

Medical Emergencies In Dental Practice

[Part 1: Prevalence and Factors associated with their number and occurrence in Riyadh]

¹Omar Y. Al-Turki BDS, ²Aljohara A. Al-Hussyeen BDS, CAGSD (pediatric Dentistry), MSc, DScD, ³Noof S. Al-Hammad BDS, Ms
⁴LatifaAlhowaish BDS, DClinDent (Ped Dent), M Ped Dent,
⁵NassrAlmaflehi BDS, MS

¹ General Dentist, Private clinic, Riyadh, Saudi Arabia

² Professor, Department of pediatric dentistry and orthodontic, Dental College, king Saud University, Riyadh, Saudi Arabia.

³ Associate professor, Department of pediatric dentistry and orthodontic, Dental College, king Saud University, Riyadh, Saudi Arabia.

⁴ Assistant professor, Department of pediatric dentistry and orthodontic, Dental College, king Saud University, Riyadh, Saudi Arabia.

⁵ Bio statistical Consultant and Lecturer, Department of periodontics and Community Dentistry, Dental College, king Saud University, Riyadh, Saudi Arabia.

Abstract:

Objectives: To determine the prevalence, types and place of occurrence of medical emergencies in dental practice and factors associated with their number and occurrence in Riyadh, the capital of Saudi Arabia.

Subjects and Methods: Across-sectional study using self-administered questionnaire was distributed to a random sample of 500 dentists working in private, governmental hospitals and clinics as well as colleges of dentistry in Riyadh, Saudi Arabia.

Results: Four hundred and nine dentists returned the questionnaire giving a response rate of 81.8%. There were 739 instances of medical emergencies during the previous year. The most commonly occurring emergencies were syncope (33.7%) and hypoglycaemia (18.9%). Approximately half (47.4%) of the subjects had at least one medical emergency.

The majority were encountered in hospitals (49.4%) and in academic locations (31.0%). Gender and Specialty of the participants were found to have a strong statistical association ($p < 0.05$) with taking down vital signs, experiencing medical crises, and the number of medical emergencies encountered, while years of experience had an association only with taking vital signs. Dentists' Rank and their place of work had no association with any of the tested variables.

Conclusion: The present investigation revealed a relatively high number of medical emergency cases in dental practices in Riyadh, Saudi Arabia. Evidence-based training on medical emergency is highly encouraged across undergraduate, postgraduate and continuous education courses.

Keywords: medical emergencies, prevalence, medical history and vital signs.

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I. Introduction

Uncommon medical emergencies can happen in any dental practice and some of them can be life threatening.¹ Although 90% of medical emergency incidences are regarded as mild, about 9% considered serious and can pose a direct threat to patient's life.² The prevalence and severity of medical emergencies have been reported in various dental practices. The most prevalent medical emergencies to occur in dental offices including negative responses to local anaesthesia, syncope, epileptic seizures, hypoglycaemia and angina pectoris, all of which have the potential to be life-threatening or cause significant negative outcomes should dental staff be lacking in training, resuscitation and management abilities.³⁻⁵ A research completed in the UK (1999) stated that a total of 20 deaths had stemmed from medical emergencies.⁶ In Australia, an estimated 15% of dental surgeons had been required to resuscitate their patients in their dental practices during the course of a one-year period.⁴ In Ohio, USA, 5% of a sample of 244 dentists surveyed were found to have carried out cardio pulmonary resuscitation (CPR) on a patient in 1995.⁷ A further work, completed in 2001, highlighted cardiac arrest incidence across 133 physician and dental practices in the US ranged between 0.008 and 1 cardiac arrest each year.⁸ In the UK, a comparable work was completed in 1999, which found that, in specific consideration to

cardiac arrest, the annual incident equated to 0.002 per dentist.⁹ Furthermore, a survey was carried out across dentists in Brazil, which found that 3% of all patients had experienced cardiopulmonary arrest.¹⁰

