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ANALYSIS OF CHANGES IN THE EPIDEMIOLOGICAL PROFILE OF PEDIATRIC PATIENTS IN A NON-REFERRAL HOSPITAL UNIT FOR COVID-19 BETWEEN 2019 AND 2021

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Abstract: With the spread of the COVID-19 pandemic, from 2019 to the present, a change was observed in the profile of hospital admissions in health units across the country, as well as the data related to them. Thus, the present work is of a qualitative nature and aims to investigate the change in the profile of hospital admissions, in pediatrics, in a non-reference hospital for COVID-19 between the years 2019 to 2021, through the use of Microsoft Excel formulas. Hospitalizations between 2019 and 2021 were analyzed, and after tabulating the data, the top 10 ICD 10 were found (in descending order of relevance). After data tabulation and analysis, the change in the profile of hospitalizations was confirmed, where patients hospitalized with symptoms related to Respiratory Syndromes were now being directed to reference services, which is consistent with the Contingency Plan in force in the state of Rio Grande From north. In addition, a decrease in pediatric hospitalizations was also identified in the years 2020 and 2021 compared to the year 2019, both in relation to respiratory syndromes and the number of hospitalizations in general. That the study in question can contribute to profiling the pediatric patient in recent years, as well as showing the difference in hospitalizations between adults and children during the pandemic.
Keywords: Data analysis; COVID-19; Big data; data mining.

INTRODUCTION

In December 2019, in the city of Wuhan, Hubei province, China, the first reports of patients suffering from pneumonia of unknown cause, caused by a new highly infectious respiratory virus, which caused severe acute respiratory syndrome in patients. This virus has been named COVID-19 or SARS-COV-2 by the World Health Organization. (Tan et al., 2019 and Chen et al., 2019)

In Brazil, the first confirmed case occurred on February 29, 2020, starting a war in the country against one of the deadliest viruses ever known, COVID-19. Coronavirus is an enveloped RNA virus that causes, in humans, mammals and birds, various respiratory, hepatic and neurological diseases.(Weiss et al., 2011 and Masters et al., 2013) four of these cause symptoms like the common cold in immunosuppressed people (Su et al., 2016) and two other types, which cause more severe and potentially fatal respiratory syndromes (SARS-CoV and MERS-CoV family). (Cui et al., 2019)

SARS-CoV was the causative agent of outbreaks of severe respiratory syndrome that occurred between 2002 and 2003 in Guangdong province, China, while MERS-CoV was the pathogen responsible for outbreaks of severe respiratory disease in the Middle East in 2012 (Zhong et al., 2019, Ksiazek et al., 2003, Drosten et al., 2003 and Zaki et al., 2012)

After the rapid global spread of this new virus, on January 30, 2020, the OMS declared the outbreak of SARS-CoV-2 as a pandemic, which remains even after control measures (Tan et al, 2020) and isolation (Huang et al., 2019) until December 2021. Among the symptoms most commonly associated with the virus are fever, cough, myalgia or fatigue, pneumonia and complicated dyspnea (called Severe Acute Respiratory Syndrome - SARS, or Acute Respiratory Distress Syndrome - ARDS), while less common symptoms include hemoptysis, diarrhea, headache, runny nose and productive cough (Huang et al., 2020) (if we do not consider the new strains). Among those infected, 15 to 20% of these may develop the disease in its most severe form, requiring admission to an Intensive Care Unit (ICU) due to its rapid progression to death. (Zheng et al., 2020)

In order to prevent further spread of the virus, a series of measures of social isolation, use of masks and hand hygiene have been used around the world. At the hospital level, in an attempt to reduce nosocomial infections, measures have been suggested such as the determination of specific sectors for suspected and confirmed patients, in addition to a series of training courses in prevention and control, isolation, disinfection and protection, classified in different degrees in the areas of infection and case protection. (Wang et al., 2020, Wei et al., 2020 and Dietz et al., 2020) Among the prevention and control actions against COVID-19, prevention is the best one. (Sanitary 2020)

The transmission of the new coronavirus takes place through exposure of healthy individuals to respiratory particles from patients contaminated through the air (expelled during speech, coughing or sneezing), in addition to direct or indirect contact with infected people through hands, objects or surfaces. contaminated, that is, these patients must be isolated by aerosols (particles are disseminated during swab collection, intubation, aspiration, pulmonary resuscitation, among other procedures that generate aerosols), droplets and contact. (Sanitary 2020) Specific places are therefore necessary for these patients, in order to avoid transmission of the virus. (Sanitary 2020)

With the spread of the COVID-19 pandemic, from 2019 to the present, a change was observed in the profile of hospital admissions in health units across the country. These changes occurred mainly due to the presence of this new unknown virus on the world stage, as well as the absence of an adequate protocol to combat and prevent it. Given this scenario, it was necessary to define the reference points for the treatment of patients with Severe Acute Respiratory Syndrome as a result of COVID-19.

