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Original Article

Dental implant therapy in the Brazilian Public System: an overview of the last decade

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Aim: This retrospective study aims to describe and analyze the number of dental implants and implant-retained prostheses performed by the Unified Health System (SUS) in the last decade. **Methods:** This study is based on secondary data from the official government database (DATASUS) performed from January 2010 to December 2019 and is reported following the STROBE. A descriptive analysis was performed of the total sample and the stratified sample divided by Brazilian states. **Results:** A total of 143,037 dental implants and 93,325 implant-retained prostheses were provided by SUS. It is possible to observe that some states played a massive role on the provision of dental implants and implant-retained prostheses (Parana state: 58.4% and 55.9% and Paraiba state: 21.1% and 25.2% of the total amount of dental implants and implant-retained prostheses, respectively) while some states did not provide a single implant-retained prosthesis. Also, inland cities were mostly responsible for the number of procedures compared to the state capitals. **Conclusion:** Although dental implant therapy is available in SUS across the country, the number of treatments provided in the last decade is still very limited and is also mainly concentrated in the southeastern region of Brazil.

Keywords: Dental health services. Dental implants. Health policies. Health services administration.

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Introduction

Brazil is one of the few countries in the world to have a public health system that provides entirely free of cost services for any person, including foreigners. The Unified Health System (Sistema Unico de Saude – SUS) was instituted by the 1988constitution and is based on the principle that citizen's health is a constitutional right and state's duty[1]. Regarding to numbers, SUS is the largest public health system in the world considering the number of users, geographical extension, and size of the affiliated network[2], whereas services are financed and provided at federal, state, or municipal levels.

In 2004, a nationwide program called "Smiling Brazil" included oral health as one of the priority areas of the SUS[1]. To do so, epidemiological census was conducted in the whole country and investments were made both in human resources (professional development) and infrastructure. The main focus of SUS and its "Smiling Brazil" program is related to primary care including oral hygiene instructions, dental restorations, root and scaling, and tooth extractions. This program also focus on the expansion and qualification of specialized treatment, which is also covered by SUS, including medium-complexity and tertiary care[2].

The last Brazilian census on oral health have shown a high prevalence of edentulism in the elderly population (53.7%), while 17.4% of the Brazilian adults have at least one tooth loss[3]. Also, projections based on the population growth indicates that until 2040, 85.9% of the elderly population will have edentulous jaws[4]. In this perspective, oral rehabilitations with dental implants and implant-retained prostheses are considered the best treatment option to rehabilitate missing teeth, presenting high success and survival rates, as well as patients' satisfaction[5-8].

Dental implants and implant-retained prostheses were introduced in SUS in 2010, through the Ministry of Health ordinances No 718/SAS/MS and No 398/SAS/MS[9,10]. To the best of our knowledge, the SUS is one of the few public health systems that offer dental implants in the public service. However, it seems that the provision of dental implant rehabilitation in Brazil is still mostly made by private practices. For this reason, this survey becomes important to assess the last decade of implants placement in the Brazilian public service, whilst the results could represent a tool for the policy-makers, aiming to reducing inequalities and improving the coverage of these treatments. Thus, the present study aims to describe and analyze the official government databank (DATASUS) regarding to dental implants, considering both the number of placed implants and implant-retained rehabilitations, made by SUS since the inclusion of these treatments in it.

Materials and methods

This retrospective study was designed as an ecologic study and is reported in accordance with the *Strengthening the Reporting of Observational Studies in Epidemiology* (STROBE) statement and is based on secondary data from DATASUS (Brazilian health information databank)[11]. In accordance to a National Resolution (CNS, nº 510), the Ethics Committee Approval was not mandatory[12].

Source

Data was acquired from DATASUS (Brazilian health information databank) using the TABNET tool, which provides information to support objective analyzes of the health situation, evidence-based decision making and the development of health action programs[13].

Data acquisition

A search comprising keywords and SUS codes related to dental implants (osseointegrated dental implant – Code 0414020421; and implant-retained prosthesis – Code 0701070153) was performed considering all procedures performed in SUS from January 2010 to the end of December 2019. Data was collected on March 17th, 2020. All inputs were analyzed and categorized into: a) Dental implants placement; b) Implant-retained prostheses. The distribution of the number of each procedure/treatment was also distributed according to Brazil's socio-demographic regions (south, southeast, northeast, north, and central-west) and states. A descriptive analysis of the total sample and the stratified sample divided by state was performed using Stata Software 14.0 (Stata Corporation, College Station, TX, USA).

