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SCIENTIFIC RESEARCH REPORT

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# General dentists' awareness of how to cope with medical emergencies in paediatric dental patients

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**Background:** General dentists (GDs) should be aware of the symptoms, signs, diagnoses and treatment of medical emergencies in paediatric patients. **Aim:** To evaluate the knowledge of GDs in coping with medical emergencies, and to identify whether they are confident to diagnose and treat medical emergencies in paediatric patients. **Design:** The questionnaire was conducted immediately before the beginning of national dental meetings and continuing education seminars in Croatia, attended by the GDs, in order to obtain a representative sample. **Results:** Of a total of 498 GDs who returned the questionnaire with valid data, 51.2% reported that a medical history was regularly taken. A high proportion (81.3%) of the GDs had never received any basic life support (BLS) training and education for paediatric patients during their undergraduate studies. After graduation, this value rose to 86.1% of GDs. However, more than two-thirds (68.7%) had experienced some emergency situation in their practice. The most frequent emergency was vasovagal syncope (83.6%) and the most rare was cardiac arrest (8.2%). One-fifth (20.5%) of GDs experienced some emergency but could not make a diagnosis. The more BLS training undergone by a GD, the more self-confident s/he felt in an emergency situation. **Conclusions:** Most GDs have a lack of knowledge to cope with medical emergencies in paediatric patients, and do not feel confident to diagnose and treat emergency situations in children. It is suggested that adequate training and education should be provided for all GDs to address this shortcoming.

***Key words:*** *General dentist, medical emergency, children, basic life support*

## INTRODUCTION

The relatively low prevalence of life-threatening conditions in dental practice does not diminish their severity or the need for each member of the dental team to have knowledge of and skill in basic procedures for resuscitation of patients[1]. During dental procedures, various risk factors, such as emotional stress, general health condition, medical therapy and drug interactions, may result in medical emergencies in all age groups[2].

Children require the special attention of general dentists (GDs) and other members of the dental team. In emergency situations, proper and timely treatment, particularly in cases of respiratory and heart failure, significantly increase survival and the preservation of neurological function in children[3]. First-aid procedures and administration of medications are adjusted depending on the age and physical development of the child. In the younger age group, ( < 12 year of age) anxiety and dental phobia are more pronounced as risk factors for emergencies[4]. Treatment under general anaesthesia or under intravenous or inhalation sedation can contribute to an emergency situation in the dental office[5]. The most common emergencies in the dental office are vasovagal syncope, mild allergic reactions, conditions related to cardiovascular disease, respiratory problems, epilepsy and diabetes complications[2,6,7]. Anaphylaxis can be a cause of emergency as all drugs and agents that are used in dental practices are possible allergens[8,9]. In young children, lack of patience and sudden movements

during the therapeutic procedure increase the risk for aspiration of dental instruments and materials. Aspiration of a foreign object may cause airway obstruction and could result in death by asphyxiation[10]. Basic emergency equipment and knowledge of its use and dosage are prerequisites for the proper response to emergency situations in the dental office[11].

Although paediatric dentistry is an official and recognised specialty in Croatia, dental treatment for children in Croatia is provided mainly by GDs. Practices are run in both public and private dental offices. Education on the topic of medical emergencies in children is included in the undergraduate curriculum as a separate course in semester eight; however, the course is only theory-based. Postgraduate continuing education courses on this topic are not obligatory.

There are no data on the knowledge of GDs about medical emergencies in paediatric patients in Croatia. Moreover, information on this subject in the literature is scarce. The aim of this study was to evaluate the knowledge and capability of Croatian GDs to diagnose and treat medical emergencies in children.

## METHODS

### Study design

There are 3,984 practicing GDs registered with the Croatian Chamber of Dental Medicine (CCDM). The target sample of this study was 525 with a response rate of 94.9% ($n = 498$). The investigation was conducted immediately before the beginning of large dental meetings and continuing education seminars, attended by the GDs from all Croatian regions, in order to obtain a representative sample. The questionnaires were handed to the GDs, participation in the survey was voluntary and the anonymity of the participants was respected. All participants gave verbal consent and the consent procedure was approved by the Ethics Committee/Institutional Review Board. This research was conducted in full accordance with the World Medical Association Declaration of Helsinki and approved by the Ethics Committee of the School of Dental Medicine, University of Zagreb, Croatia, and was conducted during the academic year 2013/2014.

