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Economic and Financial Impact of the COVID-19 Pandemic on Private Dental Clinics in Yaoundé Cameroon

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ABSTRACT

Background: The COVID-19 pandemic has had significant economic and financial repercussions on private dental clinics worldwide, particularly in low-income African countries where few studies have been conducted on the subject. Objective: To assess the economic and financial impact on private dental clinics in the city of Yaoundé before, during, and after the COVID-19 pandemic. Methods: A descriptive, retrospective cross-sectional study was conducted in 20 private dental clinics in the city of Yaoundé. Data were collected and analyzed using SPSS version 26.0 and Microsoft Excel 2016. Results were presented as frequencies, percentages, and means in tables and graphs. Fisher's exact test was used at a fixed significance level of 5%. Results: The study sampled 20 private dental clinics. While the average annual volume of services dropped substantially in 2020 by 43.7% and 40.9% in comparison of 2018 and 2019 respectively, they slightly improved from 2021. The average annual revenues dropped by 50.4% and 45.3% as compared to the years 2018 and 2019 respectively. The overall financial revenues were lower in 2020 representing 15.8% of cumulative overall total five years' total revenues compared to 21.5% in 2018 and 20.5% in 2019, while the financial revenues increase to 19.7% in 2021 and 22.5% in 2022. Conclusion: The economic and financial impacts were mainly due to declines in business volume, reduced revenue due to lower attendance, the need for new investments, and adaptation strategies to address the COVID-19 pandemic crisis. Public authorities should provide financial support to dental practices during health crises.

Keywords: Economic and financial impacts, private dental clinic, COVID-19, Yaounde-Cameroon.

INTRODUCTION

In December 2019, the appearance of a new strain of the Severe Acute Respiratory Syndrome Coronavirus 2 (SARSCoV-2) named the coronavirus disease 2019 (COVID-19) was identified in Wuhan City, Hubei Province, China [1]. In March 2020, COVID-19 was declared a global pandemic by the World Health Organisation (WHO), representing a major global public health challenge in all countries [2, 3] with its spread through direct transmission via droplet inhalation, cough, sneeze, or via aerosol-generating procedures (AGPs), and contact transmission through oral, nasal, and eye mucous membranes [4, 5]. While all health care professionals are at the highest risk of contracting the COVID-19 from their contacts with patients or co-workers [6, 7], the treating dentists are more vulnerable to exposure from pathogenic bacteria and viruses that infect the oral cavity and respiratory tract [8]. Dentists usually closed to their colleagues and patients are considered one of the high-risk category health professionals [9]. In the dentistry settings, the transmission mode of COVID-19 is through airborne inhalation and touch through contaminated surfaces [9, 10] as well as oral manifestations of burning mouth syndrome-like symptoms, loss of taste, and smell are essential for dentists as they might see patients with these complaints [11, 12] further intensifies the risk of dentists getting infected because of the nature of their works [13, 14]. Moreover, dental treatment carries the risk of cross-infection from infection-causing pathogens between the patient and the oral health care provider. The generation of splatter and aerosols during dental procedures and proximity between patient and health worker pose a risk of airborne respiratory infections [15]. Similarly, handling of sharps and contact with the patient's blood and saliva can transmit blood/ saliva borne infections. Considering the risk of airborne transmission of SARS CoV-2 through aerosols, the risk of cross-infection through dental treatment is potentially high [16]

All over the world, as well as in Africa and in Cameroon, the COVID-19 pandemic has brought major challenges on social, economic and working conditions as a result of the government's regulations and policies of social distancing, forced business closures, periods of isolation, fear and anxiety of likely becoming ill, together with the decrease in economic activity, loss of income and doubt over the future and all the changes in workplaces and the way work activities are carried out in the new restricted social and economic environment [2, 3, 17]. Dental practices have been seriously affected in different ways by the impact of the COVID-19 pandemic, including at the volume of their healthcare provided, economic and financial performance, since many dental practices had limited services by offering only emergency care and virtual consultations and allowing remote communication with their patients or were temporary closed in order to slow the spread of the virus; therefore, many patients used to delay their usual consultations, check-ups and dental case management [18 - 20]. During the COVID-19 pandemic, both sides of the dentist-patient relationships were affected, thereby adding on an unfavorable influence and an indirect impact on the economic burden as well as the short and middle terms financial impact on dental practices [16, 21 - 23]. While the operational challenges could be relatively well contained by public healthcare structures due to the mobilization of state resources, the situation of private structures such as dental practices should be much more complex economically [24]. Practicing as a private dental surgeon means being both a caregiver, but also a human resources director and an administrative and financial manager.

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However, the overall economic impact of COVID-19 pandemic on the dental practices, would vary across different settings and countries. The international literature showed that in the United States of America, revenues of the dental practices decreased by 6%, in 2020, according to analyzes based on the average revenues from the dental practices from 2019-2020 [25] while in Belgium the cost for treating a dental patient increased with 10-30 EUR and an additional time spend from 10 to 30 minutes was reported for the treatment of each patient during the pandemic [26]. In France, one of the consequences of this crisis was the cessation of practice and the closure of dental practices as a health precautionary measure, decreed by the National Order of Dental Surgeons, while providing them with replacement fee subsidies by the government [27]. In Africa, during a survey conducted in Morocco by Jaafar Mouhyi et al in 2020, 99.57% of dentists felt that their professional activities had been impacted by the coronavirus pandemic, this impact being financial for 49% of respondents [28]. In Africa and particularly in Cameroon, there are the scarcity of data on the economic impact of the COVID-19 on the private dental practice as they did not attract specific measures and economic incentives to mitigate the effects of the pandemic. Since the field of research on this important subject being incompletely explored, this study proposed to conduct this research on the economic and financial impact of the COVID-19 pandemic on the private dental practices in the city of Yaoundé, Cameroon.

METHODS

A retrospective cross-sectional descriptive study was conducted during seven months, from November 1, 2022, to May 31, 2023, and the data collected covered a five-year period, including 2018 to 2022 fiscal years. The study site was the city of Yaounde, where several private dental clinics are located and the number of which has grown considerably in recent years. Ethical clearance approval was obtained from the Institutional Ethics Committee of the Faculty of Medicine and Biomedical Sciences of the University of Yaounde I (Ref. No. 0013/UYI/FMSB/VDRC/DAASR/CSD of 6th February 2023).

The study purposely sampled 20 private dental clinics distributed in the nine health districts of the city of Yaoundé namely Biyem-assi, Cité verte, Odza, Mvog-ada, Djoungolo, Efoulan, Nkolbisson, and Nkolndongo. The sampling was non-exhaustive and consecutive, including private dental clinics whose managers had given their informed consent, those recognized by the National Order of Dental Surgeons, and having operated during the period from 2018 to 2022. Excluded from our study were private dental clinics whose records were not correctly or completely completed, and those without duly completed patient files. At each dental clinic sampled for the study, an interview was conducted with the different managers using a questionnaire.

The study's questionnaire was not adopted from any previous research and was designed entirely by the investigators. All the study team's members reviewed an initial draft of the questionnaire for critical feedback regarding the content, clarity, and presentation. The initial draft of the questionnaire was piloted on a sample of 2 private dental clinics to gather suggestions and comments to improve the clarity, content, and validity of the revised final questionnaire. The study's questionnaire was divided into six domains. The first concerned with a short introduction of the questionnaire which indicated that no personal information was required and data will be kept strictly confidential. Managers of participating private dental clinics were informed of the study objectives, and their participation was purely

voluntary. Managers of participating private dental clinics read and signed an informed consent notice before participating in this study's survey. The second domain contained information about the participating private dental professional qualifications and socio-demographic details, including years of experience and practice. The third domain targeted the participating private dental clinic's staffing, year of opening and the he operating during the COVID-19 pandemic. The fourth domain concerned about the average patient's flow and dental services and care offered as well as their costs during the years 2018 throughout 2022. The fifth domain covered the main aspects in relation to the use of online dentistry practice, new investments, questions assessing the effect of COVID-19 on the staff and the difficulty faced to pay salary to staff, followed by questions related to changes made in practice in response to COVID-19, questions on economic and financial impact of COVID-19 on their dental practice. The sixth domain addressed the questions of insurance covering the private dental clinics during the COVID-19 pandemics in the Cameroon.

At the beginning of each interview, a participant information form on the study was shared with all participating private dental clinics including: the research topic, the objective of the study, the location of the study, the duration of the study, the procedure used to conduct the study, the advantages and disadvantages related to the study. The research team was willing to respond to any additional information necessary for a better understanding. They were then offered an informed consent form and the contacted manager was able to either approve or decline the request to participate. After each approval for participation, allowing us to include the private dental clinic, the research questionnaire was administered for this research purpose, and then the various patient files were analyzed, from which the various data were collected, spanning from 2018 to 2022.

