v. 3, n. 64, 2023

International Journal of Health Science

RELATION BETWEEN THE IMMUNIZATION RATE BY THE MENINGOCOCCAL C-CONJUGATE VACCINE (MNCC) AND THE COVID-19 PANDEMIC IN THE POPULATION AGED UP TO 1 YEAR

Aline Rabelo Rodrigues
http://lattes.cnpq.br/2590772917663860

Gabriel Mangas
http://lattes.cnpq.br/9554174999506047

Gabriel Bagarolo Petronilho
http://lattes.cnpq.br/4000632192425309

Maria Fernanda Grael Tinós
http://lattes.cnpq.br/1549448758201330

Danielly Maximino da Rocha
http://lattes.cnpq.br/5629544718799343

Monique Benemérita Vilela Gomes
https://lattes.cnpq.br/7939140010787583

Arthur Santos da silva
https://lattes.cnpq.br/6791435932232705

Emanuelle Sad Pasetti
http://lattes.cnpq.br/5258764550291348

Bruno Borges Ferreira Gomes
http://lattes.cnpq.br/8006368105301003

Abstract: The meninges are membranous structures that surround the central nervous system (CNS), which are divided into very elastic and vascularized layers, and which house a repertoire of immune cells, providing mechanical and immunological protection, in addition to regulating intracranial pressure (ICP). Meningitis is defined as an inflammatory reaction of the meninges and spinal cord, with viruses, bacteria and fungi as the main etiologies. The most serious cases are caused by bacterial infections, which, in some situations, can be prevented through vaccination. Notifications of infections caused by vaccine-preventable meningitis decreased significantly in the period from 2014 to 2019, in general in the world, due to the introduction of vaccines in countries that did not provide them for their respective populations and the increase in vaccination. in countries that have already done so. On the other hand, in the period from 2012 to 2016, Brazil showed a reduction in the vaccination coverage of Meningococcus C in children younger than 1 year and 1 year of age. In the pre-Covid-19 period suffered variations, being possible to describe them both at regional and national level as a reduction in coverage in the year 2017 to 2018 and an increase from 2018 to 2019. However, it should be noted that, since Covid-19 (2020 and 2021), there has been a considerable decrease in the number of vaccinations against meningitis, a pattern that is repeated in all regions of the country.
Keywords: Meningitis; vaccine; vaccination coverage; pediatrics.

INTRODUCTION

The meninges are membranous structures that surround the central nervous system (CNS), which are divided into very elastic and vascularized layers, and that host a repertoire of immune cells, thus providing mechanical and immunological protection, in addition to regulating intracranial pressure (PIC).[1] Meningitis is defined as an inflammatory reaction of the meninges and spinal cord, with viruses, bacteria and fungi as the main etiologies. The most severe cases are caused by bacterial infections, which, in some situations, can be prevented through vaccination.[2] According to Nakamura (2021), notifications of infections caused by vaccine-preventable meningitis have largely reduced in the period from 2014 to 2019, in general in the world, due to the introduction of vaccines in countries that did not provide them to their respective populations and the increase in vaccination in countries that have already carried it out. On the other hand, in the period from 2012 to 2016, Brazil presented a reduction in the vaccination coverage of Meningococcus C in children younger than 1 year and 1 year of age.[3]

In view of the context of the SARS-CoV-2 virus pandemic and the consequent overload of health systems in almost all countries in the world, including Brazil, this infection has become the main global concern in 2020 .[4] In addition, social isolation measures have reduced the movement of people on public roads, which has resulted in a drop in vaccination for other diseases that can be prevented by vaccination, and thus, they have once again plagued public health.[2] In addition, infections caused by the SARS-CoV-2 virus have been linked to a wide spectrum of neurological complications, involving both the central and peripheral nervous systems, with meningitis being one of these complications.[5] Despite the correlation, the causality mechanisms between the two diseases are still being studied .[4]

Among the serogroups of meningococcus (Neisseria meningitidis) 5 are the main causes of meningitis in Brazil: A, B, C, W and Y. Serogroup C is the most common and the reason why the Meningococcal C-conjugate

vaccine (MncC) it was introduced into the National Immunization Program (PNI) in 2010. In the MncC vaccination scheme, children must receive 3 doses of the vaccine: one at three months of age; another at five months and the booster at twelve months. In 2020, the Meningococcal ACWY (Conjugate) vaccine was introduced in the PNI, which protects against serogroups A, C, W and Y, however, in the PNI, its vaccination schedule is planned for adolescents.[6]

This study aims to analyze the vaccination rate for C-conjugated meningococcal vaccine in relation to the pre-Covid-19 pandemic period and during the Covid-19 pandemic in pediatric patients aged up to 1 year, and the repercussions on the incidence of meningitis in this period. same context.