Medical emergencies and the prevalence of such is seen to be demonstrating a rise in the present time owing to healthcare quality improvements, alongside an increase in life expectancy, with dentists therefore required to treat larger numbers of medically compromised and elderly patients, with sedation used more and more commonly.^{1,5} Hass (2006) reported in his study that people with cardiovascular diseases encountered 33% of medical emergencies in dental office,² while Laurent et al. (2009) found that allergic reaction to some dental materials and undergoing invasive dental procedures are risk factors of increasing medical episodes.¹¹ Dentists and dental personnel should possess rich knowledge and insight in terms of medical emergencies, with a need for such professionals to be able to complete a diagnosis and have the skills to manage such a problems.^{1,4} The overall capacity of dental professionals to complete a quick and efficient diagnosis and accordingly initiate management is fundamental in ensuring morbidity and mortality are minimised.^{6,12} Other skills in performing basic life support (BLS), and administering of emergency drugs in addition to, the availability of emergency equipment in dental office could reduce the serious risks associated with medical emergencies. The available information suggests that dentists across the world may not be adequately prepared to the management of medical emergencies. A New Zealand study showed more than 50 % of dentists were dissatisfied with their training for medical emergencies, in addition, Brazilian dental practitioners were also found to have similar concern about their training experience.^{3,5,10} The studies conducted in UK, USA and Australia showed the need to revise the formal training of dentists and dental personal in the management of medical emergencies.^{1,4,6}

In the Kingdom of Saudi Arabia (KSA), dental colleges detail curricula encompassing a number of lectures centred on the various types of medical emergencies that can occur in dental practices, with attention directed towards the management of such, with these lessons taught across years of study. In addition to a compulsory course in cardio pulmonary resuscitation, which needs to be completed by all dental students prior to graduation. Furthermore, it is required that dental professionals undergo CPR training on a two-yearly basis.

Published data on the prevalence of medical emergencies in dental practice in Saudi Arabia is insufficient as only one study addressed this issue done in the Eastern province of the country¹³, therefore, the objectives of the present study are to determine the prevalence, types and place of occurrence of medical emergencies in dental practice and factors associated with their number and occurrence in Riyadh, the capital of Saudi Arabia.

II. Subjects And Methods

This research has received approval from the CDRC (College of Dentistry Research Center) at King Saud University. The study has been designed as a prospective, questionnaire-centred work, with the questionnaire modified in line with other comparable works.^{1,2,9} The research included dental practitioners that have worked for a period of at least one year in academic, private or governmental clinics. The questionnaire was distributed, with a letter providing an overview of the research objectives, amongst a number of private and government-owned clinics and hospitals, as well as dental colleges located in the KSA's capital. Involvement in the study was on a voluntary basis. In terms of the questionnaire format, the majority of the questionnaires were closed-ended, therefore requiring only a 'yes' or 'no' answer. Prior to the study being initiated, the questionnaire underwent testing in an effort to ensure understanding and clarity. This study is part of larger research including readiness of dental practices to manage medical emergencies along with skills and perceived knowledge of dentists towards management of such crises. The following sections were included in the questionnaire of the present study:

1. Background information of the dentist: Centred on demographics, posing questions on gender, place of work, number of years' experience, and the number of patients treated on a weekly basis.
2. Medical emergencies prevalence and types: The frequency with which medical crises were experienced in the practice spanning the previous year. Questions were also posed in regards any assistance the dentist required and from whom.
3. Any factors of relevance explaining why certain procedures for the management of medical emergencies could not be carried out.

III. Statistical Analysis

The data collected were analyzed using Statistical Package for Social Sciences software for Windows (SPSS Inc., Chicago, IL, USA), version 20.0. Descriptive statistics were used spanning frequency, means, percentage, standard deviations and tables. One-way variance analysis was implemented to draw a comparison between group means, and to establish any difference in this regard; if so, the Scheffe test was adopted as a multiple comparison test. Furthermore, the link between categorical variables was tested through Chi-square, with a 0.05 level of significance outlined.

