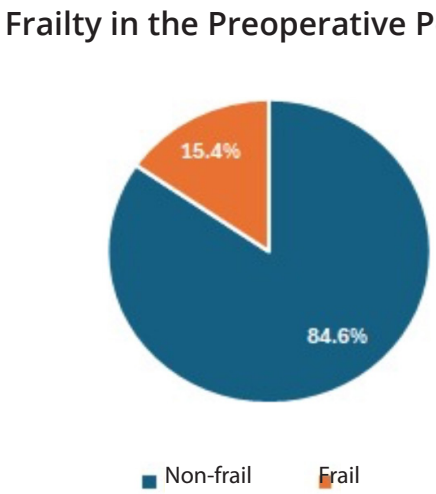


A total of 84.5% of the patients were classified as non-frail during the pre-anesthetic evaluation, compared to 15.4% who were considered frail, as shown in Table 2 and Figure 2.

Table 2. Frequency of Frailty Index in Patients Undergoing Cardiac Surgeries

Variable	(n = 91 patients)	< 60 years	≥ 60 years
Preoperative frailty	14 (15.4%)	1	13
Non-frail	77 (84.5%)	29	48

Figure 2. Percentage of Frail Individuals in the Studied Sample



DISCUSSION

Frailty constitutes a risk for complications and mortality following cardiovascular surgery. It is a multidimensional syndrome involving multiple physiological systems, with the typical phenotype being a patient exhibiting weakness, low energy, slowness, and involuntary weight loss [2,10].

As observed in Table 1, the average age of the study participants is 64.4 years (±12.5). According to Pereira[1], age is considered a significant factor in the occurrence of frailty syndrome due to changes in neuroendocrine regulation and immunological dysfunction that accelerate aging and the onset of secondary diseases. According to findings by Fhon et al.[11], in a longitudinal quantitative study involving 262 elderly individuals, frailty syndrome is associated with increased age and low educational level.

Additionally, frailty predisposes patients to a longer surgical recovery time, particularly with complications and reoperations. Furthermore, independent factors associated with postoperative morbidity and mortality include emergency surgeries and poor functional status[2].

The study population consists of 91 patients, with a predominance of males (60.4%) (Table 1). These results differ from data obtained from IBGE (2010), where female patients make up the majority undergoing surgical interventions, justified by the higher demand and utilization of healthcare services by women compared to men[1].

Regarding the walking test used in this study, Afilalo et al.[8] determined that patients with slow pre

operative walking speed (taking 6 seconds to walk 5 meters) had a 2 to 3 times higher risk of mortality and increased morbidity for any level of mortality risk predicted by the STS-PROM (Society of Thoracic Surgeons Predicted Risk of Mortality or Major Morbidity score) compared to those with normal walking speed. This supports the methodology used in this study for classifying frail patients.

According to a meta-analysis conducted by Bagnall et al.[12], nine studies have shown that preoperative frailty correlates with adverse events following bariatric surgery in elderly patients. Additionally, it highlights that frail patients have a two to four times higher risk of mortality after surgery compared to non-frail patients.

The prevalence of preoperative frailty in cardiac surgeries, when compared to other studies with similar designs, shows variability depending on the scale or method used for evaluation. Even within the same population, this prevalence can vary according to the selected scale. For example, as demonstrated by Miguelena-Hycka[7], it ranged from 10% to 29% within the same patient sample.

Despite this, studies with prospective and longitudinal designs, both preoperative and postoperative, have shown a clear and statistically significant linear trend in the incidence of postoperative morbidity among patients classified as frail, regardless of the scale used for defining frailty preoperatively[7].

In a study conducted by Montgomery et al.[5], which assessed the association between preoperative frailty and outcomes in adults undergoing cardiac surgery, 51 out of 529 patients (9.6%) were identified as frail. This finding supports our study, indicating a small difference in the percentage of frail patients, despite the smaller sample size.

The study by Montgomery et al.[5] further demonstrates that frail patients were older than non-frail patients, and postoperative complications were more common among frail patients. Frail patients received more interventions and required more intensive treatment escalation, including return to the operating room, administration of blood products, reintubation, enteral feeding via tube, and renal replacement therapy, compared to non-frail patients. Additionally, it was found that hospital mortality was 9.8% among frail patients and 1.0% among non-frail patients.

Another similar study conducted by the Virginia Heart Surgery Research Department by Henry et al.[4] evaluated frailty in cardiac surgical patients and found that out of 167 patients assessed, 46 patients (28%) were identified as frail. These frail patients experienced prolonged ventilation, pneumonia, longer ICU stays, and readmission within 30 days, leading to a worse quality of life regarding health. Similarly, the study by Niv AD et al.[6], which assessed frailty in patients undergoing elective cardiac surgery, showed that out of 167 patients who underwent myocardial revascularization and/or valve surgery, 39 patients (23%) were considered frail, leading to prolonged ICU stays.

Specifically speaking about transcatheter aortic valve implantation (TAVI), despite the good results of the procedure in follow-up, the one-year survival after TAVI for symptomatic severe aortic stenosis depended on the performance of the pre-TAVI 5-minute walk test. Patients who were unable to walk or took more than 7 seconds had worse survival compared to patients who took less than 7 seconds. This finding may assist in the selection and management of patients[9].

