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ANTERIOR UNITARY EDENTULISM: TREATMENT DECISIONS BY ODONTOSTOMATOLOGISTS IN THE CITY OF MAHAJANGA

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Abstract

Anterior unitary edentulism is the absence of a tooth in the anterior region, which affects patients psychologically. Therapeutics are varied, but odontostomatologists sometimes find it difficult to reach a decision due to various parameters. The aim of this study was to determine the therapeutic decisions made by odontostomatologists in Mahajanga. A descriptive, cross-sectional study was carried out among 50 odontostomatologists in the city of Mahajanga between July 2022 and July 2023. Odontostomatologists registered in the national order who practised dental prosthesis and who agreed to be surveyed were included in this study, and those with incorrectly completed forms and who were not resident in Mahajanga were excluded. The sample was 56.36% male and 43.64% female. Resin partial dentures were the most frequently proposed (100%) and practiced (96%) prosthesis, followed by conventional bridges (32%) and bonded two-wing bridges (14%). This therapeutic decision was significantly related to patients' financial means (p=0.001), strongly related to patient occlusion (p=0.000) and significantly related to practitioners' prosthetic knowledge and skills (p=0.044). Practitioners in Mahajanga had done very little fixed prosthodontics. However, dental implants and cantilever bonded bridges are the most indicated in cases of anterior single-tooth edentulism, as they are tissue-sparing.

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Introduction:-

Anterior unit edentulism is the absence of an anterior sector tooth, usually caused by tooth avulsion due to caries or periodontal problems [1]. Kern M, in 2018, estimated that 3 to 3.5% of adolescents have had an anterior tooth missing [2]. This edentulism poses a major psychological, aesthetic, occlusal and functional problem for patients, given their

strategic position in the smile [3]. It therefore represents an emergency and requires early treatment, a strategy that restores both the aesthetic and functional aspects of the dentition [4].

There are many treatment options available for this clinical situation. In developed countries such as France, fixed and implant-supported prostheses are the preferred treatment for single-tooth edentulism [1]. In contrast, resin prostheses are most commonly used in dental practices in underdeveloped countries, whatever the type of edentulism, according to previous studies [5 ,6].

Today, the French National Authority for Health (HAS) has recommended the use of the cantilever bonded bridge [1], and implant rehabilitation has become the preferred technique for reconstructing a single tooth in the anterior region [7].

However, a number of parameters come into play that can challenge odontostomatologists in their choice of treatment. The aim of this study was therefore to describe the prosthetic treatment decision made by odontostomatologists when faced with an anterior unitary edentulous tooth.

Methodology:-

Study location: this study was conducted in the city of Mahajanga,

Type and period of study : this was a descriptive cross-sectional study conducted over 9 months, from July 2022 to March 2023.

Study population : the study targeted odontostomatologists in the city of Mahajanga practicing in private, public and denominational dental practices.

Inclusion and exclusion criteria

This study included all practitioners registered with the Order who performed dental prostheses and who agreed to the survey. Excluded were those who filled in their survey form incorrectly and who were not resident in Mahajanga.

Data collection and analysis

Some odontostomatologists agreed to fill in the form during our visit, but others asked for time to complete the form properly. The data collected were recorded and filed on the computer using Microsoft Word 2007, then analyzed using the Statistical Package for Social Sciences (SPSS).

Variables studied

In this study, the following parameters were taken into account:

- gender,
- age range,
- sector of exercise,
- year of exercise,
- diploma,
- prosthetic treatment proposal,
- decision-making parameters,
- final therapeutic decision.

Declaration of interests

The authors declare that they have no conflicts of interest in relation to this article.

Results:-

Table I:- Distribution of Odontostomatologists according to socio-demographic profile.

Sociodemographic profile		Effective(n)	Proportion (%)
Gender	Male	30	60
	Feminine	20	40
age range	[20 - 30]	10	20

	[31-40]	12	24
	[41-50]	24	48
	[51-60]	4	08
Practice sector	Private	35	70
	Public	12	24
	Confessional	3	6
Year of exercise			
	10 years and under	18	36
	11 – 20 years	20	40
	21 years and over	12	24
Diploma	General odontostomatologists	26	52
	Specialist odontostomatologists	24	48
	Total	50	100

Table II:- Distribution of odontostomatologists according to the prosthetic treatment proposed to patients.