IV. Results

Dentists and Practice Data:

Of the 500 questionnaires distributed, 409 were completed and returned, giving 81.8% response rate. The demographic data, such as gender, number of years' experience, specialty, place of work, and rank of dentists are presented in table 1. The number of patients treated across the previous year by the dentists providing an answer to this question totalled 399,264. In consideration of the mean number of patients on a per-dentist basis, the figure was calculated as 983.4 (± 727.29) per year. Upon completing the one-way variance analysis, a statistically significant difference ($P=0.000$) was found when considering the mean number of patients treated by dentists every year across different work establishment. The largest figure in this regard was 1,664 seen by private hospital dentists, with 1,172.6 seen by government hospitals, and 1,010 seen by dentists adopting roles in more than one practice. Finally, the lowest numbers of patients were those seen by academic dentists, with a mean total of 612.5.

Medical History and Vital Signs:

Most of the dentists, equating to 96.3%, as routine, discussed the medical history of all of their patients before the initiation of treatment; the remaining 3.7% were not doing so. Although a total of 52.4% of the participants stated that they did not monitor their patients' vital signs, nonetheless, more than one-third (35.0%) would take vital signs details during the first visit, with 10.5% so doing during every visit. Notably, 3.2% did not provide an answer to this question.

Medical Emergencies Types and Prevalence:

When questioned on whether they had experienced a medical emergency, approximately half (47.4%) of the subjects stated they had had at least one such experience during the previous year. Of these subjects, a large majority (84.5%) had experienced 1–5 such instances, while 6–10 instances had been experienced by 10.3%, with more than ten experienced by 5.2%. Cases of medical emergency had been experienced by dentists in different locations, with half (49.4%) encountering such crises in hospitals, and 31.0% stating these had arisen in academic locations. Furthermore, 5.7% stated academic locations and hospitals, while other smaller minorities, equating to 4.1%, 3.1% and 1.5%, had experienced these events in both academic locations and private clinics, private clinics, or in all, respectively. The remaining subjects, totalling 5.2%, did not provide an answer to the question.

Regarding the prevalence of such emergency cases, there were 739 instances counting for 0.18% of total treated patients. The prevalence of specific medical emergencies spanning the previous 12 months can be seen detailed in Table 2, which shows the number of dental professionals outlining the total number of patients affected by particular emergencies. The most common type of emergency experienced was syncope as there were 249 cases, which counted 33.7% of the total medical episodes, followed by 139 cases of hypoglycaemia (18.9%), 92 cases of asthma (12.5), and 91 cases of hypotension (12.3). Table 3 presents further details each emergency's incidence in line with the number of patients affected on a per-million basis, along with details of the number of cases experienced on an annual basis for every dentist. When questioned on whether or not assistance was required from beyond the workplace when medical crises occurred, it was found that a large majority (91.2%) sought help, whereas the remaining 8.8% did not feel the need to do so. More specifically, 37.9% consulted a doctor, whereas 23.9% sought help from another dentist, 19.3% from ambulance services, 11.1% from rescue services, and 7.8% from a nurse.

Cross-Tabulation in Terms of Gender:

There was a strong statistical association between respondents' gender and the frequency with which vital signs monitoring was carried out ($P=0.025$): in this regard, more females, equating to 58.6% of the population, never monitored vital signs when contrasted with 45.1% of males; Also, more males were found to carry out vital signs once during the initial visit when compared with females, at rates of 43.0% and 31.5%, respectively. Furthermore, a strong association was determined between gender and facing medical emergencies ($P=0.016$): a larger number of males (53.5%) were recognized as having encountered medical crisis when compared with 41.6% of females. In consideration of the overall number of medical emergencies, such crises were experienced more so by males than females ($P=0.033$). Importantly, when considering a link between gender and taking the medical history, no association could be identified (Table 4).

Cross-Tabulation in Terms of Years' Experience:

When considering the number of years' experience in line with taking vital signs, a strong statistical association ($P=0.047$) was identified. Along with an increase in years' experience, vital signs registration was

found to decrease. Other factors, including noting down medical history, experiencing medical emergencies, the number of medical crises experienced, demonstrated no link in relation to years' experience (Table 5).

Cross-Tabulation in Terms of Dentists' Rank:

The rank of the dental professionals was found to have no link with any of the variables taken into consideration in this work ($P > 0.05$).