In the present study, 92.85% of frail patients were 60 years or older, while 7.15% were younger than 60 years, similar to the study by Sepehri et al.[3], which conducted a systematic review on the impact of frailty on postoperative outcomes in cardiac surgery. This study described that the associations were stronger in elderly patients undergoing cardiac surgery, highlighting the need for special attention to this age group.

CONCLUSION

Frailty was observed in 15.4% of the patients evaluated, with 92.85% of frail patients being 60 years or older. The walking test used in the study to estimate frailty in adults is simpler and easier to administer compared to many other frailty assessments that involve multidimensional evaluations with multiple parameters, which is a limitation of our study. Nevertheless, it can be inferred that the presence of preoperative frailty is associated with a higher risk of morbidity, mortality, and use of healthcare services, indicating that this tool can be useful and should be more routinely explored in preoperative evaluations for elective cardiac surgeries.

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ESTEVAM BORGES LOPES - http://lattes.cnpq.br/5104171664385663 - https://orcid.org/0009-0009-5137-5922

ARTUR HENRIQUE DE SOUZA - http://lattes.cnpq.br/0355122314956228 - https://orcid.org/0000-0002-5835-1052

STANLLEY DE OLIVEIRA LOYOLA - http://lattes.cnpq.br/4304216131077946 - https://orcid.org/0000-0002-1832-7103

MATHEUS SILVA DE OLIVEIRA - http://lattes.cnpq.br/9334250949525813 - https://orcid.org/0000-0002-9936-1556

GABRIEL PEIXOTO NASCIMENTO - http://lattes.cnpq.br/1553201526937403 - https://orcid.org/0000-0002-6607-7110

GUSTAVO SIQUEIRA ELMIRO - http://lattes.cnpq.br/4765163399934337 - https://orcid.org/0000-0003-2113-8757

GIULLIANO GARDENGHI - http://lattes.cnpq.br/1292197954351954 - https://orcid.org/0000-0002-8763-561X

ENDEREÇO

GIULLIANO GARDENGHI
CET – CLIANEST, R. T-32, 279 - St. Bueno, Goiânia - GO, Brasil, CEP: 74210-210
E-mail: coordenacao.cientifica@ceafi.edu.br

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SCIENTIFIC ARTICLE - REVIEW ARTICLE

ETIOLOGIES OF BACTERIAL STRAINS ISOLATED FROM BLOOD CULTURES OF CANCER PEDIATRIC PATIENTS

BIANCA DE OLIVEIRA FONSECA[1]; SORAIA TAVEIRA ROUXINOL[2]; ANA MUNHOZ ALBUQUERQUE CAVALCANTI[3]; ANA CLÁUDIA ROSA[4]; JOSÉ AUGUSTO ADLER PEREIRA[5]

1. Nurse from the Infection Control Service at Hospital Federal da Lagoa(HFL), Rio de Janeiro/RJ, Brazil
2. Physician at Hospital Federal da Lagoa (HFL), Rio de Janeiro/RJ, Brazil
3. Infectious Disease Physician at Hospital Federal da Lagoa (HFL), Rio de Janeiro/RJ, Brazil
4. Associate Professor at Faculdade de Ciências Médicas (FCM) /UERJ, Rio de Janeiro/RJ, Brazil
5. Associate Professor at Faculdade de Ciências Médicas, (FCM) /UERJ, Rio de Janeiro/RJ, Brazil

ABSTRACT

Introduction: Primary bloodstream infections (PBSIs) are serious adverse events, especially for vulnerable patients. Objectives: Data from pediatric ICUs indicate that PBSI cases are predominantly caused by coagulase-negative Staphylococcus, Staphylococcus aureus, Klebsiella pneumoniae complex, Serratia spp., and Pseudomonas aeruginosa. Of the total patients, 25 were neutropenic, and 5 were not. Methods: Data analysis showed that short-term catheters were more susceptible to PBSIs than long-term catheters. Results: The results indicated that the presence of onco-hematologic disease was a differentiating factor for positive blood cultures in neutropenic patients, where Staphylococcus epidermidis was the main agent identified among Gram-positive bacteria, and Klebsiella pneumoniae among Gram positive bacteria, which caused greater morbidity and mortality. Conclusions: Despite the limited evaluation of pathogenicity/virulence factors and the lack of investigation of antimicrobial resistance genes in the strains analyzed, it is considered that chemotherapy favors the translocation of intestinal bacteria. K. pneumoniae was the most frequent agent in PBSI cases, and probable changes may be due to colonization processes associated with the patients' multiple hospitalizations.

Keywords: Bloodstream infection, Staphylococcus sp, Klebsiella pneumoniae, Escherichia coli.

INTRODUCTION

In Brazil, cancer is the second leading cause of death in the pediatric population, and its treatment requires the use of central venous catheters (CVCs). These catheters are essential for the comprehensive treatment of these patients, with bloodstream infections being one of the main factors related to the loss of functionality of venous devices.[1] The rates of Primary Bloodstream Infections (PBSIs) also depend on the types of devices used and chosen for drug therapy.

