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Transmission of Bacterial Infections by Dental Impression

Azhar Imran Majeed Alawadi [1]*, Malath Nabil Jafar [2]
[1] College of dentistry, University of Thi-Qar, Nasiriyah, Iraq
[2] College of dentistry, Al Iraqia University, Baghdad, Iraq
Emails: azheroalawady@gmail.com [1], Malathnabil.mn@gmail.com [2]
* *Corresponding author*

Abstract : The aim of this research is to evaluate the type of transmission of bacterial infections by dental impression. Samples were collected from the clinics of the Dentistry College-University of Dhi-Qar. After obtaining the consent of both the patient and the doctor taking two swabs from the same patient, the first swab from the patient's mouth and the second from the Alginate impression. Each sample specimen's was inoculated onto appropriate plates, such as blood agar and MacConkey agar for standard aerobic development, and used the biochemical characterization and identification of these isolates at genus and species levels was confirmed using the analytical profile index (API) assays, and then the automated device VITEK 2. The result appear different signification between all the groups that divided to it that return to Dental patients are high-risk patients relative to their potential to transmit as well as acquire an infectious disease.

Keywords: Alginate impression, Analytical profile index, VITEK 2, Isolation, Iraq.

Introduction

The oral cavity is a natural habitat for a large number of microorganisms. This ecological niche can be a reservoir for opportunistic and pathogenic microorganisms that can pose a risk for cross- contamination and infection and may even cause systemic infections (Padda et al., 2019). This is of particular importance in the case of routine dental practice, as the risk of exposure to microorganisms in the oral cavity is increased due to the open and invasive nature of the procedures (Williams-Wiles and Vieira, 2019). It is important to consider that the pathways of contamination can be bidirectional. An infectious micro- organism may be transferred from the patient to members of the dental team, but also vice versa, e.g. through the hands of the dental team. Moreover, another infectious association is the transfer of pathogens from patient to patient, without the mediation of the dental staff, but rather through a surface located in the dental practice, or a device or instrument used during dental procedures (Villani et al., 2020).

This can apply in the case of inadequate sterilization of the dental instruments or disinfection of the dental unit. The possibility also exists that pathogens present in dental unit waterlines (DUWLs) could be spread by aerosols created by dental hand-pieces, presenting a risk for both the patient and members of the dental team (Sinha et al., 2020). There are a number of possible means by which transmission of viral and bacterial pathogens can occur in the dental practice. The patient's own saliva and blood are major vectors of cross-transmission. Blood-borne contamination can occur by exposure to the infectious material through non-intact skin and mucosal lesions (Gehrke et al., 2019). The highest infectious risk of this type is associated with accidental punctures by contaminated needles or injuries by sharp instruments. Insufficient cross-contamination control, such as improperly sterilized dental instruments, is also a possible device-borne means of pathogentransmission. Emanation of the pathogens through the spray of the hand-pieces of the dental unit can also be considered an air-borne or water-borne means of trans- mission, which may affect both the patient and the dental team (Sacoor et al., 2020). Air-borne infections can also occur via an inefficient ventilation system in the dental practice environment, whereby contaminated air may be withheld or recycled. Overall, the risk of any such transmission depends on the dose of the pathogens transmitted, the virulence of the pathogen, as well as the frequency or probability of exposure to the infectious material and the state of the host immune responses (Gallagher et al., 2020; Jay, 2021).

Infections can be caused by a wide range of pathogens, most prominently bacteria and viruses caused by patient exposure to aim is to control infections (Sehgal et al., 2020). The pathogenic microorganisms or transmitted to the dentist or laboratory staff via occupational exposure (Cebriá-Mendoza and Sanjuán, 2019).

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Material and methods

Sample collection

Samples were collected from the clinics of the Dentistry College-University of Dhi-Qar. After obtaining the consent of both the patient, the doctor taking two swabs from the same patient, the first swab from the patient's mouth and the second from the Alginate impression. Where it took time to collect from (15 December to 11May), they were saved and transferred to the laboratory of Al- Hussein Teaching Hospital.

Isolation and identification of bacteria

Each sample specimen's was inoculated onto appropriate plates, such as blood agar and MacConkey agar for standard aerobic development, and incubated at 37°C for 24 to 48 hours, depending on the type of plate used. The biochemical characterization and identification of these isolates at genus and species levels was confirmed using the analytical profile index (API) assays (BioMerieux, France), (Towner and Chopade, 1987), and then the automated device VITEK 2 (BioMérieux, France) was used to identify the isolated species. The identified isolates were stored in glycerol stock at -20ºC.

Statistical Analysis

The Statistical Analysis System- SAS (2018) program was used to detect the effect of difference factors in study parameters. Chi-square test was used to significant compare between percentage (0.05 and 0.01 probability) in this study (Gharban and Yousif, 2021; Razooqi et al., 2022).

