

# Prevalence and Pattern of Low Oxygen Saturation among Dental Patients during Covid-19 Pandemic in a Nigerian Tertiary Hospital

**\*Irene OGBEBOR, \*\*Benlance Ekaniyere EDETANLEN**

*\*Department of Family Dentistry, University of Benin Teaching hospital, Benin-City*

*\*\*Department of Oral and Maxillofacial Surgery, University of Benin Teaching hospital, Benin-City*

*Correspondence  
Dr. Irene Ogbemor  
Department of Family Dentistry,  
University of Benin Teaching Hospital,  
Benin-City, Edo State  
Email: lgie10@yahoo.com*

## ABSTRACT

**Objective:** Low oxygen saturation is widely reported to be associated with Covid-19 infections but data on this is scarce in our environment. Therefore, this study assessed the prevalence and pattern of low oxygen saturation among dental patients during covid-19 pandemic in a Nigerian tertiary hospital

**Methods:** This is a cross-sectional study in the department of oral diagnosis in a Nigerian tertiary hospital from January to March 2021. The demographic data collected were age, gender, religion, and occupation; others were level of education and place of residence. The clinical data collected were previous history of Covid -19 infection, medical condition, use of facemask, and dental condition. Others were oxygen saturation level and referred department. All analysis was performed with SPSS software version 24. A P-value less than 0.05 were considered statistically significant

**Results:** A total number of 150 patients were recruited in this study. Their age range was 18 -85 years with a mean age of  $35.2 \pm 15.9$  years. There were more males compared to females given a male to female ratio was 1.1: 1. Generalised chronic marginal gingivitis was the most (40.0%) prevalent dental conditions and this was followed (15.3%) by acute apical periodontitis. Most (42.0%) of the patients were referred to the department of periodontics and this was followed (35.3%) by the department of oral and maxillofacial surgery. Only 10 patients had low oxygen saturation given a prevalence of 6.2%. All the demographic variables were not significantly associated with low oxygen saturation ( $P > 0.05$ ). Also, all the clinical variables studied were not statistically significant with low oxygen saturation ( $P > 0.05$ ).

**Conclusion:** The prevalence of low oxygen saturation among dental patients in a Nigerian tertiary hospital was unremarkable. There was no association between low oxygen saturation and demographic and clinical variables of the dental patients

**Keywords:** Low oxygen saturation, dental patient, Covid-19

## INTRODUCTION

The first case of Coronavirus disease 2019 (COVID-19) was reported in Wuhan city in China. The disease started in the Chinese Huanan Seafood Market of Wuhan state of Hubei Province, where livestock animals are sold and traded (Madabhavi et al., 2020). The disease caught the attention of the world owing to it being pneumonia epidemic of unknown cause and the ease which the disease quickly spread and infected a large number of Chinese citizens and due to the

frequency of worldwide travel, it managed to disperse to neighboring and distant countries.

**Citation:** Ogbemor I, Edetanlen BE (2023). Prevalence and pattern of low oxygen saturation among dental patients during covid-19 pandemic in a Nigerian Tertiary Hospital. *Nig J Dent Sci*; 6(1):17-22.

It killed more than 1800 and infected over 70,000 individuals within the first 50 days of the outbreak (Li et al., 2020).

The most common clinical features of the coronavirus disease 2019 (COVID-19) include dry cough, fever, and dyspnea. It has an estimated incubation period of 4-5 days, although a time lapse as long as 14 days from the time of exposure to the onset of signs and symptom (Falahchai et al., 2020). The symptoms vary from asymptomatic, low grade pyrexia, dry cough, sore throat, breathlessness, tiredness, body aches, fatigue, myalgia, nausea, vomiting, diarrhea, to severe consolidation and pneumonia, acute respiratory distress syndrome (ARDS) and multiple organ dysfunction leading to death with case fatality rate ranging from 2 to 3% (Yin & Wunderink, 2018). The patients have no signs or symptoms during the incubation period while they are potential carriers for the SARS-CoV-2 and may transmit the disease to other individuals. This property makes efficient control of this disease extremely difficult (Kim et al., 2020).

