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Arboviroses notification in Brazil in the COVID 19 pandemic

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Abstract

Introduction: During tha Sars-Cov-2 pandemic the focus was the COVID-19, but what about other disease? In this way, our study shows what happen to the arbovirus's notifications. Objective: Analyze the record of notifications of arboviruses during the Sars-Cov-2 pandemic in 2020 in Brazil and compared with notifications occurred in between 2015 to 2020. **Methods:** Through a descriptive and epidemiological study, the data was collected in DATASUS BRASIL, INMET and CPTEC databases. **Results:** The drop in the notification of arbovirus cases in 2020 was proven, linked to the predominance of compulsory notifications of Dengue in the first half of 2020; this data confirms the seasonality of the occurrence of dengue. Similarly, Zika virus cases had a higher percentage of notifications in the first half of the year, contrasting with previous data. In addition to the persistence of the highest incidence of cases in the early months of 2020, Chikungunya notifications showed a constant percentage incident from 2017 to 2019, data on rainfall from 2015 to 2019 indicated low levels in the month of January compared to previous years, while in the month of 2020 a considerable increase of precipitation anomalies. **Conclusion:** Compared to previous years, the data show a considerable drop in arbovirus reports during the period of the Sars-Cov-2 pandemic in 2020. To establish more clearly the correlation between low arbovirus reporting and the COVID pandemic -19 it is necessary to carry out further studies.

Keywords: Arboviruses. COVID-19. Epidemiologic studies.

Introduction

Aedes aegypti, a mosquito that proliferates in standing water, has African origin and was introduced in Brazil in the colonial period when there was immigration of several slaves [1-4]. This mosquito can transmit Dengue disease, the most prevalent arthropod-borne viral disease in humans, that is caused by infection with the dengue virus (DENV) which occurs as four recognized serotypes: DENV-1, DENV-2, DENV-3 or DENV-4 [1-5]. These viruses are transmitted by bites of female *Aedes aegypti* mosquitoes in the inter-tropical regions of the world [1-3].

All four dengue virus serotypes have been found circulating in Brazil with the dominant one varying over time, since the infection with a DENV can result in a range of symptoms, from subclinical disease to debilitating but transient dengue fever (DF) to life-threatening dengue hemorrhagic fever (DHF) or dengue shock syndrome (DSS) [1,2]. The first dengue epidemic was registered in Brazil (state of Rio de Janeiro) in 1845 and has increased the number of infections in the last years, that's why dengue disease has been an important health public problem [3,6].

The World Health Organization (WHO) estimated that 3.6 billion people live in dengue-endemic areas and that 50 million dengue infections occur annually, with over 2 million causing dengue hemorrhagic fever (DHF) and 21,000 resulting in death [7]. In Brazil, dengue is recognized as a major cause of mortality and morbidity and ranks amongst the top ten communicable diseases in terms of overall health burden [8]. Resource-poor countries are particularly vulnerable to transmission of dengue disease, and it is present in urban and suburban areas in Brazil [1,2,9].

Another arbovirus infection, Zika Virus (ZIKV) infection in pregnant women is associated with microcephaly in their baby [10]. Moreover, this situation exhibits motor alterations, neuromuscular development delay, or auditive, physics, intellectual visual and cognitive deficit [10,11]. Further, this illness diagnosis

includes PCR tests, ELISA, immunoglobulin detection (IgG and IgM) and tests to detect specific ZIKV antibodies which are expensive exams [11,12].

Furthermore, Chikungunya (CHIKV) infection is an important affection in Asia and America continents [13-15]. The patients appear to have fever accompanied with a very debilitating joint pain, other signs and symptoms are muscle pain, joint swelling, headache, nausea, fatigue, and rash [13-16]. This disease presentation could be acute, subacute, or chronic [17].

Thus, with the advent of the pandemic, doctors and other health professionals turned to the treatment of people with Coronavirus 19, being able to neglect or under-report the cases of this arbovirus. Notwithstanding, this fact is not corroborated by the data made available in the Information System for Notifiable Diseases-BRAZIL (SINAN) and in the Monthly Epidemiological Bulletin issued by the Ministry of Health [18].