METHODS

For the elaboration of this work, information about immunization with the meningococcal MncC vaccine from the IT department of the Brazilian Unified Health System (DATASUS), a digital body integrated with the Ministry of Health, which collects, organizes and disseminates data from the unified health system, was used. national health. In the health care option, immunizations since 1994 were selected, by applied doses. In the areas of the region, data were obtained

According to federal areas of Brazil, the alternative selected for immunobiologicals was "meningococcal C-conjugated (MncC)" in the age group of 1 year, in the period from 2017 to 2021 (5 years). To compare the data and stratify in relation to the population area of each federation and birth rate, the data were distributed in a spreadsheet using Microsoft Excel for the year 2013.

RESULTS

From the data obtained on the DATASUS platform, it is noted that in Brazil the number of children vaccinated with MncC decreased from 2017 to 2018, but increased from 2018 to 2019, which is also the year with the highest number of vaccinations (n= 2,586 .344), as shown in Graph 1. However, when comparing the number of doses with the population up to one year old estimated by the number of live births in the previous year, Brazil had its peak of doses in 2017 with 89% (n =2,554,111) of coverage, followed by a drop in 2018 with 81% (n=2,371,082) of vaccination coverage and an increase to 88% in 2019. Since then, the number of vaccinations in children up to 1 year old has been in decline, with only 79% (n= 2,248,279) of vaccination coverage in 2020, and 2021 being the year with the lowest number of vaccinations (n=1,947,411) and lowest vaccination coverage (71%) since 2017. The region Southeast, responsible for representing an estimate of 39.4% of MncC vaccination coverage in the country, had 90% (n=1,020,133) of vaccination coverage in 2017, 82% (n=948,936) in 2018, 87 % (n=1,002,444) in 2019, 81% (n=888,331) in 2020 and 72% (n=752,962) in 2021; The Northeast region, corresponding to 27.7% of MncC doses applied in Brazil, presented 90% (n=713,074), 82% (n=666,751), 86% (n=716,192), 76% (n=612,431) and 69% (n=530,134) of vaccination coverage respectively in the same years, with this pattern of decline in vaccination coverage being representative, similarly followed by the other regions, all of which are above 60% of MncC vaccination coverage.

As for the total doses applied in Brazil, there has been a decrease since 2017, the year with the highest number of immunizations (n=120,353,622), with this drop being more significant from 2020 (n= 104,008,024) to 2021 (n=79,654. 735). However, in terms of

vaccination coverage, there was an increase from 73% in 2017 to 77% (n=112,918,953) in 2018 and since then there has been a large drop, with 73% (n=108,886,698) coverage in 2019, 68% (n=104,008,024) in 2020 and 61% (n=79,654,735) in 2021. This pattern of increase in vaccination coverage from 2017 to 2018 and decline since then is maintained in the regional stratification, with the exception of the North regions and South, where the year with the highest vaccination coverage was 2019, with the North region obtaining 66% (n=10,322,506) in 2017, 69% (n=10,860,231) in 2018, 73% (n=10,345,956) in 2019, 61% (n=9,784,578) in 2020 and 55% (n=8,284,489) in 2021; and the South region obtaining 77% (n=13,139,728), 81% (n=15,265,651), 82% (n=18,119,931), 79% (n=16,241,078) and 69% (n= 12,314,799) of vaccination coverage, respectively in the same period.

It was observed that between 2017 and 2021, only the North and Northeast regions were below 60% of vaccination coverage, in 2021 with 55% and 57% (n=21,026,946) coverage, respectively. Finally, it is observed that both in Brazil as a whole and when stratified regionally, 2021 was the year with the lowest number of vaccine doses applied and the lowest vaccine coverage within the period under analysis.

DISCUSSION

This study compares the incidence and vaccination coverage from 2017 to 2021 of the Meningococcal C-conjugate vaccine in Brazil in the 1-year-old age group, and the application of immunizations and vaccination coverage in general in the country in the same period.