Results

Table 1 summarizes the distribution of implant-related treatments provided by SUS considering all Brazilian states. In the last decade (January 2010 to December 2019), a total of 143,037 dental implants and 93,325 implant-retained prostheses were provided by SUS.

Table 1. Descriptive analysis stratified by state, considering the number of installed dental implants and number of installed dental prosthesis: DATASUS* (January 2010 to December 2019).

National region	State	Dental implants			Implant-retained prostheses		
		N	% in the region	% in the country	N	% in the region	% in the country
South	Rio Grande do Sul (RS)	381	0.45	0.27	216	0.41	0.23
	Santa Catarina (SC)	820	0.97	0.57	87	0.17	0.09
	Paraná (PR)	83,572	98.58	58.43	52,238	99.42	55.97
Southeast	São Paulo (SP)	8,873	84.22	6.20	7,349	93.93	7.87
	Minas Gerais (MG)	972	9.23	0.68	65	0.83	0.07
	Rio de Janeiro (RJ)	413	3.92	0.29	410	5.24	0.44
	Espírito Santo (ES)	277	2.63	0.19	0	-	-
Central-West	Mato Grosso do Sul (MS)	1,132	7.05	0.79	73	0.84	0.08
	Goiás (GO)	6,701	41.71	4.68	1,717	19.85	1.84
	Distrito Federal (DF)	0	-	-	0	-	-
	Mato Grosso (MT)	8,234	51.25	5.76	6,862	79.31	7.35

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National region	State	Dental implants			Implant-retained prostheses		
		N	% in the region	% in the country	N	% in the region	% in the country
Northeast	Bahia (BA)	70	0.23	0.05	102	0.43	0.11
	Sergipe (SE)	0	-	-	0	-	-
	Alagoas (AL)	42	0.14	0.03	42	0.18	0.05
	Pernambuco (PE)	175	0.57	0.12	0	-	-
	Paraíba (PB)	30,154	98.90	21.08	23,521	99.37	25.20
	Rio Grande do Norte (RN)	0	-	-	0	-	-
	Ceará (CE)	6	0.02	0.00	0	-	-
	Piauí (PI)	42	0.14	0.03	5	0.02	0.01
	Maranhão (MA)	0	-	-	0	-	-
North	Tocantins (TO)	0	-	-	0	-	-
	Pará (PA)	0	-	-	0	-	-
	Amapá (AP)	1,173	100.00	0.82	638	100	0.68
	Roraima (RR)	0	-	-	0	-	-
	Amazonas (AM)	0	-	-	0	-	-
	Acre (AC)	0	-	-	0	-	-
	Rondônia (RO)	0	-	-	0	-	-
Total		143,037	-	100	93,325	-	100

*Data extracted on March 17th, 2020

In Figures 1 and 2, it is possible to observe that some states played a massive role on the provision of dental implants and implant-retained prostheses (Parana state: 58.4% and 55.9% of the total amount of dental implants and implant-retained prostheses, respectively; Paraiba state: 21.1% and 25.2% of the total amount of dental implants and implant-retained prostheses, respectively) while some states did not provide a single implant-retained prosthesis. Figure 3 presents the number of dental implants and implant-retained prostheses provided by SUS from January 2010 to December 2019. It is possible to observe a peak between the years of 2017, while a notable decrease was observed in the following years (2018-2019).

In the Table 2, a comparison whether the treatments were made in the capital region of each state or inland is presented. Considering both treatments, inland cities were mostly responsible for the number of procedures compared to the state capitals.