Due to the subjectivity in the classification of PBSIs, the Brazilian Health Regulatory Agency (ANVISA) standardized the reporting of this infection across the country. Practically, PBSIs were divided into infections with a positive blood culture, corresponding to laboratory-confirmed primary bloodstream infections (LCPBSI), and infections characterized solely by clinical criteria, clinical primary bloodstream infections (CPBSI).[2]

Currently, although clinical primary bloodstream infections (CPBSIs) are not mandatory reportable infections in adult, pediatric, and neonatal Intensive Care Units (ICUs), they should be monitored and reported in these sectors within healthcare institutions.[3]

PBSIs are a global problem, especially for vulnerable patients such as pediatric patients, as they have specific characteristics that must be considered, including higher infection rates, increased susceptibility related to morbidity and mortality, and longer duration of infections.[4]

Hospitalized children with a cancer diagnosis are at a higher risk of acquiring infections, particularly hematological-oncological patients, who require longer hospitalization periods, may become colonized by hospital microbiota, and have less effective natural barriers due to the toxic effects of chemotherapy and immunosuppression caused by cancer. In most cases, infections are associated with the use of central venous catheters (CVCs).[5],[6]

In this pediatric context, it is important to note that patients with hematological neoplasms are at a greater risk of acquiring PBSIs, as they are severely immunocompromised due to the underlying disease, anti-neoplastic therapy, and/or hematopoietic stem cell transplantation.[7] According to Ziegler Pellegrini and Safdar,[8] a meta-analysis study conducted in ICU patients suggested that PBSIs worsen the clinical course of hematological-oncological patients and contribute to overall mortality.

The diagnostic criteria for reporting PBSIs were updated in 2017. This update included a flowchart to facilitate the correct identification of the condition and, for the first time, added the concept of laboratory-confirmed primary bloodstream infection (LCPBSI) associated with mucosal barrier damage. This is due to mucositis associated with certain chemotherapy modalities or the occurrence of graft-versus-host disease, which, combined with neutropenia, can facilitate bacterial translocation, leading to bloodstream infection (BSI).[3]

One of the main characteristics of immunosuppressed patients undergoing cancer treatment is neutropenia.[9] This condition is characterized by a granulocyte count of fewer than 500 cells per cubic millimeter.[10] If this white blood cell count is accompanied by febrile episodes, with temperatures exceeding 38°C, it is considered that the patient has febrile neutropenia. The emergence of multidrug-resistant pathogens presents a significant challenge in treating immunosuppressed oncology patients and, in the pediatric context, is associated with an increase in infant mortality rates.[11]

Pediatric oncology patients have significantly reduced survival due to severe complications, with fever being the primary reason for seeking pediatric emergency services. Approximately 0.9% to 39% of febrile, non-neutropenic oncology patients are bacteremic, and about 7.3% of oncology patients admitted to emergency services have positive bacterial blood cultures. Factors that favor the development of sepsis include upper respiratory tract infections, neuroblastoma, other cancer diagnoses, and the use of central venous catheters.[12]

Bloodstream infections in neutropenic patients are primarily caused by coagulase-negative staphylococci (CNS), which readily acquire antimicrobial resistance genes in the hospital environment, complicating patient treatment. This resistance phenotype in S. epidermidis and S. haemolyticus isolated in hospital settings is common, with the percentage of oxacillin resistance around 80%. The role of these species as reservoirs for resistance genes is still under discussion; therefore, analyses and investigations should be conducted to guide hygiene measures, surveillance, and prevention in the hospital environment.[13]

Over time, the etiological agents of febrile neutropenia have changed. Gram-negative bacteria were of great importance in the etiology of this condition during the 1970s, while in the 1990s, Gram-positive bacteria, mainly those related to the Staphylococcus genus, were more commonly associated. More recently, there has been a noted predominance of Gram-negative microorganisms, particularly strains of Klebsiella spp. and E. coli. These epidemiological changes can be attributed to different approaches used in oncology patients, such as the prophylactic use of fluoroquinolones and the use of intravascular catheters. Additionally, the increase in the occurrence of severe mucositis associated with chemotherapy should not be overlooked.[11,14,15]

The identification of etiological agents of primary bloodstream infections (PBSIs) through the detection of bacterial rRNA 16S genes using Polymerase Chain Reaction (PCR) and microarray assays can significantly contribute to the speed of diagnosis. Molecular biology tools offer substantial benefits for the rapid and accurate diagnosis of etiological agents in PBSIs. However, implementing this methodology requires investment in resources that are not accessible to most healthcare institutions. We aim to describe the characteristics of pediatric patients with onco-hematological diseases in terms of age and sex (demographics), the presence of neutropenia, and the type of catheter (short or long-term); evaluate the association between catheter use in patients and the occurrence of primary bloodstream infection; identify bacterial species using phenotypic and molecular methods; and determine the antimicrobial susceptibility profile.