Data were computed into Microsoft Excel (Microsoft Corp, Redmond, WA). Qualitative categorical variables were expressed as counts or frequencies (n) and percentages (%) and were analyzed using Fisher's exact test. Quantitative variables were presented as mean and standard deviation or median and interquartile range, depending on the data distribution. Financial data on revenue were estimated according to different current market fee-for-service charged for different dental services/care provided by private clinics from various sources (users' out-of-pocket payment, private insurance and employed-based schemes and other cost-recovery mechanisms). Statistical analysis was performed using SPSS (Statistical Package for Social Sciences) version 26.0 software. The significance level was set at $p \leq 0.05$ for all tests.

RESULTS

Description of the Professional and Socio-Demographic Profile of the Private Dental Clinics

The study targeted and approached 33 private dental clinics to participate in the study, of which 7 refused to participate in the study, 6 were excluded due to lack or insufficient information. Thus, the study involved a sample of 20 private dental practices distributed across the 8 health districts of the city of Yaoundé. The participating private dental clinics' professional and socio-demographic data, including the year of opening, the manager's qualifications and professional status and gender, age of manager and years of practice, are shown in Table 1 and Table 2. Out of the total of 20 private dental clinics, 50% were operating before 2020, the year where the COVID-19 outbreak was declared the global public health concerns.

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Table 1: Frequency and percentage (%) for answers of the questions about professional and socio-demographic details of private dental clinics in Cameroon

Characteristics	n	*Frequency (%)*	*Cumulative frequency (%)*
Year of opening of the dental clinic			
- ***Before 2020***	10	50	50
- ***2020***	3	15	65
- ***2021***	4	20	85
- ***2022***	3	15	100
Professional status of the manager			
- Dental doctor's owners of the clinic	15	75	75
- Dental doctor' employed of the clinic	5	25	100
Gender of the manager			
- Female	12	60	60
- Male	5	40	100

All private dental clinics that were established before and during the pandemic were operational during the COVID-19 pandemic. The managers of private dental clinics were dental doctors of which three-quarters were the owners or promoters of the dental practices in the sample (n=15; 75%), and the remaining holding the employees status were dental doctors recruited to work in these private clinics, and 60% of these managers were women (n=12). The managing dental doctors were registered with the National Order of Dental Surgeons of Cameroon. The average age of managers was 37 years (half of them were under 33 at the time of data collection). In terms of years of practice, the average was 10 years, and half of these private dental practitioners had at least 7 years of dental practice.

Table 2: Age and years of experience of the dental doctors at private clinics

Variables	Staff	Average	Minimum	Maximum	1st Quartile	Median
Age	20	37.70	27.00	60.00	29.50	33.50
Number of years of practice	20	10.65	2.00	30.00	4.00	7.00

Economic Impact on the Volume of Services/Care Delivered by Private Dental Clinics Before, During and After the Outbreak of the COVID-19 Pandemic

The volume of services delivered showed that in Yaounde the private dental clinics are primarily small-sized businesses operated across all the health districts. The results in table 3 indicated that the COVID-19 pandemic negatively impacted the volume of dental services and care provided by the private dental clinics in Yaounde, where it emerged that the most impacted ones were consultations, simple fillings, X-rays, scaling and extractions, as shown in Table 3.

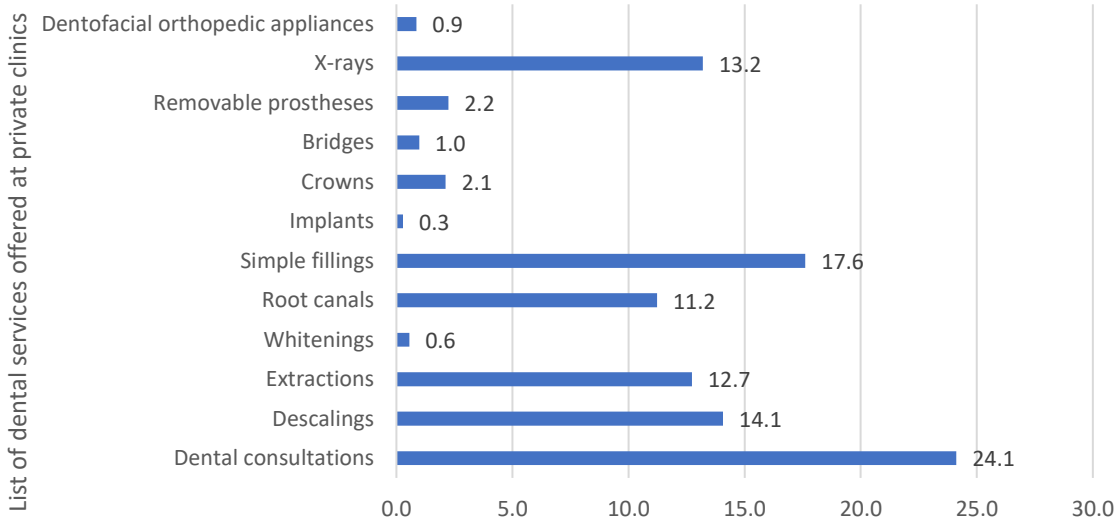
Table 3IComparison of total volume of services provided by private dental clinics between 2018 and 2022

Dental services and care delivered by private dental clinics	Years					
	2018 n=10	2019 n=10	2020 n= 13	2021 n=17	2022 n=20	Total of five years
Number of consultations	3106	2920	2389	2883	3316	14614
Number of descalings	1792	1716	1349	1731	1941	8529
Number of extractions	1674	1537	1243	1543	1715	7712
Number of whitenings	93	78	36	52	76	335
Number of root canals	1416	1472	1094	1302	1517	6801

Number of fillings	2325	2219	1676	2056	2400	10676
Number of implants	50	40	18	31	36	175
Number of crowns	345	281	161	231	268	1286
Number of bridges	149	135	64	113	134	595
Number of removable prostheses	315	281	172	263	325	1356
Number of x-rays	1671	1628	1285	1611	1808	8003
Number of Dentofacial orthopedic appliances	116	116	60	106	127	525
Total annual volume	**13,052**	**12,423**	**9,547**	**11,922**	**13,663**	**60,607**

The trend in the average services provided between 2018 and 2022 showed a much more pronounced drop in activity between 2018 and 2020, which tended to increase in 2021 and 2022 (see Figures 1 and 2 and Table 4).

Figure 1: Percentage (%) of the overall five years 2018-2022 total dental services offered in private clinics, Yaounde, Cameroon



Data from Figure 1 shows the comparison of the service provision in the private dental clinic over the period of five years with the consultations being approximately 1/5 following by simple fillings, descalings, x-rays, extractions, root canals and so on. In 2020, the volume of private dental services declined substantially over the five year-period of 2018-2022 as shown in Figure 2.

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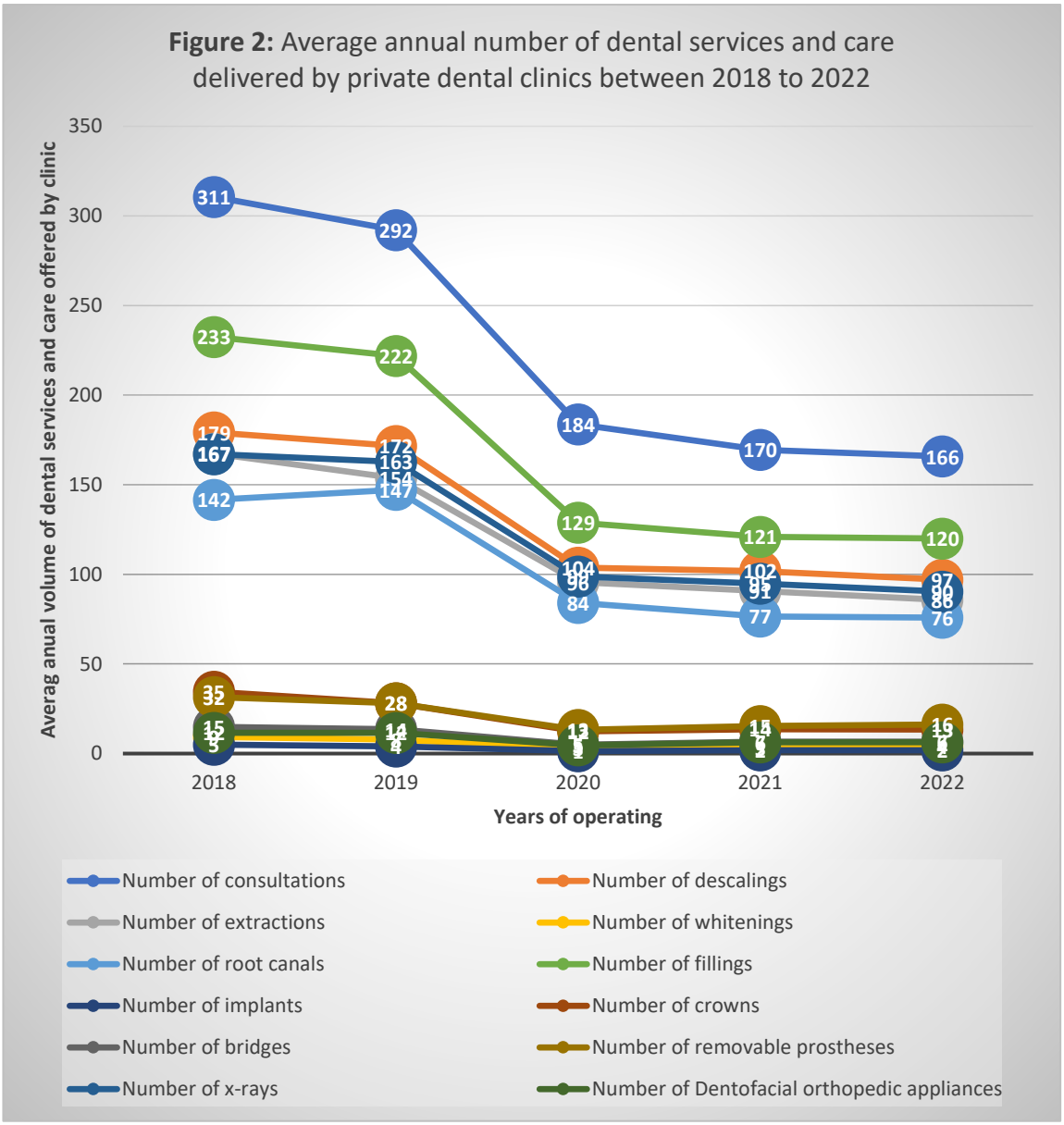