Cross-Tabulation in Terms of Dental Specialty:

When considering an association between dental specialty and taking down vital signs, the experience of medical crises, and the number of medical emergencies encountered, a strong statistical association was identified ($P = 0.000$). Almost half of all surgeons (47.8%) were found to take note of vital signs during every visit, with 22.0% of periodontists doing so, while 12.5% public health specialists did the same when contrasted with other specialties. A large proportion of specialists were found to never take vital signs, including orthodontists (88.6%), pediatric dentists (69.1%) and restorative professionals (61.5%).

Importantly, in consideration to the experience of instances of the medical emergency during the previous 12 months, more surgeons (79.2%) had had such an experience, whereas orthodontists were seen to be the lowest (20.0%), followed by 32.4% of pediatric dentists. Moreover, 1–5 emergency cases were experienced by more periodontists and prosthodontics ($\approx 48.0\%$) than other specialties, whereas a larger number of surgeons ($\approx 42\%$) had experienced at least six instances of medical crises when compared with other specialties.

Cross-Tabulation in Terms of Workplace

When examining the link between workplace and taking the medical history before treatment, completing vital signs, and the number of medical crises instances, no association was identified ($P > 0.05$).

V. Discussion

This paper aimed at evaluating the prevalence and types of medical emergencies in dental offices in the largest city in Saudi Arabia, Riyadh. It also assessed the measures that practicing dentists did to prevent the occurrence of such emergencies. Several similar studies are available in the literature; however, very few have been carried out in the Middle East; and this is the first in the capital city of Saudi Arabia.

The response rate of 81.8% is considered very good. The findings can easily be generalized owing to the sampling procedures, as well as the reasonable response rate. The total number of patients seen in the last 12 months by participated dentists was approximately 400,000. The average number seen by each dentist, on an annual basis is 983.4. There was a statistically significant difference in the average number of patients seen amongst participants, according to the place in which they practice dentistry, the highest number being seen in private clinics whilst the lowest number was seen in academic institutions. This finding is not surprising, as academicians do not normally have a lot of clinical hours and are busy teaching dental students.

Taking into account the differences in education and training in dentistry in different countries, as well as the differences in dental practice management, combined with the legal aspects in each country, it is difficult to compare our findings to previous published studies. Only two studies have been conducted in Saudi Arabia; however, the samples cannot be considered representative of all dental practices in the country.^{13,14}

The questionnaire used in the present study was validated and piloted prior to collecting the main study's data. Questions were minimized to the greatest possible extent so as to ensure the dentists will not be discouraged from participation whilst at the same time yielding the necessary reliable data. The survey reached both genders (200 males and 209 females), and included practitioners from different specialties, ranks, years in practice and different places of work, thus giving the findings a better interpretive value in regards the current dentists' population.

The use of a questionnaire is known to carry a recall bias risk; nonetheless, the anonymity of the participants has been suggested to minimize this bias. Accordingly, this was applied in the present manuscript.¹⁵

A total number of 739 medical emergency cases were encountered by participant dentists throughout the past 12 months. Almost half of the study population reported that they have been involved in at least one medical emergency situation whilst practicing dentistry in their place of work through the last 12-month period. This finding is in agreement with that which has been reported in the literature, notably a study conducted in Germany.¹⁶

In a study performed in the eastern province of Saudi Arabia, the total number of medical emergencies encountered over 3 years was much lower (599 cases), with an approximate average of 200 cases per year. This comparison should be considered with caution, as the total number of patients seen, although over the three-year period, could be less than what was reported in this study. In addition, Riyadh city has a larger population than the eastern province.¹³

The participants were asked to report only the emergency cases encountered during the last 12-month period in the hope that any recall issues would be eliminated. The percentage and number of reported episodes were seen to be considerable.

It should be emphasized that any practicing dentist should expect to be in the position of needing to identify and possibly manage a medical emergency situation at some point in his/her dental career.¹⁷

Participants have reported the different places in which medical emergencies have been encountered, with almost half seen to have occurred in hospitals, whilst only one-third of reported cases were in dental schools. This can be explained by the fact that hospitals in Saudi Arabia accept all medically compromised cases, whilst academic institutions might apply rules to restrict managing medically compromised patients due to the fact that emergency access might be difficult in dental schools.