METHODS

Study Design and Variables

This is a descriptive retrospective study with a quantitative data approach, analyzing bacterial straims isolated from blood cultures of hospitalized pediatric patients from August 2015 to August 2016. The study site was the Pediatric Service of a Federal Hospital located in the municipality of Rio de Janeiro. This service consists of 10 clinical and surgical pediatric wards, each with 2 beds, 10 pediatric intensive care unit beds, and a pediatric hematology outpatient clinic, where consultations, laboratory tests, and chemotherapy administration are conducted. This research was carried out in collaboration with the Microbiology Laboratory of the aforementioned hospital, associated with the Department of Microbiology, Immunology, and Parasitology of the Faculty of Medical Sciences of the State University of Rio de Janeiro (DMIP-FCM-UERJ), where the bacterial strains were analyzed.

Sampling was conducted using a convenience approach, considering blood cultures from all pediatric patients during the period from August 2015 to August 2016, based on the following eligibility criteria: patients diagnosed with onco-hematological diseases who had blood cultures with microbial growth and considered to have an infection when two or more blood cultures showed growth of the same microorganism, provided that the patients did not have an identifiable infectious focus in another site (pulmonary, urinary, etc.) during the studied period. One sample per patient related to infection or colonization was included. Bacterial strains with an isolation interval of more than 14 days from the same patient were also included. The exclusion criteria were patients who had positive blood cultures but were related to secondary bloodstream infections, which would be those with positive blood cultures with identifiable infectious foci in another site (pulmonary, urinary, etc.).

Collection of bacterial strains isolated from blood cultures in the routine of the microbiology laboratory of the hospital institution.

The routine evaluation of patients with clinical suspicion of sepsis (clinical signs such as fever, tachycardia, hypotension, oliguria, among others), primary bloodstream infection, and those who, upon admission or during hospitalization, were experiencing febrile neutropenia includes the request for bacteriological tests by the clinical team of the hospital where the study was conducted. Thus, it is emphasized that both the request and the collection of blood for the analyzed blood cultures occur as standard clinical practice in the unit in question, regardless of the present study. The bacterial strains were forwarded and included in the Bacterial Collection of the Department of Microbiology, Immunology, and Parasitology (DMIP-UERJ). Data for registering these blood samples for cultures were obtained from the referral forms, which include information regarding patient characteristics, antimicrobial use, central venous catheter use, lock therapy in fully implanted catheters, neutropenia, abdominal symptoms, and the classification of IPCS based on the criteria defined by ANVISA.[3]

All bacterial samples were stored in a 10% skim milk solution (Skim Milk; Difco Laboratories, Detroit, Michigan, USA) containing 10% glycerol and maintained at -20°C until the tests were performed.

Bacterial Identification in the Clinical Laboratory

The bacterial samples underwent initial identification at the clinical laboratory using the VITEK® 2 System with software version 6.01 (bioMérieux, France). For the identification of Gram-positive and Gram-negative strains, the VITEK® 2 GP and GN cards (bioMérieux, France) were used, respectively. The probability of identification accuracy (confidence level) is categorized into four groups: excellent (96% to 99%), very good (93% to 95%), good (89% to 92%), and acceptable (85% to 88%).

Bacterial Identification by Mass Spectrometry

This stage of the work was conducted in collaboration with the Institute of Microbiology Professor Paulo de Góes at the Federal University of Rio de Janeiro (IMPG-UFRJ). All bacterial strains underwent identification confirmation through proteomic analysis, utilizing the Matrix-Assisted Laser Desorption/Ionization Time-of-Flight Mass Spectrometry (MALDI-TOF MS) technique. Using a wooden stick, a small sample of the colony isolated on Mueller Hinton agar (BD®, Heidelberg, Germany) was transferred to a well of a 96-well plate (Bruker Daltonik GMbH, Germany). To each well, an aliquot of 10 µL of alpha-cyano-4-hydroxycinnamic acid (CHCA - Bruker Daltonik GMbH, Germany) matrix was added and allowed to dry at room temperature.

Bacterial Identification by DNA Fragment Sequencing

For the species identification of an exigent microorganism that is rarely isolated in the routine of the studied hospital institution, the sequencing of the rDNA16S gene of the bacteria was employed. The sequencing of the amplification product was conducted in collaboration with the Fiocruz Network of Technological Platforms – Genomics in Rio de Janeiro, using the DYEnamic ET terminator kit (Amershambiosciences, São Paulo, Brazil). The reactions were carried out on the ABI 3730xL Sequencer. The sequences obtained were compared against sequences deposited in databases (NCBI) for bacterial identification.

Antimicrobial Susceptibility Testing

The strains had their antimicrobial susceptibility profiles obtained in the assistive laboratory using the automated VITEK® 2 System with software version 6.01 (bioMérieux, France).

For the Gram-positive strains, the VITEK® 2 AST-637 card (bioMérieux, France) was used. The following antimicrobials were analyzed: fusidic acid (AFS), ampicillin (AMP), benzylpenicillin (PEN), ciprofloxacin (CIP), clindamycin (CLIN), high-level streptomycin (HLR-ST), erythromycin (ERI), gentamicin (GEN), high-level gentamicin (HLR-GE), linezolid (LIN), moxifloxacin (MOX), norfloxacin (NOR), oxacillin (OXA), rifampicin (RIF), teicoplanin (TEC), tigecycline (TIG), and trimethoprim-sulfamethoxazole (SMX), vancomycin (VAN). For the Gram-negative strains, the VITEK® 2 AST-239 card (bioMérieux, France) was used. The following antimicrobials were analyzed: amikacin (AMI), ampicillin (AMP), ampicillin--sulbactam (APS), cefepime (CPM), cefoxitin (CFO), ceftazidime (CAZ), ceftriaxone (CRO), cefuroxime (CRX), ciprofloxacin (CIP), ertapenem (ERT), gentamicin (GEN), imipenem (IMP), meropenem (MER), piperacillin-tazobactam (PPT), and tigecycline (TIG).