Figure 2: Trend in the evolution of average services provided between 2018 and 2022

Overall, the results from Figure 3 and Table 4 showed that comparing to 2018 and 2019, in average the total annual volume of services and care provided by the private dental clinics dropped substantially in 2020 by about 43.7% and 40.9% respectively. While when comparing now with their overall performance of dental service provision in 2020, these drops in volume of services/care provided by the private dental clinics were slightly improved to negative levels of 4.5% and 2.6% in 2021 and 2022 respectively. The 2020-level of decline in the delivery's performance of private dental clinics varied considerably between different types of dental services ranging from very high drop of 72.3% of number of implants (as compared to 2018) and 64.5% of number of whitenings (as compared to 2019) to the very low level of drops of about 37.1% of number of dental consultations (as compared to 2019) and 40.6% of number of root canals. Meanwhile as compared to the year 2020 of COVID-19 pandemic, some improvements were observed in 2021 and 2022 with the high increase in the average annual

volume of dental services/care of about plus 35.1% and 35.0% of number of ODF devices and of bridges respectively in 2021 and about plus 24.2% of the number of whitenings in 2022.

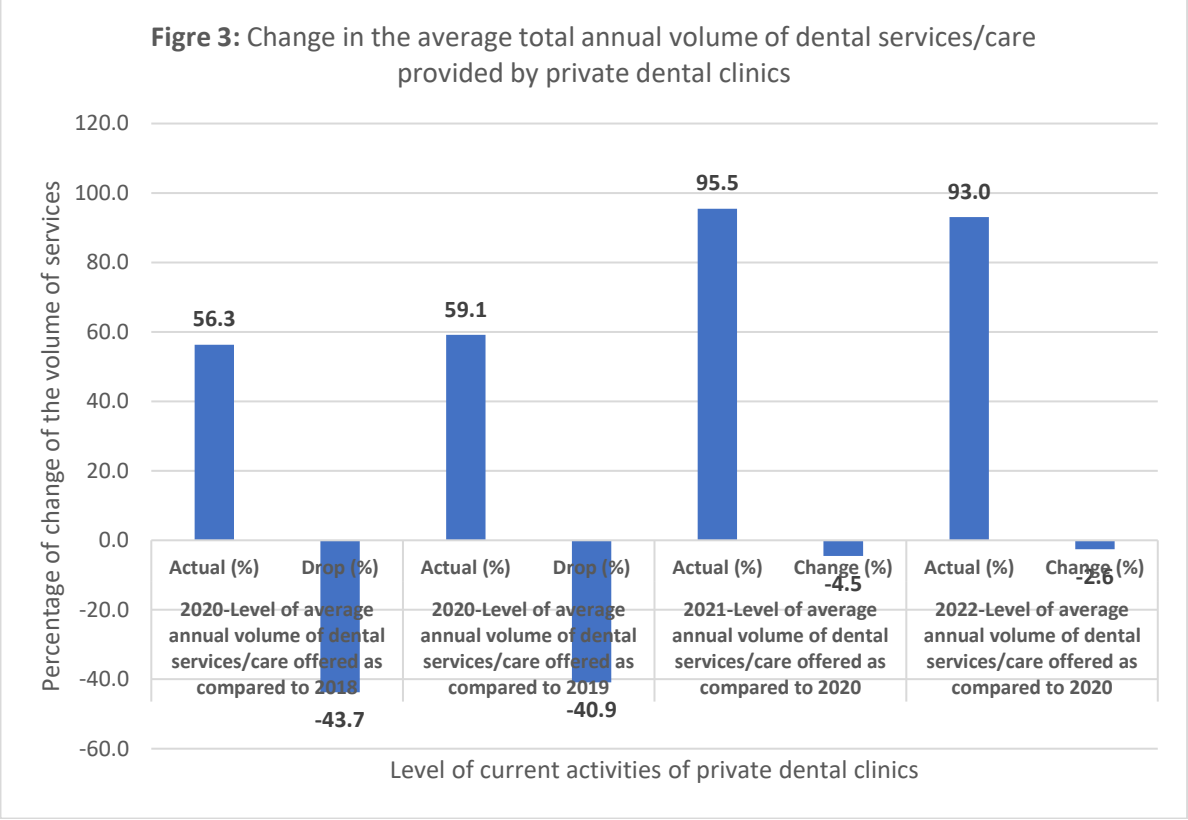

Table 4: Percent evolution of the level of average total annual volume of dental services/care of private clinics in 2020 as compared to 2018, 2019, 2021 and 2022 in Yaounde, Cameroon

Average total annual numbers of dental services/care provided	2020-Level of average annual volume of dental services/care offered as compared to 2018		2020-Level of average annual volume of dental services/care offered as compared to 2019		2021-Level of average annual volume of dental services/care offered as compared to 2020		2022-Level of average annual volume of dental services/care offered as compared to 2020	
	Actual (%)	Drop (%)	Actual (%)	Drop (%)	Actual (%)	Change (%)	Actual (%)	Change (%)
Number of dental consultations	59.2	-40.8	62.9	-37.1	92.3	-7.7	90.2	-2.2
Number of descalings	57.9	-42.1	60.5	-39.5	98.1	-1.9	93.5	-4.7
Number of extractions	57.1	-42.9	62.2	-37.8	94.9	-5.1	89.7	-5.5
Number of whitenings	29.8	-70.2	35.5	-64.5	110.5	10.5	137.2	24.2
Number of root canals	59.4	-40.6	57.2	-42.8	91.0	-9.0	90.1	-1.0
Number of fillings	55.5	-44.5	58.1	-41.9	93.8	-6.2	93.1	-0.8
Number of implants	27.7	-72.3	34.6	-65.4	131.7	31.7	130.0	-1.3
Number of crowns	35.9	-64.1	44.1	-55.9	109.7	9.7	108.2	-1.4

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Number of bridges	33.0	-67.0	36.5	-63.5	135.0	35.0	136.1	0.8
Number of removable prostheses	42.0	-58.0	47.1	-52.9	116.9	16.9	122.8	5.0
Number of x-rays	59.2	-40.8	60.7	-39.3	95.9	-4.1	91.5	-4.6
Number of Dentofacial orthopedic appliances	39.8	-60.2	39.8	-60.2	135.1	35.1	137.6	1.8
Average total annual volume of dental services/care offered	**56.3**	**-43.7**	**59.1**	**-40.9**	**95.5**	**-4.5**	**93.0**	**-2.6**

Financial Impact on the Revenue of Private Dental Clinics Before, During and After the COVID-19 Pandemic

