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Evaluation of Oral Health Practitioners and Facilities on Preparedness for Medical emergencies in Dental practices, Ndola – Zambia: A pilot study

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ABSTRACT

INTRODUCTION: Preparedness to handle medical emergencies in dental practices depends on a range of factors, such as understanding the magnitude of the problem, availability of essential medical emergency drugs and equipment, and trained personnel. This pilot study aimed to inventory these factors in the available oral health facilities in Ndola, Zambia, to establish the preparedness level for handling these emergencies.

METHODS: A cross-sectional study included 24 oral health practitioners in eight oral health facilities in Ndola, Zambia. The survey utilized a checklist for inventory of essential drugs and equipment and a questionnaire to capture practitioner's sociodemographic data, medical emergency experience, and training history. Data analysis was done using IBM SPSS version 23, and results were presented using descriptive statistics.

RESULTS: A total of 24 oral health practitioners with M: F of 2:1 were encountered. The majority (45.8%) were ≥41 years of age, and 58.3.% were degree holders. Medical emergency training history was as follows; 100% trained during undergraduate studies, 50% further trained after graduation, 25% for BLS, and 8.3% validated their certificates. Only 25% of the facilities had all the essential drugs and equipment. Medical emergency for the past 1 year was 54% with no statistically significant associations with gender, age, and level of education ($p<0.05$).

CONCLUSION: The preparedness level for management of medical emergencies in dental practices was very low. Facilities need to ensure the availability of all the essential medical emergency drugs and equipment and provisional BLS CPDs to the practitioners as required.

Keywords: Evaluation, Oral health, Practitioner, Preparedness, Medical emergencies

INTRODUCTION

Medical emergencies in dental practices are unexpected situations involving illness or injury requiring immediate action. These include; vasovagal syncope, angina pectoris, hypoglycemia, epileptic seizures, choking, asthma, anaphylaxis, and cardiac arrest [1,2]. Systemic conditions such as cardiovascular diseases, diabetes, anxiety, and some other risk factors such as local anesthetic administration, patient long waiting time, etc., are some of the reported predisposing factors that are associated with their occurrences [3].

It is important that oral health practitioners are able to recognize medical emergencies during

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their daily clinical practices and also be competent to carry out management of these emergencies if they do occur. Successful execution of the above depends on a wide range of factors such as the availability of equipment and medical emergency drugs, trained personnel, and accepted treatment protocols for medical emergencies, which often become the basis for quality assurance and legal standards of care [1,6].

Based on the data for the incidence of medical emergencies, it is estimated that, on average, a general dental practitioner (GDP) will experience a medical emergency at least once every two years. [4, 5]. This may be regarded as low, but if the oral health practitioners are not capacitated with the skills for prevention of these emergencies and the facts from reported increase rate of elderly population and medically compromised patients, the estimated incidence would be greatly increased [7, 8]. This is infarct true as supported by a study done by Shweta et al., 2015 which revealed that half of all patients treated in dental school facilities have at least one chronic disease or condition [7]. Since some diseases and their treatment increase the likelihood of a medical emergency during dental clinical care, oral health practitioners must be prepared as well as equipped to prevent or manage a variety of medical emergencies.

Prevention of medical emergencies in oral health facilities is a key point to consider, especially in resource-limited areas where some equipment and drugs used to manage these conditions may be scarce [9, 10]. This may be greatly achieved by taking proper medical history, filling out the health history proforma, and conducting a comprehensive pre-operative assessment of dental patients to identify risk factors for these conditions, providing the basis for appropriate precaution [7,10]. Despite all those precautions, a medical emergency may still occur, and hence, the availability of equipment and appropriate drugs is mandatory for a well-trained oral health practitioner in basic life support (BLS) to manage these conditions by following medical emergency management protocol [11,12, 13]. Therefore, office preparation and staff training are essential for the prompt recognition and successful management of medical emergencies that arise in oral health clinical settings [6, 14, 22].

