

Assessment of the Knowledge of Infectious Diseases and Their mode of Transmission Among Dental Health Care Personnel in a Tertiary Health Institution in Southern Nigeria

* Yvonne Osaretin MABIAKU, **Tagberetse Oghenegare MABIAKU, *** Alphonsus Rukevwe ISARAH

[*Department Of Surgery, **Department Of Family Medicine, College Of Health Sciences, Delta State University Abraka, Delta State, Nigeria, ***Department Of Community Medicine, College Of Health Sciences, University Of Benin, Edo State Nigeria.]

Correspondence

Dr. Y O Mabiaku

Department Of Surgery, College Of Health Sciences, Delta State University Abraka, Delta State, Nigeria

Email: yvonnemabiaku@gmail.com

Yvonne O Mabiaku
<https://orcid.org/0000-001-5380-4633>
Tagberetse O Mabiaku
<https://orcid.org/000-0003-2397-0037>
Alphonsus R Isarah
<https://orcid.org/>

ABSTRACT

Background: Dental Health Care Personnel (DHCP) and clinical students in training are constantly exposed to saliva and oral fluids in the course of carrying out oral health care procedures. For optimum observance of infection control protocols, there is a need for adequate and appropriate knowledge of infectious agents and their mode of transmission in order to prevent cross infection in a dental clinic setting.

Objective: To determine the level of knowledge of infectious agents transmissible in a dental clinic among dental health care personnel and final year clinical students and nurses in a tertiary health facility.

Methods: This paper is a cross-sectional descriptive study which used a well-structured self-administered questionnaire. A convenient sampling technique was applied and a total of 111 DHCP and final year clinical students and nurses were recruited into the study. Data were analyzed using the Statistical Package of Social Science (SPSS) version 16 (IBM, Chicago, IL, USA). Bivariate analysis showed that the dentist cadre had the best level of knowledge of infectious agents transmissible in dental clinics. This, however, was not statistically significant $p=0.298$

Results: A total of one hundred and eleven respondents, ages ranging from 15 to 55 years and with a mean age of 31.0 ± 5.5 participated in this study. More than two-third 75(67.6%) of the respondents were dental surgeons and the least 2(1.8%) were the dental hygienist. More males 63(56.8%) participated in the study and most respondents 107(96.4%) were Christians. Fifty-five (49%) had good knowledge, 9(8.1%) had fair knowledge, and 47(42.3%) had poor knowledge of infectious diseases/conditions transmissible in dentistry. Respondents' status was not a determinant of the level of knowledge, $p=0.298$.

Conclusion: The average knowledge of the DHCP, final year clinical students and dental student nurses in this study was good, but their knowledge about HDV and infectious bacteria in dental unit water was poor.

Keywords: knowledge, infectious agents, Dental Health Care Personnel, Dental clinic.

Received: 30-May, 2022

Revision: 27 July, 2022

Accepted: 28 July, 2022

Citation: Mabiaku YO, Mabiaku TO, Isarah AR. Assessment of the knowledge of infectious diseases and their mode of transmission among Dental Health Care Personnel in a tertiary health institution in Southern Nigeria. *Nig J Dent Res* 2022; 7(2):-116-122 <https://dx.doi.org/10.4314/njdr.v7i2.7>

INTRODUCTION

Infectious diseases are diseases that arise from the presence and growth of pathogenic biological agents in a host organism. ¹Transmission of infectious diseases can be broadly classified into direct and indirect route. Contagious diseases are easily transmitted by physical contact with the infected person or his/her secretions, or objects touched by them. In the dental surgery environment, the dental team which includes; the Dental surgeon, Dental nurses, Dental technologist, patients are at a risk of cross infection. Equally at risk, are the final year clinical students who carry out treatment procedures as part of their professional training. These group of individuals may be exposed to a wide variety of microorganisms that can be transmitted by blood (e.g Hepatitis B, Hepatitis C Human Immunodeficiency Virus-HIV etc.), saliva (e.g. Epstein Barr virus, Mycobacterium tuberculosis etc.), respiratory secretions (Influenza virus, Severe acute respiratory syndrome coronavirus 2, Covid-19) or skin secretions (Chickenpox, Herpes simplex 1 and 2 etc) as well as waterborne environmental species such as Pseudomonas and Legionella species.^{2,3} Blood borne viruses (BBV) and respiratory pathogens such as *M. tuberculosis*, and *Covid-19 virus*, are of concern because they can cause serious diseases with fatal consequences.^{4,5}