Data Processing and Analysis

The data obtained were analyzed using a quantitative approach in light of descriptive statistics and tabulated using Microsoft Excel Office XP®. For continuous variables related to the patient, such as age range, microorganism profile, and resistance, absolute and relative frequency measures (percentage) were calculated. For associations, statistical significance (p) was assessed using the chi-square (χ^2) test, considering a significance level of 0.05.

Ethical Procedures

The study was submitted to the Research Ethics Committee and was approved with the following approval number: 4.502.848. CAAE: 41955320.4.0000.5259.

RESULTS

Patients

During the study (over the 12 months of data collection, from August 2015 to August 2016), 50 patients were included, of which 45 met the inclusion criteria established by the study. Five patients were excluded: one for being outside the age range, two because the clinical specimen was different from blood, and two for having secondary bloodstream infections. Of the total patients, 25 out of 45 (55.6%) had onco-hematological diseases, among which 20 out of 25 (80%) were neutropenic and 5 out of 25 (20%) were not neutropenic at the time of collection. Most onco-hematological patients were in the preschool age group, followed by school-age children and infants, respectively (Table 1).

Table 1. Distribution of pediatric onco-hematological patients with positive blood cultures according to age group, sex, and hospital ward

Age Group	Onco-hematological Patients				
	Female	Male	Pediatric ICU	Ward	Total
	n	n	n	n	n
0 to 28 days (neonatal)	0	0	0	0	0
>28 days to 2 years (infant)	1	2	0	3	3
3 to 6 years (preschool)	3	7	1	9	10
7 to 11 years (school-age)	2	6	2	6	8
12 to 18 years (adolescent)	2	2	1	3	4
Total	8	17	4	21	25

The majority of the onco-hematological patients, 10/25 (40%), were in the school-age group and were hospitalized in the pediatric ward. Males predominated in both patient groups. No statistical difference was found regarding the distribution of patients by age groups.

When associating the types of central catheters, classified as short-term (peripheral catheters and central catheters), which in pediatric patients (peripheral catheters) do not have a routine change, both must be continuously evaluated for the need for removal, hemodynamic monitoring, etc., and long--term (tunneled catheters that can remain implanted for months or even years, providing safe access for long-term therapies, such as for onco-hematological diseases, among others). Regarding the presence of CLABSI, as shown in Table 2, it was observed that patients with long-term catheters had a higher occurrence of CLABSI than those with short-term catheters among onco-hematological patients with neutropenia; however, the difference was not statistically significant. It is important to note that nine onco-hematological patients without neutropenia had two or more episodes of CLABSI (data not

Table 2. Association of Types of Catheters Inserted in Pediatric Onco-Hematological Patients with neutropenia regarding the presence of primary bloodstream infection.

Types of Catheter	PBI*	No PBI*	Total
	n	n	n
Short-Term	5	4	9
Long-Term	22	9	31
Total	27	13	40

*PBI: Primary bloodstream infection.

shown).

Bacterial Strains

In the identification of bacterial samples from oncology-hematology patients with neutropenia, 21 enterobacteria were isolated (11 K. pneumoniae, 7 E. coli, 3 E. cloacae), 2 P. aeruginosa, 1 Stenotrophomonas maltophilia, 1 Candida parapsilosis, and 3 Brevibacterium cellere. In oncology-hematology patients without neutropenia, bacterial species such as Campylobacter jejuni, Brevibacterium celere, and Pantoea sp. were isolated. The majority of bacterial species were derived from episodes of primary bloodstream infection (PBI), except for coagulase-negative staphylococci (CNS), where almost all were involved in non-PBI cases (Table 3). Only one episode of PBI was caused by CNS in a neutropenic patient (case 17, strains 47 - S. epidermidis in Table 4). In the blood cultures of patients (with or without neutropenia), we were able to detect species using unconventional identification methods, which do not correspond to "classical" pathogens, but may correspond to opportunists such as Corynebacterium sp., Sphingomonas paucimobilis, and Francisella tularensis (Table 4). However, Brevibacterium celere, a microorganism not associated with human infections, was isolated in blood cultures from 4 different patients (Table 5).

Bacterial Identification

Approximately three-quarters of the bacterial strains (54/79.4%) showed concordance in identification between the VITEK® 2 System, conducted at the originating laboratory, and MALDI-TOF MS, used as a confirmation instrument for the data. In the 12 cases of disagreement in identification, seven had scores above 2, indicating certainty in species identification, while five had scores between 1.7 and 1.99, relating to the level of confidence in genus (Table 5).

Table 3. Distribution of bacterial species and their antimicrobial resistance markers recovered from blood cultures of pediatric oncology-hematology patients with neutropenia.