Neisseria meningitidis (meningococcus/ *N. meningitidis*) is an aerobic diplococcus, gram negative, with polysaccharide antigenic composition with 13 different serogroups. Homo sapiens is the only reservoir of this pathogen, which is transmitted by aerosols and/or secretions from the airways. Its clinical manifestation requires its colonization to overcome and bypass the immune system. SARS-CoV-2 may be related in some cases to bacterial co-infection, including *N. meningitidis*, a factor which contributes to the morbidity and mortality of both infections.[6]

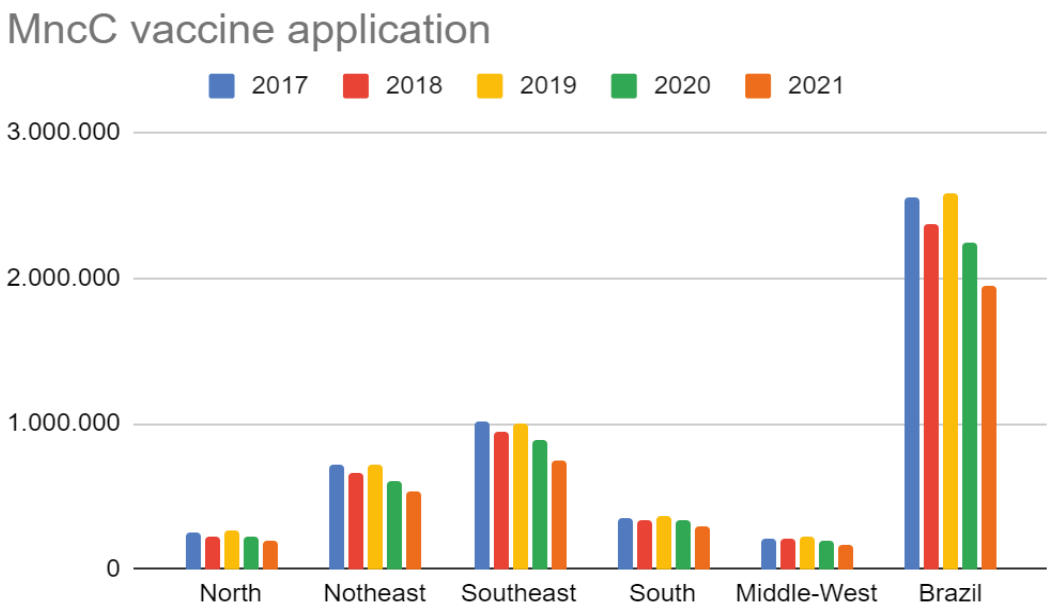
Anti-meningococcal vaccination is indicated for protection, prevention and control of meningococcal disease (DM) mainly in pediatric patients, which when exposed present a higher morbidity and mortality.[7]

Graphic 1 shows the total doses of MncC applied in Brazil between 2017 and 2021 and stratified by region, and Graphic 2 shows the vaccination coverage of the immunizer in the same period, considering the number of live births in the previous year. These expose a national reality of a significant reduction in childhood vaccinations during the Covid-19 pandemic, through the MncC vaccine, responsible for preventing one of the deadliest forms of meningitis: Meningococcal.[8]

Graphic 3 shows the total doses of immunizers applied in Brazil between 2017 and 2021, stratified by region, and Graphic 4 shows vaccination coverage in the same period. They demonstrate a significant drop in the number of doses and vaccination coverage during the period of the Covid-19 pandemic.