The private dental clinics have experienced unprecedented declines in revenue during the COVID-19 pandemic. Overall, the revenues dropped from the two precedent years with XAF 51, 226, 811 (US$ 85,378) in 2018 and XAF 46,414,444 9US$77,357) in 2019 to the low level of XAF 25, 408, 378 (US$42,347) in 2020, the year of the COVID-19 pandemic. The declines in the revenues concerned all dental services/care offered by the private dental clinics in Yaounde, as shown in Table 4 and Table 5. Little improvements were observed with relative low increase of revenues to XAF 30,789,922 (US$51,317) and XAF 32,682,244 (US$54,470) in 2021 and 2022 respectively. Despite the recovery from 2021, the average level of 2018 had not yet been reached. Thus, during the COVID-19 pandemic year of 2020, as shown in Figure 3 the average total annual revenues of private dental clinics dropped by 50.4% and 45.3% as compared to the years 2018 and 2019 respectively. With regards to different dental services/care, during the COVID-19 pandemic year of 2020, the high level of declines was observed in the revenues generated from implants with 65.6% and 56.4% as compared to 2018 and 2019 respectively, while the low level of declines concerned the revenues from the consultations with 31.3% and 19.7% as compared to 2018 and 2019 respectively. After the COVID-19 pandemic year of 2020, the revenues of private dental clinics increased by 21.2% and 28.6% in 2021 and 2022 respectively. In terms of services, the bridges, following by divitalizations, implants, crowns and dentofacial orthopedic appliances contributed respectively more to the cumulative overall five years' revenues of private dental clinics as shown in Figure 4 and table 5 below:

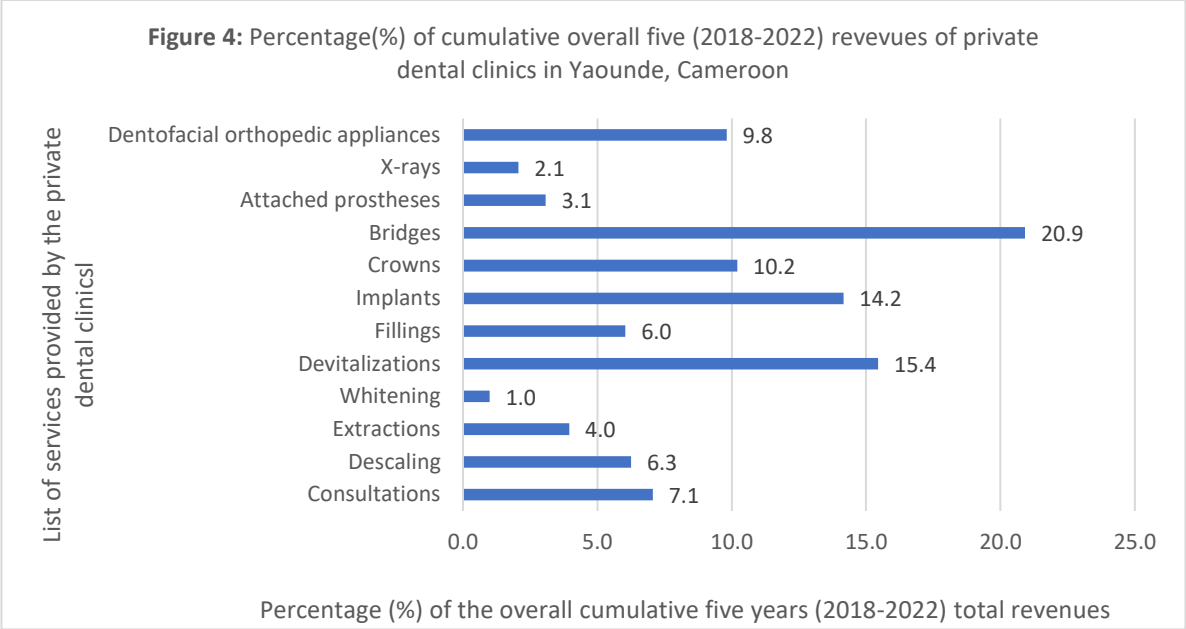

Figure 4: Percentage(%) of cumulative overall five (2018-2022) revevues of private dental clinics in Yaounde, Cameroon

Table 5: Financial impact on the revenue of private dental clinics before during and after the COVID-19 pandemic in Yaounde, Cameroon (1US$ = XAF600)

Revenue on dental services/care	2018 (n=10)		2019 (n = 10)		2020 (n = 13)		2021 (n = 17)		2022 (n = 20)	
	XAF	US$	XAF	US$	XAF	US$	XAF	US$	XAF	US$
Consultations	3,363,000	5,605	2,877,000	4,795	2,311,000	3,852	2,336,000	3,893	2,286,000	3,810
Descaling	2,745,000	4,575	2,638,900	4,398	1,882,000	3,137	2,176,900	3,628	2,221,500	3,703
Extractions	1,901,900	3,170	1,744,800	2,908	1,194,700	1,991	1,303,500	2,173	1,238,200	2,064
Whitening	582,000	970	488,000	813	216,000	360	264,000	440	310,000	517
Devitalizations	683,3500	11,389	7,148,500	11,914	4,703,000	7,838	4,898,000	8,163	5,231,000	8,718
Fillings	2,795,800	4,660	2,660,300	4,434	1,782,900	2,972	1,955,300	3,259	2,078,600	3,464
Implants	8,875,000	14,792	7,000,000	11,667	3,050,000	5,083	3,600,000	6,000	3,887,500	6,479
Crowns	5,685,000	9,475	4,590,000	7,650	2,400,000	4,000	3,060,000	5,100	3,300,000	5,500
Bridges	11,175,000	18,625	10,125,000	16,875	4,425,000	7,375	6,525,000	10,875	6,750,000	11,250
Attached prostheses	1,614,500	2,691	1,437,500	2,396	676,000	1,127	899,000	1,498	1,120,000	1,867
X-rays	928,333	1,547	904,444	1,507	634,444	1,057	677,778	1,130	709,444	1,182
Dentofacial orthopedic appliances	4,727,778	7,880	4,800,000	8,000	2,133,333	3,556	3,094,444	5,157	3,550,000	5,917
Average Total Annual revenues	51,226,811	85,378	46,414,444	77,357	25,408,378	42,347	30,789,922	51,317	32,682,244	54,470

Data from Figures 5 and 6 shows that the comparison of financial revenues between 2018-2022. The results shows that the financial revenues were lower in 2020 representing 15.8% of cumulative overall total five years' total revenues compared to 21.5% in 2018 and 20.5% in 2019, while the financial revenues increase to 19.7% in 2021 and 22.5% in 2022. On the other hand, the financial revenues drops to 50.4% in 2020 as compared with 2018 and a drop to 45.3% as compared with 2019 as shown in Figure 6.

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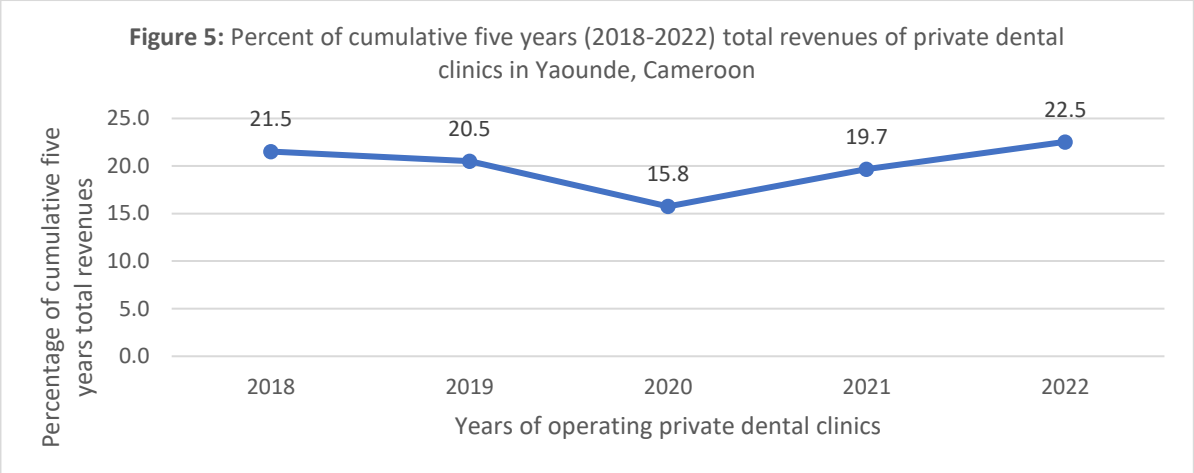