Since these emergencies are unexpected situations or illnesses requiring immediate action, every oral health facility should have all the minimum level of equipment immediately available and in working order, together with the presence of all essential drug supplies to effectively manage medical emergencies in their clinical setting [13,15,16]. Though some medical emergency situations may be successfully managed without the need for drug administration, for example, syncope and seizures, others, such as bronchospasm, angina, hypoglycemia, and myocardial infarction (MI), do require their administration [14]. The aim of this pilot study was to perform an inventory of medical emergency drugs, equipment, and staff training and highlight the reported medical emergency incidences to establish the preparedness level of the oral health facilities for handling these emergencies in Ndola, Zambia.

METHODOLOGY:

Study Design: A cross-sectional study was conducted by evaluating oral health practitioners and their facilities for preparedness for the management of medical emergencies during dental practices in Ndola, Zambia.

Study Area: This study was conducted in all oral health facilities which were available in Ndola City, Copperbelt Province, Zambia during the study time. This included all eight registered oral health facilities that provide oral health services.

Study Population:

The study population was comprised of all oral health practitioners in the eight oral health facilities in Ndola at the time of evaluation.

Eligibility Criteria: All oral health practitioners in the eight available oral health facilities in Ndola City, Zambia

Oral health practitioners who were not in their facilities during the time of evaluation were excluded.

Data Collection Procedure: The survey utilized a self-administered closed-ended questionnaire to capture the practitioner's sociodemographic data, incidence of medical emergency experienced for the past one year, and medical emergency training history. A checklist containing the list of all the recommended minimum essential drugs and equipment was used for the inventory of drugs and equipment used in the management of medical emergencies during dental practices.

Data Analysis: Data were processed and analyzed using IBM SPSS Statistics version 23 (IBM Corp., Armonk, NY, USA). Chi-square statistical analysis to assess associations or outcomes of interest was used as appropriate, and associations were considered significant when the p-value was ≤ 0.05.

Ethical Clearance and Considerations: Ethical approval was obtained from the Tropical Diseases Research Centre (TDRC) at Ndola University Teaching Hospital (NTH), Zambia. Confidentiality of the information from the oral health practitioners was observed.

RESULTS

Table 1 shows the distribution of study participants by gender, age, and education. A total of 24 Dental practitioners were encountered in the available oral health faculties in Ndola with a M: F of 2:1, and the majority (45.8%) of them were ≥41 years of age. Collectively, 58.3% were degree holders, 16.7% were diplomas, and 25% were Certificate holders.

Figure 1 shows that 54% of the oral health practitioner reported experiencing medical emergencies during their clinical practice in the past.

Table 1: Distribution of study participants by gender, age, and education

GENDER	(n)	(%)
Male	16	66.7
Female	8	33.3
Total	24	100
AGE GROUP (Years)		
25-32	4	16.7
33-40	9	37.5
>41	11	45.8
Total	24	100
EDUCATION		
Certificate	6	25
Diploma	4	16.7
Degree	9	37.5
Masters	5	20.8
Total	24	100

Figure 2 shows the reported types and frequency of medical emergencies experienced by oral health practitioners for the past year. Syncope, hypoglycemia, and epinephrine reactions have been experienced by 45.8% of dental practitioners and rank the commonest. The anaphylactic shock was the second most common, with 29.2%, followed by mild allergy, seizures, and asthmatic attacks, which were 16.7% each. FBA and swallowing of an object were reported by 12.5% of the participants, while Angina pectoris was the least reported medical emergency (4.2%). None of the practitioners reported experience of cardiac arrest or myocardial infarction.

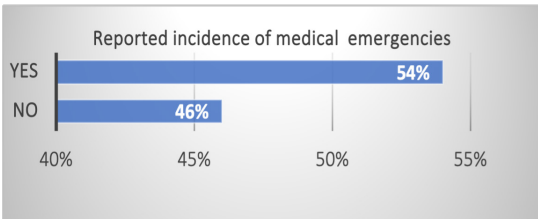

Figure 1: Distribution of participants by medical emergency experience in the past year of practice

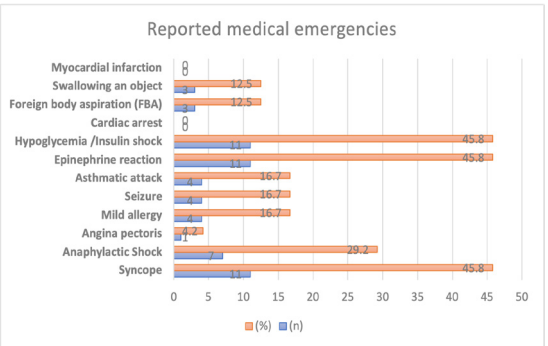

Figure 2: Type and frequency of reported medical emergency experienced by an oral health practitioner for the past 1 year