The spread of infectious agents can be from breathing bioaerosols which are suspended in the clinic ambient air or droplet nuclei from coughing and sneezing. This bioaerosol could be laden with infective material when dental handpieces and ultrasonic scalars are in use. *Melanie et al*⁶ and *Amiri et al*,⁷ reported that hospital acquired infections can be from person to person, between staff and patient or across populations to family members. Some previous studies^{8,9} reported cases of cross infection from DHCP to patients such as the transmission of HIV from DHCP to patients. Also reported by *Beltrami et al*,¹⁰ was the simultaneous transmission of HCV and HIV to and from patients and DHCP after a non-intact skin exposure. *Moreso*, occupational exposures to infected blood have also been reported to occur among oral surgeons during fracture reduction involving the use of wires^{11,12}.

The risk of disease transmission may vary depending on the host susceptibility, however, transmission of infection can be halted by providing adequate infection control and safety measures during practice, in order to break the chain of infection transfer.¹³ There are two levels of infection control,

the standard precautions for infection control and the transmission-based precautions. Standard precautions for infection control refers to all precautions taken when managing any patient and handling every patient as a potentially infectious case, while the transmission-based precautions; are simply an extension of the standard precaution, but applies to precautions in managing patients with already established cases of highly infectious conditions such as; Ebola disease and Corona virus disease; COVID-19. They are categorized into four groups: (i) Airborne precautions; with the use of respiratory mask and personal protective equipment (PP), in managing COVID-19 patients, (ii) Droplet Precautions; uses PPE for cases of Meningococcal infection, (iii) Contact precautions, utilizes PPE in treating patients with Shingles (iv) Sterilization Precautions; this involves incineration of non-disposable items utilized in transmissible spongiform encephalopathies.¹⁴

The increase in recent years of emerging and re-emerging infections of new resistant and potentially fatal infectious diseases, calls for a serious upgrade in the knowledge of infectious agents and the possible mode of their infectivity. This will form the basis for effective preventive measures. This study therefore aimed at determining the level of knowledge of infectious agents and their mode of transmission among the DHCP and final year clinical students and nurses in the University of Benin Teaching Hospital, Benin City, Nigeria.

MATERIALS AND METHODS

Study Area

The study was carried out in the Dental complex of the University of Benin Teaching Hospital (UBTH). The complex was composed of specialty clinics in Restorative, Oral and Maxillofacial surgery, Oral Medicine, Oral Pathology, Orthodontics, Paedodontics, Periodontics and Community Dental Health. The complex runs both outpatient and inpatient dental services as well as emergency services. UBTH is located in Egor Local Government Area of Edo State, Nigeria. It is bounded to the north by Ikpoba Hill, to the west by University of Benin, to the east by Federal Government Girls' College, and the south by Edo State Development Property Authority. The hospital was established in 1970 and its catchment area includes Ondo, Edo and Delta State.

Study Design and Population

A cross-sectional study conducted among all DHCP, which included Dental Surgeons, Dental Therapist, Dental Surgery Technicians and Dental Technologists working as permanent staff of the Dental Centre of the UBTH as well as the students on clinical posting which included, all final year Dental students of the University of Benin (UNIBEN) and dental student nurses of UBTH

Sample Size determination and Sampling Technique

The calculated sample size plus a 10% attrition for this study using the formular for cross-sectional studies was 110 and the sampling technique utilized was a convenient sampling

Data Collection

A five-section (ABCDE), self-structured questionnaire with closed and open-ended questions was used to collect data. Information collected included; socio-demographic characteristics of respondents, duration as DHCP and knowledge of transmissible infections in Dental clinics. Research assistants recruited after a two days training period and on the standardization of instruments were final year dental students and dental house officers.

