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Research Article

Odontogenic Abscesses during the Pandemic by SARS-CoV-2

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Abstract

Dental abscess are pathologies caused by infectious processes in the teeth and/or their surrounding tissues. They can lead to complications, or in some cases they can be lethal, in base of the anatomy of the area of the oral cavity in which they develop. Therefore, this is a recurrent reason why patients with an odontogenic abscess may need to go to the dental emergency room. In this study, the access data to the emergency room of the “Policlinico Umberto I” of patients with odontogenic abscesses were analyzed and were put into a relation with the epidemic by SARS-CoV-2. The periods of 2019 and 2020 have been taken into consideration and the pre- and post- lockdown periods were analyzed by comparing the data. Due to the restrictions imposed during the lockdown in Italy, we would have expected an increase in the number of accesses to the dental emergency room for odontogenic abscesses, but the results showed a decrease in the percentage of accesses for this pathology. Having regard to the results, an attempt to give a logical explanation to this decline in the numbers recorded at our Polyclinic has been made.

Introduction

Odontogenic abscesses represent a suppurative pathology that develops from teeth or from the periodontium, as a result of the proliferation of bacteria, which leads to the spread of the pathological process in neighboring tissues. The most affected people are the one of the second and third decade, and there is an increase in the ratio between males and females, that becomes more evident in the adults. The dental elements most affected by abscessed pathology are the lower molars, both of the right and left side [1]. Usually the odontogenic abscess is supported by a set of obligatory and optional aerobic and anaerobic bacteria. Among these species of bacteria, the most common are: Streptococcus Viridans, Fusobacterium Nucleatum, Prevotella, Porphyromonas Gingivalis and Endotelialis and Actinomyces [2,3]. Subsequently to the penetration of these bacteria into periodontal tissues, there is an inflammatory reaction by the organism. Then the spread of the pathology occurs, according to the bone and muscle anatomy around which it originates [4]. In fact, after eroding the cortical bone and passing the periosteum, it spreads following the path of least resistance [5]. It can then spread by contiguity in the sublingual, submandibular, peritigo-mandibular space, and through the pharynx spaces it can reach the mediastinum. Another way of spreading is through the blood or the lymphatic system. The most relevant risk factors for the spread of the pathology are uncompensated diabetes mellitus and advanced age. These risk factors are both characterized by a decrease in the body's immune defenses, and thus they are also closely related to the duration of hospitalization. In addition, the duration of hospitalization is also related to the type of abscess [6,7].

The complications to which dental abscess can lead are the diffusion of the infection in the deep spaces of the neck that could reach the mediastinum and cause mediastinitis [8,9,10], Ludwig's Angina [11], Lemierre syndrome [12], necrotizing fasciitis [13,14], sinusitis [15], periorbital abscess [16], cerebral abscess [17] and airway obstruction [18]. Osteomyelitis has rarely been reported in patients in bisphosphonate therapy, who extracted the element from which abscess developed [19]. Another risk factor not to underestimate is the socio-economic aspect of the most disadvantaged Italian families. Especially in this particular historical period, these families can't afford further expenses and more easily tend to procrastinate dental care, exposing themselves to a major risk of abscess, as already documented in an article written by Fusconi M, Greco A, Galli M et al. [20]. The therapeutic approach to the dental abscess is always surgical. In most of the cases it is an immediate extraction of the outbreak elements and intra-extraoral drainage, but sometimes it could be deferred, if the antibiotic therapy is particularly effective, and the extraction is planned later, without carrying out drainage [21].