Proportion of prosthetic treatment	Effective (n)	Proportion (%)
Yes	50	100
No	00	00
If yes		
Implant-mounted prosthesis	41	82
Resin PAP	50	100
Metallic PAP	16	32
Cantilever bonded bridge	8	16
Glued bridge	19	38
Cantilever bridge	7	14
Conventional bridge	39	78

Table III:- Distribution of odontostomatologists according to decision parameters for anterior edentulous units.

Decision Parameters	Yes		No	
	Effective	Proportion (%)	Effective	Proportion (%)
patient related				
Age	22	44	28	56
Condition	24	48	26	52
Smoking	09	18	41	82
Aesthetic demand	42	84	08	16
Financial means	42	84	08	16
Availability and motivation	28	56	22	44
linked to edentulism				
Location	36	72	14	28
Length	25	50	25	50
Height	38	76	12	24
Shape	27	54	23	46
Related to teeth bordering edentulism				
Healthy crown	29	58	21	42
Crown with superficial decay	0	00	50	100
Very dilapidated crown	7	14	43	86
Crown/root ratio	32	64	18	36
Root shape and length	20	40	30	60
Tooth volume	17	34	33	66
Pulp condition	21	42	29	58
linked to the environment of				

teeth bordering edentulism				
Periodontium	28	56	22	44
Occlusal parameters	46	92	4	08
By function	25	50	25	50
related to practitioners				
Knowledge and skill on this prosthesis	33	66	17	34
Lack of technical platform	44	88	6	12

Table IV:- Distribution of odontostomatologists by most frequent final prosthetic solution.

Therapeutic decision	Yes		No	
	Effective	Proportion (%)	Effective	Proportion (%)
Resin PAP	48	96	2	04
Metallic PAP	01	02	49	98
Implant-mounted prosthesis	00	00	50	100
Cantilever bonded bridge	02	4	48	96
Glued bridge	07	14	43	86
Cantilever bridge	01	02	49	98
Conventional bridge	16	32	34	68

Table V:- Distribution of odontostomatologists by most frequent final therapeutic decision and decision parameters.

Decision Parameters		Final treatment decisions						
Patient-related parameters		Resin PAP	Metal PAP	Implant	Cantilever bonded bridge	Bridge glued to two fins	Cantilever bridge	Conventional bridge
		Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No
		n(%) n(%)	n(%) n(%)	n(%) n(%)	n(%) n(%)	n (%) n (%)	n(%) n(%)	n(%) n(%)
Age		20(90.9) 2(9.1)	1(4.5) 21(95.5)	0(0,0) 22(100)	1(4.5) 21(95.5)	6(27.3) 16(72.7) p: 0.017	20(90.9) 2(9.1)	1(4.5) 21(95.5)
Condition		24(100) 0(0,0)	1(4.2) 23(95.8)	0(0,0) 24(100)	2(8.3) 22(91.7)	6(25) 18(75) p: 0.031	24(100) 0(0,0)	1(4.2) 23(95.8)
Smoking		9(100) 0(0,0)	0(0,0) 9(100)	0(0,0) 9(100)	1(11.1) 8(88.9)	6(66.7) 3(33.3) p: 0.000	9(100) 0(0,0)	00(0,0) 9(100)
Aesthetic demand		42(100) 0(0,0) p: 0.001	0(0,0) 42(100) p: 0.021	0(0,0) 42(100)	2(4.8) 40(95.2)	7(16.7) 35(83.3)	1(2.4) 41(97.6)	12(28.6) 30(71.4)
Financial means		42(100) 0(0,0) p: 0.001	1(2.4) 41(97.6)	0(0,0) 42(100)	2(4.8) 40(95.2)	6(14.3) 36(85.7)	1(2.4) 41(97.6)	12(28.6) 30(71.4)
Availability and motivation		28(100) 0(0,0)	0(0,0) 28(100)	0(0,0) 28(100)	1(3.6) 27(96.4)	6(21.4) 22(78.6) p: 0.088	1(3.6) 27(96.4)	8(28.6) 20(71.4)
Related to edentulism								