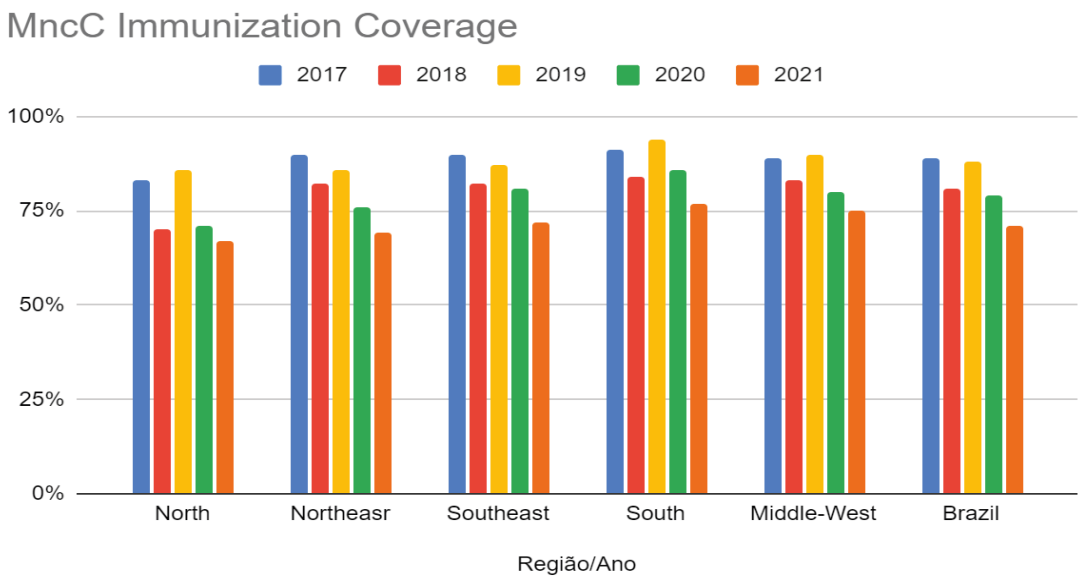
This reality of greater hesitation and vaccine refusal was mainly due to the lockdown period, social distancing, parents' fear of exposing their children to SARS-CoV-2 at the time of vaccination in basic health units, the general population's fear of being exposed to very frequented environments and, mainly, the spread of false news regarding the side effects and risks of vacines.[9]

RIBEIRO et al (2019)[10] when describing the monitoring of the evaluation of the national meningococcal disease surveillance system



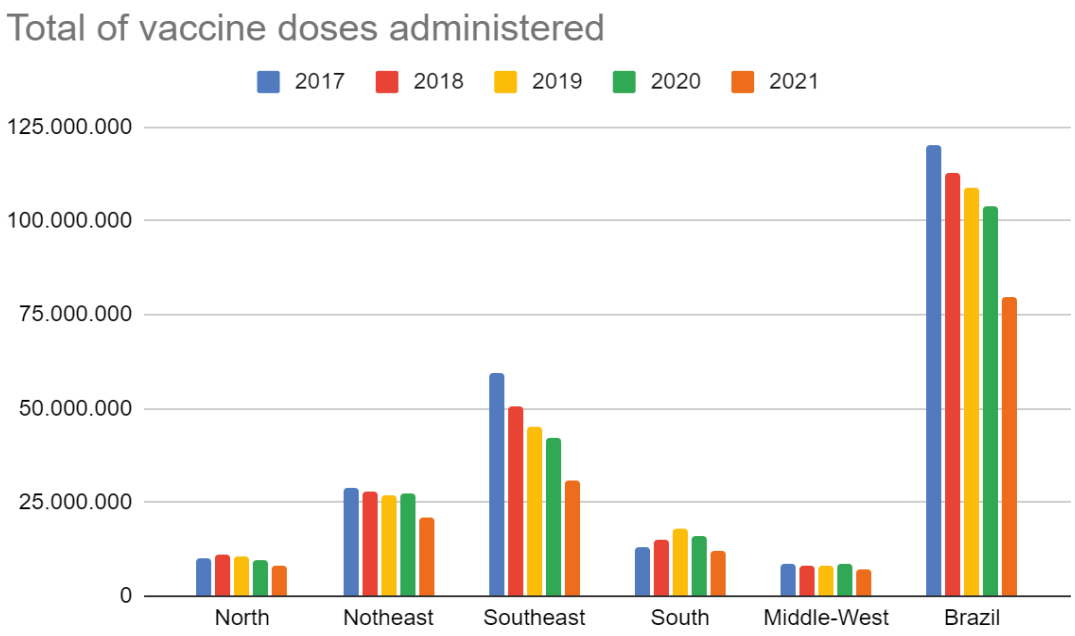
Graphic 1: Immunobiologicals: Conjugated Meningococcal - C (MncC) applied in Brazil from 2017 to 2021 in the 1-year-old age group, according to region.

