Original Article

Paradigms of vaccination adherence at 1,000 days of life: analysis and repercussions on public health

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ABSTRACT

Introduction: The Immunization National Program focus on coordinating and ensuring the national vaccination coverage, in order to reduce the incidence of immunopreventable diseases. However, there are sociopolitical and demographic factors reducing adherence to immunization, mostly in children under 2 years old. Thus, we need to debate the causes and impacts of that issue in Brazil. **Objectives**: To assess the vaccination coverage aiming children at the 1,000-day period, between 2016 and 2020. **Materials and Methods**: This is an analytical, cross-sectional, epidemiological study, with quantitative and qualitative approaches, regarding the immunization of individuals up to 2 years old between 2016 and 2020, using the DATASUS platform, as well as the PubMed, Scielo, VHL, and the Brazilian Department of Health databases. **Results**: We could observe a predominant reduction of 10.51% in the administered vaccine doses between the years 2016 and 2020 among the population up to 2 years old. The immunobiologicals which suffered the most significant reduction were: hepatitis B (84.87%), influenza (99%), and oral poliomyelitis (18.45%). **Discussion**: Some of the factors associated with the decreased administered immunobiologicals during that period are: low vaccination coverage; fake news spreading; lack of information among the population; and the covid-19 pandemic, along with social distancing. **Conclusion**: Despite the importance of vaccines for controlling infectious, communicable diseases, we could notice a decrease in immunobiological administration, and an increase in morbidity and mortality, showing the need of drawing up strategies in order to promote adherence to immunization and to expand vaccination coverage in Brazil.

KEYWORDS: Vaccination coverage, Immunization, Brazil, Child.

RESUMO

Introdução: O Programa Nacional de Imunização objetiva organizar e garantir a cobertura vacinal nacional, a fim de reduzir doenças imunopreviníveis. Há, contudo, circunstâncias sociopolíticas e demográficas que reduzem a adesão à vacinação, sobretudo em crianças menores de 2 anos. Assim, é necessário discutir as causas e os impactos dessa questão no Brasil. **Objetivos**: Analisar a cobertura vacinal direcionada às crianças no período dos 1000 dias, entre os anos de 2016 e 2020. **Material e Métodos**: Trata-se de um estudo epidemiológico analítico, de recorte transversal, com abordagem quantitativa e qualitativa, sobre a imunização de indivíduos de até 2 anos entre os anos de 2016 a 2020, com o uso da plataforma DATASUS e das bases de dados PUBMED, SCIELO, BVS

e do Ministério da saúde. **Resultados**: Verificou-se a redução, predominantemente, de 10,51% das aplicações de vacinas entre os anos de 2016 a 2020 na população de até 2 anos de idade. Ademais, os imunobiológicos que mais sofreram redução foram: hepatite B (84,87%), influenza (99%) e poliomielite oral (18,45%). **Discussão**: Alguns fatores relacionados à redução da aplicação de imunobiológicos nesse período são a baixa cobertura vacinal, propagação de *fake news*, falta de informação da população e a pandemia da COVID-19, com o isolamento social. **Conclusão**: Apesar da importância das vacinas para o controle das doenças infectocontagiosas, percebeu-se a redução de aplicações dos imunobiológicos e o aumento da morbimortalidade, sendo necessária a criação de estratégias para promover a adesão à imunização e a ampliação da cobertura vacinal no Brasil.

PALAVRAS-CHAVE: Cobertura vacinal, imunização, Brasil, criança.

INTRODUCTION

The vaccination process in Brazil has gone through many changes over the years, since the smallpox compulsory immunization in the 19th century, and the Oswaldo Cruz Reform in the 20th century, until the National Immunization Program (NIP) launching, in 1973.[1] Within that context, the NIP enabled the coordination of the national immunization policy, so essential for public health, and made the reduction of moribity, mortality and incidence of infectious diseases possible, through free immunobiological administration within the Brazilian Unified Healthcare System (SUS).[2,3] Polio, rubella, and neonatal tetanus, for instance, have been eradicated, amongst other communicable diseases whose numbers have also been considerably reduced.[4] Furthermore, some NIP resources, such as the National Vaccination Calendar (NVC), has allowed health managers and users to be engaged in proper vaccination coverage.[2]

For that matter, immunization constitutes one of the best cost-benefit measures when it comes to promoting life quality among the population and combating infectious diseases.[3,5] Therefore, besides avoiding deaths and preventing diseases from reaching socially vulnerable people, such an action enables child mortality to be reduced – which is part of UN's Millennium Development Goals (MDG).[5] However, even if we consider the increased number of NPI-covered vaccines in the last decade,[5] the benefits of vaccination, and the fact that they are freely offered as a fundamental right, some enduring factors still objects to achieving better rates of vaccination coverage.