Before analyzing the change in the hospitalization profile during the COVID-19 pandemic, we must understand that a large volume of data is generated daily around the world, whether these data are hospitalized or not, and it is necessary to search for methodologies that assist researchers in acquiring these. According to INTEL, until the year 2003, around five exabytes (1 EB = 1,000,000,000,000,000,000 Bytes or 1 EB = 1 152 921 504 606 846 976 Bytes) of information were generated. In 2012, this volume was created in just two days, and the volume of digital data grew by 2.72 zettabytes (ZB-1,000,000,000,000,000,000,000(1021) or 1180591620717411303424 (270) Bytes), with a forecast of doubling the every two years, reaching 8 ZB in 2015 (Corporation et al., 2012). This large volume of data is called Big Data. (Wu et., 2014)

The process of discovering patterns and relationships considered relevant in large sets of data and the set of techniques used to assist in the discovery of relevant knowledge that are currently available, we name Data Mining. (Zhang et al., 2002 and Ferretti et al., 2016) In the health area, Data Mining has been widely used in medicine for the discovery of new therapies, cause/effect factors, new therapeutic approaches, as well as the discovery of patterns, such as with regard to Genetics and DNA. (Ferreira et al., 2006 and Fayyad et al., 1996).

In 2020, the Medline biomedical literature base had 36,687 scientific publications for the search term Coronavir, MERS-CoV, SARS-CoV, COVID, HCoV, SARS, MERS, among more than 30 million citations from PubMed. Extracting all the relevant data, as well as analyzing them one by one, would require a lot of study time. Therefore, the use of algorithms and computational tools is necessary for better knowledge management. (Magalhães et al., 2020)

Thus, the present work aims to investigate the change in the profile of hospital admissions, in pediatrics, in a non-reference hospital for COVID-19 between the years 2019 to 2021 using Microsoft Excel.

METHODOLOGY

The research is of a quantitative nature, using Microsoft Excel as a computational tool.

The years 2019 to 2021 were chosen because 2019 was the year immediately preceding the COVID-19 pandemic, 2020 was the most intense year of the pandemic and 2021 was the year in which the easing of isolation measures began.

The description of the steps is below:

- Data collection took place from the records of hospitalizations in a non-reference pediatric unit for COVID-19 in the city of Natal-RN, at ''Universidade Hospital Onofre Lopes (HUOL).
- The data refer to more than 1900 hospitalizations between 2019 and 2021 in the pediatric ward, excluding patients admitted to the pediatric ICU.
- From the collected data, only the number of hospitalizations per year and their respective related ICD 10 were extracted, not identifying any patient.

ICD 10: developed by the OMS, it is the International Statistical Classification of Diseases and Related Health Problems. Its main function is to monitor the incidence and prevalence of diseases, through a universal standardization of diseases, problems, causes, symptoms and other social circumstances. (International classification of diseases)

- The data were then stored in the form of an Excel table, one table for each year (PATIENT_TABLE_2019, PATIENT_TABLE_2020 and PATIENT_TABLE_2021).

YEAR	CID	INTERNATIONS
2019	A09	8
2019	A159	1
2019	A188	1
2019	A379	3
2019	A38	1
2019	A419	2
2019	A502	1
2019	A509	2
2019	A681	1
2019	A689	5
2019	A86	2
2019	A90	6
2019	A920	2
2019	A928	2
2019	A929	4
2019	B002	1
2019	B258	2
2019	B451	2
2019	B550	1
2019	B659	2
2019	C250	1
2019	C629	1
2019	C70	1

Figure 1: table referring to admissions in 2019.