Data management: Assessment of knowledge:

Each correct answer to a question was awarded a score of one [1], while wrong responses earned no score. A total of 31 scores was awarded for knowledge. All scores above 50% (15.5-31) of the total score of the study population was rated as good, scores between 40-49% (12.5-15.5) were rated as fair/moderate, while those who scored 39% and below (12.4-0), were rated as poor. The responses were collated and entered into the SPSS spreadsheet. Results were presented as tables and charts where appropriate. The computer software, Statistical Package for Social Sciences (SPSS) Version 16 was used to analyze the data.

Ethical Consideration

The study was approved by the hospital's Ethics and Research committee, with protocol number ADM/F 22/A/VOL. VII/950. The respondents were not exposed to any harm and the study stimulated them to improve on the level of their knowledge of infection control. Verbal informed consent was obtained from all respondents in the study and an

assurance of confidentiality was given to all respondents in this study.

RESULT

A total of one hundred and eleven respondents with a mean age of 31.0 ± 5.5 participated in the study. The majority were males, 63 (56.8%); dentist, 75(67.6%), Christians, 107(96.4%) and all respondents had a tertiary level of education. [Table 1]

One hundred and five respondents (94.6%) said HIV is transmissible, 80(72.1%) affirmed that HCV is transmissible in dental clinics, 90(85.6%), agreed that HBV was transmissible in the dental settings. Responses to questions about the knowledge of the transmissibility of respiratory infection in dental clinics were relatively lower than that for blood borne pathogens. Mycobacterium tuberculosis (MTB), Influenza, and SARS had 69(62.2%), 63(56.8%), 56(50.5%), responses respectively to questions about their transmissibility in dental clinics. [Table 2]

Report on knowledge of mode of transmission of individual infections/infectious agents revealed that 59(53.2%), 55(49.5%), 79(71.2%), and 37 (33.3%) respondents regarding HIV, HCV, HBV, HDV respectively, had good knowledge of the correct mode of their transmission which is by blood and body fluids. There was an obvious poor knowledge about the mode of transmission of HDV. [Table 3]

The report on the knowledge of common bacteria in dental water lines revealed that only eight (7.2%) of the respondents knew the implicated organisms (legionella and pseudomonas) [Table 4]

Regarding the knowledge of the two highly infectious agents (HBV and HIV) in dental health settings, 18(16.2%) have the right knowledge of HBV transmission while 86 (61.3%) of the respondents, knew that HIV could be transmitted through blood spill on the conjunctiva. [Table 5]

The report on the overall knowledge of infectious agents transmissible in the dental setting, revealed that a total number of 55 respondents which accounted for 49% had good knowledge. [Table 6]

The bivariate analysis on the status of the respondents and the overall level of knowledge revealed that the dentist cadre had the best level of knowledge about infectious agents transmissible in dental centers. This however, not statistically significant $p=0.298$. [Table 7]

Variables	Freq (n = 111)	Percent (%)
Age (in years)		
≤14	18	16.2
25 – 34	68	61.3
35 – 44	19	17.1
≥45	6	5.4
Sex		
Male	63	56.8
Female	48	43.2
Religion		
Christianity	107	96.4
Muslim	4	3.6
Status of Participants		
Dentist	75	67.6
Dental hygienist	2	1.8
Dental nurse	12	10.8
Dental Lab technologist	3	2.7
Dental Student	13	11.7
Dental student nurse	6	5.4
Educational Status		
Tertiary	111	100

Table 2: knowledge about the transmissibility of infectious agents in the dental clinic