### Questionnaire

The questionnaire by Marks *et al.*[12] was used. It was validated for the Croatian language and consisted of 49 questions/statements divided into four parts. The first part of the questionnaire included general information on GDs: gender; working environment; and the number of years since graduation. In the second part of the questionnaire, respondents replied to questions about taking a medical history from their patients. Questions about education in basic life support (BLS), as well as about the type of emergency equipment in their dental practices, were answered in the third part of the questionnaire. The fourth part of the questionnaire consisted of questions on the frequency that GDs dealt with medical emergency situations, as well as self-assessment on their ability to diagnose and treat patients in medical emergency situations.

The average time needed to fill out the questionnaire was 15 minutes, and questionnaires were collected immediately after completion.

### Statistical analysis

The data were analysed using Statistica 12 (STATISTICA version 12; StatSoft, Inc., Tulsa, OK, USA) by descriptive and non-parametric statistics. The non-parametric Kruskal–Wallis test was applied to analyse the differences between the various categories and analyse them. The level of significance was set at 5%.

## RESULTS

Five-hundred and twenty-five GDs, representing 12.5% of all active GDs in the CCDM, were invited to participate in this study. Questionnaires with valid data were returned by 498 (94.9%) GDs. All regions of Croatia were represented in the sample.

The proportion of female GDs (54.4%) was slightly than that of male GDs (46.6%). Distribution regarding working environment reflects almost three-quarters (72.1%) of GDs practicing in cities with over 70,000 inhabitants. Slightly more than four-fifths (82.6%) of participants reported that it would take up to 10 minutes for an ambulance to arrive at their practice and for 70.3% of them the hospital is no more further than 5 km from their practice. Slightly more than half (53.4%) of the participants graduated 10 years ago or less and, of the others, 42.2% graduated between 10 and 20 years ago.

Only 51.2% of the GDs reported that they always take a medical history, and mostly these were GDs who had graduated in the previous 5–10 years (56.6%). Around one in 10 (10.4%) GDs reported that they never take a medical history, and most of these were GDs who had qualified recently (16.2%). Only 36.7% of GDs always updated the patients' medical history, and 20.1% of dentists never did so (*Tables 1 and 2*).

During their undergraduate studies, 81.3% of GDs never received any BLS training and education for paediatric patients. After graduation, 86.1% never received adequate BLS training (*Table 3*).

**Table 1** Distribution of respondents according to medical history-taking

| Variable | *n* | % |
|---|---|---|
| Medical history taken | | |
| Yes | 255 | 51.2 |
| No | 52 | 10.4 |
| Mostly | 136 | 27.3 |
| Sometimes | 55 | 11.1 |
| Medical history checked and up to date | | |
| Yes | 183 | 36.7 |
| No | 100 | 20.1 |
| Mostly | 120 | 24.1 |
| Sometimes | 95 | 19.1 |

**Table 2** Distribution of respondents according to medical history-taking in correlation to the number of years since graduation

| Years since graduation | Medical history-taking | | | | Total |
|---|---|---|---|---|---|
| | Yes | Mostly | Sometimes | No | |
| <5 years | 57 (43.85) | 33 (25.38) | 19 (14.62) | 21 (16.15) | 130 |
| 5–10 years | 77 (56.62) | 35 (25.74) | 17 (12.50) | 7 (5.15) | 136 |
| 10–20 years | 111 (52.86) | 60 (28.57) | 15 (7.14) | 24 (11.43) | 210 |
| >20 years | 10 (14.29) | 8 (57.14) | 4 (28.57) | 0 (0.00) | 22 |
| Total | 255 | 136 | 55 | 52 | 498 |

Values are given as *n* or *n* (%).
Pearson chi-square = 36.5218; degrees of freedom (d.f.) = 12; $P = 0.000267$.