During its first years, NIP dealt with some issues concerning the inclusion of the most impoverished segments of society, as the national vaccination coverage surveys in the 1980s revealed.[6] Although such a disparity was remedied in the following years, the 2007 national survey showed a lower coverage among extremely poor segments, as well as in the richest ones. Besides, from 2016 on, they have identified a new coverage decline, which enabled new epidemic occurrences.[6]

Such state of affairs is worrisome, especially due to the decreased adherence to immunization of individuals aged 0 to 2 years, which is denominated 1,000-day period. During that stage, there is a significant neuro and psychomotor development, repercussing in adult life.[7,8] Thus, it becomes essential to prevent, through vaccination, infectious communicable diseases like rubella, measles, and chickenpox, whose complications may directly impact morbidity and mortality in that age group.[3,4,7,8]

Debating and bringing to light the consequences of those factors for people's adherence to vaccination plans is essential, especially due to the consolidation of anti-vax movements and widespread fake news. Such a discussion can also assess the impacts the reduced vaccination coverage can have on the child, the society, and the healthcare system. Furthermore, notably within the SARS-CoV-2 infection pandemic scenario, it becomes urgent to realize the challenges to control covid-19 by immunization, as well as the importance of renewing efforts to fight other illnesses which have immunobiologicals to prevent their occurrence or aggravation–even in face of the public health emergency.

This paper aims to assess the vaccination coverage among individuals aged 0 to 2 years, in the period between 2016 and 2020. Thereby, we intend to evaluate the profile of vaccination coverage on that age group during that period; to assess the covid-19 pandemic impact in the imunobiological administration on that target public; and to verify which factors have contributed to such a scenario. Furthermore, we will catalogue potential impacts regarding such deficit, as well as suggest alternatives in order to encourage immunization consent.

METHOD

Type of study

This is an analytical, cross-sectional approach, with quantitative aspects, with data collected in the TABNET system, on the DATASUS platform; and qualitative, with the formulation of hypotheses by analyzing the obtained variables and the available literature.

Population and period of study

The research was developed by assessing immunizations administered in individuals aged 0 to 2 years who used the Brazilian Unified Healthcare System between the years of 2016 and 2020. The data were fully included, as presented in the TABNET system.

Data collecting

All information was obtained in two steps. The first step consisted in systematically selecting the available literature from 2015 to 2021, of documentary aspect, by consulting the Brazilian Health Department database; and of bibliographic aspect, by searching the Virtual Health Library, PubMed, and Scielo databases, using the health descriptors "Vaccination Coverage", "Immunization", "Brazil", "Child", and the Boolean operator "AND". For the next step, we have consulted the TABNET system, on the DATASUS platform, in order to access information regarding Health Care, specifically the group "Immunizations – since 1994", with the variables: "Immunobiologicals", "Federation Unit", "Administered doses", and period (2016 to 2020).

Data analysis

After collecting all the data, we have tabulated and analyzed them, using Excel 2016 software. For descriptive assessment purposes, we have used probability and statistics tools. In addition, tables and graphs were drawn up.

Ethical matters

The system used for data study is available for public consultation, and the information is open to access. Therefore, there is no need of approval from the Research Ethics Committee.

RESULTS

Considering the importance of immunization to both individual and community health-illness process, in terms of cost-effectiveness and prevention, we need to comprehend the vaccination coverage in the 1,000-day period in Brazil, from 2016 to 2020, which will be possible by assessing the data available in the TABNET system, on the DATASUS platform.

First, we have to comparatively analyse the vaccination coverage among the Brazilian population, with no age group restriction, in order to access the adherence profile to immunization in the country during the years from 2016 to 2020. Table 1 shows the administered doses in Brazil per year, in correlation to the Brazilian regions.

Table 1. Absolute values of routinely administered doses of all immunobiologicals offered to children 0-2 years old by the National Immunization Program, in the period from 2016 to 2020, by federate region.