In this way, this research is aimed to analyze the record of notifications of arboviruses during the Sars-Cov-2 pandemic in 2020 in Brazil and compared with notifications occurred in between 2015 to 2021.

Methods

Study Design and Search Strategies

In the months of December 2020 and January 2021 was produced a descriptive and epidemiological study about chronic diseases of notification in Brazil in the period between 2016 to 2020. To compose the bibliography of this article, the data were obtained from the Department of Informatics of the Unified Health System of Brazil (DATASUS - Brazil) using the TabNet Win32 3.0, a generic public domain tab, as a research tool, being an original source of the Health Information and Notifications System (SINAN).

To search for arbovirus data (Dengue, Zika Virus and Chikungunya), the DATASUS platform provided several research options, among which were selected "Epidemiological and Morbidity" and "Diseases and Diseases of Notifications - 2007 onwards (SINAN)". Thus, "Dengue from 2014 onwards", "Zika Virus" and "Chikungunya Fever" were chosen as alternatives, in addition, in the area of coverage option, this study was classified in "Brazil by Region, UF and Municipality". Following all these steps, access to TabNet is achieved. In the line field, "Month 1st Symptom (s)" was selected. In the column, "Not active" was chosen. "All cases" in Content. Otherwise, the results by year were selected in the "available periods" tab. The format selected was "Tables with borders". So, the information collected was stratified by month, year, sex, and age group.

Differently, data that was considered not important for this research were removed from the study analysis. All the data found were tabulated in a Microsoft Excel for Mac 365 Subscription Spreadsheet, in order that it provides a methodological way to visualize the data and perform a descriptive analysis of the most significant experimental findings.

By the National Institute of Meteorology (INMET), the standardized precipitation index was defined by a scale ranging from - 2.0 to + 2.0. Being - 2.0 extremely dry, - 1.5 severely dry, - 1.0 moderately dry, 0 normal SPI, + 1.0 moderately wet, + 1.5 severely wet and + 2.0 extremely wet [19]. Regarding total precipitation and precipitation anomaly, the Center for Weather Forecasting and Climate Studies (CPTEC) classifies this data in millimeters [20].

Results

Between 2016 and 2020 there was an important variation on arboviruses notified. In 2020, the COVID-19 pandemic occurred, resulting in a decrease in the notification of arbovirus cases (Dengue, Zika and Chikungunya) this year [7]. In this way, we observed an increase of Dengue, Zika and Chikungunya infection in 2019 compared to 2018 and 2017 [7].

On the other hand, the predominance of compulsory Dengue notifications occurred in the first semester of 2020 (860.806 cases – 89.21%) compared to the second half of this same year (104.213 cases – 10.79%). Beyond that, in 2019, there were 1.335.725 (85.81%) notifications of probable cases between the epidemiological week 1 and 26 and 220.870 (14.19%) during the second part of the year, consequently confirming the seasonality of the incidence of this disease. Just like the other years, 2018, 2017 and 2016 prove the seasonal period of Dengue (**Table 1** and **Figure 1**).

Along with the Dengue disease, in 2016, most Zika Virus notifications occurred in the first half of the year (Board 2). In contrast, in other years, the notification percentage increased during the second half of the year in about 25% consecutive two years. However, the prevalence of this condition persists during the first epidemiological weeks of the year (SE1-SE26) (**Table 2** and **Figure 2**).