**Table 3** Distribution of respondents regarding basic life-support training and education

| Variable | Adults *n* (%) | | Children *n* (%) | |
|---|---|---|---|---|
| BLS training and education during undergraduate studies | | | | |
| Never | 143 | (28.7) | 405 | (81.3) |
| During 1 year | 231 | (46.4) | 67 | (13.5) |
| During ≥2 year | 124 | (24.9) | 26 | (5.2) |
| | $\chi^2 = 279.5$; d.f. = 2, $P < 0.001$ | | | |
| BLS training and education after graduation | | | | |
| Never | 308 | (61.9) | 429 | (86.1) |
| 1–2 times | 150 | (30.1) | 61 | (12.3) |
| >2 times | 40 | (8.0) | 8 | (1.6) |
| | $\chi^2 = 78.7$; d.f. = 2, $P < 0.001$ | | | |

BLS, basic life support; d.f., degrees of freedom.

Concerning dental office equipment for emergencies, over 92.6% of GDs confirmed having adrenaline and fewer than half to have an oxygen mask (43.6%), an ambu-bag (47.4%) and oxygen for emergencies (33.7%). Only 6.4% of GDs have an automatic external defibrillator (AED), more commonly those who had graduated longer than 10 years ago (*Figure 1*).

Two-thirds of the GDs (68.7%) had experienced some emergency situation in their dental practice. The most frequent emergency was vasovagal syncope (83.6%) and the most rare was cardiac arrest (8.2%). Slightly more than one-fifth (20.5%) of GDs had experienced some emergency situation with their patients but were unable to diagnose what was happening (*Table 4*).

Slightly more than half (52.2%) of GDs do not feel confident in administering adrenalin in an emergency situation and almost half (43.2%) do not feel confident in administering oxygen.

Ranging from 45% to 64.9%, GDs do not feel sufficiently competent to deal with medical emergency situations such as asthmatic shock (64.9%), angina pectoris (62.7%), cardiac arrest (57.0%), hypoglycaemic/hyperglycaemic episodes (56.6%), epileptic episode (55.2%), high blood pressure (54.2%), breathing obstruction (49.8%), vasovagal syncope (45.6%) and anaphylactic shock (45.0%).

*Figures 2 and 3* illustrate the self-perception of the GDs' competencies in diagnosing and in treating medical emergency situations in children. A similar result was found in both categories. The more training that the GD had undergone, the more confident (s)he felt. The only exception was for vasovagal syncope, both in diagnosing ($P = 0.1777$) and in treating ($P = 0.504$), and angina pectoris in diagnosing ($P = 0.098$). Almost 40% (38.8%) of GDs think that review BLS training is needed once a year, and 33.5% think that it is needed once every 2 years.

## DISCUSSION

This survey is the first study of Croatian GDs regarding their competencies in responding to medical emergencies in paediatric patients. However, to our knowledge, studies on medical emergencies have been conducted only in adult patients, not in children. These studies concluded that dentists are in need of additional, continuing education in the field of medical emergency management in dental offices[13,14].

The major advantages of the present study are the representative number of registered active GDs (12.5%), that all GDs are members of the CCDM and from the whole of Croatia, and the very high response rate (94.9%).

GDs are spread throughout Croatia with an uneven distribution between urban and rural dental offices. This is the reason why almost three-quarters (72.1%) of GDs interviewed were practicing in cities of over 70,000 inhabitants.

About half (51.2%) of the respondents take medical histories regularly, which is similar to the value reported by Marks *et al.*[12] (55.3%). Most had graduated 5–10 years ago. GDs who have been in practice for a longer period, a decline in regular taking of a medical history is apparent.