Studies (Nimbalkar et al., 2018; Paul et al., 2022; Stell et al., 2022) have shown that there is low oxygen saturation in patients with Covid-19. Low oxygen saturation is when the oxygen level in the blood is less than 95% (Philip et al., 2020). Diagnosis of Covid-19 is mainly by laboratory tests but this may not be readily available in poor resource facilities and this made the use of pulse oximetry paramount in identification of patients at risks. Studies (Ashtiani et al., 2020; Clift et al., 2020; Knight et al., 2020; W Ng et al., 2020) have shown that the risk of spread of Covid is relatively higher in dentistry compared to other specialties. Despite the high risk of contamination and spread of Covid-19 in dentistry (W Ng et al., 2020), it appears there is lack of data on prevalence and pattern of low oxygen saturation among patients presenting for dental treatment. Therefore, the aim of this study is to assess the prevalence and pattern of low oxygen saturation among patients in a Nigerian tertiary hospital. It is hoped that this study will help to identify individuals who are at risk of Covid-19 in a setting where pulse oximeter is available and Covid test kits are luxury.

## MATERIAL AND METHODS

This is a cross-sectional study in the department of oral diagnosis in a Nigerian tertiary hospital from January to March 2021. Following ethical approval from the Hospital's Research and Ethical Committee and informed consent taken, all consecutive patients that presented to the hospital for dental conditions were recruited for the study. Due to lack of previous related study, best guess prevalence was chosen as the prevalence of patients with low oxygen saturation (Araoye, 2003).

The minimum sample size for statistically meaningful deduction was determined using the formula of Fisher (Dixit et al., 2020) for calculating sample size:  $N = Z^2 P(1-P)/d^2$ . Where n is the minimum sample size for a

statistically significant survey, Z is deviant at the portion of 95% confidence interval (C.I) =1.96, P is prevalence of patients with low oxygen saturation =50%, and d is margin of error acceptable or measure of precision= 10%. Using this formula, a minimum sample (n) was 97. Therefore the study of 97 patients will give meaningful statistical deduction. However, sample was increased to 150 to compensate for any attrition. Excluded patients were those less than 18 years. The demographic data collected were age, gender, religion, and occupation; others were level of education and place of residence. The clinical data collected were previous history of Covid -19 infection, medical condition, use of facemask, and dental condition. Others were oxygen saturation level and referred department. The level of oxygen saturation was measured and recorded based on a guideline from a previous study (Patra, 2012) and it was measured using a pulse oximeter (JZK-302, JZiki limited, Beijing, China). Both descriptive and inferential statistics were performed. In the descriptive statistics, the categorical data were summarised as frequency and percentages while the continuous variables were summarised as range, means and standard deviation. In the inferential statistics, univariate analysis was done with Chi square of association after categorisation of the variables. All analysis was performed with SPSS software version 24 (IBM corp., Armonk, NY, USA) . A P-value less than 0.05 were considered statistically significant.

## RESULTS

A total number of 150 patients were recruited in this study. Their age range was 18 -85 years with a mean age of  $35.2 \pm 15.9$  years. Table 1 shows the demographic characteristics of the patients. The age of less than 45 years was more than half (74.0%) of the age group equal or older than 45 years. There were more males compared to females given a male to female ratio was 1.1: 1. Both Esan (39.9%) and other tribes (39.9%) were the most common ethnic groups. Most of the patients were Christians 94% compare to Muslims 6%. Just more than half (50.7%) of the respondents were dependants while the least (4.7%) were skilled respondents. About two-third (71.3%) of the respondents had tertiary level of education and majority (92.0%) of them reside in urban city. Table 2 shows the clinical characteristics of the patients. Unfortunately, only less than half (34.0%) of the patients were found to use face mask during the course of the study. Interestingly, about two-third (79.3%) of the patients were free of medical conditions. Generalised chronic marginal gingivitis was the most (40.0%) prevalent dental conditions and this was followed (15.3%) by acute apical periodontitis. Most (42.0%) of the patients were referred to the department of periodontics and this was followed (35.3%) by the department of oral and maxillofacial

surgery. Luckily, only few (4.7%) patients presented with history of Covid-19 infection during the period of the study. Only 10 patients had low oxygen saturation given a prevalence of 6.2%.