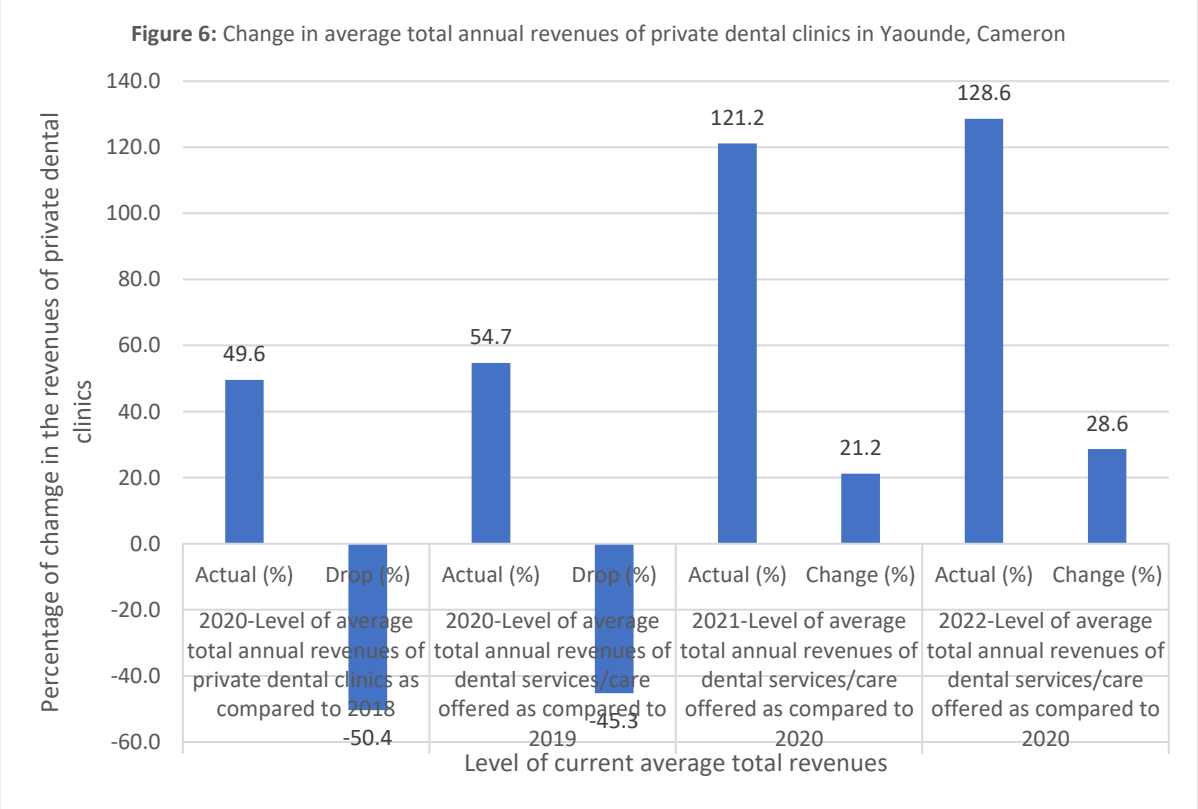

Table 6: Percent evolution of average total annual revenues by type of service for all private dental clinics in Yaounde in 2020, 2021 and 2022.

	2020-Level of average total annual revenues of private dental clinics as compared to 2018		2020-Level of average total annual revenues of private dental clinics as compared to 2019		2021-Level of average total annual revenues of private dental clinics as compared to 2020		2022-Level of average total annual revenues of private dental clinics as compared to 2020	
	Actual (%)	Drop (%)	Actual (%)	Drop (%)	Actual (%)	Change (%)	Actual (%)	Change (%)
Consultations	68.7	-31.3	80.3	-19.7	101.1	1.1	98.9	-1.1

Descaling	68.6	-31.4	71.3	-28.7	115.7	15.7	118.0	18.0
Extractions	62.8	-37.2	68.5	-31.5	109.1	9.1	103.6	3.6
Whitening	37.1	-62.9	44.3	-55.7	122.2	22.2	143.5	43.5
Devitalizations	68.8	-31.2	65.8	-34.2	104.1	4.1	111.2	11.2
Fillings	63.8	-36.2	67.0	-33.0	109.7	9.7	116.6	16.6
Implants	34.4	-65.6	43.6	-56.4	118.0	18.0	127.5	27.5
Crowns	42.2	-57.8	52.3	-47.7	127.5	27.5	137.5	37.5
Bridges	39.6	-60.4	43.7	-56.3	147.5	47.5	152.5	52.5
Attached prostheses	41.9	-58.1	47.0	-53.0	133.0	33.0	165.7	65.7
X-rays	68.3	-31.7	70.1	-29.9	106.8	6.8	111.8	11.8
Dentofacial orthopedic appliances	45.1	-54.9	44.4	-55.6	145.1	45.1	166.4	66.4
Total Dental services	**49.6**	**-50.4**	**54.7**	**-45.3**	**121.2**	**21.2**	**128.6**	**28.6**

Further understanding of the distribution of the revenues over the years 2018 throughout 2022 used the Gini index to assess the disparity of revenues across the private dental clinics in Yaounde. Indeed, the Gini index is a measure of statistical dispersion used to represent revenue inequality within the sample of private dental clinics. Gini index has a value between 0 and 1, with 0 representing perfect equality (every private dental clinic has slightly the same revenue) and 1 representing perfect inequality (few clinics had all the revenues). Data in Figure 7 show a higher Gini index of 0.75 in 2018 and 2019 before the outbreak of the COVID-19 pandemic thereby indicating greater inequality in the revenues, while a lower value of 0.28 or/and 0.34 in 2020 suggests a more equitable distribution of revenues among the private dental clinics in Yaounde during the COVID-19 pandemic. Hence, the private dental clinics faced the same proportional declines in their revenues during and after the COVID-19 pandemic as the Gini index less than 0.4 indicates that the revenue distribution is relatively equal, while a value of 0.75 before 2020 would suggest a much higher level of revenue inequality.

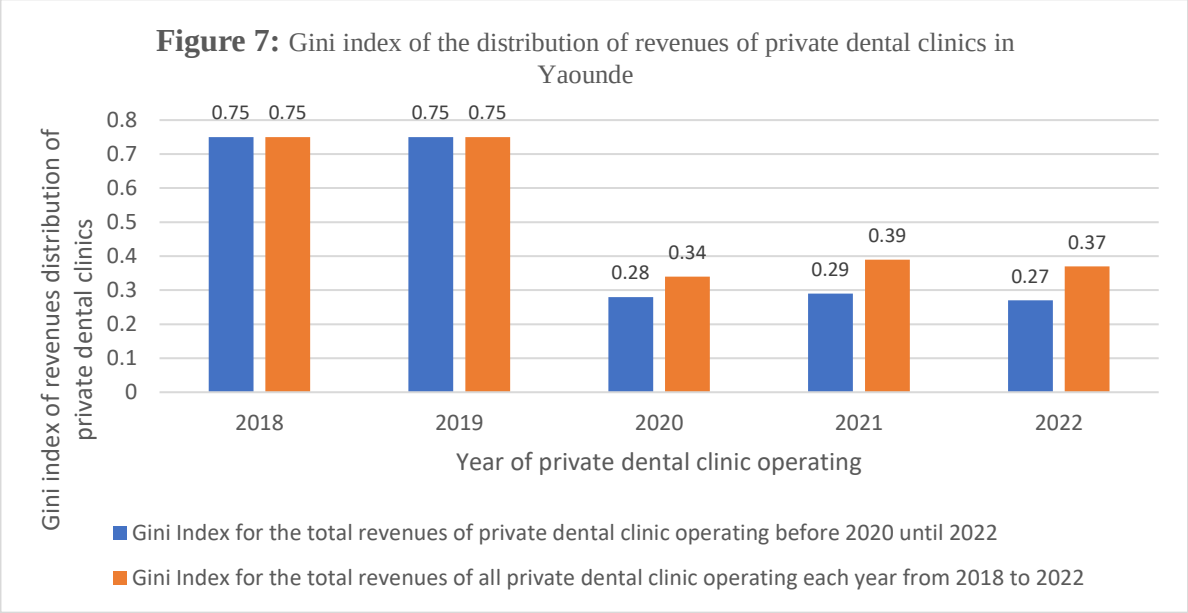

Figure 2*:* Gini index of the distribution of revenues of private dental clinics in Yaounde, Cameroon

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Economic Adaptation Strategies of Private Dental Clinics During the Covid-19 Pandemic

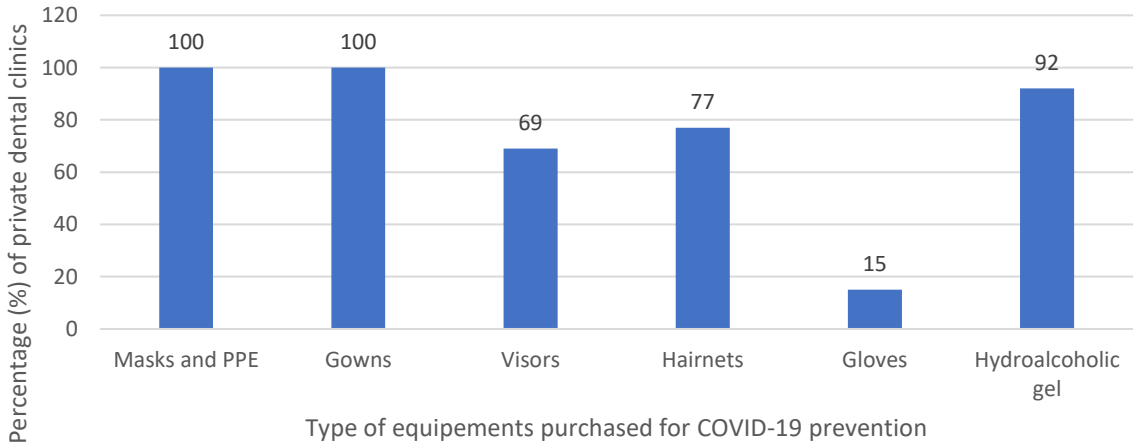
Of the 13 practices operating during the pandemic, it was noted that more than half (n=9; 69%) had used teleconsultations fairly frequently. It was also noted that online monitoring was used by the same proportion of practices, albeit infrequently for a third of them as shown in Table 7.