YEAR	CID	INTERNMENT
2020	A059	1
2020	A085	1
2020	A09	12
2020	A419	5
2020	A46	4
2020	A490	1
2020	A499	2
2020	A509	1
2020	A878	1
2020	A879	1
2020	A90	1
2020	A929	1
2020	B258	1
2020	B259	2
2020	B451	1
2020	C691	1
2020	C692	1
2020	C700	1
2020	C710	1
2020	C729	1
2020	D126	1
2020	D180	1
2020	D380	1

Figure 2: table for the year 2020.

YEAR	CID	INTERNMENT
2021	A410	1
2021	A419	7
2021	A501	1
2021	A509	2
2021	A689	1
2021	A86	3
2021	B004	1
2021	B018	1
2021	B080	1
2021	B309	1
2021	B342	1
2021	B349	1
2021	C029	1
2021	C753	1
2021	D103	1
2021	D140	1
2021	D180	2
2021	D181	1
2021	D391	1
2021	D483	1
2021	D559	1
2021	D570	2
2021	D571	1
2021	D649	3
2021	D693	1

Figure 3: table referring to the year 2021.

- After making the tables, a formula was generated in Microsoft Excel to identify the 10 highest values among all, as well as their respective CID.
- To find the highest values, the formula "MAJOR" was used, and to find its correspondent (CID), the "INDEX" and "MATCH" were used.
- After finding the most frequent CID 10, we can then analyze which hospitalization profile between the chosen years.

RESULTS AND DISCUSSION

The dataset consists of 3 tables, referring to the years 2019, 2020 and 2021, respectively. At first glance, it is possible to observe the difference in admissions over the years, where 2019 has 854 admissions, 2020 577 and 2021 548.

One of the determining factors for the decrease in hospitalizations in this non-reference pediatric unit for COVID-19 in the pandemic years is due to the fact that recent studies show that children and adolescents are less infected by SARS-CoV-2 compared to adults. These studies point out that, unlike influenza or respiratory syncytial virus infections, children usually do not play a critical role in the transmission of COVID-19 in the community. (Lee et al., 2020)

Allied to this factor, it is known that COVID-19 mainly affects people with chronic diseases, regardless of age. As a result, parents of children with comorbidities intensified isolation and protection measures for their children, thus reducing common hospitalizations inherent to the disease process. (Palmeira et al., 2020) Another important factor is that, during the pandemic, children and adolescents with respiratory symptoms were not admitted to non-reference units for COVID-19, which were referred to the respective specialized services.

In order to elucidate whether there was a change in the hospitalization profile in a non-reference hospital for COVID-19, all pediatric hospitalizations in this service were analyzed (excluding hospitalizations in the Pediatric Intensive Care Unit), through the previously constructed tables and using the Microsoft Excel.

When analyzing the data from the table of patients for 2019, 2020 and 2021, these were the 10 CID 10 with the highest number of hospitalizations, respectively:

MORE FREQUENTLY		CID
1	38	J159
2	37	N049
3	25	J350
4	21	N390
5	20	J218
6	15	K529
7	14	J960
8	11	K509
9	11	K754
10	11	L932

Figure 4: The 10 biggest hospitalizations in 2019.

ICD 10 J159: Unspecified bacterial pneumonia.
ICD 10 N049: Nephrotic syndrome - unspecified.
ICD 10 J350: Chronic tonsillitis.
ICD N390: Urinary tract infection of unspecified location.
ICD 10 J218: Acute bronchiolitis due to other specified microorganisms.
ICD 10 K529: Non-infectious gastroenteritis and colitis, unspecified.
ICD 10 J960: Acute respiratory failure.
ICD 10 K509: Crohn's disease of unspecified location.
ICD 10 K754: Autoimmune hepatitis.
ICD 10 L932: Localized lupus erythematosus.

MORE FREQUENTLY		CID
1	32	N049
2	20	J350
3	20	N390
4	14	E101
5	13	J960
6	12	A09
7	10	G409
8	10	K769
9	9	N189
10	8	J159

Figure 5: The 10 biggest hospitalizations of 2020.

ICD 10 N049: Nephrotic syndrome - unspecified.
ICD 10 J350: Chronic tonsillitis.
ICD 10 N390: Urinary tract infection of unspecified location.
ICD 10 E101: Insulin-dependent diabetes mellitus.
ICD 10 J960: Acute respiratory failure.
ICD 10 A09: Diarrhea and gastroenteritis of presumed infectious origin.
ICD 10 G409: Unspecified epilepsy.
ICD 10 K769: Liver disease not otherwise specified.
ICD 10 N189: Chronic renal failure, unspecified.
ICD 10 J159: Unspecified bacterial pneumonia.