Source: DATASUS. Generated in 20/11/2022 at 19:30:57



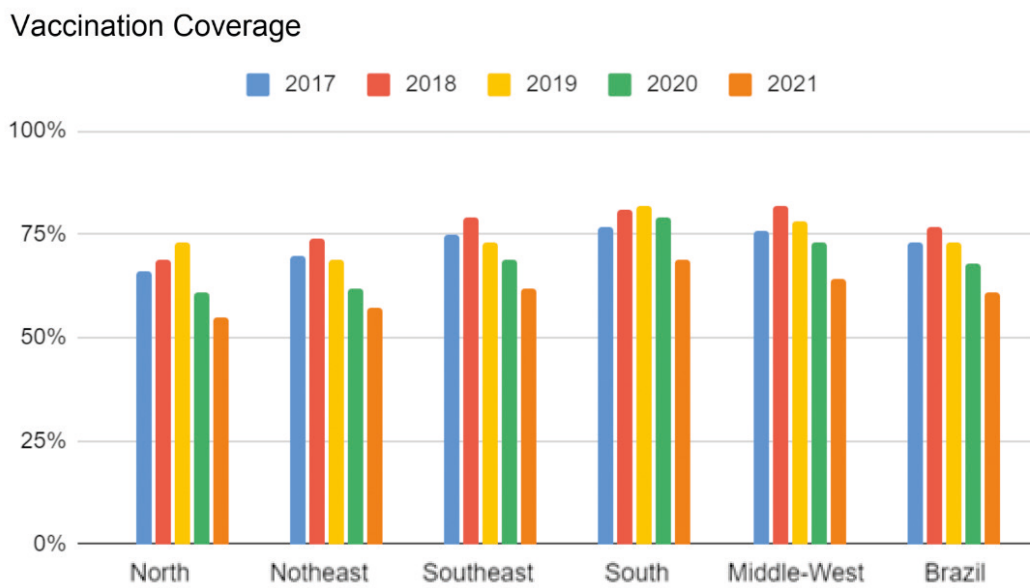
Graphic 2: Conjugated Meningococcal Vaccination Coverage - C (MncC) in Brazil from 2017 to 2021 in the 1-year-old age group, according to region.

Source: DATASUS.



Graphic 3: Immunizations: All MncC vaccine doses applied in Brazil from 2017 to 2021, according to region.

Source: DATASUS.



Graphic 4: Vaccination coverage in Brazil from 2017 to 2021, by region.

Source: DATASUS.

in Brazil, from 2007 to 2017, found that to block a possible outbreak, when there is a case of meningococcal meningitis, vaccination is essential.

An immunized population is not only at a lower risk of presenting meningococcal disease, but also with a lower morbidity and mortality. It should be noted that only inhabitants who received the two minimum doses are truly immunized.[11]

Brazil is in the category of underdeveloped countries, therefore it has a 50% probability of death from DM, with *Neisseria meningitidis* being the main causative agent of death from meningitis. septic syndrome and/or meningitis which can become septic shock, making this patient subject to intensive care.[12]

CONCLUSION

In conclusion, the application of the C-conjugated meningococcal vaccine in the age group of up to 1 year in the pre-Covid-19 period underwent variations, making it possible to describe them both at the regional and national levels as a reduction in coverage in the year 2017 to 2018 and an increase from 2018 to 2019.

However, it should be noted that, as of Covid-19 (2020 and 2021), a considerable decrease in the number of vaccinations against meningitis has been observed, with this pattern being repeated in all regions of the country. This drop is strongly related to the period of social distancing and its consequences on the behavior of the population during the pandemic caused by the SARS-Cov-2 virus, in which public places, including health services that offer the MncC vaccine, are no longer frequented and a fear regarding immunization was instituted. This set of factors ended up contributing to a greater risk of infection by *N. meningitidis* and consequent greater risk of death and greater occupation of intensive care beds.

REFERENCES

1-Cugurra A, Mamuladze T, Rustenhoven J, Dykstra T, Beroshvili G, Greenberg ZJ, Baker W, Papadopoulos Z, Drieu A, Blackburn S, Kanamori M, Brioschi S, Herz J, Schuettpelz LG, Colonna M, Smirnov I, Kipnis J Skull and vertebral bone marrow are myeloid cell reservoirs for the meninges and CNS parenchyma. Science. 2021 Jul 23;373(6553):eabf7844. doi: 10.1126/science.abf7844.