Patient	Sample	Species	Episode of PBSI (P) / Contamination Episode (C)	Resistance Markers
1	9	*K. pneumoniae*	PBSI1	CIP-GEN-TIG-APS-CPM-CAZ-CRO-CRX*
2	2	*S. epidermidis*	C1	PEN-CIP-CLIN-ERI-MOX-NOR-OXA-RIF-
2	10	*K. pneumoniae*	PBSI1	MS
2	17****	*K. pneumoniae*	PBSI2	MS
3	14	*K. pneumoniae*	PBSI1	MS
5	113	*K. pneumoniae*	PBSI1	MS
7	38	*S. epidermidis*	C1	PEN-OXA*

7	59	*K. pneumoniae*	PBSI1	TIG-APS-CPM-CFO-CAZ-CRO-CRX-PPT*
7	38	*S. epidermidis*	C1	PEN-OXA*
7	80	*K. pneumoniae*	PBSI2	CIP-TIG-APS-CPM-CAZ-CRO-CRX*
8	53	*P. aeruginosa*	PBSI1	APS-CFO-CRO-CRX
8	60	*K. pneumoniae*	PBSI2	APS-CPM-CAZ-CRO-CRX-PPT*
8	62	*K. pneumoniae*	PBSI3	APS-CPM-CAZ-CRO-CRX-PPT*
8	79	*E. coli*	PBSI4	MS
8	68	*S. saprophyticus*	C1	PEN-OXA-SUT-AFS*
8	76	*K. pneumoniae*	PBSI5	APS-CPM-CAZ-CRO-CRX-PPT*
8	73	*K. pneumoniae*	PBSI6	MS
8	69	*C. parapsolosis*	PBSI7	-
11	16	*S. hominis*	-	C1
12	20	*S. epidermidis*	C1	PEN-ERI-OXA*
12	39	*S. epidermidis*	C2	PEN-ERI-OXA-TEC*
12	40	*S. epidermidis*	C3	PEN-ERI-OXA-TEC*
16	12	*B. celere*	C1	-
16	45	*B. celere*	PBSI1	-
16	37	*S. hominis*	-	C2
17	47	*S. epidermidis*	PBSI1	PEN-CLIN-ERI-OXA*
18	50	*S. hominis*	-	C1
18	51	*B. celere*	-	C2
19	130****	*S. hominis*	C1	PEN
23	103	*P. aeruginosa*	PBSI1	APS-CFO-CRO-CRX
23	91	*S. hominis*	-	C1
31	5	*S. maltophilia*	PBSI1	-
31	19	*E. coli*	-	-
34	1	*E. coli*	-	-
35	3	*E. coli*	-	-
37	132****	*E. coli*	-	IPCS1
38	58	*E. coli*	-	-
39	72	*E. coli*	-	-
48	30	*E. cloacae*	PBSI1	AMP-APS-CFO-CRX
48	33	*E. cloacae*	PBSI2	AMP-APS-CPM-CFO-CAZ-CRO-CRX-GEN*
48	56	*E. cloacae*	PBSI3	AMP-APS-CFO-CRX

*Resistance profile classified as multidrug-resistant; SCN: Coagulase-negative Staphylococcus; sample not analyzed. AMP: Ampicillin; AFS: Fusidic acid; APS: Ampicillin-Sulbactam; CAZ: Ceftazidime; CFO: Cefoxitin; CLIN: Clindamycin; CPM: Cefepime; CIP: Ciprofloxacin; CRO: Ceftriaxone; CRX: Cefuroxime; ERI: Erythromycin; ERT: Ertapenem; LIN: Linezolid; IMI: Imipenem; MER: Meropenem; MOX: Moxifloxacin; NOR: Norfloxacin; OXA: Oxacillin; PEN: Penicillin; PPT: Piperacillin-Tazobactam; RIF: Rifampicin; SUT: Sulfamethoxazole-Trimethoprim; TEC: Teicoplanin; TIG: Tigecycline; MS: Multisensitive sample; -: Antibiogram not standardized and not performed.

Table 4. Distribution of bacterial species and their antimicrobial resistance markers recovered from blood cultures of pediatric onco-hematological patients without neutropenia.

Patient	Sample	Species	Episode of PBSI (P) / Contamination Episode (C)	Resistance Markers
30	66	*S. aureus*	PBSI1	PEN-OXA*
32	8	*B. celere*	C1	-
41	134****	*C. jejunii*	PBSI1	-
42	54	*E. faecalis*	PBSI1	CLIN-HLR-G
47	26	*Pantoea*	PBSI1	-

Resistance profiles classified as multidrug-resistant; SCN: Coagulase-negative Staphylococcus; Sample not analyzed. CLIN: Clindamycin; GEN: Gentamicin; OXA: Oxacillin; PEN: Penicillin; -: antibiogram not standardized and not performed.

Table 5. Distribution of bacterial species and their antimicrobial resistance markers recovered from blood cultures of pediatric oncology-hematology patients without neutropenia.