Syncope was reported as being the most common medical emergency in the present study (249 cases, 33.7%), with an incidence rate of 0.6 cases per dentist per year. This result is similar to what previous authors have reported.^{9,13,16,18}

Syncope is a frequent event in dental office and, overall, seems to be well managed as there are few reports of untoward sequelae.¹⁴ Exactly how often syncope occurs is not known, although attempts have been made in the current study to quantify its frequency amongst dentists working in Saudi Arabia over a one-year period; this shows a considerably high number, which has proven to be the most common occurrence amongst dentists surveyed.

Hypoglycaemia was the second most frequent occurrence reported by those dentists surveyed in the present study, with 348 cases reported in the last 12 months. This is seen to be well aligned with what Alhamad et al. established in their survey, but does not agree with studies carried out worldwide, where epileptic attacks and respiratory problems took second place instead of hypoglycaemia.^{3,9,13,15,19} This can be explained by the fact that diabetes is a very common endocrine disorder amongst Saudi population and was therefore a common medical emergency encountered by participants.²⁰

Hypoglycaemia is a condition of low blood glucose levels and represents the most common acute complication of diabetes; however, it can also develop in patients who do not have diabetes, and requires immediate attention and management by the dentist providing treatment.²¹

Asthmatic attacks and hypotension were not uncommon episodes in the present study (92 and 91 cases, respectively). Both medical emergencies were reported with relatively similar incidences in previous studies.^{3,9,15,19} Asthma and hypotension might be encountered by any practicing dentist and with any patient during dental procedure. They require accurate diagnosis and initial management so as to avoid unwanted complications.²¹ Alqurashi et al study showed considerable increase prevalence of diabetes mellitus among adults in Saudi community, while Moradi-lakeh et al reported in their survey that prevalence of asthma among Saudi's is low but patients with known asthma do not have it under good control.^{20,22}

It is interesting to note that cardiac arrest, myocardial infarction and cerebrovascular accidents were the rarest medical emergencies reported in this survey; nonetheless, they have received the greatest emphasis in terms of training efforts in the local CPR courses. Cardiac emergencies are also the least common in previous national and international studies.^{9,13,16,18}

Other medical emergencies reported in the current survey range from being 5 to 62 times more prevalent than cardiac arrest, for instance. Although cardiac emergency is inevitably a life or death event, the mortality and morbidity associated with other medical emergencies, if they are not promptly and correctly managed, should not be underestimated.

It is therefore essential that all dental practitioners have appropriate skills in emergency patient care.²¹ The vast majority of participated dentists (96%) take their patients' medical history prior to the provision of dental treatment; however, almost half of the dentists never record their patients' vital signs, and almost one-third take the vital signs during the first visit only. These findings are comparable to what was reported by private dental clinics and polyclinics in the western region of Saudi Arabia.¹⁴

When participants were asked about whether they sought any help when an emergency cases occurred, they vast majority replied positively. Therefore, dentists need to ensure the establishment and ongoing maintaining of a working relationship with emergency care services, hospitals and physicians so that there are adequate professionals at hand when there is an emergency.²³

It is indicated that a thorough medical history should be available for each individual patient.²⁴ Greenwood (2009) suggests that the presence of an updated medical history can reduce the risk of emergencies.¹⁷

It is clear from the above findings that an acceptable number of participants are taking and recording medical history for their patients. An association was found between the number of years in practice and the recording of vital signs ($P=0.047$).

This finding means that, the younger the dentist, the higher the possibility that he/she will take vital signs. This can be explained by the fact that fresh graduates are less experienced and thus are more cautious

when providing dental treatment. Another possible reason is that younger dentists are more likely to provide dental treatment under conscious sedation and therefore are obliged to record vital signs. Additionally, a significant relation was identified between the specialty, the activity of taking vital signs, and experiencing medical emergency. Surgeons were the most likely to take vital signs and to face a medical emergency followed by periodontists. These findings are expected when considering the nature of dental treatment provided by these specialties. Dental surgery and periodontology involve more physiologic and psychological stresses, and therefore can lead to a medical emergency and require a record of baseline vital signs prior to intervention.¹⁸

The incidence of medical emergencies, as has been established through the completion of the present work, is a point to be highlighted. There is a need for dentists to undergo practical training in emergency management. Basic life support skills are important and need to be regularly revised; however, these are inadequate separately. Accordingly, dentists need to learn and be competent in carrying out the actions required of them should medical emergencies arise.