Region	2016	2017	2018	2019	2020	Total
North	8,856,068	10,322,506	10,860,231	10,345,956	9,383,081	**49,767,842**
North-East	24,930,400	28,937,647	27,704,935	27,092,399	26,298,409	**134,963,790**
South-East	37,382,806	59,229,912	50,735,153	45,147,077	40,432,146	**232,927,094**
South	12,664,660	13,139,728	15,265,651	18,119,931	15,556,183	**74,746,153**
Central-West	9,071,488	8,723,829	8,352,983	8,181,335	8,104,859	**42,434,494**
Brazil	**92,905,422**	**120,353,622**	**112,918,953**	**108,886,698**	**99,774,678**	**534,839,373**

Source: Information System of the National Immunization Program (SI-PNI/CGPNI/DEIDT/SVS/MS), via TABNET – DATASUS.

We can notice a progressive decrease in the total number of administered doses in Brazil, from 2017 on; until 2020, there was a 17.09% reduction of total administered doses. The South-East region showed a larger decreased number of doses in that period, of about 31.73%. Likewise, the North-East and North regions had a reduced number of administered doses from 2017 on, totalling a 9.1% decrease until 2020. The South region, however, since 2016 presented a boost in dose administrations, and, even having it decreased in 2020, showed a total increase of 18.39% in that period. The Central-West region had a 10.65% reduced number of administered doses since 2016.

The vaccination coverage in Brazil, between 2016 and 2020, among children up to 2 years old–the 1,000-day period–probably reflects the population dimension; the access to public care; cultural aspects regarding vaccine acceptance; among other factors.[3] Thereby, the most populous Brazilian state, Sao Paulo, has the higher number of immunizations in that period; and the less populous state, Roraima, has the lowest number of administered doses.

Moreover, such a number is not consistent over time, which can denote changes in the population size; a greater or lesser availability of vaccines; the population adherence rate; the level of effectiveness of vaccination campaigns; among other reasons.

When we examine the number of administered doses in the specified period to children under 2 years old, we can notice a decrease in the totality of immunizations in the country. When the same analysis is made by federation unity, we can notice flutuations over the years, with some states having an increased number of vaccinated children in a certain year, and others having a decreased number in the same year. Even so, there was a reduction in the number of administered doses from 2016 to 2020 in all Brazilian states – significantly in the federation unities of Amapa (-41.31%); Federal District (-39.96%); and Rio de Janeiro (-35.19%). Thereby, as we could infer from the total number of administered doses each year, a 10.51% decrease in the number of doses administered in the Brazilian population up to 2 years old is predominant.

Doses of immunobiologicals administered on the group age of individuals under 2 years old, between the years of 2016 and 2020, were: BCG (tuberculosis); HepA (hepatitis A); HepB (hepatitis B); INF (influenza); IPV (inactivated – poliomyelitis); OPV (oral – poliomyelitis); and MMR (measles, mumps, and rubella). They are shown on Table 3. We could notice a gradual but significant reduction in the number of HepB, INF, and OPV doses. There were also some minor variations over the years, as in the cases of BCG, HepA, IPV, and MMR, with larger or smaller amounts of administered doses; but, overall, we could observe a small increase between 2016 and 2018, with a slight decrease from 2017 to 2018. However, those vaccination numbers were reduced between 2018 and 2020 (Figure 1).

Considering the achieved results, in the period from 2016 to 2020, we can notice an increase in immunobiological administration, especially against MMR (around 20.75%), and hepatitis A (around 6.02%). However, we can detect decreased administration of other vaccines, like BCG (-25.08%), inactivated polio (-2.3%), and oral polio (around -18.45%). Likewise, we must acknowledge there was a reduced number of people immunized with some vaccines, prominently against influenza (-99%), and hepatitis B (-84.87%). Therefore, a decreased adherence to immunobiologicals was evident, with a 7.55% drop in administrations.

Table 2. Absolute values of administered doses of imminobiologicals available at NIP, per year, by state, in the period from 2016 to 2020, to children up to 2 years old.