MORE FREQUENTLY		CID
1	19	J350
2	18	N049
3	16	I859
4	10	G409
5	10	N137
6	9	N133
7	8	E840
8	8	K766
9	7	A419
10	7	E141

Figure 6: the 10 biggest hospitalizations in 2021.

ICD 10 J350: Chronic tonsillitis.
ICD 10 N049: Nephrotic syndrome - unspecified
ICD 10 I859: Esophageal varices without bleeding.
ICD 10 G409: Unspecified epilepsy.
ICD 10 N137: Uropathy associated with vesicoureteral reflux.
ICD 10 N133: Other unspecified hydronephrosis.
ICD 10 E840: Cystic fibrosis with pulmonary manifestations.
ICD 10 K766: Portal hypertension.
ICD 10 A419: Septicemia unspecified.
ICD 10 E141: Unspecified diabetes mellitus - with ketoacidosis.

From the results described above, we can conclude that the number of hospitalizations for syndromes involving the Respiratory System was higher in 2019 compared to the other years analyzed.

This was due to the fact that this service is not a reference for patients with respiratory symptoms during the COVID-19 pandemic, with a clear decrease in hospitalizations of children with diseases such as pneumonia and bronchiolitis. This difference between the years analyzed demonstrates that the patient's profile in this unit has changed due to the global context in which we were/are inserted.

Among all hospitalizations related to diseases involving the Respiratory Tract, some of them were not even listed in hospitalizations in 2020 and 2021, and when they appeared, they were in smaller numbers compared to 2019.

ICD 10 J129 (unspecified viral pneumonia) a): 1 case in 2019.

ICD 10 J13 (due to Streptococcus pneumoniae): 1 case in 2019.

ICD 10 J158 (other bacterial pneumonias): 5 cases in 2019 and 1 in 2020.

ICD 10 J159 (Unspecified bacterial

pneumonia): 38 cases in 2019, 8 cases in 2020 and only 1 case in 2021.

ICD 10 J180 (unspecified broncho-pneumonia): 7 cases in 2019, 1 in 2020 and 1 in 2021.

ICD 10 J188 (other pneumonias due to unspecified microorganisms): 1 case in 2019.

ICD 10 J189: (unspecified pneumonia): 8 cases in 2019, 1 in 2020 and 2 in 2021.

ICD 10 J210 (acute acute bronchiolitis due to respiratory syncytial virus): 8 cases in 2019 and 1 in 2021.

ICD 10 J218 (Acute bronchiolitis due to other specified microorganisms): 20 cases in 2019 and no cases in the years 2020 and 2021.

ICD 10 J219 (unspecified acute bronchitis): 8 cases in 2019, no cases in 2020 and 2021.

As can be inferred from the data collected, there was a change in the profile of pediatric patients hospitalized in this non-reference hospital unit for COVID-19, which is consistent with the guidelines created for the flow of patients to specific institutions based on the Contingency Plan State for Human Infection with the New Coronavirus (. Secretary of State for Health of Rio Grande do Norte - SESAP 2021). That is, from the moment when fewer patients with respiratory symptoms were admitted to this unit in question, we can see that the flowchart for directing symptomatic patients followed its correct flow.

FINAL CONSIDERATIONS

The present study aimed to analyze the change in the profile of pediatric hospitalizations in a non-reference hospital for COVID-19 between the year immediately before the pandemic (2019) and 2 years after it, 2020 and 2021.

After tabulating the data and analyzing it with the help of Microsoft Excel, the change in this hospitalization profile was confirmed, where patients hospitalized with symptoms related to Respiratory Syndromes were now being directed to reference services, which is consistent with the current Contingency Plan in the state of Rio Grande do Norte.

In addition, a decrease in pediatric hospitalizations was also identified in 2020 and 2021 compared to 2019, which also demonstrates a change due to the pandemic scenario.

From this work, I hope that new analyzes will be carried out so that they can bring improvements to the Health Services, being able to carry out a posteriori a comparison between the hospitalization profile between a non-reference unit for COVID-19 and a reference unit for this disease. That the study in question can contribute to profiling the pediatric patient in recent years, as well as showing the difference in hospitalizations between adults and children during the pandemic.

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