The standard diagnostic examination to evaluate the dental elements infectious foci is the orthopantomography, whereas to evaluate the extent of the abscessed pathology it is performed a CT of the facial bone and then decide, based on the spread, what is the best surgical approach. One of these is the Minimally Invasive Intraoral Approach (MIIA), which can be implemented in cases where the extension of the abscess is not beyond the lower margin of the jaw [22]; otherwise, a cervicectomy has to be performed and in the most severe cases with an involvement of the mediastinum also a thoracotomy with associated tracheotomy, if there is an obstruction of the airways. At the same time we proceed with the extraction of the infected tooth. Surgical therapy is always accompanied by antibiotic therapy often in double combination of penicillin or headaches, which have a prevalent action on aerobic microorganisms, and metronidazole which is effective against anaerobic microorganisms [23]. Instead, for the treatment of sinusitis of dental origin the best result is with a combined endoscopic and intraoral approach, where functional endoscopic sinus surgery (FESS) goes to clean up the jaw sinus and intraorally the cause of sinusitis, i.e. infected teeth, is eliminated [15]. Abscesses are therefore a pathology that often requires prompt intervention to be solved and many people must go to the emergency room for this problem [4]. The number of accesses to the dental emergency room for odontogenic abscesses is an important data from the point of view of quantity. This is demonstrated by the data collected at the dental emergency room of the “Policlinico Umberto I” during the period 2019-2020 and showed in this retrospective study. The purpose of this article is to understand whether the lockdown, which took place in Italy in 2020, had a statistically significant influence on the number of accesses for odontogenic abscesses in public health facilities, particularly at the “George Eastman” emergency room in Rome, Italy. The lockdown that took place was caused by an emergency that became worldwide after the spread of the SARS-CoV-2 virus, from which the associated disease COVID-19 derives. The spread started from the city of Wuhan, in China, at the end of 2019. This pathology affects the respiratory tract and can lead to acute respiratory distress syndrome (ARDS) and death, but also has other possible complications such as heart diseases, bleeding disorders, sepsis and multi-organ failure [24]. In other subjects it doesn't give symptoms. Those people become healthy carriers of the virus, so if they're not aware of their situation they can transmit

it to other people [25]. Because of this situation, obligations have been imposed on the citizens of the various countries, limiting their movement. Taking in account the particular historical moment, the restrictions and the consequent imposition to stay at home, have the people neglected oral hygiene, causing an increase in the number of abscesses or have they had the opportunity to dedicate more time to their oral hygiene, increasing its level? Is it possible that the “telephone first aid” with prescription of antibiotic therapy caused a postponed access to the emergency room and this led to a post lockdown election therapy, reducing the number of accesses?

Materials and Methods

The data of the accesses to the emergency room of the Policlinico Umberto I during the periods ranging from the 1st of January 2019 to the 14th of December 2020 have been examined. It must be taken into account that during the Lockdown period the patients who needed to be visited for various emergencies were referred to the Dipartimento di Emergenza e Accettazione (DEA) of the Policlinico Umberto I, while the patients visited before and after the Lockdown period went to the George Eastman Dental Emergency Department (Pronto Soccorso Odontoiatrico George Eastman). Microsoft Excel programs and the Chi- Square Test Calculator (Social Science Statistics, 2018) were used for the tables and statistical calculations to perform the Chi Square test. These data have been divided by code and diagnosis, and for each one it has been seen the number of accesses for that specific pathology. There was no interest in dividing patients by age, sex and previous pathologies. We focused on the number of accesses for the different pathologies. Furthermore, a subdivision on the type and number of accesses in different periods was made. These periods were: period 1 from 01/01/2019 to 14/12/2019; period 2 from 01/01/2020 to 14/12/2020. Subsequently, the period corresponding to the year 2020 was divided into: period 2a, called the “pre-lockdown” period, from 01/01/2020 to 08/03/2020; period 2b, called “lockdown” from 09/03/2020 to 08/06/2020; period 2c, called “post-lockdown” from 09/06/2020 to 14/12/2020.