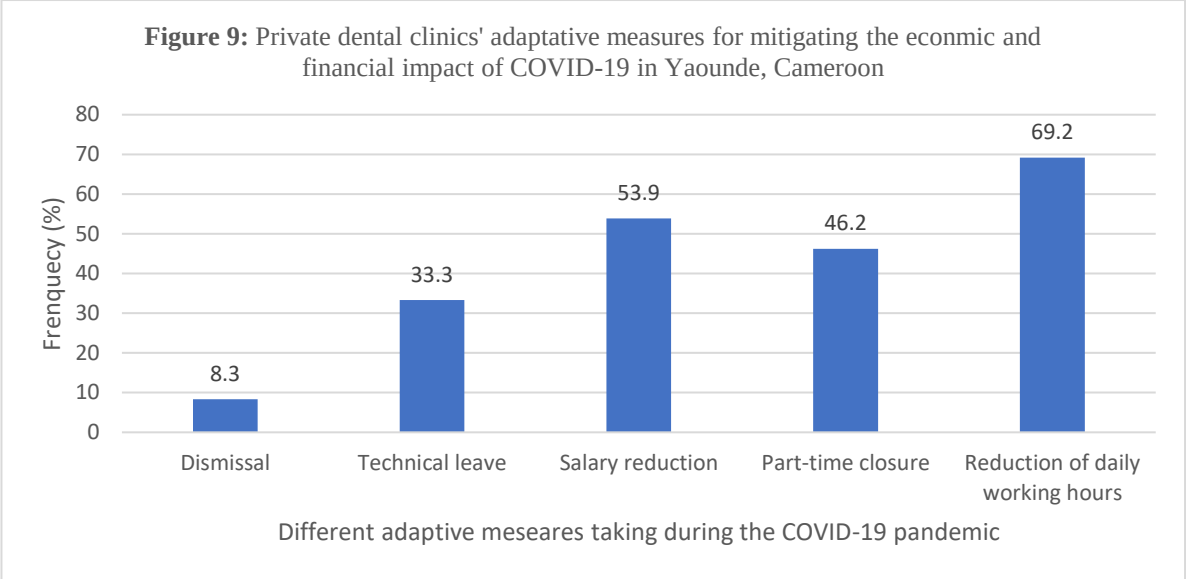
Table 7: Proportion of recourse to teleworking during the COVID-19 pandemic

Variables & modalities	Number clinics	Frequency (%)
Teleconsultations		
Yes	9	69,23
No	4	30,77
Frequency of use of teleconsultation		
Very frequently	3	33,33
Frequently	5	55,56
Rarely	1	11,11
Online patient monitoring during the pandemic		
Yes	9	69,23
No	4	30,77
Frequency of use of online patients' tracking		
Very frequently	4	44,44
Frequently	2	22,22
Rarely	2	22,22
Very rarely	1	11,11

In terms of investment in protective equipment made during the pandemic, masks and others personal protective equipment, gowns and hydroalcoholic gels, following by hairnets and visors were the equipment that received the most investment (Figure 8). In addition, faced with the shock caused by the COVID-19 pandemic, economic adaptation strategies had been put in place to limit the impact of the crisis on activity, in particular the review of daily working hours downwards, the reduction of salaries and the temporary closure of offices which were the most adopted measures (Figure 9).

Figure 8: Proportion of private dental clinics by type of additional investisment in equipments made during the COVID-19 pandemic in Yaounde





The adaptive measures included a downward review of daily working hours (69% of private dental clinics, with a preference for 2 to 5 hours of reduced daily work), a reduction in salaries (54% of private dental clinics, ranging from 20% to 50% reduction) and the temporary closure of firms (46% of firms) as shown in Table 8.

Table 8: Proportion of private dental clinics according to the economic adaptation strategies used during the COVID-19 pandemic, in Yaounde, Cameroon

Variables & modalities	Number of private dental clinics	Frequency (%)
Reduction applied to salaries		
-50%	3	42,86
-30%	2	28,57
-20%	2	28,57
Number of days closed		
Less than 10 days	5	83,33
Between 21 to 30 days	1	16,67
Reduced number of working hours		
Less than 2 hours per day	3	33,33
Between 2 to 5 hours per day	6	66,67

Moreover, in terms of support, it was noted that apart from one private dental clinic (5%) that had benefited from financial support from the National Social Security Fund (NSSF) and two private dental clinics (10%) that had been supported by associations, the public subsidies from the government through the ministry of public health as well as support from the national order of dental surgeons were non-existent for the private dental clinics to mitigate the economic and financial impact of the COVID-19 pandemic in Cameroon. Most private dental clinics had to resort to loans without credit facilities from banks, in order to bear the losses resulting from the COVID-19 pandemic. Regarding the desired subsidies, the main ones, in order of preference, were material support, technical support and financial support.

With regards to the participation of insurance companies in the operation of private dental clinics, it emerged that only 32% of the sampled private dental clinics declared themselves

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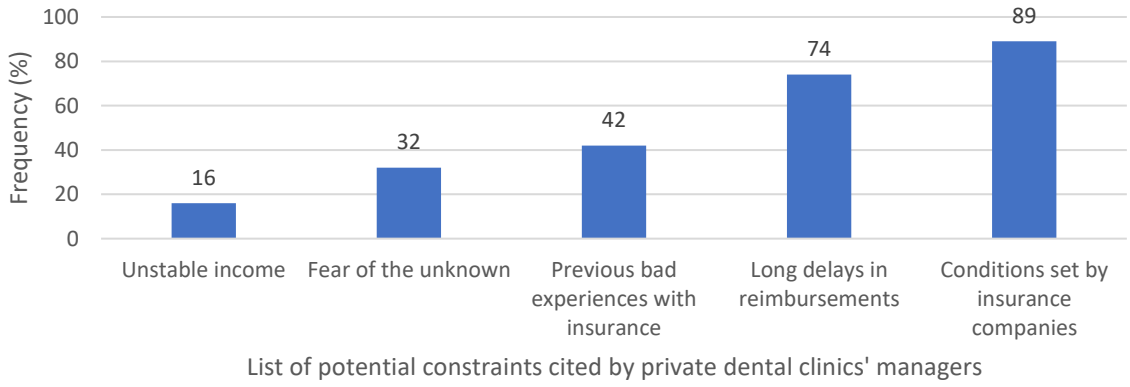
insured, most of whom had been so insured before 2018. For just over half of the insured private dental clinics, the type of insurance they had subscribed to was limited liability insurance. The premium brackets were less than or equal to XAF 500,000 (US$833.3) for 57% of private dental clinics. However, it should be noted that only one private dental clinic was able to benefit from support from their insurer during the COVID-19 pandemic. As for those who were uninsured, the reasons given were multiple, and it was noted that in more than half (53.9%) of the uninsured private dental clinics, the insurance was considered uneconomical. However, regarding the implementation of insurance to cover losses in times of crisis, all the practices surveyed found the initiative to be a good one; 37% and 42% respectively said they were willing to pay an insurance premium ranging from XAF100,001 to XAF 200,000 (US$166.7 to US$333.3) and XAF 200,001 to XAF 500,000 (US$333.4 to US$833.3). The advantages of such insurance, according to 74% of respondents, would be its ability to protect private dental clinics, and 37% of private dental clinics would consider its ability to anticipate the economic consequences of a possible future health crisis. Moreover in terms of constraints to its implementation, it was noted that 89% of private dental clinics cited the conditions set by the insurance company, 74% cited the delay in reimbursements and 42% cited previous bad experiences with insurance companies as shown in Figure 10.