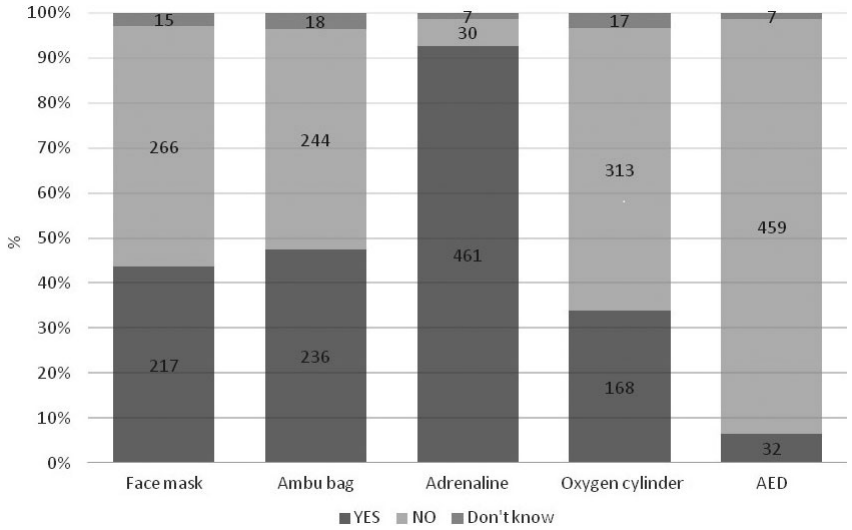


*Figure 1.* Dental office equipment for medical emergencies. AED, automatic external defibrillator.

**Table 4** Prevalence of medical emergencies in dental offices

| Variable | *n* | % |
|---|---|---|
| Did you have an emergency situation in your dental office? | | |
| Yes | 342 | 68.7 |
| No | 156 | 31.3 |
| If Yes, what kind of emergency situation? | | |
| Vasovagal syncope | 286 | 83.6 |
| Diabetes (hypoglycaemia/hyperglycaemia) | 128 | 37.4 |
| Epileptic seizure | 117 | 34.2 |
| Allergic shock | 86 | 25.1 |
| Cardiac arrest | 28 | 8.2 |
| Emergency situation but no diagnosis | 70 | 20.5 |
| Other | 77 | 22.5 |

Around one in 10 (10.4%) of GDs never take a medical history, mostly the youngest GDs (16.2%). Furthermore, fewer than 40% (36.7%) of GDs always update their patients' medical histories, and 20.1% never do so. Only some patients/parents alerted the GDs to their medical condition before treatment. This is absolutely not acceptable but could be explained by the relatively rare exposure to life-threatening situations[15] or due to the work load, and not allowing time to perform this update.

Slightly more than four-fifths (81.3%) of GDs stated that they had never received any BLS training for paediatric patients during their undergraduate studies. This rose to 86.1% when postgraduate training was taken into account. This high percentage could be explained by the fact that in Croatia, basic knowledge of BLS procedures is acquired as part of the undergraduate dental curriculum during one semester, but not specifically dedicated to children. Only a few hours on theory-based BLS concerning children are included in the mandatory undergraduate subject 'Paediatric and preventive dentistry'. Postgraduate continuing education courses are not mandatory and represent a personal choice for each dentist. In Belgium, BLS training and education is also not mandatory and such data for other countries are unavailable. From the results of this survey it is clear that the estimation of GDs' own competence is always greater for those who attended BLS training.

Dental office equipment for medical emergencies in Croatia is not satisfactory. Not all respondents (92.6%) have adrenalin and fewer than half have an oxygen mask (43.6%), an ambu-bag (47.4%) and oxygen for emergencies (33.7%). Of those who graduated 10 years ago or longer, 6.4% have an AED, although it is not clear if such a device is mandatory in a general dental practice. Most emergency kits for the dental office reflect an adult patient orientation, and emergency therapy for children requires equipment that is specific for the child as well as modification of the dosages of emergency drugs[16].

Slightly more than two-thirds (68.7%) of all respondents had experienced some emergency situation in their dental practice. The most frequent emergency was vasovagal syncope (83.6%) and the most rare was cardiac arrest (8.2%) because most patients with this condition are under medical control. Staff providing medical treatment were in a non-hospital setting and treatment was taking place under local anaesthesia. In Belgium, the vasovagal syncope is also the most frequent emergency situation and cardiac arrest the rarest[12]. The most worrying fact is that 20.5% of Croatian GDs experienced an emergency situation with their patients but could not make an adequate diagnosis. This confirms that they are not well trained and prepared for emergency situations.