The number of accesses for odontogenic abscesses in each period was seen. From the data, the percentage of the number of accesses for each pathology on the total was obtained, with a rounding up or down of the first decimal after the comma. The percentages obtained were compared to the number of accesses for odontogenic abscesses. In the set of odontogenic abscesses of each period, the following categories were included: “periapical abscess with or without sinus”, “cellulite and abscess of oral soft tissues” and “other phlegmon and facial abscesses”. Once these data were obtained, the data on accesses for odontogenic abscesses of period 1 with period 2 were compared and the chi-squared value and the p value were calculated. The same procedure was carried out for the number of odontogenic abscesses between the period 2a and 2c and the chi square and p value were obtained (Table 1).

Table 1: Subdivision of the periods of time considered.

Period 1	Period 2		
From 01/01/2019 To 14/12/2019	From 01/01/2020 To 14/12/2020		
	Period 2a Pre-Lockdown	Period 2b Lockdown	Period 2c Post-Lockdown
	From 01/01/2020 To 08/03/2020	From 09/03/2020 To 08/06/2020	From 09/06/2020 To 14/12/2020

Results

The data obtained from this study are the following: in period 1, out of 20624 accesses to the dental emergency room, 1789 of these were due to odontogenic abscesses (Figure 1); in period 2 out of a total of 12010 accesses, 871 were caused by odontogenic abscesses (Figure 2); in period 2a out of 3681 accesses, 317 for odontogenic abscesses (Figure 3); during the lockdown period 2b, the number of patients with odontogenic abscesses was 4 out of 85, and all of them belonged to the periapical abscess category without sinus (Figure 4); in the period 2c out of 8245 accesses, 550 due to odontogenic abscesses (Figure 5). The percentages obtained from these data were: in period 1 a percentage corresponding to 8.7% of odontogenic abscesses was found with respect to the total accesses (Figure 1); in period 2 a percentage equal to 7.2% (Figure 2); in period 2a about 8.6% (Figure 3); in period 2b about 4.7% (Figure 4); in period 2c a percentage of 6.7% (Figure 5).

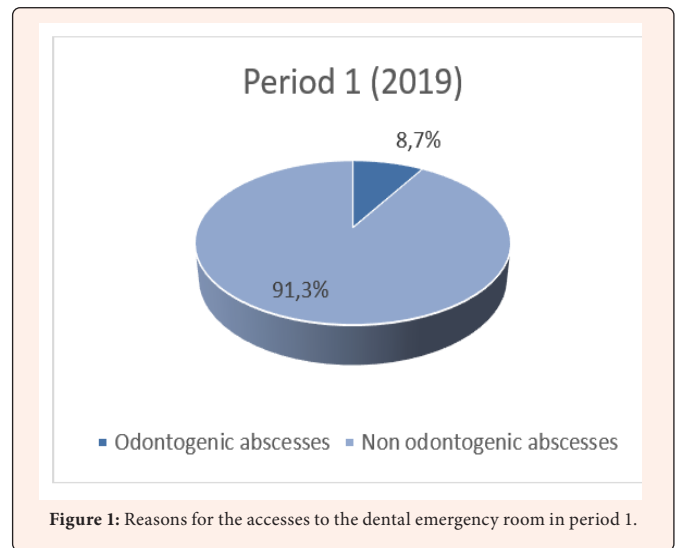


Figure 1: Reasons for the accesses to the dental emergency room in period 1.