Table 3 shows the association between low oxygen saturation and demographic variables. Patients with age equal or greater than 45 years were more than those with age less than 45 years but this observation was not statistically significant ( $P > 0.05$ ). There were

more males with low oxygen concentration compared to their female counterparts and this difference was not statistically significant ( $P=0.06$ ). The tribe, religion, occupation level of education and place of residence were also not significantly associated with low oxygen saturation ( $P>0.05$ ). Table 4 shows the association between low oxygen saturation and clinical variables. All the clinical variables studied were not statistically significant with low oxygen saturation ( $P>0.05$ ).

Table 1: The demographic characteristics of the patients (n=150)

Variables	Category	Frequency(n)	Percentage (%)
Age group	≥ 45	39	26.0
	<45	111	74.0
Gender	Male	77	51.3
	Female	73	48.7
Tribe	Esan	59	39.3
	Bini	18	12.0
	Etsako	14	9.3
	Others	59	39.3
Religion	Christianity	14.1	94
	Islam	9	6
Occupation	Skilled	7	4.7
	Unskilled	43	28.7
	Semiskilled	24	16.6
	Dependant	76	50.7
Level of Education	Primary	7	4.7
	Secondary	36	24.0
	Tertiary	107	71.3
Residence	Urban	138	92.0
	Rural	12	26.0

Table 2: The clinical characteristics of the patients (n=150)

Variables	Category	Frequency(n)	Percentage (%)
Use of facemask	Yes	51	34.0
	No	99	66.0
Medical Condition	Yes	31	20.7
	No	119	79.3
Dental Condition	Generalised chronic marginal gingivitis	60	40.0
	Atypical facial pain	1	0.7
	Acute pulpitis	19	12.7
	Chronic periodontitis	3	2.0
	Sialolithiasis	1	0.7
	Malocclusion	3	2.0
	Cervical Caries	1	0.7
	Retained Root	5	3.3
	Tooth Fracture	11	7.3
	Acute apical periodontitis	23	15.3
	Supernumerary teeth	1	0.7
	Dentoalveolar abscess	4	2.7
	Missing Teeth	1	0.7
	TMJ dislocation	2	1.3
	Erythema multiformis	1	0.7
	Maxillary fracture	1	0.7
	Fascial space infection	1	0.7
	Severe attrition	1	0.7

Referred Department	Enamel hypoplasia	1	0.7
	Periodontal abscess	2	1.3
	Pericoronitis	8	5.3
	Oral and Maxillofacial Surgery	53	35.3
	Periodontics	63	42.0
	Restorative	28	18.7
	Prosthodontic	2	1.3
	Oral medicine	2	1.3
	Orthodontics	2	1.3
Previous history of Covid	Yes	7	4.7
	No	143	95.3
Low oxygen Saturation	Yes	10	6.2
	No	140	93.3

Table 3: The association between low oxygen saturation and demographic variables

Variables	Category	Low oxygen saturation		Chi value	P-Value
		Ye s(n=10)	No (n=140)		
Age group	≥ 45	7	104	0.09	0.77
	<45	3	36		
Gender	Male	8	69	3.52	0.06
	Female	2	71		
Tribe	Esan	3	56	1.58	0.66
	Bini	1	17		
	Etsako	2	12		
	Others	4	55		
Religion	Christianity	9	132	0.30	0.58
	Islam	1	8		
	Others	0	0		
Occupation	Skilled	2	5	7.02	0.07
	Unskilled	4	39		
	Semiskilled	1	29		
	Dependant	3	73		
Level of Education	None	0	0	1.64	0.44
	Primary	1	6		
	Secondary	1	35		
	Tertiary	8	99		
	Urban	9	129		
Residence	Rural	1	11	0.06	0.81