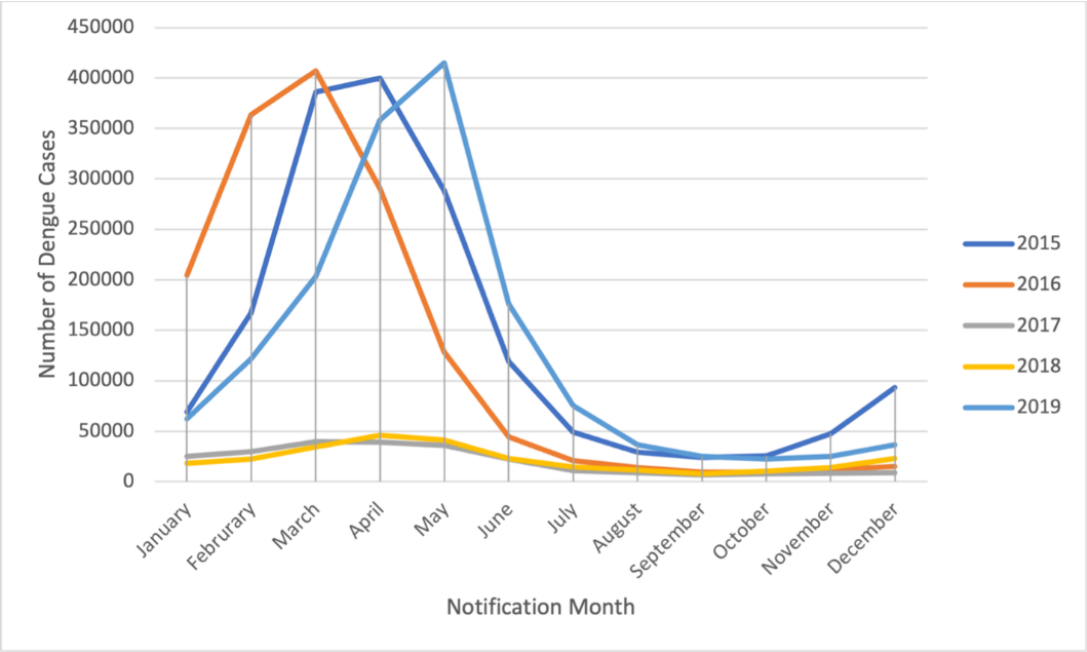
Moreover, since the year 2017 there has been a drop in notifications from Chikungunya until the year 2020 (**Table 1**). As in the other arboviruses studied here, this illness has a characteristic prevalence in the first semester of the year, nevertheless, there was a constant percentage incident during the last three years (variation of only 15%) (**Table 1** and **Figure 3**).

Table 1. Compulsory notification between 2017 and 2020.

		Dengue		Zika Virus		Chikungunya	
Year	**Epidemiological Week**	**Notifications (total number)**	**% (year)**	**Notifications (total number)**	**% (year)**	**Notifications (total number)**	**% (year)**
2015	SE1 – SE26	1.428.740	84.15	-	-	-	-
	SE27 – SE53	269.061	15.85	-	-	-	-
2016	SE1 – SE26	1.438.468	94.7	264.633	94.02	-	-
	SE27 – SE53	80.390	5.30	16.831	5.98	-	-
2017	SE1 – SE26	191.651	73.03	25.953	79.41	204.323	82.46
	SE27 – SE53	51.685	26.97	6.731	20.59	43.469	17.54
2018	SE1 – SE26	185.535	69.65	12.980	65.47	84.779	71.38
	SE27 – SE53	80.851	30.35	6.571	34.53	33.986	28.62
2019	SE1 – SE26	1.335.725	85.81	21.363	70.04	124.491	69.74
	SE27 – SE53	220.870	14.19	9.137	29.96	54.009	30.26
2020	SE1 – SE26	860.806	89.21	13.470	69.79	67.370	67.50
	SE27 – SE53	104.213	10.79	5.830	30.21	32.434	32.50