Location		35(97.2) 1(2.8)	1(2.8) 35(97.2)	0(0,0) 36(100)	2(5.6) 34(94.4)	7(19.4) 29(80.6)	1(2.8) 35(97.2)	11(30.6) 25(69.4)
Length		25(100) 0(0,0)	1(4) 24(96)	0(0,0) 25(100)	1(4) 24 (96)	6(24) 19(76) p: 0.042	1(4) 24(96)	9(36) 16(64)
Height		38(100) 0(0,0) P: 0.010	1(2.6) 37(97.4)	0(0,0) 38(100)	1(2.6) 37(97.4)	6(15.8) 32(84.2)	1(2.6) 37(97.4)	12(31.6) 26(68.4)
Shape		26(96.3) 1(3.7)	1(3.7) 26(96.3)	0(0,0) 27(100)	1(3.7) 26(96.3)	6(22.2) 21(77.8)	1(3.7) 26(96.3)	10(37) 17(63)

Table VI:- Distribution of Odontostomatologists according to the most frequent final therapeutic decisions and the parameters linked to the teeth bordering the edentulous and to the environment of the teeth bordering the edentulous.

Decision Parameters		Final treatment decisions						
linked to teeth bordering edentulism		Resin PAP	Metal PAP	Implant	Cantilever bonded bridge	Glued bridge	Cantilever bridge	Conventional bridge
		Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No
		n(%) n(%)	n(%) n(%)	n(%) n(%)	n (%) n (%)	n(%) n(%)	n(%) n(%)	n(%) n(%)
Healthy crown		29(100) 0(0,0)	0(0,0) 29(100)	0(0.0%) 29(100)	2(6.9) 27(93.1)	6(20.7)23(79.3)	1(3.4) 28(96.6)	7(24.1) 22(75.9)
Superficial carious crown		0(0,0) 50(100)	0(0,0) 50(100)	0(0,0) 50(100)	0(0,0) 50(100)	0(0,0) 50(100)	0(0,0) 50(100)	0(0,0) 50(100)
dilapidated crown		6(85.7) 1(14.3)	0(0,0) 7(100)	0(0,0) 7(100)	0(0,0) 7(100)	1(14, 3) 6(85,7)	0(0,0) 7(100)	7(100) 0(0,0) p: 0.000
Crown/root ratio		32(100) 0(0,0)	0(0,0) 32(100)	0(0,0) 32(100)	1(3.1) 31(96.9)	6(18.8)26(81.2)	1(3.1) 31(96.9)	9(28.1) 23(71.9)
Root shape and length		20(100) 0(0,0)	0(0,0) 20(100)	0(0,0) 20 (100)	1(05) 19(95)	6(30) 14(70) p: 0.008	1(05) 19(95)	10(50) 10(50) p: 0.026
Tooth volume		17(100) 0(0,0)	0 (0.0) 17(100)	0 (0.0) 17(100)	1(5.9)16 (94.1)	6(35.3)11(64.7) p: 0.002	1(5.9)16(94.1)	8(47.1) 9(52.9)
Pulp condition		20(95.2) 1(4.8)	0 (0.0) 21(100)	0 (0.0) 21 (100)	2 (9.5)19(90.5) p: 0.090	6(28.6)15(71.4) p: 0.012	1(4.8)20(95.2)	9(42.9)12(57.1)
linked to the environment of the teeth bordering the edentulous area								
Periodontium		28(100) 0(0,0)	1(3.6) 27(96.4)	0(0,0) 28(100)	2(7.1) 26(92.9)	6(21.4)22(78.6)	1(3.6) 27(96.4)	1(3.6) 27(96.4)
Occlusal parameters		46(100) 0(0,0) p: 0.000	1(2.2) 45(97.8)	0(0,0) 46(100)	2(4.3) 44(95.7)	6(13) 40(87)	1(2.2) 45(97.8)	13(28.3) 33(71.7)
Parafunction		25(100) 0(,0)	0(0,0) 25(100)	0(0,0) 25(100)	2(8) 23(92)	6(24) 19(76) p: 0.042	1(4) 24(96)	8(32) 17(68)

Table VII:- Distribution of odontostomatologists according to the most frequent final therapeutic decisions and parameters linked to practitioners.