Results and discussion

The isolates of bacteria appear different between the different studies that divided it as appear in tables (1-5)

Table 1: Results in study A (Total No. of sample =14)

Bacteria spp.	Bactria from oral cavity	%	Bactria from impression	%
Pseudomonas	1	3.57%	0	0
Klebseilla	3	10.71	2	13.3
Morexilla	7	25	1	6.66
Streptococcus	9	32.14	4	26.66
Enterococcus	2	7.14	1	6.66
Staphylococcus	3	10.71	2	13.3
Candida	2	7.14	2	13.3
No growth	0	0	4	26.66
Micrococcus	1	3.57	1	6.66
Total No.	28	100	15	100
Chi-Square (χ^2)	--	10.037 **	--	9.215 **
P-value	--	0.0001	--	0.0017
** (P≤0.01)				

Table 2: Results in study B (Total No. of sample =13)

Bacteria spp.	Bactria from oral cavity	%	Bactria from impression	%
Klebseilla	1	3.57	1	4.54
Morexilla	11	39.28	6	27.27
Streptococcus	12	42.85	9	40.9
Staphylococcus	3	10.7	4	18.18
Diphtheroid	1	3.57	1	4.54
No growth	0	0	1	4.54
Total no.	28	100	22	100
Chi-Square (χ^2)	--	13.845 **	--	13.063 **
P-value	--	0.0001	--	0.0001
** (P≤0.01)				

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Table 3: Results in study C (Total No. of sample=13)

Bacteria spp.	Bactria from oral cavity	%	Bactria from impression	%
Klebseilla	2	6.89	1	4.16
Morexilla	7	24.13	5	20.83
Streptococcus	12	41.37	11	54.83
Staphylococcus	5	17.24	4	16.66
Candida	1	3.44	1	4.16
No growth	0	0	1	4.16
Micrococcus	2	6.89	1	4.16
Total no.	29	100	24	100
Chi-Square (χ^2)	--	12.304 **	--	13.952 **
P-value	--	0.0001	--	0.0001
** (P≤0.01)				

Table 4: Results in study Diabetic patients Stats. (Total No. of sample=5)

Bacteria spp.	Bactria from oral cavity	%	Bactria from impression	%
Klebseilla	2	25	2	28.57
Morexilla	1	12.5	1	14.28
Streptococcus	3	37.5	2	28.57
Staphylococcus	1	12.5	1	14.28
Candida	1	12.5	1	14.28
Total no.	8	100	7	100
Chi-Square (χ^2)	--	8.711 **	--	5.038 *
P-value	--	0.0074	--	0.0392
* (P≤0.05), ** (P≤0.01)				

Table 5: Results in study Smoker patients Stats. (Total No. of sample=11)

Bacteria spp.	Bactria from oral cavity	%	Bactria from impression	%
Klebseilla	1	4	1	4.76
Morexilla	9	36	7	33.3
Streptococcus	11	44	10	47.61
Staphylococcus	1	4	1	4.76
Micrococcus	3	12	2	9.52
Total no.	25	100	21	100
Chi-Square (χ^2)	--	12.382 **	--	14.507 **
P-value	--	0.0001	--	0.0001
** (P≤0.01).				

Dental patients are high-risk patients relative to their potential to transmit aswell as acquire an infectious disease. An equal concern has been exhibited forcross-contamination and disease transmission from patient to patient. The constant dangers of cross-contamination in dental practice among patients, dentists, and ancillary staff have been pointed out by Murray and Slack; theyreported the possibility of absorbent cotton pledgets, air syringes, glass slabs, andhand towels acting as sources of contamination (Williams-Wiles and Vieira, 2019).

The Centers for Disease Controland Prevention (CDC), in its infection control guidelines, indicated that dentalimpressions are potential sources of cross-contamination and should be handledin a manner that prevents exposure to practitioners, patients, and the environment.Based on the corroboration of data and regulation confined to the province, appreciative standards of Dental Infection Control and Occupational

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Safety mustbe followed by the dental team for patient and dental healthcare safety. Initiallythe dentistry was routinely done without protective gears but after 1991 dental personnel was required to wear gloves, masks, gown, and protective eye. Dentistry is one of the most exposed professions to respiratory diseases e.g. covid-19 caused by patient exposure to aim is to control infections (Villani et al., 2020). The pathogenic microorganisms or transmitted to the dentist or laboratory staff via occupational exposure (Cebriá-Mendoza et al., 2019)

The final results of the study showed that alginate transmits most types of bacteria from the patient's mouth to the impression. It was found that the mosttransmitted bacteria through alginate are Streptococcus and Moraxella. It shouldbe noted that some bacteria were transmitted in most patients, but they did notgrow in the culture media of other patients. Patients with systemic diseases, such as diabetics, were observed to have more types of pathogenic bacteria, which arealso transmitted through the alginate impression such as *Klebsiella*, while a greater transmission of *Streptococcus* and *Moraxella* was observed in smokers, the age groups did not show a significant difference in the presence andtransmission of bacteria as shown in all tables.

Conclusion

In the light of the growing concerns about infection spreading that dominateGlobal news and National Medical institutions and since the transmission of pathological bacteria was proven to be inevitable in dental impressionprocedures, then it is only logical to stress the importance of adopting sterilization and disinfecting protocols as fundamental and irreplaceable pillows of sound Dental Practice and Rendering lenient sterilization and disinfection procedures as anindication of Malpractice

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