State	2016	2017	2018	2019	2020	Total
Acre	1,068,443	1,040,486	1,042,453	965,850	930,607	**5,047,839**
Alagoas	462,718	491,815	468,962	469,954	392,359	**2,285,808**
Amapa	2,348,378	2,732,985	3,614,395	2,835,710	2,411,278	**13,942,746**
Amazonas	448,371	564,293	764,030	632,659	435,985	**2,845,338**
Bahia	3,259,020	4,082,027	3,688,841	4,166,115	4,055,622	**19,251,625**
Ceara	482,008	469,917	457,555	445,250	318,358	**2,173,088**
Federal District	787,130	940,983	823,995	830,418	838,872	**4,221,398**
Espirito Santo	3,171,415	3,911,648	3,679,852	3,461,396	3,098,843	**17,323,154**
Goias	1,452,571	1,506,500	1,544,663	1,550,377	1,502,217	**7,556,328**
Maranhao	4,740,623	5,084,870	5,080,480	4,167,721	4,512,218	**23,585,912**
Mato Grosso	1,281,294	1,263,510	1,398,825	1,442,442	1,388,240	**6,774,311**
Mato Grosso do Sul	1,515,767	1,796,561	1,856,279	2,026,712	1,630,176	**8,825,495**
Minas Gerais	4,518,660	4,713,058	4,802,844	4,905,044	5,029,161	**23,968,767**
Para	1,506,137	1,827,954	1,885,955	1,789,739	1,763,464	**8,773,249**
Paraiba	921,798	1,077,692	1,135,732	1,123,208	1,012,492	**5,270,922**
Parana	5,822,135	7,755,854	6,320,305	6,625,760	6,361,598	**32,885,652**
Pernambuco	9,038,601	14,904,258	12,356,184	10,384,759	10,675,316	**57,359,118**
Piaui	1,771,520	4,698,957	2,197,371	2,308,086	2,221,685	**13,197,619**
Rio de Janeiro	7,293,705	13,641,225	9,931,002	6,271,891	5,809,314	**42,947,137**
Rio Grande do Norte	19,278,980	25,985,472	26,250,596	26,182,341	21,725,831	**119,423,220**
Rio Grande do Sul	4,945,994	5,314,135	6,468,464	7,418,394	6,474,310	**30,621,297**
Rondonia	3,493,106	3,318,145	4,165,092	5,912,015	4,190,747	**21,079,105**
Roraima	4,225,560	4,507,448	4,632,095	4,789,522	4,891,126	**23,045,751**
Santa Catarina	1,613,528	1,730,643	1,701,420	1,691,350	1,441,941	**8,178,882**
Sao Paulo	1,961,731	2,132,032	1,997,405	1,933,861	1,975,758	**10,000,787**
Sergipe	3,021,750	3,349,646	3,163,713	3,050,300	3,164,755	**15,750,164**
Tocantins	2,474,479	1,511,508	1,490,445	1,505,824	1,522,405	**8,504,661**
Total	**92,905,422**	**120,353,622**	**112,918,953**	**108,886,698**	**99,774,678**	**534,839,373**

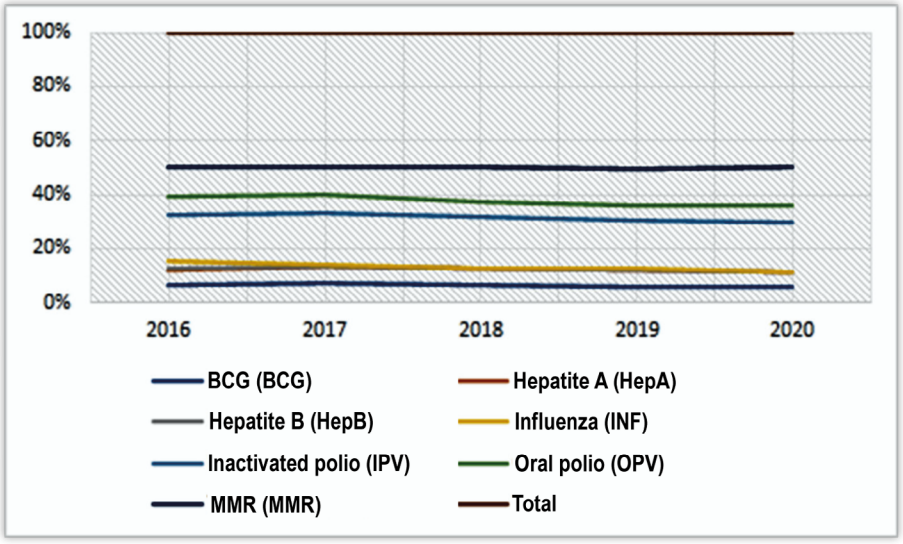
Source: Information System of the National Immunization Program (SI-PNI/CGPNI/DEIDT/SVS/MS), via TABNET – DATASUS.