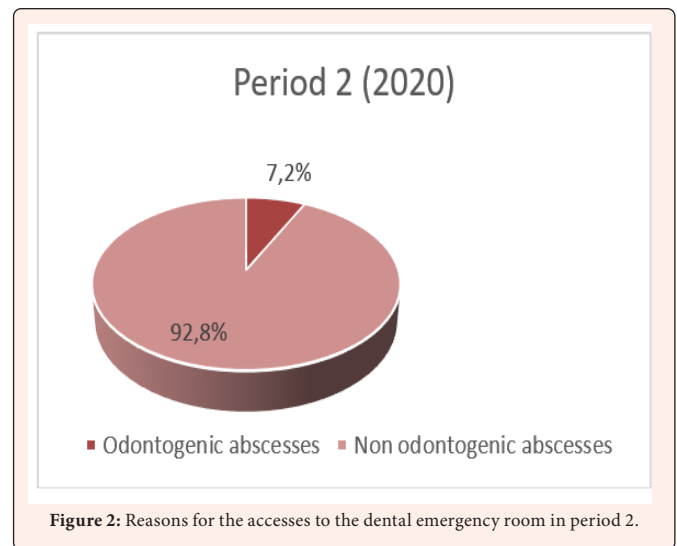


Figure 2: Reasons for the accesses to the dental emergency room in period 2.

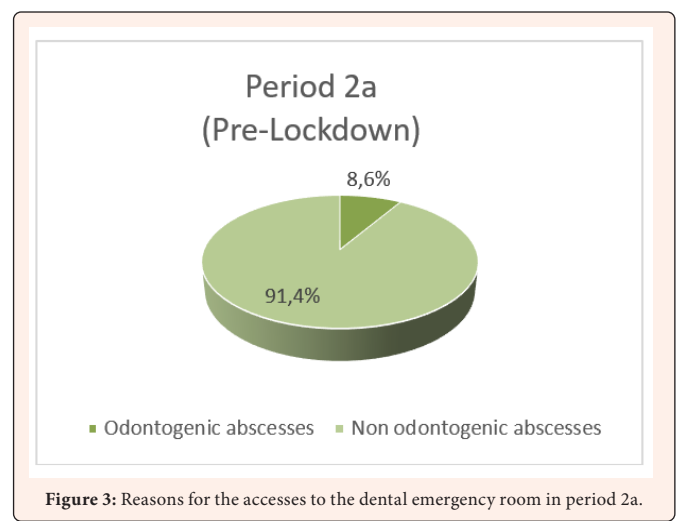


Figure 3: Reasons for the accesses to the dental emergency room in period 2a.

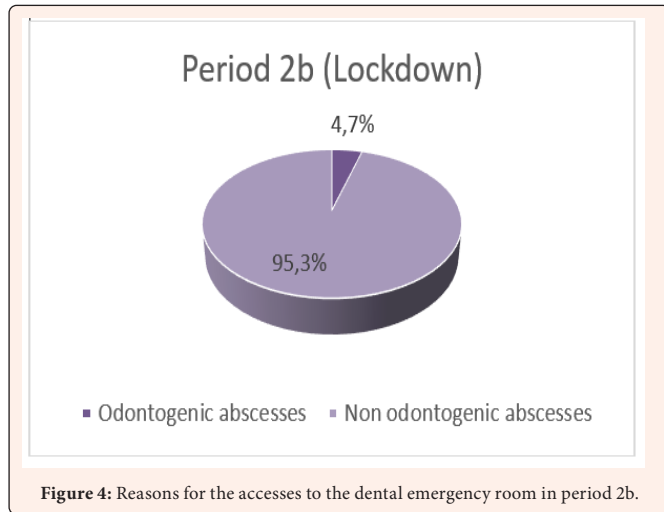


Figure 4: Reasons for the accesses to the dental emergency room in period 2b.

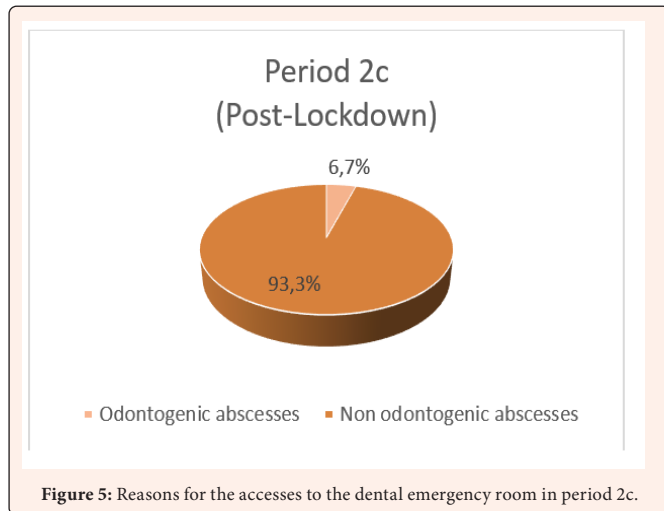


Figure 5: Reasons for the accesses to the dental emergency room in period 2c.