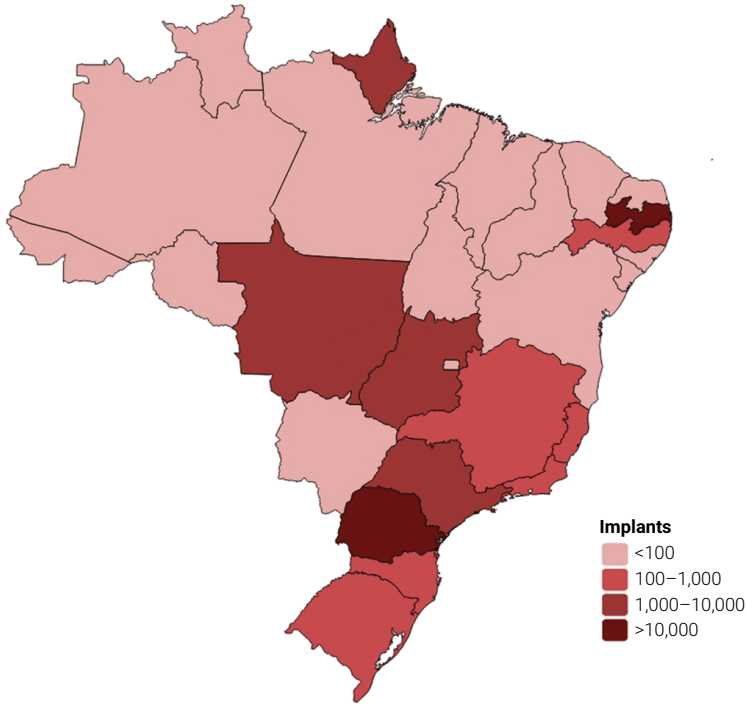

Figure 1. Heat-map of the distribution of dental implants provided by SUS for each Brazilian state.

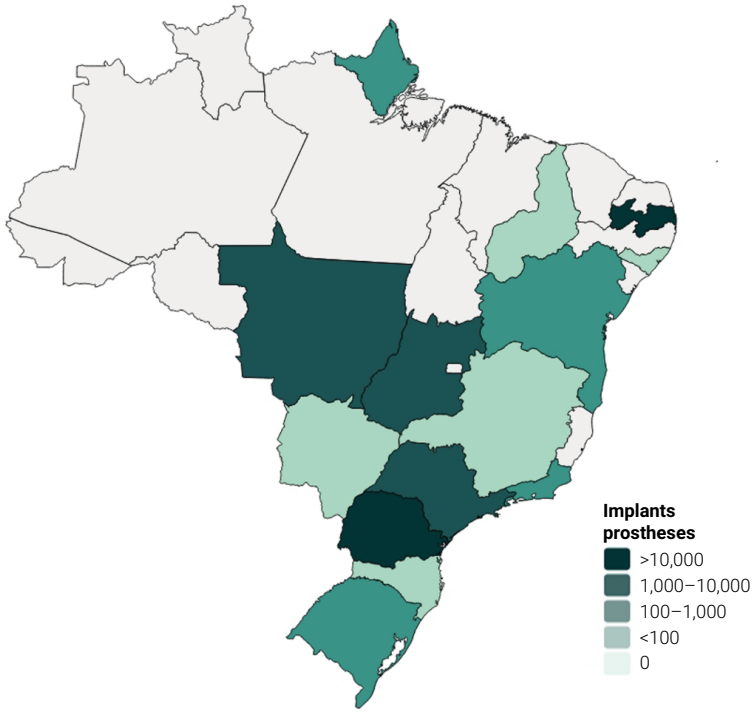

Figure 2. Heat-map of the distribution of implant-retained prostheses provided by SUS for each Brazilian state.

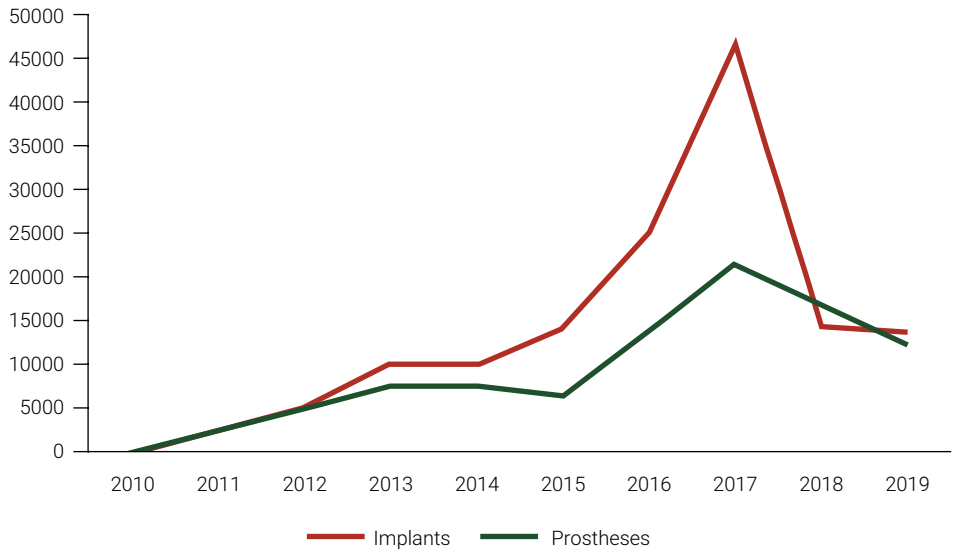

Figure 3. Number of dental implants (red line) and implant-retained prostheses (green line) provided by SUS from January 2010 to December 2019.