Infectious agents	Responses		
	Don't Know n (%)	No n (%)	Yes n (%)
HIV	4 (3.6)	2 (1.8)	105 (94.6)
HCV	22 (19.8)	9 (8.1)	80 (72.1)
HBV	13 (11.7)	3 (2.7)	95 (85.6)
HDV	34 (30.6)	12 (10.8)	65 (58.6)
CMV	38 (34.2)	4 (3.6)	69 (62.2)
MTB	32 (28.8)	10 (9.0)	69 (62.2)
Herpes zoster	33 (29.7)	14 (12.6)	64 (57.7)
Influenza and avian flu	33 (29.7)	15 (13.5)	63 (56.8)
SARS	40 (36.0)	15 (13.5)	56 (50.5)
Lassa fever	36 (32.4)	6 (5.4)	69 (62.2)

Table 3: Knowledge about mode of transmission of individual infections/infectious agents

Infectious agents	Mode of transmission			
	Don't Know n (%)	(A)Blood n (%)	(B)Body fluids n (%)	Both A & B n (%)
HIV	18 (16.2)	34 (30.6)	0 (0.0)	59 (53.2)
HCV	39 (35.1)	12 (10.8)	5 (4.5)	55 (49.5)
HBV	22 (19.8)	7 (6.3)	3 (2.7)	79 (71.2)
HDV	54 (48.6)	13 (11.7)	7 (6.3)	37 (33.3)
CMV	51 (45.9)	16 (14.4)	6 (5.4)	38 (34.2)
MTB	49 (44.1)	14 (12.6)	20 (18.0)	28 (25.2)
Herpes zoster	52 (46.8)	13 (11.7)	15 (13.5)	31 (27.9)
Influenza & avian flu	50 (45.0)	9 (8.1)	23 (20.7)	29 (26.1)
SARS	72 (64.9)	8 (7.2)	11 (9.9)	20 (18.0)
Lassa fever	61 (55.0)	6 (5.4)	23 (20.7)	21 (18.9)
Varicella	53 (47.7)	7 (6.3)	20 (18.0)	31 (27.9)

Table 4: Knowledge about the type of bacteria associated with dental unit water

Knowledge	Frequency	Percent
Incorrect knowledge	77	69.4
Partial knowledge	26	23.4
Correct knowledge	8	7.2
Total	111	100.0

Table 5: Knowledge about HBV and HIV

Infectious agents	Knowledge	
	Correct n (%)	Incorrect n (%)
HBV	18 (16.2)	93 (83.8)
HIV	68 (61.3)	43 (38.7)

Table 6: Respondents' overall assessment of the level of Knowledge of infectious agents transmissible in dental settings

Assessment	Frequency	Percent
Good	55	49.5
Fair	9	8.2
Poor	47	42.3
Total	111	100.0

Table 7: Status of respondents versus Overall Level of knowledge.

Status of respondent	Level of Knowledge		
	Good	Fair	Poor
Dentist	39(52)	8(11)	28(37)
Dental hygienist	0(0)	0(0)	2(100)
Dental nurses	7(58)	0(0)	5(42)
Dental lab technologist	1(13)	0(0)	2(67)
Dental students	4(31)	0(0)	9(69)
Dental student nurse	4(66)	1(17)	1(17)
Total	55	9	47

DISCUSSION

This study aimed at determining the level of knowledge of infectious agents and their mode of transmission among the DHCP as well as the final year clinical students and nurses. In this study, Dental Surgeons constituted the largest participants. This

was likely due to the fact that the study center was a teaching hospital setting with the different cadre of dental surgeons' in different fields of dentistry participating; such as the house officers, registrars, senior registrars and consultants.

In this study, the majority of the participants were aged between 25 – 34 years. The age range in this study is similar to a previous study by Al-Faouri et al.¹⁶ This could be due to the fact that most of the participants were Dental surgeons in their training. This study reported more males' respondents than females. This may be connected to the cultural challenge of the girl child education in African society. And the majority of the participants were Christians, this is obviously due to the fact that the institution is located in Southern Nigeria.