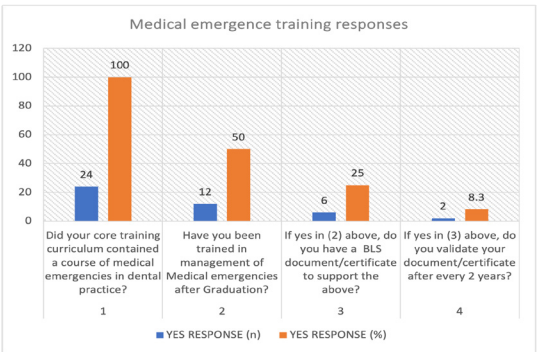

Figure 3: Distribution of participants by medical emergency training responses.

Table 2: Distribution of participants by gender, age, and level of education with medical emergency experience in the past year

	MEDICAL EMERGENCY EXPERIENCE				
GENDER	**Yes**	**No**	**Total**	**Chi-square**	**P-value**
Female	4	4	8		
Males	9	7	16	0.084	0.772
Total	13	11	24		
AGE (Years)					
25-32	4	0	4		
33-40	4	5	9		
≥41	5	6	11	4.064	0.131
Total	13	11	24		
EDUCATION LEVEL					
Certificate	3	3	6		
Diploma (DT)	1	3	4		
Degree (BDS/DDS)	6	3	9		
Masters (specialist)	3	2	5		
Total	13	11	24	2.048	0.563

Table 2 shows the distribution of participants by gender, age, and level of education with medical emergency experience in the past year. There were no statistical significance ($p< 0.05$) associations between medical emergencies experienced with Gender ($X^2 = 0.084$, p-value = 0.772), Age ($X^2 = 4.064$ p-value = 0.131) and Level of Education ($X^2 = 2.048$, p-value = 0.563).

Figure 3 shows the distribution of participants by medical emergency training responses. All participants (100%) were exposed to medical

Table 3: Inventory of essential medical emergency drugs in the various oral health facilities (Key; x = Absent, √ = Present).

DRUG	**ORAL HEALTH FACILITIES**								**TOTAL**
	CM	**MB**	**ADH**	**HV**	**DRB**	**MCS**	**NM**	**NTH**	**n(%)**
Epinephrine	√	√	x	√	x	√	√	x	5 (62.5)
Nitroglycerine	x	√	x	√	x	√	x	x	3 (37.5)
Antihistamine	x	√	x	√	x	√	x	√	4 (50)
Salbutamol	x	√	x	√	√	√	x	x	4 (50)
Aspirin	√	√	x	√	√	√	x	x	5 (62.5)
Glucagon	x	√	x	√	√	x	x	x	3 (37.5)
Dextrose	√	√	√	√	√	√	√	√	8 (100)
Atropine	x	√	x	√	√	x	x	x	3 (37.5)
Inj. Hydrocortisone	x	√	√	√	√	√	x	√	6 (75)
Naloxone	x	√	x	√	x	x	x	x	2 (25)
Midazolam/ Lorazepam	x	√	x	√	x	x	x	x	2 (25)
Flumazenil	x	√	x	√	x	x	x	√	3 (37.5)
TOTAL n(%)	3 (25)	12 (100)	2 (16.6)	12 (100)	6 (50)	7(58.3)	2 (16.6)	4 (33.3)	

emergencies course during their training, 50% have been trained in the management of medical emergencies after graduation, 25% had documents or certificates for Basic Life Support (BLS) training, and among these, only 8.3% showed proof of validation of their certificates after every 2 years.

Table 3 shows the inventory of essential medical emergency drugs in the various oral health facilities. The most commonly available drug was Dextrose 10%, all dental facilities had the drug, followed by injectable hydrocortisone with 75%, Epinephrine and aspirin (62.5%) each, Salbutamol and Antihistamines were found in half (50%) of the facilities, Nitro-glycerin and Glucagon availability was at 37.5%. The least available drugs were Naloxone, Midazolam, and Flumazenil, which accounted for 25% each.
Only 2 facilities had all (100%) minimum immediately available essential drugs needed to manage medical emergencies, and two other facilities were found to have the least (16.6%) minimum essential available drug supply.