Table 2. Comparison of implant-related treatments provided by SUS in capitals or inland cities of Brazil (number of installed dental implants and number of installed dental prosthesis: DATASUS*; January 2010 to December 2019)

National region	Capital (State)	Capital		Inland		Total	
		Implants	Prostheses	Implants	Prostheses	Implants	Prostheses
South	Porto Alegre (RS)#	-	-	381	216	381	216
	Florianopolis (SC)	-	-	820	87	820	87
	Curitiba (PR)	611	461	83572	52238	83572	52238
Southeast	São Paulo (SP)#	-	-	8873	7349	8873	7349
	Belo Horizonte (MG)	28	20	972	65	972	65
	Rio de Janeiro (RJ)	6	5	413	410	413	410
	Vitória (ES)	277	-	277	0	277	0
Central-West	Campo Grande (MS)	44	73	1132	73	1132	73
	Goiania (GO)#	-	-	6701	1717	6701	1717
	Brasilia (DF)#	-	-	0	0	0	0
	Cuiaba (MT)#	-	-	8234	6862	8234	6862
Northeast	Salvador (BA)#	-	-	70	102	70	102
	Aracaju (SE)#	-	-	0	0	0	0
	Maceió (AL)#	-	-	42	42	42	42
	Recife (PE)#	-	-	175	0	175	0
	João Pessoa (PB)#	-	-	30154	23521	30154	23521
	Natal (RN)#	-	-	0	0	0	0
	Fortaleza (CE)#	-	-	6	0	6	0

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National region	Capital (State)	Capital		Inland		Total	
		Implants	Prostheses	Implants	Prostheses	Implants	Prostheses
Northeast	Teresina (PI)	42	5	42	5	42	5
	São Luis (MA)#	-	-	0	0	0	0
North	Palmas (TO)#	-	-	0	0	0	0
	Belém (PA)#	-	-	0	0	0	0
	Macapa (AP)#	-	-	1173	638	1173	638
	Boa Vista (RR)#	-	-	0	0	0	0
	Manaus (AM)#	-	-	0	0	0	0
	Rio Branco (AC)#	-	-	0	0	0	0
	Porto Velho (RO)#	-	-	0	0	0	0
Total		1008	564	141836	93022	143037	93022

#Capital without data registered
*Data extracted on March 17, 2020

Discussion

The present study provides an insight of the SUS role in regard to oral rehabilitations using dental implants in the last decade (2010-2019). Although the incidence of tooth loss is decreasing worldwide in the last decades[14] and, according with the last epidemiological Brazilian census (2003 and 2010) it was observed a decline of tooth loss in teenagers and young adults; however, edentulism rates were still raising in the elderly as a result of the increase in life expectancy[4,15,16]. Likewise, it is projected that tooth loss will continue to be a major dental problem in the next decades, which might impair patients general health and cause disabilities[17]. Not only complete edentulism but a reduced number of teeth is directly related to quality of life worsening, since it can compromise daily activities, such as chewing, nutrition, phonation, social life, and self-esteem[18,19].

Although dental implants are recognized as the gold standard approach to replace missing teeth[5,6], Brazil is one of the few countries in the world that provides free dental implant rehabilitations in the public health system while some countries with higher human development indexes (HDI) do not fully cover such treatments. The costs involved in implant rehabilitations are among the key factors that are considered by patients when choosing their therapy. It is well-known that the vast majority of edentulous persons usually belong to the poorest population stratum and have difficult access to treatment with dental implants[20]. In Brazil, a single dental implant costs on average about 1,000-1,500 Brazilian reais (BRL), which is approximately 250 US dollars (USD). Considering that Brazil's minimum wage is about to 245 USD, the low-income population has no option than to rely on the public health system to obtain their rehabilitations. In a recent review, a single implant rehabilitation was a more cost-effective option compared to a three-unit fixed dental prosthesis to replace a single tooth[21]. Considering the rehabilitation of multiple teeth, dental implants were initially associated with higher initial costs; however, the patient-centered outcomes

were improved during life-course compared to other treatment options. In this perspective, the present study presents important results about the coverage of implants placement in the National Health System. As above stated, although the costs could impact the coverage, the enhancement of dental implants in the SUS could represent a key factor to improve the oral health-related quality of life in the Brazilian population.