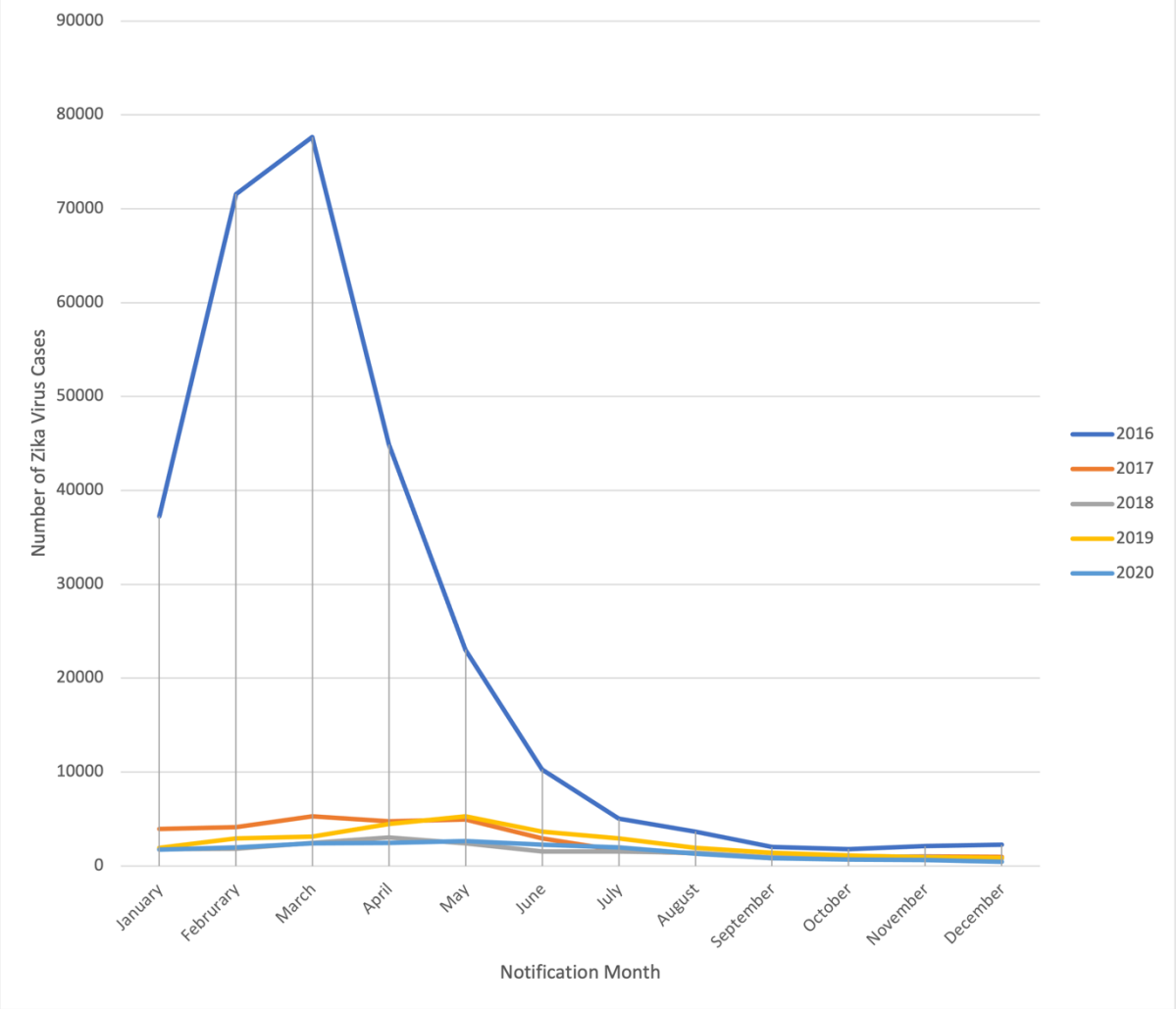
Source: SINAN.

Figure 1. Cases of Dengue by Notification Month and Notification Year.