Final treatment decisions							
Related parameters to practitioners	Resin PAP	Metal PAP	Implant	Cantilever bonded bridge	Glued bridge	Cantilever bridge	Conventional bridge
	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No
	n(%) n(%)	n(%) n(%)	n(%) n(%)	n(%) n(%)	n(%) n(%)	n(%) n(%)	n(%) n(%)
Knowledge and skill on this prosthesis	33(100) (0.0) p: 0.044	1(3) 32(97)	0(0,0) 33(100)	2(6.1) 31(93.9)	7(21.2) 26(78.8) p: 0.041	1(3) 32(97)	10(30.3) 23(69.7)
Lack of knowledge and skills on other types of prostheses	8(88.9) 1(11.1)	1(11.1) 8(88.9) p: 0.031	0(0,0) 9(100)	0(0,0) 9(100)	0(0,0) 9(100)	0(0,0) 9(100)	3(33.3) 6(66.7)
Lack of technical platform for other solutions	42(95.5) 2(4.5)	1(2.3) 43(97.7)	0(0,0) 44(100)	1(2.3) 43(97.7)	7(15.9) 37(84.1)	1(2.3) 43(97.7)	16(36.4) 28(63.6)

Discussion:-

Sociodemographic profiles (table I)

Our study population consisted of 50 odontostomatologists in the city of Mahajanga, with a male predominance of 60%. These results are in agreement with a study carried out in Côte d'Ivoire in 2020, which reported a male-female ratio of 1.9 [8].

The 41-50 age group was the most represented (48%), with an average age of 45. The same result was found in a study published in February 2024, where the average age of odontostomatologists in Antananarivo and Fianarantsoa was 44.5 years [9].

Over half the clinicians (70%) worked in the private sector and 12% in the public sector. These results differ from those observed in Ouagadougou in 2018, where 50% of clinicians worked in the public sector [5]. This difference could be attributed to the low salaries of civil servant odontostomatologists in Madagascar, which encourages them to prefer independent work in private practice.

The majority of respondents (40%) had between 11 and 20 years' experience. The same result was reported in Burkina Faso in 2018 [5].

1. Forty-eight percent (48%) of odontostomatologists were specialists. Fall Medina et al, on the other hand, reported 6% of practitioners specializing in prosthetics [5]. This difference is justified by the fact that the proportion of specialists in this study encompasses all specialties in odontostomatology.
2. Decision-making parameters in the choice of therapy (table III)

When a maxillary incisor is lost, there are a number of treatment options available to the patient. These need to be considered in the light of the patient's many decision-making parameters [10].

In this study, patients' financial means (84%) and aesthetic requirements (84%) were the most important factors considered by odontostomatologists in their choice of treatment. Patients experience anterior edentulism as a "handicap" due to the aesthetic prejudice it causes, and as a source of social withdrawal, both professionally and personally [11]. Thus, aesthetic demands are often the main reason for consultation in cases of anterior single-tooth edentulism, influencing the choice of materials used [12]. The patient's wishes and financial means must therefore be discussed and fully understood by practitioners [1].

Location (72%) and coronal height (76%) in relation to the root, as well as occlusion (92%) were also taken into account by odontostomatologists in their treatment decisions. These parameters are the main criteria for evaluating the abutment tooth in fixed prosthetics [13] and, according to the French Health Authority (Haute Autorité de la Santé), the coronal height of the abutment(s) is the main factor to be evaluated before making cantilever bridges in the mandibular anterior region. Furthermore, the definitive loss of the anterior organ will have as its main consequence occlusal problems: wedging, guiding and centring functions [1]. Consideration of the healthy state of the teeth in the choice of treatment was also noted (58%). Indeed, performing peripheral preparations on healthy teeth is considered too mutilating, leading to a loss of chance for the patient. A bridge on living teeth could have multiple side-effects, including pulpitis, necrosis and abscesses [14].