Table 4 shows the medical emergency equipment/materials inventory in the various oral health facilities. The most common available equipment/materials were BP Machines. All (100%) oral health facilities had it, followed by Intravenous materials, which were found in 87.5% of the facilities. The least available equipment/materials were an Airway protector and an Automated external defibrillator found in 37.5% and 25% of the evaluated oral health facilities, respectively.
Only 2 (two) facilities had all (100%) minimum essential immediately available equipment/materials needed to manage medical emergencies, and two other facilities were found to have the least (37.5% and 12.5%) available equipment/materials.

DISCUSSION

This pilot study was conducted to evaluate the level of preparedness for the management of medical emergencies that may occur during different dental clinical practices in Ndola, Zambia. The evaluation was based on a spot inventory of oral health facilities on essential drugs, equipment, and different aspects of oral health practitioner training needed for managing these emergencies.
Twenty-four oral health practitioners were encountered in all eight available oral health faculties during the evaluation. The demographic characteristics of the participants were as follows: M: F = 2:1, the majority (45.8%) of them were aged

Table 4: Inventory of medical emergency equipment/materials in the various oral health facilities (Key; x = Absent, √ = Present).

EQUIPMENTS	ORAL HEALTH FACILITIES								TOTAL
	CM	MB	ADH	HV	DR.B	MCS	NM	NTH	n(%)
Ambu bag	x	√	x	√	√	x	x	x	3(37.5)
Intravenous materials	√	√	√	√	√	√	x	√	7(87.5)
Pulse oximeter	√	√	x	√	√	√	x	√	6(62.5)
Syringes &Needles	√	√	√	√	√	√	x	√	7(87.5)
Automated External Defibrillator	x	√	x	√	x	x	x	x	2(25)
BP Machine	√	√	√	√	√	√	√	√	8(100)
Oxygen cylinder & facemask	x	√	x	√	√	√	x	x	4(50)
Airway protector	x	√	x	√	√	x	x	x	3(37.5)
TOTAL n (%)	4(50)	8(100)	3(37.5)	8(100)	7(87.5)	5(62.5)	1(12.5)	4(50)	

41 years and above, more than half (58.3%) were degree holders, 16.7% had diplomas and 25% were Certificate holders. This demographic characteristic was similar to a study in a nearby country, Tanzania [15]. However, the number of participants in this study was small as the study was focused not only on the number of participants but also on the actual availability of drug supplies and equipment at the facility at the time of assessment.

The proportion of oral health practitioner who reported experiencing medical emergencies during their practice in the past year was 54%. This incidence seems to agree with 56% reported in South Africa in late 2015 [21]. Available data from a study done in Tanzania in 2015 revealed a prevalence of 32.4% of reported medical emergencies in the past four years [15]. Out of Africa, specifically Europe and Italy, a recent nationwide web-based survey of Italian dentists revealed a prevalence of 65.2% during their professional practice [19]. This current prevalence of more than half of medical emergencies in one year, revealed in this survey, seems to be high and calls for a proper intervention strategy, especially those targeting the prevention of incidence of these emergencies in oral health facilities [7,9,10]. However, once an emergency condition arises, proper management preparation should be in place.

In this study, Syncope, together with other medical emergencies, namely hypoglycemia and epinephrine reaction, has been reported to be experienced by 45.8% of oral health practitioners and ranked the commonest. None of the practitioners reported experience of cardiac arrest or myocardial infarction. It's not surprising that Syncope ranks the most among other emergencies, as this has also been reported by several studies [1, 2,15,19, 20]. Hypoglycemia and epinephrine reaction incidence are usually less compared to syncope, but in this survey, all were reported at the same magnitude. Worthy noting in this survey is the reported non-occurrence of cardiac arrest and myocardial infarction. Several studies also documented a generally low incidence of these emergency conditions [23, 24, 25], though with an increased rate of elderly individuals because of advances in medical treatment and medically compromised patients, the estimated incidence of such emergency would be expected to increase significantly [7,8], hence measure for prevention and treatment strategies for these conditions should always be in place. Further analysis of reported medical emergencies with social demographic characteristics of study participants revealed no statistically significant association ($p< 0.05$) between medical emergencies experienced in the past year with Gender ($X^2 = 0.084$, p-value = 0.772), Age ($X^2 = 4.064$ p-value = 0.131) and Level of Education ($X^2 = 2.048$, p-value = 0.563. This lack of association may not be concluded beyond doubt in this current survey as there were few study participants.