Table 3. Doses of immunobiologicals administered each year, in the period from 2016 to 2020, on children up to 2 years old, as recommended by the INP to that age group, routinely.

Imunnobiological	2016	2017	2018	2019	2020	Total
BCG (BCG)	2,836,591	2,912,557	2,851,519	2,532,790	2,125,147	**13,258,604**
Hepatitis A (HepA)	2,176,876	2,606,213	2,520,606	2,620,496	2,308,029	**12,232,220**
Hepatitis B (HepB)	87,225	86,424	40,605	20,706	13,191	**248,151**
Influenza (INF)	1,158,365	136,077	90,217	40,052	3	**1,424,714**
Inactivated polio (IPV)	7,206,794	7,955,567	7,917,519	7,574,433	7,040,966	**37,695,279**
Oral polio (OPV)	2,735,761	2,657,209	2,387,406	2,375,148	2,230,815	**12,386,339**
MMR (MMR)	4,447,787	4,099,349	5,426,134	5,881,959	5,370,936	**25,226,165**
Total	**20,649,399**	**20,453,424**	**21,234,029**	**21,045,697**	**19,089,122**	**102,471,671**

Source: Information System of the National Immunization Program (SI-PNI/CGPNI/DEIDT/SVS/MS), via TABNET – DATASUS.

Figure 1. Variation in the number of doses of immunobiologicals administered each year, in the period from 2016 to 2020, on children up to 2 years old, as recommended by the INP to that age group.



Source: Information System of the National Immunization Program (SI-PNI/CGPNI/DEIDT/SVS/MS), via TABNET – DATASUS.

DISCUSSION

We consider the first 1,000 days of life as the period from the individual's conception to their 2 years of age. We also know that stage involves a key development in the child's immune system. Thus, children should ideally be vaccinated in their first months of life, so that their first contact with those antigens is through the vaccine. Following the vaccine schedule is essential to ensure effective prevention.[7,8]

Immunization, especially in childhood, is one of the greatest and most important interventions in public health. It is considered a key element in order to achieve health equity, as well as the most effective way of preventing, controlling, and eradicating many immunopreventable diseases.[2] Nonetheless, the results have revealed decreased immunization rates in recent years, differing in the Brazilian states between 2016 and 2020, due to a vast range of factors.[2]

When analising Table 3, we can observe, compared to 2016, a reduction in doses of the following immunobiologicals administered on children under 2 in 2020: BCG (tuberculosis); HepB (hepatitis B); INF (influenza); IPV (inactivated – poliomyelitis); and OPV (oral – poliomyelitis). Circumstances to be considered in order to understand such a reduction include the discrepancy in the vaccination coverage rate in the different Brazilian regions. We may list social and demographic factors, notably within the North and North-East regions, which have a limited vaccination coverage, and, therefore, their population face a higher risk of contracting immunopreventable diseases. In addition, low family income, guardians with poor education, mothers with a high number of children, and even the order of the children's birth are also reasons for the lack of vaccination, and consequently, for the lower vaccination coverage.[2]

It is worth mentioning that the poor access to health care have direct influence on child vaccination coverage.[5] The lower economic classes are disadvantaged, as they are subjected to plights restricting their admission to health services. We can cite, for instance, the limited access to public transport, and the long distance between health services and their homes.[2]

The vaccination decline in Brazil may be also explained by the poor vaccine distribution.[10] The insufficient resources for immunibiological production, due to the national production incapacity, and the country's consequent dependence on international laboratories, corroborates such a fact. Moreover, there are many irregularities on vaccine distribution, limiting health care availability, due to inefficient logistics and careless product handling while in transit.[4]

On the other hand, the decreased vaccination adherence may be partly explained by the spread of not scientifically proven fake news, and the lack of reliable information concerning the importance of vaccines, and their benefits. Such a scenario leads to circumstances of reluctance, on the grounds of individuals' fear of adverse effects and doubts about the true effectiveness of immunobiologicals.[4,11]

Therefore, we must consider the particularities that the outcome of modernity have brought to that matter, such as digital tools. In spite of being strong allies in sharing knowledge, those resources also disseminate fake news to the population, notably through social media. Fake news have specific features, with alarmist tone and sensationalistic headlines, in order to capture the reader's attention. If the individual have not previous access to scientifically accurate information, they may become a victim of misinformation, contributing to the growing mistrust towards vaccines – which is bolstered by a survey the Brazilian Department of Health carried out in 2018; its results confirmed that 89% of health fake news undermined vaccine credibility.[4]