In 2016, a previous study showed that the access to dental implants at SUS was increasing until that moment, but the distribution was very unequal throughout the country[22]. Our findings update their data, and it is clear that there was an important increase from 2015 to 2016 and from 2016 to 2017 (Figure 3). However, the following years showed a clear reduction in the total number of procedures of 30.7% in 2018 and 29.6% in 2019 compared to 2017. It is important to highlight that since 2014 Brazil is facing a serious economic crisis and that in 2016 the Brazilian government changed its priorities, with a cascade of budget cuts that surrogated the health investments in the following years which could explain the massive reduction of procedures during these years[23].

Bueno et al.[24] evaluated the correlation between social and oral health determinants represented by the indicators of the National Oral Health Policy (Smiling Brazil) and found that, hierarchically, clusters with the best performance in social determinants and oral health outcomes were composed by the Brazilian Capitals, presenting the highest values of notification of procedures. Regions that presented high indexes of social determinants in the years 2000-2010 might have pioneered in the organization and availability of these procedures of medium complexity that, until then, were not offered by the public health system[24]. The organization and provision of health services are related to the human development of the macro-regions[25] and with this, the South and Southeast regions present higher rates of use of dental services, with a high number of specialized dental procedures. These findings are also observed in our study, where the South and Southeast regions were the regions that provided more dental implant treatments in the last decade while the North region, which presents the lowest social and economic indexes in Brazil, has also presented the lowest number of treatments regarding dental implants. It is important to highlight that the Brazilian government has public policies to reduce health inequities for the North and Northeast regions[23,25,26]; however, those inequities are evident in our findings.

In order to provide information to support objective analyzes, evidence-based decision making, and the development of health action programs, SUS have created the Brazilian health information databank (DATASUS). This databank also allowed for decentralization and an improvement in the management of SUS activities, contributions, viability, usage of available resources, and it is constantly updated and discloses the information needed for health actions[13]. As funding is only available after the execution of the procedures and the corresponding input in the databank, the DATASUS tool can be considered a reliable tool for accounting and analysis of the services provided by SUS. However, according to a Technical Note from the Brazilian Ministry of Health[27], non-conformities in outpatient production reported by some municipalities were identified, which would explain the high number of procedures performed in some locations. The processing of outpatient production in the SUS Outpatient Information System (SIA/SUS) is performed by the local manager, even when

the services were provided by non-governmental companies, and therefore, those responsible were informed of the need to reimburse overpriced amounts. When data are not presented by the cities, it is assumed that the procedures were not carried out since the government's funding occurs only after the registration and reporting of the performed procedures. Consequently, eventual failures in the registration of procedures could underestimate the implants and prosthetic procedures. Thus, the misregistration and lack of data of some locations constitutes a limitation of the present study. However, it is our understanding that such limitation impact also the SUS management and planning and, therefore, specific actions should be made by SUS in order to secure that all cities provide the information to the database. Another important limitation of this study is the lack of sociodemographic data available in DATASUS, since the database does not provide access to patients' medical records, preventing access to data that would be important to our study, such as gender, age range of individuals, type of rehabilitation (unitary, partial or total), number of implants placed in each patient, and clinical aspects, such as the need of reintervention or clinical success. Regarding the type of the rehabilitation, it is important to highlight that SUS have only one general code for implant rehabilitations that does not define whether a single crown or a full-mouth rehabilitation was made. Thus, it is highly recommended that such code must be revised by SUS since the costs of each type of treatment present very different costs and specificities. In this way, we suggest that codes for implant-retained single crowns, implant-retained partial fixed dentures, overdentures and full-arch fixed rehabilitations could be adopted by the SUS.