Figure 10: Possible constraints on the establishment and membership of an insurance company by private dental clinics in Yaounde



DISCUSSION

During the COVID-19 pandemic it was not possible to accurately estimate or predict the short-, medium-, or long-term economic and financial impact on private dental clinics in Africa. The current study was then planned with the aim of measuring and analyzing the economic and financial impact of the COVID-19 pandemic on private dental clinics in Yaounde, Cameroon, with special emphasis on the performance of service delivery and the revenues of private dental clinics in the city of Yaoundé before, during and after the COVID-19 pandemic. To the best of our knowledge, this is the first study conducted on the economic and financial impact of COVID-19 on private dental private clinics Cameroon, and especially to highlight the delivery's performance (volume or quantity of activities) and revenues generated by the private dental clinics. In this section, the results of the study are synthesized along with key remarks and possible explanations of the observed findings, compared with the relevant other results discussed in light of the international literature. The discussion ends with few suggestions aiming to possibly enhance the economic and financial resilience for the development of private

dental clinics during the future potential systemic and structural crises affecting the overall health system.

Professional and Socio-Demographic Profile of the Private Dental Clinics

During the years 2018, 2019, 2020, 2021 and 2022, there was a slightly increase in the number of private dental clinics that demonstrated economic and financial activities. In the study settings in 2018 and 2019, the recorded number of private dental clinics was 10, which rose to 13 in 2020, to 17 in 2021 and to 20 in 2022. This evolution of the private dental clinics operating before, during and after the COVID-19 pandemic contrasted with the finding of a Romania study in Bucharest that reported a reduction in the number of private dental practices that demonstrated financial activity during the years 2019, 2020 and 2021 [3]. This can be explained by the fact that this Yaounde's study focuses on the private dental clinic as an institution or organization while the Bucharest's study targeted the individual private dental practices. Hence, a total of 20 private dental clinics participating in the study spread across the 8 health districts of the city of Yaoundé. They employed dental practitioners all registered with the National Order of Dental Surgeons. Half (50%) out of 20 private dental clinics opened and operated before 2020, while about 65% and 85% carried out business activities during the COVID-19 pandemic in 2020 and the year after in 2021 respectively and all private dental clinics operated in 2022. All the private dental clinics created before and during the pandemic had been operational during it. This could be due to the lack of subsidies in the event of closure, and the lack of guaranteed income insurance and the lack of pre-established salaries like those of civil servants in the same field, forcing practitioners to continue practicing in order to meet their various essential needs, at the risk of contracting and spreading the virus.

The dental doctors owned about 75% of private dental clinics and 25% were employees managing of the business. Thus, it emerged that 3/4 of the managers were promoters of the private dental clinics. The female dental doctor's predominance (60%) with a sex ratio of 0.66 in favor of women. This trend could be explained by the current feminization of professions in the medical field in Cameroon, and their great preference for practicing in an urban environment. This finding is consistent with a previous study in Galicia, Spain which found that about 60.8% of women managing dental clinic with a sex ratio of 0.64 in favor of female [2] as well as the finding of an India's study which found that in dental clinics, females were relatively more than males (55.5% vs 44.5%) [16]. The average age of the dental doctors managing the private clinics was 37.7 years (half of them were under 33.5 years at the time of study) with ages ranging from 27 to 60 years, which is brought non consistence of the results reported by a previous which found the average age of 48 +/- 10.30 years, with ages ranging from 26 to 82 years [2]. This could be explained by the fact that this study included young graduates who, due to the lack of direct recruitment to the civil service, worked mainly in the private dental clinics. In terms of years of practice, the average was 10.65 years, with the years of practice experience ranging from 2 to 30 years and the median of 7 years. These findings are consistent with a study carried out in Poland which found that the number of years of experience less than or equal to 10 years was the most represented with 47.9% [29]. The findings also aligned with another study which found that the average age of dental practices with activity in 2019 was 11.9 ± 8.25 years with a median of 9 years (interquartile range: 5-18 years), most of the dental practices having a company age higher than 10 years (45.7%), or between 5 to 10 years (35.3%)[3]. This could be explained by the large number of young dental practitioners recently trained in the

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same city who have not been recruited into the public sector thereby moving to practice in the private sector.

The Evolution of the Volume of Dental Services Offered by the Private Clinics Between 2018-2022

By analyzing data from Table 3 comparison of the volume of dental services/care performed between and across 2018-2022, it emerged that the most important provision for the overall five cumulative volume was concerned consultations, simple fillings, x-rays, scaling and extractions. This could be explained by the fact that these procedures are those most frequently performed in general practice dental practices, due to their relatively affordable cost. Data from Figures 1 and 2 show that by comparing to 2018 and 2019, in average the total annual volume of services and care provided by the private dental clinics dropped substantially in 2020 by about 43.7% and 40.9% respectively. These findings are in line with the results of other studies which found that the year 2020 saw the largest decline in dental services due to the rapidly spreading COVID-19 pandemic, which exposed the unpreparedness of healthcare systems worldwide as following the recommendations of leading medical and dental societies, the private dental practices restricted their services to emergency care only during the period of the pandemic [30], thereby resulting in a drastic reduction in the number of patients admitted during this period [31]. Similar findings were found in Poland who experienced a significant decrease in the number of patients treated weekly compared to before the COVID-19 pandemic [29]. The decrease in patient numbers during the lockdown has also been reported by dental services in Switzerland and Liechtenstein [23]. The significant patient decline was also reported in a Norwegian study where twice as many patients were treated by telephone compared to routine clinical care [33]. The decline in the volume of services provided was also reported from China where numerous public dental hospitals stopped the elective treatment of patients and only offered emergency treatment [34]. During the pandemic period, it was reported the reduction of the number of appointments with patients in dental clinics [35, 36]. A nationwide survey carried out in Brazil, indicated that this reduction in patients seen weekly was significantly greater in public dental clinics (38.7±18.6) than in private ones (22.5±17.8) [35]. Another study in Spain regarding the economic and health-care impact of COVID 19 on public and private dental practices found that 86% of participants reported seeing up to five patients per week considering the existing recommendations to treat only urgent situations during the national state of alarm [37]. The COVID-19 period clearly affected the number of endodontic patients which was lower for 66% of the dental clinics and only 20.3% of dental clinics reported "business as usual" regarding patient numbers [21]. According to a study conducted in Japan, 46.7% of the dental clinics reported a decrease in the number of patients, in agreement with the current study results [38]. The findings of this study could be explained by the overall reluctance of patients to attend health facilities during the pandemic year of 2020, due to the fear of contracting the virus, especially since in the dental office, one is in direct contact with saliva, which considerably increases the risk of being infected with COVID-19. Despite the recovery that began in 2021, the volume of services achieved in 2022 was below that of 2018. It appeared that opening the private dental clinics during a health crisis had hampered the development and deployment of their activities. This could be due to the economic crisis that followed the COVID-19 pandemic, as well as the overall increase in the price of dental equipment and consumables due to the border closures of certain supplier countries.

Comparison Financial Trends of Private Dental Clinics Before, During and After the COVID-19 Pandemic in Yaounde, Cameroon

The COVID-19 pandemic had a substantial financial impact on private dental clinics in Yaounde, Cameroon. The comparison of financial revenues between 2018-2022 indicates that the financial revenues were lower in 2020 representing 15.8% of cumulative overall total five years' total revenues compared to 21.5% in 2018 and 20.5% in 2019, while the financial revenues increase to 19.7% in 2021 and 22.5% in 2022. On the other hand, the financial revenues drops to 50.4% in 2020 as compared with 2018 and a drop to 45.3% as compared with 2019. These findings are consistent with the results of previous studies which indicated that the unavoidable consequence of the COVID-19 pandemic has been the impact on the financial status of professionals as a result of reduced activities with fewer daily appointments and higher investments in adapting to a new clinical environment with new preventive protocols [2]. These findings are also consistent with an Egyptian's study which found that about 77.3% of dental clinics reported the pandemic's negative financial impact on their endodontic practices, with 44% reporting a more than 50% drop in revenue and about 90% of dental clinics anticipated a decrease in income by continuing the COVID-19 pandemic [21]. In the same line, the COVID-19 pandemic lockdown led to a decline in the utilization of all services of more than 70%, accompanied by mean revenue losses of approximately 15–19% for both public and private insurance as well as additional payments for special treatments [22]. The findings of another study conducted in Iraq showed that the revenues of desntists decreased by about half for 75% of participating patients while the economic losses in dental clinics amounted to about 50% due to reduced working days, rescheduling of appointments to see only emergency cases, lack of government support, adaptation to practice modification and reduction of overall income [39], confirming the results for Switzerland [40]. In addition, a study of Polish dentists highlighted the negative impact on the economic aspect [29], while an Indian's study reported a considerable impact on financial concerns with both emotional and professional repercussions [41]. However, many international studies because of being very different to ours in terms of the number of dental clinics and age, do not reflect the economic reality that appears in this study, with very different figures. A German's study found that dental clinics with 1 to 4 practitioners were less affected by the economic impact of COVID-19 compared to larger dental clinics, with personnel expenses being the largest cost element at 40% and the increase in the average monthly cost of materials due to the COVID-19 pandemic [42]. Another study in Spain found that almost 60% of the dental clinics had experienced an estimated decrease in income of between 1,000 and 10,000 euros [43], which may not be aligned with our study findings with a slightly different figures of a decrease in revenues of private dental clinics in 2020 as compared to 2018 and 2019. It is probably that these differences in the ranges of revenues decrease could be justified by the fact that the various fees charged and costs of dental surgeries across different settings with different progressively increased fees and costs throughout the successive waves during the COVID-19 pandemic. Moreover, the changes brought by the COVID-19 pandemic that affected the private dental clinics' activity have directly and indirectly influenced their economic status; as some previous authors have indicated, the revenue stream was a significant predictor of burnout during the COVID-19 pandemic [17].