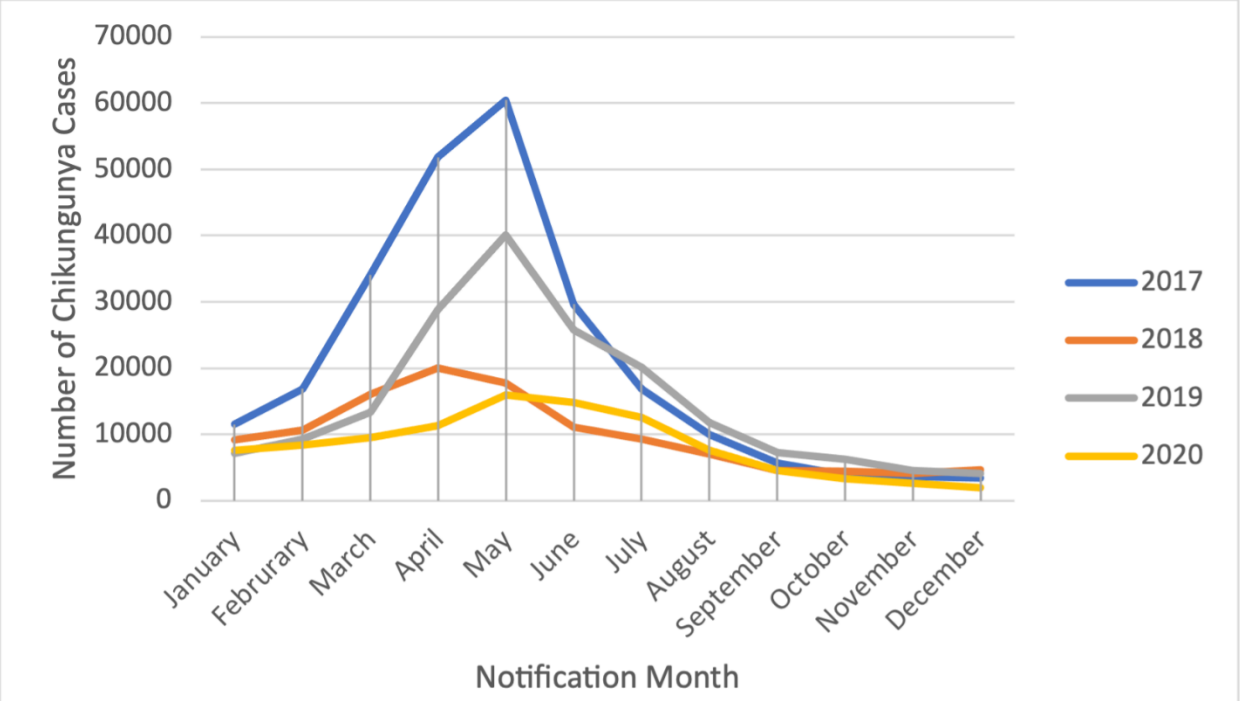
Source: SINAN.

Figure 2. Zika Virus Cases by Notification Month and Notification Year.



Source: SINAN.

Figure 3. Chikungunya Cases by Notification Month and Notification Year.



Source: SINAN.

Table 2. Comparison of predominant climates, precipitation levels and precipitation anomalies in the years 2015 to 2020.

Year	*Month*	*Weather*	*Precipitation level (mm)*	*Precipitation anomalies (mm)*
2015	January	Predominantly dry	2.1 to 250	-299.99 to -25.0
	June	Normal	0 to 100	-199.99 to 0
	December	Predominantly dry	100.1 to 350	-199.99 to 0
2016	January	Predominantly wet	100.1 to 450.1	0.1 to 300
	June	Normal to dry	0 to 100.0	- 24.0 to 50.0
	December	Predominantly dry	100.1 to 250.0	-199.9 to - 25.0
2017	January	Wet in the south and north; Dry in the Midwest, Southeast and Northeast	100.0 to 350.0	-199.9 to -25.0
	June	Normal	0 to 150.0	-49.9 to 25.0
	December	Normal	100.1 to 400.0	> 0
2018	January	Predominantly dry in the Midwest and North regions; Normal in the Southeast and Northeast regions; wet in the south region	50.1 to 350.0	-199.9 to 25.0
	June	Predominantly dry in the north, midwest and southeast regions; Normal in the rest of the country's regions	0 to 100.0	-99.9 to 0
	December	Predominantly humid in the north, southeast and northeast regions; Dry in the Midwest regions; Normal to wet in the south region	100.1 to 400.0	-199.9 to 50.0
2019	January	Predominantly dry in the Southeast, Midwest and Northeast regions; Normal to wet in the north and south regions	2.1 to 300.0	-299.99 to 50.0
	June	Dry in the Southeast, Midwest and Northeast regions; Wet in the south and north	0 to 100.0	-99.9 to 25.0
	December	Predominantly dry in the Southeast, Midwest and Northeast regions; Normal to wet in the north and south regions	25.1 to 300.0	-199.9 to 100.0
2020	January	Dry in the northeast, midwest and north regions; Wet in the southeast region, dry to normal in the south	50.1 to 400.0	-199.9 to 200.0
	June	Wet in northeast, south and north; Dry in the southeast region	0 to 300.0	-99.9 to 100.0
	December	Dry in the Midwest, North and Northeast regions; Wet in the southeast region; Normal in South	2.1 to 350.0	-199.99 to 100.0

Source: Ministério da Agricultura, Pecuária e Abastecimento [a] [19] e Ministério da Agricultura, Pecuária e Abastecimento [b] [20].