Practitioners' knowledge and skills in removable resin partial dentures (66%), their lack of knowledge of other types of prostheses such as bridges and implant-supported prostheses (18%) and the lack of technical equipment, particularly for implant-supported prostheses (88%), were also taken into account by practitioners in their choice of treatment. Several studies have cited the lack of technical facilities, the cost of materials and incompetence as obstacles to the fabrication of implants and fixed prostheses [15,16].

Proposal and final therapeutic decision

The study revealed that all odontostomatologists had offered prosthetic treatments to patients with anterior unit edentulism (Table II), among which resin partial dentures (100%) were the most commonly chosen (Table IV). The same results were reported by Fall et al, in 2018 and 2019 for patients with anterior single-unit edentulism [5,17]. This prosthesis is a solution for anterior single-tooth edentulism, but is not recommended as it damages adjacent teeth and their periodontium. In addition, the clasps will be visible, compromising aesthetics [14]. According to sekele IB, resin PAP is detrimental to oral health and uncomfortable for the patient because it is bulky and unsightly [18]. In developed countries such as France, fixed prostheses and implants have been prioritized over removable prostheses for this type of edentulism [1].

This choice is significantly related to the patient's financial means ($p=0.001$), strongly related to the patient's occlusion ($p=0.000$) and significantly related to the practitioner's knowledge and skills in this area ($p=0.044$) (Tables V, VI and VII). In many African countries, financial constraints have been the most frequent reason for choosing the provisional resin partial denture [7], and are an obstacle to patient access to the best available treatment [5].

As far as fixed prostheses are concerned, the practice in the dental office was low when faced with an anterior edentulous single tooth (Table IV).

Thirty-two percent of odontostomatologists (32%) chose conventional bridgework in this study, and this decision was strongly significantly related to decayed abutment teeth ($p=0.000$). This means that odontostomatologists in the city of Mahajanga respected the current concept of minimally invasive dentistry and only performed this type of prosthesis on dilapidated abutment teeth. Nevertheless, this type of prosthesis was the most costly in the long term compared with implants and bonded bridges [19]. Conventional bridgework was also the first fixed prosthetic treatment (26.50%) performed in Ouagadougou for an anterior edentulous single tooth [5].

Fourteen percent (14%) opted for a conventional bonded bridge to correct anterior edentulism. This choice correlated significantly with age, patient general condition, pulpal status and practitioner knowledge of this type of prosthesis, with p values ranging from 0.012 to 0.042 (Tables V and VII). A highly significant relationship was also found between the choice of this type of prosthesis and smoking, with $p = 0.000$ (Table V). The technique is not very mutilating, but it does present a fairly high risk of detachment. In fact, in the case of a bridge with 2 bonded wings, the differential mobility of the teeth bordering the edentulous area implies stresses on the wings that can lead to partial detachment [20]. Advances in knowledge of bonding materials and significant tissue savings make this a

solution not to be overlooked [1]. Bonded bridges (cantilever or multi-supported) are even better placed than implants according to the study by Antonarakis GS et al [19], and the use of this type of prosthesis in the treatment of anterior single-tooth edentulism is not new [21,22].