However, the private dental clinics in Yaounde, have started to improve their activities in 2021. Despite this emerging recovery from 2021, the average level of revenue from 2018 had not yet been reached as compared to the 2020 pandemic's year, the private dental clinics' revenues

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increased by 21.2% and 28.6% in 2021 and 2022 respectively and these figures were still lower than the overall decreased level of revenues about 50.4% and 45.3% in 2020 as compared to the previous years 2018 and 2019 respectively. These findings corroborate with a previous study results which pointed out that the private dental practices have revived their activity starting from 2021 with turnover and revenue stream that were significantly lower in 2020 compared to 2021, ($p<0.001$), the profit was higher in 2021 when compared with 2020 ($p<0.001$) and the performance of the companies measured in Turnover/Number of Employees (T/E) was higher in 2021 when compared to 2020 [3].

Economic Adaptation Strategies of Private Dental Clinics During the Covid-19 Pandemic

The COVID-19 pandemics witnessed some economic adaptive strategies by private dental clinics in Yaounde. The results of this study showed that private dental clinics adapted various changes to their management ranging from patient screening and scheduling, investment in clinic infrastructures and personal protective equipment, reorganizing the human resources' management and constraints and opportunities of having insurance coverage during the health crisis like the COVID-19 pandemic. The teleconsultation and online monitoring were adopted by about 69.3% of private dental clinics among which 88.9% and 66.7% frequently use them for dental patient's management and monitoring respectively. These findings were not in agreement with a previous study which found that a significant proportion of dental clinics did not do online consultation (63.5%) in the lockdown phase of the COVID-19 pandemic [44]. In addition, there was an investment in protective equipment such as masks, gowns, hydroalcoholic gels, hairnets and visors. These findings were consistent with previous studies which found that the period of the COVID-19 pandemic experienced the reorganization of the private dental practices working strategies including the use telephone triages, training routines on how to use, remove, and dispose personal protective equipment [3]. A Saudi Arabia's study pointed out that 65% of dental clinics had a distinct workflow for COVID-19 patient screening and new management routines [45], while another study reported the reduction of the number of appointments with patients in dental clinics [43]. The results of this study point out that further economic adaptation strategies which had been put in place by private dental clinics to limit the impact of the crisis on activity, concerned the review of daily working hours downwards (69.2%), salary reduction of staffs (53.9%), part-time closure (46.2%), technical leave (33.3%) and dismissal of staffs (8.3%). In some aspects these results contrasted with the findings of a study in Egypt where most dental practice employers paid full salaries to their staff (82.3%) despite the closure of the clinics as well as in Iran where only 22% (n=31) decreased the staff's salary due to the reduction in the working hours [46]. However, the findings of this study are in agreement with the results of a US study which found that only 27% paid the full salary to staff, 45% paid half the salary, and 28% did not pay salaries [47]. Overall, about 30% of private dental clinics closed their business for at least 10 days, this tends to be in agreement with a study that mentioned that 56.7% of the dental practices in Egypt reported that one or more of their staff decided not to work during the COVID-19 pandemic [21].

The results of this study indicate that there was a substantial inequality in the distribution of revenues (with a Gini index of 0.75) in 2018 and 2019 before the outbreak of the COVID-19 pandemic, while a Gini index's value of 0.34 in 2020 suggests a more equitable distribution of revenues thereby explaining that the decrease level of revenues and losses was equally distributed among private dental clinics in Yaounde during the COVID-19 pandemic. Moreover,

the private dental clinics received little support during the COVID-19 pandemic. Only three private dental clinics (15%) had benefited from financial support from the National Social Security Fund (NSSF) and local association network. The public subsidies were non-existent for the private dental clinics to mitigate the economic and financial impact of the COVID-19 pandemic in Cameroon as with the lack credit facilities from banks and very low level of financial supports, several private dental clinics had to resort to loans in order to mitigate the losses resulting from the COVID-19 pandemic. While these are consistent with the results of a study that found that dental practices were not paid any support from the government of Switzerland to mitigate negative economic impact of the COVID-19 pandemic [40], they contrast with the results of a study in Germany which pointed out that government supported was offered as a failure for the private dental practices in the case of quarantine imposed by the local health authority organized by the Ministry of Health of each country(Bundesland) [23]. The lack of government support was mentioned as one of the key factors affecting economic losses in dental clinics in Iraq [39]. The findings from the United States are more contrasted as earlier studies estimated that 95% of dental practices received some form of government financial assistance during the COVID-19 pandemic, and about 86.6% received COVID-19-related relief funds among general practitioners' practices received an average of $91,000 while specialists' practices received an average of $109,000 and on average, the relief funds were equivalent to about one-seventh of billings collected for all dentists [48]. On the other aspect, the insurance coverage was relatively low with only 32% of private dental clinics declared themselves insured, with over half of them which had subscribed to limited liability insurance. However, regarding the need of insurance to cover losses in times of crisis, all the practices surveyed found the initiative to be a good one; 37% and 42% respectively said they were willing to pay an insurance premium based on expected advantages of such insurance: according to 74% of respondents, would be its ability of protection (74%) and its ability to anticipate the economic consequences of a possible future health crisis (37%). The low level of insurance subscription could be explained by the perceived constraints for the implementation of insurance which are related to the conditions set by the insurance company (89%), the delay in reimbursements (74%) and previous bad experiences with insurance companies (42%).

However, finally while the private dental clinics in Yaounde survived the COVID-19 pandemic in 2020, they have revived their activity starting from 2021. Meanwhile, the findings of this study provide further evidence that the economic and financial impact of COVID-19 continue to hit the private dental clinics during the early post-pandemic period in 2021 and 2022. There is ample evidence that the private dental clinics who survived the COVID-19 pandemic gained the management experience of economic adaptive strategies when facing the crises. The findings of this study adds to the growing but limited body of empirical research on the enormous economic impacts that could be observed during the systemic crisis by the private dental clinics in low income settings. Most importantly, it is worth mentioning that this does shed light on productivity of private dental clinics before (pre-pandemic), during and changes after (post-pandemic) that showed a relatively increased of volume and financial figures. Moreover, the findings of this study cannot be fully generalized because of country, regional and international differences in terms of the COVID-19 pandemic worldwide.

STUDY LIMITATIONS

This study has some limitations such the short time span of data collection, the private dental clinics adaptive behavioral changes during the outbreak and the lockdown for the COVID-19

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regulations and constantly changing different measures placed great challenge on private dental clinics. Although the number of participating private dental clinics is representative for Yaounde, it is possible that our study comprised mainly private dental clinics who experienced little impact or who did not want to disclose their personal sensitive economic and financial data regarding the COVID 19 pandemic. However, the study samples a small number of private dental clinics, while large sample size with a wider geographical distribution across the country would be more useful to come to a definite conclusion about the full economic and financial impacts on private dental clinics. Most importantly, the findings of this study need to be placed in the national context of the COVID-19 pandemic. While another limitation of this study is concerned with the fact that it solely depends on the private dental clinic manager's compliance with answering the questions honestly, thus, the data analyzed may not capture the full economic and financial impact of the pandemic on private dental clinics.

CONCLUSION

The present study attempted to assess the economic and financial impact of the COVID-19 on the operation of private dental clinics in the city of Yaounde. It emerged that: the revenue generated by private dental clinics experienced a sharp decrease between 2018 and 2020 and this tended to gradually increase thereafter in 2021 and 2022. The lack of government support during the pandemic shed light on the framing of oral health as a private responsibility rather than a public health issue, keeping it out of many government-funded healthcare programs. Nevertheless, the COVID-19 pandemic offers an opportunity to act as a catalyst and provide the necessary impetus to drive and improve the resilience of health structures, and particularly that of private dental clinics, which, by virtue of their organization, constitute separate structures and require the special attention of public authorities. However, there is always the risk that after the crisis, public and political attention will shift, forgetting important lessons and neglecting necessary reforms. The results and experiences from this study could help private dental clinics and policy makers to improve the situation in a possible potential crisis. Moreover, the resilient private dental clinics could strengthen the access for everyone to essential oral health services—prevention, care, and rehabilitation in line with the World Health Organization's new global oral health strategy and action plan for 2023 to 2030.

Conflicts of Interest

No conflict of interest was identified for this study.

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