Within that context, the spread of accurate scientific information could help the fight against the reduction of child vaccination coverage.[3] Holding on feeble efforts against fake news only exacerbates the problem, as far as they adapt to new technologies and trends, thus expanding their scope. By making a WhatsApp number available to collect viral information to be checked and cleared up, the Brazilian Department of Health enabled a positive step towards reversing that process. However, considering the reduced number of administered vaccines–as seen on Table 3–, the current government measures are insufficent to break the deadlock[4]. Furthermore, new strategies should take into account their different target publics, with different levels of schooling, income, and access to technology, as well as the best way to successfully engage them.[2]

There are several notorious impacts with the reduced doses of some immunobiologicals, such as the measles outbreaks in Brazil in 2018,[10] the disease had already been eradicated in the country. Such a plight may be related to the diminished number of MMR doses administered on children under 2, in the period from 2016 to 2017, as spotted on Table 3. The increased number of doses seen in the period between 2018 and 2019, as revealed on Table 3, may be related to intensive campaigns – like the National Vaccination Campaign conducted in 2018, in order to limit measles dissemination and consequent public health aggravations.[13]

However, even with the campaigns, measles still persists in Brazil, in states like Para and Amazonas, which had 23 and 5 known cases, respectively, between January and March 2019.[10] Such persistence is probably due to the low vaccination coverage against the disease in those areas. Also worrisome is the decrease of MMR administrations between 2019 and 2020, which might be due to the social distancing during the covid-19 pandemic – a probable booster for the dissemination of new measles outbreaks throughout the country.[6]

Regarding vaccination against hepatitis B, there was an evident increase in administered doses of that immunobiological in the period between 2016 and 2017; but a decrease between 2017 and 2019, as shown on Table 3. In spite of the increasing, when compared to the year of 2016, the 2016-2017 period didn't show full outreach, as the scarce 84.1% coverage on children under 1 month vaccinated against hepatitis B can attest.[10] The low coverage, thus, might be related to the spreading of fake news regarding vaccination risks, and to the lack of proper information about vaccines and their key role in preventing their children from catching diseases. Fake news make adherence difficult, consequently resulting in a drop in numbers of administered doses.[9]

As for vaccines against poliomyelitis, despite of the increased number of administered doses of inactivated polio (IPV), and the decreased number of administered doses of oral polio (OPV), in the 2016-2017 period, there was a drop in vaccination coverage in that same period. Both years had rates below the 95% application goal (Table 3); the year of 2016 had vaccination coverage of 84.4%, and 2017, only 83.4%. As for booster dosages, administered when the baby is 15 months old, there was a reduced coverage in 2017 (only 77%), e.g., around 23% children up to that age were not properly immunized against the disease.[10]

Both vaccines had a decrease in administered doses in 2018-2019 when compared to 2016-2017, as shown in Table 3. Such can raise the incidence of polio cases, as those children were not correctly immunized with polio vaccines. One of the reasons for that problem is the lack of officially available information, in cities, on their importance as a preventive practice; no knowledge can lead to lower vaccination adherence. Furthermore, we have the unfair distribution of immunobiologicals in the country, as, according to the Department of Health, over half of the Brazilian cities do not have appropriate coverage of many vaccines within the national schedule.[4,10]

We can also notice a gradual decline in the administrations of influenza (INF) immunobiological doses in the period from 2016 to 2019 (Table 3). Circumstances like the lack of information, as already mentioned, and the appearence of symptoms after vaccination may be responsible for that decrease.[11] In addition, the need for annual influenza vaccine administration demands vaccination campaigns, and information spreading on that immunobiological every year, in order to raise awareness and, consequently, promote vaccination adherence among the population. We can also see impacts on public health due to the decreased number of influenza administered doses, which is an essential immunobiological to prevent the flu and its complications – pneumonia, for instance. One of the findings validating those impacts were the 394 cases and 66 deaths from influenza

reported until April 2017; besides 392 cases and 62 deaths all over Brazil until the second week of April 2018.[14]

Administered doses of BCG and hepatitis A immunobiologicals, even presenting a slight increase in the 2016-2017 period, are still far from the national vaccination coverage goals on that age group (Table 3). According to the Department of Health, 44.6% of Brazilian cities did not reach the 95% polio vaccination rate. Besides, vaccines like BCG and hepA had similar numbers regarding vaccination coverage in the cities, in that period.[10]

For that matter, we know such a plight is a consequence of uneven distribution of immunobiologicals throughout the country, since many cities do not disclose their vaccination coverage.[2] Those circumstances sustain a potential escalation of severe cases of both hepatitis A and tuberculosis, due to the lack of immunization.[8] In the period from 2018 to 2019, the BCG immunobiological had an intense drop of administered doses, possibly worsening the clinical conditions of the disease. The hepA vaccine, on the other hand, showed small variations in that period, adding to uphold the low vaccination coverages; consequently, to the higher susceptibility to hepatitis A contraction and progression, precisely for the lack of immunization (Table 3).