Only 4% of odontostomatologists decided to compensate for edentulism with a cantilever bonded bridge, and no implant treatment was found. The reasons for this practice were inadequate financial means, lack of mastery of implant fabrication techniques and lack of technical equipment, but no significant statistical difference was found (Tables V and VII). Kalala et al (11) in the Democratic Republic of Congo reported that the practice of implantology is not common for reasons linked to the cost of prosthetic restoration and patients' low purchasing power [23]. According to Fall M et al, the indication for implant-supported prosthetics appears to be statistically related to professional experience [5]. It is worth noting that today, dental implants and cantilever bonded bridges are increasingly popular prosthetic solutions for single-unit anterior edentulism, due to their tissue-sparing nature and high success rates (92 to 100% at 10 years), as shown by several studies [24-27]. The cantilever bonded bridge is the first choice for children and adolescents with single-tooth edentulism [28], while implant prosthetics in the aesthetic anterior zone is recommended for older patients (25 years), as it could lead to major functional and aesthetic problems, such as loss of the anterior guide or unsightly neckline formation resulting from implant infra-positioning in young growing patients [29].

Conclusion:-

Anterior unitary edentulism, or the absence of an anterior tooth, is a widespread condition with a wide range of therapeutic solutions. However, the choice can be complex in some situations, and it is necessary to determine what compromises are acceptable to compensate for this missing tooth. Thus, this study was carried out to describe the therapeutic decision-making of odontostomatologists in Mahajanga when faced with the loss of a single anterior tooth.

Faced with a case of anterior edentulism, all odontostomatologists in Mahajanga offered their patients all types of dental prosthesis. However, resin partial dentures were the most frequently chosen treatment. Fixed prostheses were rare, and no practitioner performed dental implants in this situation. The patient's financial means, respect for tissue economy, the patient's occlusion, the lack of technical facilities and the practitioner's competence in the type of prosthesis were all taken into account in this decision.

It is therefore essential to develop continuing education for healthcare professionals to enhance their therapeutic skills. What's more, we need to guarantee patients easy access to prosthetic care, thanks to a high-performance health insurance system.

References: -

1. High Authority for Health (HAS). (2016) : Evaluation of extended plural prostheses (cantilever bridges) and glued plural prostheses (glued bridges). No. ISBN 978-2-11-139138-3,112 pages.
2. Kern M. (2018) : Single-retainer resin-bonded fixed dental prostheses as an alternative to orthodontic space closure (and to single tooth implant).Quintessence int, 49(10):10.
3. Philip-A C. (2016) : Treatment of agenesis of the maxillary lateral incisors. Medicine,13(40):0-3.
4. Zitzmann NU et al. (2015) : Resin bonded restorations: a strategy for managing anterior tooth loss in adolescence. J Prosthesis Bump.;113:270-6.
5. Fall M, Ouédraogo Y, Millogo M, Diarra AA, Ouattara S, Konsem T. (2018) : management of single edentulism in dental practices in the city of Ouagadougou. Rev Col Odonto-Stomatol Afr Chir Maxillo-fac,25(2):46-51.
6. Samake MSN, Togora S, Diawara O, Sidibe T, Ba A, Bautra B. (2020) : Prosthetic treatment needs in adult patients admitted to dental consultation at the csref of commune i of the district of Bamako. Théschir Dent; univ of Bemako, Mali. 109 pages.
7. Alexandra W. (2019) : Factors of aesthetic failure during an anterior single implant restoration: books,164.
8. Kouadio K. (2020) : Place of implant-supported restorations in prosthetic therapies in Ivory Coast: Survey carried out among dental surgeons in the Abidjan district [thesis]. Abidjan: department of prosthetics and occlusodontics UFR odontostomatology, Félix Houphouët-Boigny University, 22.31-6.