Furthermore, by comparing the data on accesses for odontogenic abscesses of period 1 with period 2, we obtained a chi square equal to 20.5023 and a p value <0.005 with a significance level of .05, showing that the difference between the two periods is significant from a statistical point of view (Table 2). Comparing the number of odontogenic abscesses between period 2a and 2b, with a chi-squared value of 14.2234 and a p value <0.005 with a level of significance of .05, we have a difference between the periods significant from a statistical point of view too (Table 3).

Table 2: Analysis of the differences between period 1 and period 2, with the corresponding chi-square value and p-value.

Periods	Odontogenic abscesses	Non odontogenic abscesses	Marginal Row Totals
Period 1	1789 (1681.06) [6.93]	18835 (18942.94) [0.62]	20624
Period 2	871 (978.94) [11.9]	11139 (11031.06) [1.06]	12010
Marginal Column Totals	2660	29974	32634 (Grand Total)

The chi-square statistic is 20.5023. The p-value is < 0.00001. Significant at p < .05.
The chi-square statistic with Yates correction is 20.3128. The p-value is < 0.00001. Significant at p < .05.

Table 3: Analysis of the differences between period 2a and period 2c, with the corresponding chi-square value and p-value.

Periods	Odontogenic abscesses	Non odontogenic abscesses	Marginal Row Totals
Period 2a	317 (267.6) [9.12]	3364 (3413.4) [0.71]	3681
Period 2c	550 (599.4) [4.07]	7695 (7645.6) [0.32]	8245
Marginal Column Totals	867	11059	11926 (Grand Total)

The chi-square statistic is 14.2234. The p-value is .000162. Significant at p < .05.
The chi-square statistic with Yates correction is 13.9369. The p-value is .000189. Significant at p < .05.

Discussion

Odontogenic abscesses are infections with bacterial origin that extend to the neighboring tissues, formed by a set of purulent material with cellular debris, bacteria, immunity cells and exudate. Their evolution depends on the location of origin of the infection, on the individual's immune response and above all on the therapies adopted to stop the infectious process. Based on this, various complications can occur [4,5,26,27]. The lockdown period that took place in 2020, due to the measures implemented by various countries around the world to deal with the SARS-CoV-2 epidemic, led to many restrictions on the movement of people and a blockage of basic dental services. The dentists' intervention was allowed only for dental emergencies, since the most important route of transmission of the virus is through the droplets and the aerosol, that both can develop during dental sessions favoring the transmission of the virus [28]. This led to the assumption that there would have been an increase in the number of oral diseases due to a failure to prevent the most common problems such as dental caries or periodontal problems. Furthermore, in the last few years the number of visits to the emergency room for odontogenic infections has always been increasing.