Discussion

During the COVID 19 pandemic, the medical community is mainly focused on the treatment of this disease. Through research, there were more than 180.000 articles about COVID 19, proving the considerable focus on this research area, mostly because of the need for effective treatment and a vaccine to prevent this disorder [21].

In the present study, we could observe the most important findings: the prevalence of Dengue disease, Chikungunya disease, and Zika Virus disease in the first part of the year (2020) likewise other years (2016-2019), even during the Coronavirus Pandemic. These findings corroborate with Maciel et al. [22] study, which show the relations between the prevalence of these infections with the climatic factors in tropical areas like Brazil.

Among the prevalence of infectious disease disseminated by *Aedes aegypti*, the results found in this study showed an increased transmission during the first semester of the year, possibly because of the tropical weather in Brazil. Many authors had described the

summer rain herewith the hot weather as contributing to the increase of A. aegypti mosquitoes [6,7,23-26].

Despite the increase in the prevalence in the first semester of the year in 2020 compared to the other years, the numbers of the notifications were low, corroborating the researcher's hypothesis. There was, at least, a decrease of 34,75% in Dengue notifications compared to 2019, a decrease of 77% in Zika Virus notification and a decrease of 56% in Chikungunya notifications. This fact can demonstrate the great focus on Coronavirus 19 infection neglecting other infectious diseases.

In 2020, the climate was considered normal in the first half of the year, however, in previous years there was a greater number of comparisons with this year despite the precipitation levels being a little lower than expected. Bueno [27] mentions that "the pluviometry index and the temperature directly influence the incidence of the disease", in this case, as arboviruses. Furthermore, the data collected demonstrate that the period with the highest rate of notification of arboviruses are the months that resulted in the lowest precipitation (mm) compared to the year 2020 and previous years. In contrast, Pereira et al [28] infer that the A. aegypti vector uses water deposits as a breeding site.

However, the National Water Agency (ANA) reports that, between 2015 and 2017, there was a large amount of this phenomenon in the South region, followed by the North, Southeast, Northeast, and Midwest regions. In addition, about three million people were affected by flooding in 2017 [29]. This demonstrates that floods may have been a mechanism for the spread of arboviruses before the year 2020. Another fact to be considered is the pandemic of Sars-Cov-2, which due to its severity, may have focused only on this new virus and, therefore, neglected, in part, the notifications of arboviruses in Brazil.

Furthermore, the increase of A. aegypti is associated with urbanization due to artificial containers mostly located outdoors around human dwellings, that fact is shown in studies in South Africa, Kenya, Trinidad, Malaysia, and Brazil on the other hand that circumstance does not explain the reason of this mosquito spread during the 2015 and 2017 [11,30-36].

Moreover, the first human case report caused by ZIKV infection occurred in Nigeria in 1954. And considering that A. aegypti proliferates in places where there is accumulated water and two evolutionary and ecological cycle (wild and urban), in 2016 there was an increase in Zika Virus notifications, this can be explained by the presence of a more humid climate this year, favoring the accumulation of water and the spread of the virus vector [4]. Similarly, probable cases of Dengue, an arbovirus transmitted by the same Zika Virus vector, in the South Region (Paraná, Santa Catarina and Rio Grande do Sul) increased from 2015 to 2016 according to Eduvirgem [37]. Thereby, the government develops more rigorous actions to prevent the rapid spread of the vector and the virus in Brazilian territory [37-39].

Conclusion

The predominance of compulsory Dengue notifications occurred in the first semester of the year in 2015 to 2020 and compared to other arboviruses infectious. And, in 2019, there were more notifications of probable cases between the epidemiological week 1 and 26 compared to 2020, which shows a decrease of notifications in this year. The same happened with Zika Virus and Chikungunya notifications. In addition, seasonality and level of precipitation have played an important role in arboviruses dissemination. Moreover, this research shows that there is a decrease in arboviruses notifications in 2020, that fact probably is due to the Sars-Cov-2 pandemic, thereby it needs new studies to find the reason for this data results.

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Ethics approval

Not applicable.

Informed consent

Not applicable.

Data sharing statement

No additional data are available.

Conflict of interest

The authors declare no conflict of interest.

Similarity check

It was applied by Ithenticate@.

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