9. Lalanirina GL, Alijaona DF **,** Razanadraisoa A, Andrianasolo VV, Ranaivo JM, Randrianarivony J et al. (2024) : CAD/CAM (Computer-Aided Design and Manufacturing) fixed prosthesis: current situation in Madagascar. IJO Journals, 07(02):12-26.
10. Muller C. (2016) : The glued cantilever bridge: clinical cases and orthodontic considerations . The Orthodontist. December, 5(5):20-5.
11. Mackenzie L. (2017) : Replacement of missing teeth based on minimal mutilation: part one. Cosmetic Dentistry: Minimally Invasive Treatments :193-255.
12. Amani S, Kouakou N, Bamba A, N'Guessan K, Konan D, Assi K. (2006) : Update on the approach to the practice of metal prosthesis in Ivory Coast: survey carried out among one hundred (100) dental surgeons in the city of Abidjan: Rev Col Odonto-Stomatol Afr Chir Maxillo- fac,13(1): 24-27.
13. Cassandre P. Evaluation of abutment teeth in prosthesis: Human medicine and pathology; September 28, 2018. https://dumas.ccsd.cnrs.fr/dumas-01880407
14. Cerutti M. The bonded cantilever bridge: an alternative for cases of single anterior edentulism. Surgery. 2018. dumas-02044819
15. Razanadraisoa A, Ratsimandresy NN, Lalanirina GL, Andrianasolo VV, Andrianinarivo RG, Rabarijaona HSN, Ranjarisoa LN, Ralaiarimanana LFE. (2022): knowledge, attitudes and therapeutic practices of prosthetic implants for total edentulism of odontostomatologists in Mahajanga. ROSMEL, 22:01-09.
16. Pesson DM et al. (2018) Knowledge and practices of supraimplant prosthesis in Ivory Coast: survey among dental surgeons in Abidjan. Rev. IV. Odonto-Stomatol, 20(1):49-56.
17. Fall M, Sawadogo A, Ouédraogo Y, Diarra AA, Ouédraogo S. (2019) : Wearing prostheses: survey in dental practices in the city of Ouagadougou. Rev Col Odonto-StomatolAfrChirMaxillo-Fac, 26(1):29-34.
18. Faye D, Kanoute A, Seck MT, Diouf AA. (2012) : Accessibility to innovative care technologies in Africa: case of implantology in Senegal. Cah. Public health,11(1):54-64.
19. Antonarakis GS, Prevezanos P, Gavric J, Christou P. (2014): Agenesis of maxillary lateral incisor and tooth replacement: cost-effectiveness of different treatment alternatives. Int J Prosthodont, 27(3):257-63.
20. Sasse M, Kern M. (2014): Survival of all-ceramic anterior cantilever resin-bonded zirconia ceramic fixed dentures. J Dent, 42:660-3.
21. Tirlet G, Attal JP. (2015) Bonded cantilever glass-ceramic bridges reinforced with lithium disilicate: reasons for choice and clinical implementation. Clinical Realities, 26(1):35-46.
22. El Ouali R, El Figuigui L, Zouhair I, El Yamani A. (2014): The therapeutic challenge in the maxillary anterior region: about a case. AOS, 270:24-30.
23. Kalala EK, Mantshumba MA, Vuysteke P, Vinckier F, Kumpanya NP, Bobe PA, Sekele IB, Bolenge IJ, Lutula PJ, Ntumba MK. (2014) : Dental implantology at the Kinshasa University Hospital. African Annals of Medicine, 7(4):73-77.
24. Kern M, Passia N, Sasse M, Yazigi C. (2017) : Ten-year outcome of zirconia ceramic cantilever resin-bonded fixed dental prostheses and the influence of the reasons for missing incisors. J Dent, 65:51-5.
25. Botelho MG, Chan AW, Leung NC, Lam WY. (2016) : Long term evaluation of cantilevered vs fixed-fixed resin bonded fixed partial dentures for missing maxillary incisors. J Dent, 45:59-66.
26. Huttig F, Klink A. (2016): Zirconia-based anterior resin-bonded single-retainer cantilever fixed dental prostheses: a 15- to 61-month follow-up. Int J Prosthodont, 29(3):284-6.
27. Uraba, et al. (2017) : Biomechanical behavior of adhesive cement layer and periodontal tissues on the restored teeth with zirconia RBFDPs using three-kinds of framework design: 3D FEA study, J Prosthodont Res, 62(2):227-33.
28. Williams S, Albadri S, Jarad F. (2011) : The use of zirconium single-retainer, resin-bonded bridges in adolescents. Dent Update, 38(10):706-10.
29. Kern M. (2018) : Single-retainer resin-bonded fixed dental prostheses as an alternative to orthodontic space closure (and to single-tooth implants). Quintessence international prosthodontics, 49(10):789-98.