The results obtained in this study, on the other hand, show a decrease in the accesses to the emergency room due to odontogenic abscesses after the lockdown in Italy. This is confirmed with both the difference between the years 2019 (8.7%) and 2020 (7.2%) (Figure 6), and the data for period 2a (8.6%), which represents the pre-lockdown of 2020, and period 2c (6.7%), which represents the post-lockdown period of the same year. Furthermore, the decrease that occurred between periods 2a and 2c (-1.9%) is even greater if we take into account that the data collection period 2c is double compared to period 2a (Figure 7 & 8). This makes us even more appreciate this decrease. From this study we would have expected an increase in the number of accesses to the emergency room for odontogenic abscesses, because of the difficulty to move and the possibility of preferring not to go to dental facilities in case of little discomfort or pain, that could have intercepted the pathology and could have implemented preventive treatments (fillings, root canal treatments, tooth extraction in disodontiasis, therapies for periodontal problems) during the lockdown. This didn't happen. A decrease in the accesses for odontogenic abscesses was also observed during lockdown in the United Kingdom [29,30], in the USA [31] and in France [32], but in our study, this decrease was also found in the post-lockdown period. It dropped from a percentage of 8.6% (pre-lockdown period) to 4.7% during the lockdown and then in the post-lockdown period to 6.7%. The causes that have led to this result may be: one hypothesis is that people continued to go to the dental facilities even during the lockdown and to receive the treatments that prevented the abscess pathology; the other one is that the people didn't go to specialized centers but did treatment (in particular antibiotic treatments) at their residence, decreasing the number of accesses for this pathology. Another hypothesis is that people have dedicated themselves with greater dedication to the care of their oral cavity, having to stay more time at home, lowering the probability of developing caries and periodontal pathologies due to plaque accumulation and this indirectly had a positive effect on pathologies developing from these problems, reducing the number of odontogenic abscesses. As regards the first hypothesis, this is to be taken into little consideration given the limitations that there have been in the exercise of dental services since, even if a real closure of the dental activity has not been imposed by the government, the National Order of Doctors has invited to open their own dental practice only in cases of urgency. Another factor that may have negatively influenced the presentation of patients to dental clinics may have been the fear of becoming infected at the same clinics and even more so at public facilities.

The etiology of this fear is that the dental profession is considered to be among the most at risk of disease transmission, but this is false. In fact, the measures implemented by dentists before, during and after dental services reduce to a minimum the probability of becoming infected. This is also evident from a study carried out in the United States by Cameron G. Estrich et al., in which it is showed that less than 1% of the dentists who participated in the study were infected with SARS-CoV-2 [33]. This demonstrates how the measures taken by dental professionals (personal protective equipment, disinfectants, instrument sterilization, surface sanitization and air changes) are capable of minimizing SARS-CoV-2 infection. The most probable hypothesis remaining is the one of a telephone emergency room with prescription of antibiotics that have resolved or repressed most of the odontogenic infections. Those who did not respond to this procedure had to go to the emergency room or in the first instance to their dentist, who could implement only emergency therapies, following the suggestions of the order of doctors. The problem of the abuse of antibiotics is that of the ever-increasing resistance to them by bacteria and this can lead to complications in the treatment of these pathologies with even fatal outcomes. To prevent this, it is useful to do an antibiogram to perform a more targeted therapy [34,35]. The best therapy is always prevention. It is therefore necessary to implement actions, by health personnel and not, which lead to a greater awareness of public opinion regarding the maintenance of good oral hygiene, which allows to avoid pathologies such as caries or periodontal problems which can lead to odontogenic abscesses if they aren't treated. It is necessary to remind patients to carry out periodic check-ups, to teach them how to brush and use dental floss correctly, to implement a healthy diet and to intervene in all those situations in which a pathology of the oral cavity is found [36,37]. It should also be noted that while cases of dental emergency department accesses declined during the lockdown and post-lockdown periods, the number of hospitalizations for head and neck abscess conditions due to odontogenic causes did not change significantly during these periods. This means that while milder abscess conditions declined in number, given the data on emergency department admissions, abscess conditions requiring hospitalization and admission remained nearly unchanged during the 2020s. This occurred because most people who go to the emergency room do not have urgent reasons, but mild or moderate conditions. This may be a consequence of the unconsciousness of the patients about their health condition, not being able to make a distinction between mild and dangerous odontogenic abscesses.