## DISCUSSION

As pulse oximetry is inexpensive, non-invasive and can be used continuously, it provides a convenient way to monitor the oxygenation of patients via indirect measurement of the saturation of arterial blood. Pulse oximetry is also used as a triage tool in COVID-19 pneumonia. The prevalence and pattern of low oxygen saturation among dental patient during covid-19 pandemic was assessed in this study as it will provide a baseline data for future studies. It also reappraises the role of low oxygen saturation in the course of the disease. It also gives an insight of the frequency of

patient that may be carrier of the infection there by raising index of suspicion. Low blood-oxygen levels have been a significant problem in Covid-19 patients (Plüddemann et al., 2011). Shortness of breath and acute oxygen deprivation are symptoms associated with COVID-19 infection (Ashtiani et al., 2020). The SARS-CoV-2 - virus that causes coronavirus, after entering the body infects the immature red blood cells (RBC) which eventually results in the reduction or declination of the oxygen level in the blood, causing serious effects on the immune system's response (Nimbalkar et al., 2018; Yin & Wunderink, 2018).

Table 4: The association between low oxygen saturation and clinical variables of the patients

Variables	Category	Low oxygen saturation		Chi Value	P-Value
		Yes(n=10)	No (n=140)		
Use of facemask	Yes	1	50	2.75	0.10
	No	9	90		
Medical Condition	Yes	1	30	0.74	0.39
	No	9	110		
Dental Condition	Generalised chronic marginal gingivitis	5	55	35.6	0.06
	Atypical facial pain	0	1		
	Acute pulpitis	0	19		
	Chronic periodontitis	0	3		
	Sialolithiasis	0	1		
	Malocclusion	1	2		
	Cervical caries	0	1		
	Retained root	0	5		
	Tooth fracture	1	10		
	Acute apical periodontitis	1	22		
	Supernumerary teeth	0	1		
	Dentoalveolar abscess	0	4		
	Missing teeth	0	1		
	TMJ dislocation	0	2		
	Erythema multiformis	0	1		
	Maxillary fracture	1	0		
	Fascial space infection	0	1		
	Severe attrition	1	0		
	Enamel hypoplasia	0	1		
	Periodontal abscess	0	2		
	Pericoronitis	0	8		
Previous history of Covid	Yes	0	7	0.52	0.47
	No	10	133		

The mean age in this study was 35.2 years and this could be that this age group has relatively high dental awareness. More males were observed in this study unlike previous studies (Nimbalkar et al., 2018; Paul et al., 2022) that recorded more female patients. Patients that previously suffered COVID-19 infection were relatively few in this study and this could be that younger patients presents more to our hospital than the older patients.

In this study, the prevalence of low oxygen saturation was 6.2%. This is comparable to 6.3% reported by Vold et al. in 2012 in Norway. However, it is lower than 21.5% reported by Wong et al. in the UK and greater than 4.9% reported by Vold et al. in 2014 in Norway among healthy general population. The variations observed among the different studies could be related to sample size and study designs. The 6.2% in the present study is a suggestion that there is low prevalence of oxygen saturation during COVID-19 pandemic in our environment.

There was no significant association between the prevalence of oxygen desaturation and the socio-demographic characteristics of the patients ( $P > 0.005$ ). This finding differs from that of Wong et al, who

reported association between high prevalence of oxygen desaturation and ethnicity. Unlike in the present study, Jo et al. (2019) also reported association between low oxygen saturation and age characteristics of the patients. Also, Vold et al. in 2012 recorded an association between low oxygen saturation and obesity. The reason for lack of association between the low oxygen saturation and the socio-demographic features in this study could be related to the low prevalence recorded. This lack of association was also reported by Vold et al. in their study in 2014. This study had few limitations, the sample size is relatively low and there could be error of measurement in the use of pulse oximeter.

## CONCLUSION

The prevalence of low oxygen saturation among dental patients in a Nigerian tertiary hospital was unremarkable. There was no association between low oxygen concentration and demographic and clinical variables of the dental patients