Methods Applied in Bacterial Identification					
Pediatric Oncology-Hematology Patients with Neutropenia					
Patient	Sample	PBSI*/C**	VITEK® 2 System	MALDI-TOF MS (*score*)	16S rDNA Gene Sequencing
16	12	C1	**	*Brevibacterium celere* (2.049)	-
16	45	PBSI1	**	*Brevibacterium celere* (2.049)	-
18	51	C1	*Corynebacterium sp.*	*Brevibacterium celere* (2.049)	-
Oncology-Hematology Patients without Neutropenia					
Patient	Sample	PBSI/C	VITEK® 2 System	MALDI-TOF MS (*score*)	16S rDNA Gene Sequencing
32	8	C1	*Sphingomonas paucimobilis*	*Brevibacterium celere* (2.049)	-
41	134	PBSI1	*Francisella tularensis*	-	*Campilobacter jejuni*

* PBSI: Primary bloodstream infection; C: contamination in blood culture.

The bacterial strains 12 and 45 were not initially identified by the VITEK® 2 System but were identified as Brevibacterium celere using MALDI-TOF MS.

Antimicrobial Sensitivity Profile

For 22 samples, it was not possible to obtain a resistance profile to antimicrobials, as no resistance was observed in seven strains (K. pneumoniae n = 5; E. coli n = 2) to any of the tested antimicrobials. For 11 strains, there was no standardization for performing an antibiogram using the VITEK® 2 Sys

tem (C. albicans n = 1, C. tropicalis n = 1, C. parapsilosis n = 1, Pantoea sp. n = 1, S. maltophilia n = 1, S. sanguinis n = 1, S. paucimobilis n = 1, and Brevibacterium celere n = 4). Additionally, for four strains, the viability of the microorganism was lost (C. jejuni n = 1, E. coli n = 2, and S. hominis n = 1). Different resistance profiles were observed in the bacterial strains, with the greatest diversity of profiles seen among SCN (14 profiles), K. pneumoniae (4 profiles), E. cloacae (4 profiles), and E. coli (4 profiles). Among the resistance profiles of SCN, approximately two-thirds exhibited markers that classified them as multidrug-resistant (resistant to OXA). All highlighted profiles in K. pneumoniae were multidrug-resistant (all resistant to cefepime and none resistant to imipenem). For E. cloacae, two profiles were resistant to CPM, while for E. coli, a single profile was classified as multidrug-resistant (resistant to CPM) (Table 3).

DISCUSSION

Studies show that among cancer patients, hematological diseases pose the highest risk for Primary Bloodstream Infection (PBSI) compared to patients with solid tumors, as well as for those with malignant hematological diseases such as leukemia and lymphoma.[6]

Neutropenia is the greatest independent risk factor for Primary Bloodstream Infection (PBSI), and patients with this infection have higher mortality rates compared to non-neutropenic patients. It is important to note that totally implanted catheters are inserted through surgical procedures, emphasizing the need for updates and reviews of routines, surveillance, training, and verification of preventive measures through insertion and maintenance bundles for Central Venous Catheters (CVCs), including hand hygiene and aseptic technique.[5,16]

A cross-sectional study conducted a retrospective analysis of Primary Bloodstream Infections (PBSI) in oncology-hematology patients with long-term venous catheters, showing that this device was associated with 68% of PBSI cases.[17] Indeed, oncology patients often use long-term central venous catheters for safe chemotherapy treatment, making them more susceptible to infection risks related to catheter care. Therefore, strict care in handling and infusing medications is necessary. This indicates that in the study unit, surveillance and preventive measures appear to be effective, and when these are not followed, the risk of PBSI may increase regardless of the type of catheter used.

Bloodstream infections associated with Ports are classified using the same criteria as those related to other central venous catheters. Although it is considered the device with the lowest risk compared to other venous catheters, frequent complications are encountered in some healthcare services. According to the IDSA and ANVISA guidelines, blood cultures should not be routinely collected from patients who do not show symptoms of Primary Bloodstream Infection (PBSI). In a retrospective study conducted at a pediatric oncology treatment institution, the main complications associated with this type of catheter were mechanical and infectious.[6]

This bacterial strains, due to being an exigent species for culture, was not recovered for further analysis, thus it was not possible to perform antimicrobial susceptibility testing.

Among the bacterial species isolated in this study, most were derived from episodes of PBSI. However, coagulase-negative staphylococci (CNS) species were mostly not associated with PBSI, except for one case of PBSI caused by CNS in a neutropenic patient. In contrast, Gram-positive bacteria predominated in blood cultures from patients with immunodeficiencies and other non-oncological and

non-hematological conditions.[4]

Özalp Gerçeker, Yardımcı, and Aydınok17 found coagulase-negative staphylococci (CNS) in 47.6% of oncological hematology patients, making it the most frequent species in bloodstream infections. Another study showed that in pediatric neutropenic patients, E. coli strains were the microorganisms most frequently observed.[18]

Gram-negative bacteria with a multidrug-resistant profile accounted for 40% of bacterial infection cases, with K. pneumoniae being the primary species associated, representing 66.6% of these cases. This bacterial species has been shown to pose a higher risk for admission to the Pediatric Intensive Care Unit and increased mortality in another study.[4] Our findings also contrast with those of Schonardie, Beck, and Rigatto, who noted that their results pertained exclusively to infections in neutropenic patients.[19] The authors identified the etiologies of bloodstream infections, detecting coagulase-negative staphylococci (CNS) as the most frequent agent (40.1%), with E. coli isolated more frequently (13.2%) than Klebsiella spp. (13.2).