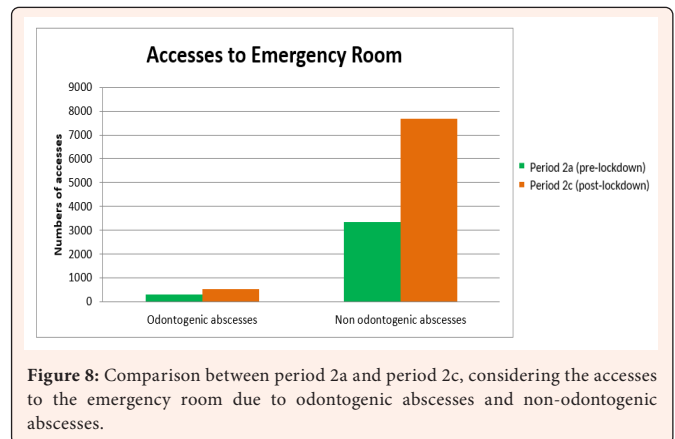


Figure 8: Comparison between period 2a and period 2c, considering the accesses to the emergency room due to odontogenic abscesses and non-odontogenic abscesses.

Conclusion

This study showed a decrease in the number of accesses to the emergency room for odontogenic abscesses in the months following the lockdown in Italy in 2020. This conclusion may have various causes: people continued to go to dental facilities even during the lockdown, people did not go to specialized centers but followed antibiotic therapy at their residence, or that people having to stay more time at home have dedicated themselves more to the care of their oral cavity, preventing the pathologies underlying the development of odontogenic abscesses. Therefore, a study of the following period, during 2021, will be used to see if there will be a return to access data for odontogenic abscesses compared to previous years, confirming that the decrease is an isolated event caused by the 2020 lockdown, or this decrease is going to continue. In this case there will be the need to look for a different cause for this drop in access to the emergency room for odontogenic abscesses.

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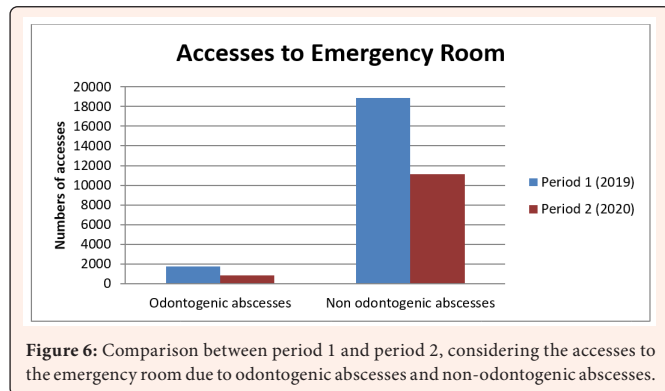


Figure 6: Comparison between period 1 and period 2, considering the accesses to the emergency room due to odontogenic abscesses and non-odontogenic abscesses.

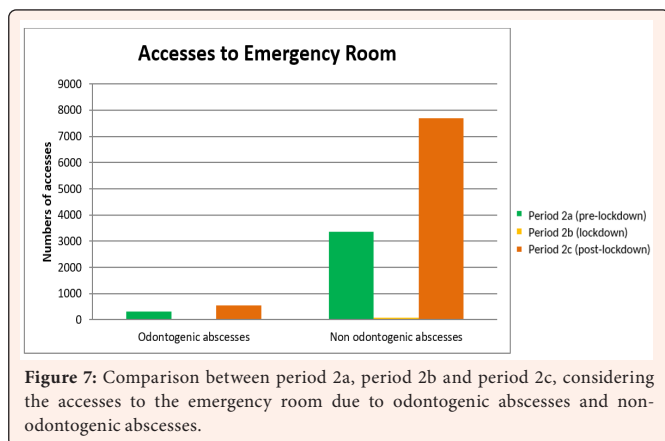


Figure 7: Comparison between period 2a, period 2b and period 2c, considering the accesses to the emergency room due to odontogenic abscesses and non-odontogenic abscesses.



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