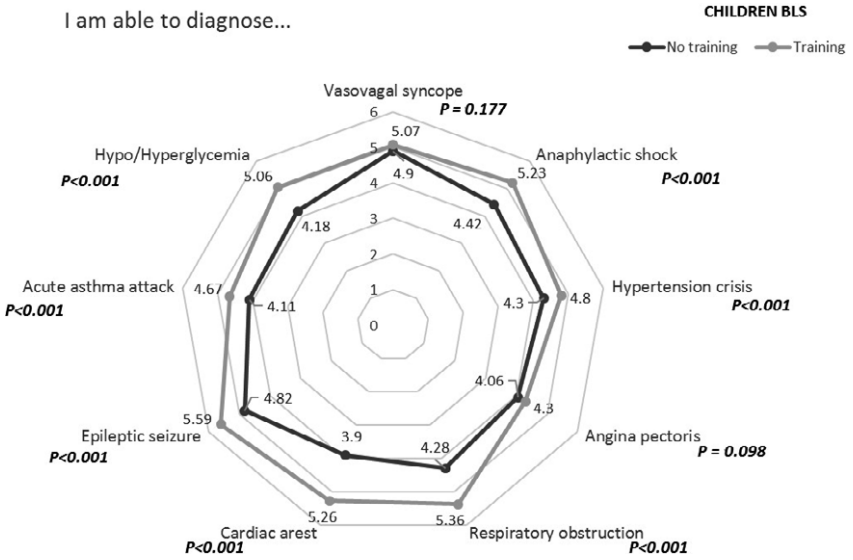


*Figure 2.* Self-perception of respondents' competencies regarding diagnosis of emergencies.

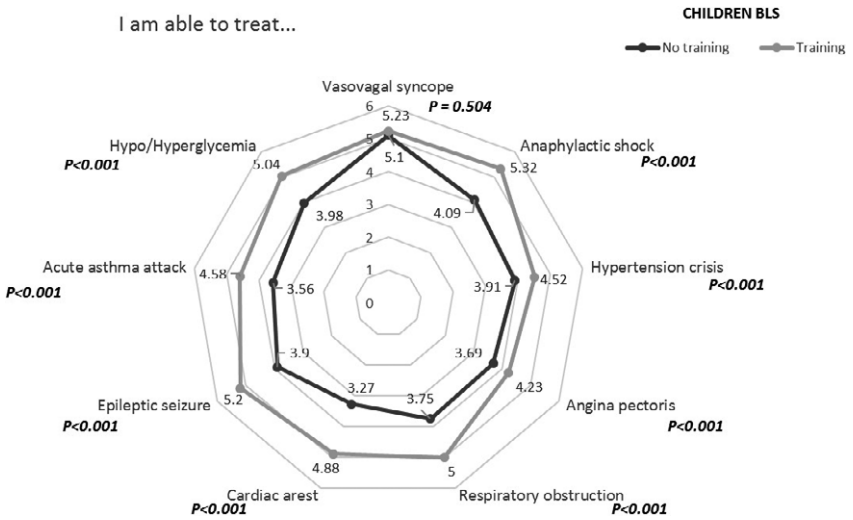


*Figure 3.* Self-perception of respondents' competencies regarding treatment of emergencies.

More than half (52.2%) of GDs do not feel confident to administer adrenalin in an emergency situation and almost 45% (43.2%) do not feel confident to use oxygen. In the very high range of 45–64.9%, Croatian GDs do not feel educated enough to deal with many medical emergency situations. According to World Health Organization (WHO) data, the most common chronic disease in paediatric patients is asthma[17,18]. However, 64.9% of our respondents felt unable to cope with an asthma attack in a child.

This study has shown that in Croatian GDs the knowledge of BLS in children is inadequate and that most feel the need for additional education. Other studies confirm the necessity of improving both knowledge and practice in order to become well-proposed practitioners[19–22].

According to 'The Report of the European Advisory Committee on the Training of Dental Practitioners' and 'Clinical Proficiencies required for the Practice of Dentistry in the European Union', dentists must have adequate education and training to minimise possible technical, ethical and legal problems associated with dental practice[23].

## CONCLUSION

This study has identified a high deficiency of knowledge and competencies amongst Croatian GDs regarding the management of medical emergencies in children. There are no studies in other countries evaluating the knowledge and preparedness of GDs for emergency situations in paediatric patients; such

studies have only been carried out in adults. These deficiencies could be addressed by comprehensive undergraduate education as well as by postgraduate continuing education covering BLS issues in paediatric patients. If implemented, these changes can improve dental practice in Croatia.

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## Conflict of interest

None declared.

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