2-Nakamura T, Cohen AL, Schwartz S, et al. The Global Landscape of Pediatric Bacterial Meningitis Data Reported to the World Health Organization-Coordinated Invasive Bacterial Vaccine-Preventable Disease Surveillance Network, 2014-2019. The Journal of Infectious Diseases. 2021 Sep;224(12 Suppl 2):S161-S173. DOI: 10.1093/infdis/jiab217. PMID: 34469555; PMCID: PMC8409679

3-CRUZ, Adriana. The fall of immunization in Brazil. Consensus. 2017 Dec 14;25:20-29. [Accessed 13 March 2023]. Available at: https://portal.fiocruz.br/sites/portal.fiocruz.br/files/documentos/revistaconsensus_25_a_queda_da_imunizacao.pdf

4-Zamani R, Pouremamali R, Rezaei N. Central neuroinflammation in Covid-19: a systematic review of 182 cases with encephalitis, acute disseminated encephalomyelitis, and necrotizing encephalopathies. Rev Neurosci. 2021 Sep 17;33(4):397-412. doi: 10.1515/revneuro-2021-0082.

5-Widyadharma, I.P.E., Hendellyn, A., Laksmi Dewi, A.A.A.P., Adnyana, I.M.O., Sumatra, D.P.G.P., and Utami, D.K.I. (2021). Neurologic manifestations of COVID-19 infection in Asia: a systematic review. Egypt J. Neurol. Psychiatr. Neurosurg. 57: 28, https://doi.org/10.1186/s41983-021-00279-3.

6-MARTINS G. Ministry of Health reinforces the importance of vaccination against meningitis. Ministry of Health [online]. 2022. [Accessed 16 January 2023]. Available at: https://www.gov.br/saude/pt-br/assuntos/noticias/2022/outubro/ministerio-da-saude-reforca-a-importancia-da-vacinacao-contra-meningite

7-Requejo, Henry I. Z. . Immunological behavior of anti-meningococcal vaccines. Journal of Public Health [online]. 1997, v. 31, no. 4 [Accessed 6 January 2023], pp. 402-416. Available at: <https://doi.org/10.1590/S0034-89101997000400010>. Epub 16 Aug 2001. ISSN 1518-8787. https://doi.org/10.1590/S0034-89101997000400010

8-Brunetta AMA, Porazzi GM, Vinagre JM de Q, Maitelli L de P, Santos HDH, Elias RM, et al. Impact of the Covid-19 pandemic on meningitis records in the pediatric population in Brazil: 2019-2020. COORTE - Scientific Journal of Hospital Santa Rosa [Internet]. 2022 Dec 18 [cited 2023 Jan 12];(14). Available from: http://revistacoorte.com.br/index.php/coorte/article/view/254/175

9-PROCIANOY, G. S. et al. Impact of the COVID-19 pandemic on vaccination of children up to one year of age: an ecological study. Science & Collective Health, v. 27, no. 3, p. 969–978, Mar. 2022. https://doi.org/10.1590/1413-81232022273.20082021

10-RIBEIRO, Igor Gonçalves; PERCIO, Jadher; MORAES, Camille de. Evaluation of the national meningococcal disease surveillance system: Brazil, 2007-2017. Epidemiol. Serv. Health, Brasília , v. 28, no. 3, e2018335, Sept. 2019 . Available at <http://scielo.iec.gov.br/scielo.php?script=sci_arttext&pid=S1679-49742019000300015&lng=pt&nrm=iso>. Hits on 29 Dec. 2022. Epub 15-Oct-2019. http://dx.doi.org/10.5123/s1679-49742019000300009.

11-Sáfadi, Marco Aurélio Palazzi and Barros, Analíria Pimentel. Meningococcal conjugate vaccines: efficacy and new combinations. Journal of Pediatrics [online]. 2006, v. 82, no. 3 suppl [Accessed 29 December 2022], pp. s35-s44. Available at: <https://doi.org/10.1590/S0021-75572006000400005>. Epub 01 Apr 2008. ISSN 1678-4782. https://doi.org/10.1590/S0021-75572006000400005.

12-Branco, Ricardo G., Amoretti, Carolina F. and Tasker, Robert C.. Meningococcal disease and meningitis. Journal of Pediatrics [online]. 2007, v. 83, no. 2 suppl [Accessed 6 January 2023], pp. S46-S53. Available at: <https://doi.org/10.1590/S0021-75572007000300006>. Epub 25 Jun 2007. ISSN 1678-4782. https://doi.org/10.1590/S0021-75572007000300006