## REFERENCES

- Araoye MA (2003). Research methodology with statistics for health and social sciences. 1<sup>st</sup> ed. Illorin Nathadex publishers;35: 115-121
- Ashtiani RE, Tehrani S, Revilla-León M, Zandinejad A (2002). Reducing the risk of Covid-19 transmission in dental offices: A Review. *J Prosthodont*; 29(9):739-745.
- Clift AK, Coupland CAC, Keogh RH, et al (2020). Living risk prediction algorithm (QCOVID) for risk of hospital admission and mortality from coronavirus 19 in adults: national derivation and validation cohort study. *BMJ*; 371:m3731. doi: 10.1136/bmj.m3731.
- Dixit PB, Dixit S, Dahal S, Poudel P, Roy D, Manandhar N (2020). Pattern of dental problems among patients visiting a dental hospital during Covid-19 Pandemic. *Kathmandu Univ Med J*; 18(70):58-61.
- Falahchai M, Babaee Hemmati Y, Hasanzade M (2020). Dental care management during the COVID-19 outbreak. *Spec Care Dentist*; 40(6):539-548. doi: 10.1111/scd.12523.
- Kim JY, Choe PG, Oh Y, et al (2020). The first case of 2019 novel coronavirus pneumonia imported into Korea from Wuhan, China: Implication for infection prevention and control measures. *J Korean Med Sci*;35(5): 6
- Jo YY, Park CG, Lee JY, Kwon SK, Kwak HJ (2019). Prediction of early postoperative desaturation in extreme older patients after spinal anesthesia for femur fracture surgery: a retrospective analysis. *Korean J Anesthesiol*; 72(6):599-605.
- Knight SR, Ho A, Pius R, et al (2020). SARIC4C investigators. Risk stratification of patients admitted to hospital with covid-19 using the ISARIC WHO Clinical Characterisation Protocol: development and validation of the 4C Mortality Score. *BMJ*;370:m3339.
- Li Q, Guan X, Wu P, et al (2020). Early transmission dynamics in Wuhan, China, of novel coronavirus-infected pneumonia. *N Engl J Med*; 382:1199-207
- Madabhavi I, Sarkar M, Kadakol N (2020). COVID-19: A review. *Monaldi Arc Chest Dis*; 90:248-2581
- Nimbalkar SM, Bansal SC, Patel CL et al (2018). Clinical competency in pulse oximetry among medical professionals and nursing personnel in a tertiary care hospital. *J Clin Diagn Res*; 12(9):9-13.
- Paul S, Marco F, Valentina Q (2022). Pulse oximetry and the pandemic: *BMJ*; 378:e071474. doi.org/10.1136/bmj-2022-071474
- Patra P (2012). Sample size in clinical research, the number we need. *Int J Med Sci Public Health*; 1:5-9.
- Philip KEJ, Bennett B, Fuller S, et al (2020). Working accuracy of pulse oximetry in COVID-19 patients stepping down from intensive care: a clinical evaluation. *BMJ Open Res*; 7:e000778. doi: 10.1136/bmjresp-2020-000778.
- Plüddemann A, Thompson M, Heneghan C, Price C (2011). Pulse oximetry in primary care: primary care diagnostic technology update. *Br J Gen Pract*; 61:358-359.
- Stell D, Noble JJ, Kay RH, et al (2022). Exploring the impact of pulse oximeter selection within the COVID-19 home-use pulse oximetry pathways. *BMJ Open Respir Res*; 9:e001159. doi.org/10.1136/bmjresp-2021-001159
- Vold ML, Aasebø U, Hjalmsen A, Melbye H (2012). Predictors of oxygen saturation  $\leq 95\%$  in a cross-sectional population based survey. *Respir Med*; 106:1551-1558.
- Vold ML, Aasebø U, Melbye H (2014). Low FEV<sub>1</sub>, smoking history, and obesity are factors associated with oxygen saturation decrease in an adult population cohort. *Int J Chron Obstruct Pulmon Dis*; 9:1225-1233.
- W Ng K, Poon BH, Kiat Puar TH, et al (2020): Covid-19 and the risk to health care workers: a case report. *Ann Intern Med*; 172:766-767
- Wong AI, Charpignon M, Kim H, Josef C, de Hond AAH, Foja JJ, et al. (2021) Analysis of discrepancies between pulse oximetry and arterial oxygen saturation measurements by race and ethnicity and association with organ dysfunction and mortality. *JAMA Netw Open*; 4(11):e2131674. doi:10.1001/jamanetworkopen.2021.31674
- Yin Y, Wunderink RG (2018). MERS, SARS and other coronaviruses as causes of pneumonia. *Respirology*; 23(2):130-137. doi: 10.1111/resp.13196.