The findings of this study suggest that the public policies adopted by SUS in the last decade are still far from providing the best treatment option to the population[9,10]. Recent papers by Hartmann et al.[28,29] have found that the incremental costs for full-arch fixed prosthesis compared to overdentures retained by a single implant is not proportional to the respective gain in effectiveness, and that simplified implant treatments for edentulous patients result in favourable outcomes. Considering that, we also suggest the standardization of overdentures retained by a single implant by SUS, considering that it would reduce the costs and provide high-quality services to the population. Finally, new policies and public actions should be made in order to provide this type of treatment for the Brazilian population.

In conclusion, although dental implant therapy is available in SUS across the country, the number of treatments provided in the last decade is still very limited and is also mainly concentrated in the southeastern region of Brazil.

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References

1. Paim J, Travassos C, Almeida C, Bahia L, Macinko J. The Brazilian Health System: history, advances, and challenges. Lancet. 2011 May 21;377(9779):1778-97. doi: 10.1016/S0140-6736(11)60054-8.

2. Pucca GA Jr, Gabriel M, de Araujo ME, de Almeida FC. Ten Years of a National Oral Health Policy in Brazil: Innovation, Boldness, and Numerous Challenges. J Dent Res. 2015 Oct;94(10):1333-7. doi: 10.1177/0022034515599979.

3. Peres MA, Barbato PR, Reis SC, Freitas CH, Antunes JL. [Tooth loss in Brazil: analysis of the 2010 Brazilian Oral Health Survey]. Rev Saude Publica. 2013 Dec;47 Suppl 3:78-89. Portuguese. doi: 10.1590/s0034-8910.2013047004226.

4. Cardoso M, Balducci I, Telles Dde M, Lourenço EJ, Nogueira Júnior L. Edentulism in Brazil: trends, projections and expectations until 2040. Cien Saude Colet. 2016 Apr;21(4):1239-46. doi: 10.1590/1413-81232015214.13672015.

5. Dos Santos MBF, Agostini BA, de Moraes RR, Schwendicke F, Sarkis-Onofre R. Industry sponsorship bias in clinical trials in implant dentistry: Systematic review and meta-regression. J Clin Periodontol. 2019 Apr;46(4):510-9. doi: 10.1111/jcpe.13100.

6. Sarkis-Onofre R, Marchini L, Spazzin AO, Santos MBFD. Randomized Controlled Trials in Implant Dentistry: Assessment of the Last 20 Years of Contribution and Research Network Analysis. J Oral Implantol. 2019 Aug;45(4):327-33. doi: 10.1563/aaid-joi-D-18-00276.

7. da Cunha MC, Santos JF, Santos MB, Marchini L. Patients' Expectation Before and Satisfaction After Full-Arch Fixed Implant-Prosthesis Rehabilitation. J Oral Implantol. 2015 Jun;41(3):235-9. doi: 10.1563/AAID-JOI-D-12-00134.

8. de Lima EA, dos Santos MB, Marchini L. Patients' expectations of and satisfaction with implant-supported fixed partial dentures and single crowns. Int J Prosthodont. 2012 Sep-Oct;25(5):484-90.

9. Ministry of Health of Brazil. [Health Care Secretariat Ordinance n.718, from Dec-12-2010]. Brasilia: Ministry of Health; 2010. Portuguese.

10. Ministry of Health of Brazil. [Health Care Secretariat Ordinance n.398, from Jul-28-2011]. Brasilia: Ministry of Health; 2011. Portuguese.

11. von Elm E, Altman DG, Egger M, Pocock SJ, Gotzsche PC, Vandenbroucke JP, et al. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. Lancet. 2007 Oct 20;370(9596):1453-7. doi: 10.1016/S0140-6736(07)61602-X.

12. Ministry of Health of Brazil. [Resolution Nº 510, from Apr-07-2016]. Brasilia: Ministry of Health; 2016.

13. Ministry of Health of Brazil. Health Unic System. [DATASUS Health Information (TABNET)]. [cited 2020 Mar 19]. Available from: tabnet.datasus.gov.br. Portuguese.

14. Kassebaum NJ, Bernabé E, Dahiya M, Bhandari B, Murray CJ, Marcenes W. Global Burden of Severe Tooth Loss: A Systematic Review and Meta-analysis. J Dent Res. 2014 Jul;93(7 Suppl):20S-28S. doi: 10.1177/0022034514537828.

15. Hammerle CH, Chen ST, Wilson TG Jr. Consensus statements and recommended clinical procedures regarding the placement of implants in extraction sockets. Int J Oral Maxillofac Implants. 2004;19 Suppl:26-8.