Furthermore, we can indicate the covid-19 pandemic, which started in Brazil in 2020, as a relevant factor for immunobiologicals decrease. Due to the main focus on patients infected with the SARS-CoV-2 virus, in the 2019-2020 period there was not as much care as needed towards other prevailing diseases—some of them having vaccines, like tuberculosis, hepatitis B, flu, polio, measles, mumps, and rubella. A drop in doses of those immunobiologicals on children under 2 between 2019 and 2020 is clear (Table 3). Such may be related to the pandemic scenario, as well as to its resulting social distance measures, which may be factors for the reduced number of doses in that period.[6]

CONCLUSION

From that perspective, the importance of vaccinating individuals in their first 1,000 days of life becomes evident when we think of stimulating the immune system. The exposure to the antigens in the vaccine provides a more successful immune response against the infection, mitiganting the disease, or even preventing it from progressing. Such an action reduces morbidity and mortality among vaccinated children in that age group, and helps preventing infectious, communicable, immunopreventable diseases from spreading.

We can conclude that, despite the fact that vaccines successfully fight infectious, communicable diseases, prevent morbidity and death, help in maintaining quality of life, are freely offered by SUS, and consist of a worthwhile, cost-effective public health measure, people's adherence to immunization, and specifically to Brazilian 0-2-year-old children's immunization, in the period from 2016 to 2020, suffered a reduction.

Many serious, potentially fatal diseases are immunopreventable through vaccination. Nonetheless, the amount of administered doses decreased among the Brazilian population, no age-restricted, assessed in the years from 2016 to 2020. Particularly among the population up to 2 years old, in that period there was a predominant decrease in the number of administered doses. For that matter, there might be an increased incidence of hepatitis B and flu cases, or influenza complications (like pneumonia); and polio may strike the Brazilian population again, since the vaccines against those diseases had the higher reduction between 2016 and 2020, among children under 2. Other immunobiologicals have had decreased doses since 2018, especially BCG, with a consequent reduction in vaccine prophylaxis for severe cases of tuberculosis.

Hence, infectious, communicable diseases may cause more frequent mortality (as in the case of tuberculosis), and morbidity (as lower limbs paralysis by polio), notably among the low-income population with poor access to healthcare. Other potential consequences of low immunization rates, especially among children up to 2 years old, are: increased child morbidity and mortality; bad epidemiological situation for many diseases, with new incidences or aggravations; possible new major epidemics; negative impacts on the child's health; social damage and healthcare system damage, due to the national context of low vaccination coverage.

We could confirm numerous factors concerning vaccination coverage and people's adherence: demographic, economic, social, and cultural variables; limited access to healthcare services; lack of information, and consequent hesitation, about vaccines; anti-vax movements, and fake news; low national production, and irregular distribution, of vaccines, which do not reach many Brazilian cities; and, mainly since 2019, treatment and prevention actions against covid-19—as BCG may have been reduced, and other immunobiologicals have indeed been reduced, between 2019 and 2020, among children under 2, possibly due to fear of SARS-CoV-2 virus contamination.

Therefore, we can attest that health agencies (especially municipal, state, and federal organs) and high-level health sciences educational institutions should take strong, public actions on providing health advice, with strategies drawn up to reach many publics, even

those with limited access to technology, providing quality information and edutainment, all guided by science, and aiming at positive impacts on public health. Moreover, they should decide on other strategies to boost people's adherence to vaccination, both in general and among children up to 2 years old: combating fake news, by using electronic systems; improving the Brazilian Unified Healthcare System, by offering better options and access to healthcare services; improving primary health care, by engaging professional health teams and advising users about the importance of vaccines. Finally, they should constantly assess the administered doses, in order to identify the obstacles to vaccination, so as to implement new strategies and public policies to increase vaccination coverage in Brazil.

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