In the present study, the isolation of multidrug-resistant Enterobacteriaceae was not prevalent; the prevalence of MDR Enterobacteriaceae was low, even when considering both infection agents and contaminating microorganisms. Among the resistance profiles observed among Staphylococcus spp., the phenotypic profile of multidrug resistance (resistance to oxacillin – MRSA and MRSE) was noted in nearly all bacterial strains. It is known that, in severe cases caused by oxacillin-resistant Staphylococcus spp., the most commonly adopted therapeutic option is vancomycin. However, a case has recently been reported in our country of a bloodstream infection caused by a vancomycin-resistant strain. The increasing number of reported infections caused by resistant Staphylococcus spp. in Brazil underscores the necessity for surveillance studies to help understand how these strains circulate in healthcare settings.[20,21] These infectious complications sometimes necessitate evaluating the potential need for intravenous device removal.[6]

Strains of Enterobacteriaceae isolated from blood cultures of neutropenic patients with onco-hematological diseases were analyzed, with the most prevalent species in this group being K. pneumoniae and E. coli, which are part of the intestinal microbiota. Klebsiella spp. samples were more prevalent, and this finding may be justified by the alteration of the microbiota in these patients due to multiple hospital visits and admissions related to their health condition. Intestinal colonization by K. pneumoniae is markedly associated with hospitalization.[22]

In total, we isolated 4 strains of K. pneumoniae and 1 strain of E. coli resistant to third-generation cephalosporins. Resistance to these antimicrobials is primarily related to the production of ESBL-type enzymes, with the most commonly associated genes worldwide, including in Brazil, being blaCTX-M and blaSHV.[23,24] A limitation of our study was the lack of investigation into the genetic mechanisms associated with this resistance. We did not search for the presence of these genes.

The evaluation of bacteremia in cancer patients should be considered and classified as PBSI according to the new criteria (breach of barrier and mucosa) recommended by national infection control classification guidelines. Therefore, this definition aims to identify bacteremias in this patient group related to the disruption of the mucosal barrier, promoting the translocation of gastrointestinal bacteria that are not directly associated with CVC infections.[5]

Infection rates are lower when using tunneled catheters with cuffs, totally implanted ports in subcutaneous tissue, peripherally inserted central catheters (PICC), and tunneled catheters without cuffs, compared to non-tunneled short-term catheters. PICCs have been frequently used in this patient group because they remain in place for a long time and have fewer complications related to infection compared to other catheters. Some studies in neonatology also show that central venous catheters present a lower risk of infection than peripheral ones in this population.[25]

The frequent use of catheters necessitates the routine evaluation of patients' clinical conditions and CVCs for diagnosing PBSI associated with these devices, with blood cultures being the most common test collected. Blood culture collection is widely used for diagnosing sepsis and PBSI. However, laboratory diagnosis in patients exhibiting signs and symptoms of PBSI caused by various bacterial species can be challenging, especially in neonates and children, requiring a combined assessment of clinical aspects and laboratory support. In many clinical situations, the positivity rate of blood cultures is low, often below 30%. Some patients may exhibit false-negative blood culture results due to prior antimicrobial use or the timing of blood collection when bacteremia is not present.[3]

CONCLUSION

Blood collection for blood cultures is particularly challenging in children, both due to clinical diagnostic issues and the necessary limitations on the volume and quantity of blood samples. In children with cancer, there is also a greater difficulty in determining whether microorganism isolations correspond to infections or are due to contamination. The occurrence of neutropenia, among other conditions that lead to immunosuppression, is associated with mucosal injuries, promoting bacterial translocation from the intestinal microbiota. Multiple hospitalizations resulting from remissions complicate matters since they lead to colonization by hospital strains of bacteria. Additionally, a major challenge is that hematological patients are more prone to infections by microorganisms that are not detectable by routine clinical microbiology, necessitating molecular biology methods for detection, which are not accessible to most healthcare institutions.

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BIANCA DE OLIVEIRA FONSECA - http://lattes.cnpq.br/3499251063102755 - https://orcid.org/0000-0002-6251-4977

SORAIA TAVEIRA ROUXINOL - http://lattes.cnpq.br/6251263167108864 - https://orcid.org/0000-0003-2908-030X

ANA MUNHOZ ALBUQUERQUE CAVALCANTI - http://lattes.cnpq.br/5906245346479121 - https://orcid.org/0000-0002-4092-5871

ANA CLÁUDIA ROSA - http://lattes.cnpq.br/7809403473011306 - https://orcid.org/0000-0002-3308-1922

JOSÉ AUGUSTO ADLER PEREIRA - http://lattes.cnpq.br/4615388062321214 - https://orcid.org/0000-0003-0530-0697

MAILING ADDRESS:

JOSÉ AUGUSTO ADLER PEREIRA
Avenida Professor Manoel de Abreu, 444 - 3º andar, Maracanã. Rio de Janeiro/RJ - CEP:20550-170
E-mail: jadlerpereira@gmail.com

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