Training, up-to-date knowledge, and periodic validation of BLS certificates are key for proper preparedness and management of medical emergencies [8,11,12,16]. All practitioner evaluated in this survey reported having been exposed to medical emergency courses during their training; half have been further trained after graduation as part of CPDs, and a quarter had documents or certificates for BLS training, and among these, only a few (8.3%) had evidence of validating their certificate every two years. There seems to be not much emphasis among the practitioners on continuous training after graduation, and those trained tend not to validate their BLS certificates. This has been reported by several studies to affect the level of up-to-date knowledge and skill of practitioner on prevention and management of medical emergencies in their oral health settings, hence negatively affecting the level of preparedness for management of these emergencies [10,15,16,17].

The availability of drugs and equipment is paramount in managing medical emergencies in the dental clinic [11,12,13]. In this survey based on the inventory of drugs in the encountered oral health facilities at the time of evaluation, Dextrose 10% was the most commonly available drug all the dental facilities had it, three-quarters of the facilities had injectable hydrocortisone, 62.5% had Epinephrine and aspirin, Salbutamol was found in half of the facilities. In contrast, other essential drugs, such as Nitro-glycerin, Glucagon, Naloxone, Midazolam, Flumazenil, etc., were only found in less than 38% of the facilities. In general, only a quarter (25%) of all the facilities had all the minimum essential drugs needed to manage medical emergencies. It is mandatory to ensure that all the drugs for emergency management are

available and accessible, as one may not predict the kind of emergence that might happen during the clinical management of a patient. In fact, different studies and health-related professional bodies recommend all dental facilities have all the essential drugs for proper preparedness to manage these emergencies [9,13, 22, 23].

Regarding equipment availability, the most common equipment/materials were BP Machines. All the facilities had it, followed by Intravenous materials, which was found in 87.5% of the facilities. The least available equipment/materials were airway protectors and automated external Defibrillators (AED), which were found in 37.5% and 25% of the evaluated oral health facilities, respectively. These findings agree with a recent study by Manal Abu et al., 2022 [23]. Only a quarter (25%) of the facilities had all the minimum available equipment/materials needed to manage medical emergencies. The low availability of equipment/materials evidenced in this study makes the level of preparedness for the management of these emergency conditions to be of great concern, as stipulated and recommended by several studies [9,13, 22, 23]. Though cardiac arrest is not the most common emergence in dental settings, the absence of AED noted in most oral health facilities would pose a unique challenge when the need for using this device arises. Findings from a French study revealed that 1 to 20 general dentists would have to deal with cardiopulmonary resuscitation (CPR) at least once in their career, and another Australian study estimated that 15% of dental surgeons resuscitated patients in their clinics [24, 25]. This necessitates the availability of AED in the clinic for resuscitation as the procedure is lifesaving.

The strength of this study is based on its ability to perform a physical inventory of available essential medical emergency drugs and equipment in the surveyed oral health facilities. This provided the real picture of preparedness for managing medical emergencies in the evaluated facilities. Likewise, the interview and the physical check for the medical emergency certificates from the oral health practitioners provided reliable information on the training level for the oral health practitioners to manage these emergencies. This study has flaws as well. The sample size studied is small compared to most studies reviewed in the literature. This was due to the small number of oral health facilities available in the studied area at the time of evaluation, which necessitated, as previously alluded to in the methodology, the inclusion of all the available facilities.

CONCLUSION

The preparedness level for managing medical emergencies in dental practices was low. Facilities need to ensure all the essential medical emergency drugs and equipment are readily available and accessible for use during the management of emergency conditions. Oral health practitioners should regularly update their Basic Life Support (BLS) skills and validate their BLS certificate as required. There is a great need to conduct further studies with a larger sample size of oral health practitioners and facilities to increase the power of the study.

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