Approximately half of the respondents in this study had good knowledge of the transmissibility of some common infectious agents and their mode of transmission. More so, better knowledge of the transmissibility of the blood-borne pathogens, than those that are transmissible solely by body fluids secretions and excretions such as herpes simplex virus was exhibited by the participants. The better knowledge of blood-borne pathogens in the study may be due to the relatively more prevalent and chronic nature of the disease conditions they create.⁵ The knowledge of blood-borne pathogens like Hepatitis D Virus was the lowest in this study. This is very likely due to its less popularity. More so, Hepatitis D is also described as a virus with a defective blood-borne pathogen that depends on the presence of HBV to successfully replicate in an infected host.¹⁷ As such, infections arising solely from its presence are rarely reported. Our study reported better knowledge of HVB than HIV as regards means of transmissibility. About a quarter of the respondents still believed that HIV spread is solely through blood contact. Although this may be the most likely mode in a clinical setting because of injuries from sharps,⁶ exposure to infected body fluids is equally an effective source of infection with the virus.^{6,11} The knowledge of HIV transmissibility through blood spills on the conjunctiva was good in our study. This is in direct contrast with the results obtained from a previous study,¹⁸ where authors reported a good knowledge of the transmissible infectious conditions but they had misconceptions about HIV spread through the conjunctiva. Authors¹⁷ have reported that the probability of HIV spread

through the conjunctiva or mucous membrane was 0.1%.

A vast majority in this study know about HBV survival in spilt blood or outside the body, which is 7 days. This is probably due to the vast information about its infectivity and complications within the healthcare setting. This is of particular importance in dentistry where HBV could be transmitted via infected saliva.⁴ This result was however in contrast with the result of another study conducted in the United States of America, where about 30% of the respondents had poor knowledge of the survival span of HBV.¹⁹ Most respondents did not know about the mode of transmission of SARS and Lassa fever, this may be due to the low prevalence of these agents in this environment and hence the lack of concern about their occurrence and transmissibility. This is however not the right attitude for a health care worker because there can be a sudden outbreak of some of these infections, and that will result in serious fatalities.

Another major source of infective pathogens in the dental clinic is the source of water. A study done in Italy to determine the level of contamination in the clinical environment reported a high level of contamination.^{20,21} In this study, only 7.2% of persons had the right knowledge of the water-related bacteria in dental unit water, which are legionella and pseudomonas. These organisms are reported to cause legionnaire disease and lung infection respectively²¹. So, sound knowledge of their presence in the dental unit water source is necessary, in order for the institution of appropriate precautionary to minimize their presence.

Half of the respondents in this study have a good level of knowledge of the general infectious agents/conditions transmissible in the dental clinic. This result compares favourable and even better than some other studies,^{22,23} where the level of knowledge was reported to be poor. The level of knowledge of the dental hygienist in Jordan and that of the dentist in Turkey were both reported to be moderate.^{24,25} The situation in this study center, though fair, still requires some attention, because of the relatively large percentage of those with poor levels of knowledge.

There was no significant relationship shown between the level of knowledge displayed and the cadre of respondents in this study. This is in contrast with a comparative study of general dental surgeons and oral specialists in Turkey, where the oral specialist

had a better knowledge score about infection control than the general dental surgeons.²⁶ This may probably be due to the very small number of respondents representing some cadre of DHCP in our study.

CONCLUSION

The average knowledge of the DHCP, final year clinical students and dental student nurses in this study was good, but their knowledge about HDV and infectious bacteria in dental unit water was poor. Generally, the knowledge of the blood borne pathogens was better than that of the airborne infective agents/conditions.

RECOMMENDATION

On the premise of this study, there is a need for routine continuing dental education on infection control seminars, organized either bi-annually or quarterly for all dental health care personnel and final year clinical students and nurses of the University of Benin Teaching Hospital (UBTH) as well as in dental hospitals in general. Due attention must be given to the unpopular, yet important, infective agents such as pseudomonas and legionella, peculiar to dental unit water.

Source of support

Nil

Conflict of interest

None declared

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