16. Mello CC, Lemos CAA, Verri FR, Dos Santos DM, Goiato MC, Pellizzer EP. Immediate implant placement into fresh extraction sockets versus delayed implants into healed sockets: A systematic review and meta-analysis. Int J Oral Maxillofac Surg. 2017 Sep;46(9):1162-1177. doi: 10.1016/j.ijom.2017.03.016.

17. Tyrovolas S, Koyanagi A, Panagiotakos DB, Haro JM, Kassebaum NJ, Chrepa V, et al. Population prevalence of edentulism and its association with depression and self-rated health. Sci Rep. 2016 Nov 17;6:37083. doi: 10.1038/srep37083.

18. Haag DG, Peres KG, Brennan DS. Tooth loss and general quality of life in dentate adults from Southern Brazil. Qual Life Res. 2017 Oct;26(10):2647-57. doi: 10.1007/s11136-017-1587-4.

19. Rosing K, Christensen LB, Øzhayat EB. Associations between tooth loss, prostheses and self-reported oral health, general health, socioeconomic position and satisfaction with life. J Oral Rehabil. 2019 Nov;46(11):1047-54. doi: 10.1111/joor.12836.

20. de Siqueira GP, dos Santos MB, dos Santos JF, Marchini L. Patients' expectation and satisfaction with removable dental prosthesis therapy and correlation with patients' evaluation of the dentists. Acta Odontol Scand. 2013 Jan;71(1):210-4. doi: 10.3109/00016357.2012.654612.

21. Vogel R, Smith-Palmer J, Valentine W. Evaluating the health economic implications and cost-effectiveness of dental implants: a literature review. Int J Oral Maxillofac Implants. 2013 Mar-Apr;28(2):343-56. doi: 10.11607/jomi.2921.

22. Almeida AMR, Gurgel GSCA, Campos CG, Azevedo Guimarães EA. [Access to dental implant osseointegrated in the Unified Health System (SUS): description of the national panorama]. Arq Odontol. 2016;52(3):145-53. Portuguese. doi: 10.7308/aodontol/2016.52.3.03.

23. Chaves SCL, Almeida AMFL, Reis CS, Rossi TRA, Barros SG. Oral Health Policy in Brazil: transformations in the period 2015-2017. Saude Debate. 2018;42:76-91. doi: 10.1590/0103-11042018s206

24. Bueno RE, Moysés ST, Bueno PA, Moysés SJ. [Social determinants and adult oral health in Brazilian state capitals]. Rev Panam Salud Publica. 2014 Jul;36(1):17-23. Portuguese.

25. Neves M, Giordani JMDA, Hugo FN. [Primary dental healthcare in Brazil: the work process of oral health teams]. Cien Saude Colet. 2019 May 30;24(5):1809-1820. Portuguese. doi: 10.1590/1413-81232018245.08892017.

26. Fernandes Jde K, Pinho JR, Queiroz RC, Thomaz EB. Avaliação dos indicadores de saúde bucal no Brasil: tendência evolutiva pró-equidade? [Evaluation of oral health indicators in Brazil: a trend towards equity in dental care?]. Cad Saude Publica. 2016 Feb;32(2):e00021115.

27. Ministry of Health of Brazil. [Technical Note/CGSB/DAB/SAS/MS: Nº 23/ 2017. Information on implantology procedures in SUS]. Brasilia: Ministry of Health; 2017 [cited 2020 Sep 11]. Available from: http://189.28.128.100/dab/docs/portaldab/documentos/nt_cgsb_23_2017.pdf. Portuguese.

28. Hartmann R, Bandeira ACFM, Araújo SC, Brägger U, Schimmel M, Leles CR. A parallel 3-group randomised clinical trial comparing different implant treatment options for the edentulous mandible: 1-year effects on dental patient-reported outcomes and chewing function. J Oral Rehabil. 2020 Aug 9. doi: 10.1111/joor.13070.

29. Hartmann R, de Menezes Bandeira ACF, de Araújo SC, McKenna G, Brägger U, Schimmel M, et al. Cost-effectiveness of three different concepts for the rehabilitation of edentulous mandibles: Overdentures with 1 or 2 implant attachments and hybrid prosthesis on four implants. J Oral Rehabil. 2020 Aug 9. doi: 10.1111/joor.13071.