In Saudi Arabia, dentistry is recognized as having reached a high level of qualification across all fields. Medical emergencies warrant more in-depth practical and theoretical knowledge; this is fundamental when seeking to ensure further development, especially when seeking to provide the population with a safer and better service. It is the hope of the researchers that the present work will encourage education in the dentistry field to be re-evaluated and assessed, with further evidence-based training developed and implemented in the specific field of medical emergency care. This should be offered across undergraduate, postgraduate and post-education courses.

VI. Conclusions

Within the limitation of the present study, the following conclusions can be drawn:

- 1- A relatively high prevalence of medical emergencies was reported in our sample.
- 2- The most common type of emergency experienced was syncope followed by hypoglycaemia, asthma, and hypotension.
- 3- A strong statistical association was identified between the numbers of years of experience in line with taking vital signs. Along with an increase in years' experience, vital signs registration was found to decrease.
- 4- A significant relation was identified between the specialty, the activity of taking vital signs, and experiencing medical emergency. Surgeons were the most likely to take vital signs and to face a medical emergency followed by periodontists.

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Table 1: Demographic distribution of dentists

Gender	No (%)
Male	200(48.9)
Female	209(51.1)
Years in practice	
<5 years	123(30.1)
5-10 years	125(30.6)
>10 years	158(38.6)
No response	3(0.70)
Rank	
Consultant	113(27.6)
Specialist	105(25.7)
General practitioner	57(13.9)
Postgraduate student	134(32.8)
Specialty	
Surgery	24(5.9)
Endodontic	42(10.3)
Periodontic	54(13.2)
Pedodontic	71(17.4)
Oral medicine and radiology	2(0.50)
Prosthetics	58(14.2)
Restorative	65(15.9)
Orthodontic	35(8.6)
Public Health	16(3.9)
No response	42(10.3)
Place of work	
Governmental hospital	225(55.0%)
Academic institution	144(35.2%)
Private clinic/hospital	15(3.7%)
More than one place	24(5.9%)
No response	1(0.2%)

Table 2: Prevalence of medical emergencies over a 12-month period

Medical Emergency	Patients affected No (%)	Dentists No (%)
Syncope	249 (33.7)	111(27.1)
Hypoglycemia	139 (18.9)	73(17.8)
Asthma	92 (12.5)	38(9.3)
Hypotension	91 (12.3)	48(11.7)
Moderate allergic reaction	48 (6.5)	23(5.6)
Hypertension crises	34 (4.6)	15(3.7)
Hyperventilation	25 (3.4)	18(4.4)
Convulsion	24 (3.3)	21(5.1)
Anaphylaxis	9 (1.2)	8(2.0)
Unspecified collapse	8(1.1)	6(1.5)
Angina	7 (0.9)	5(1.2)
Choking	7 (0.9)	5(1.2)
Cardiac arrest	4 (0.5)	2(0.5)
Cerebrovascular accident	1 (0.1)	1(0.2)
Myocardial infarction	1 (0.1)	1(0.2)
Total	739 (100)	

Table 3: Incidence of medical emergencies

Medical Emergency	Patients affected/million/year	Cases/dentist /year
Syncope	623.6	0.613
Hypoglycemia	348.1	0.342
Asthma	230.4	0.226
Hypotension	227.9	0.224
Moderate allergic reaction	120.2	0.118
Hypertension crises	85.2	0.083
Hyperventilation	62.6	0.061
Convulsion	60.1	0.059
Anaphylaxis	22.5	0.022
Unspecified collapse	20.0	0.020
Angina	17.5	0.017
Choking	17.5	0.017
Cardiac arrest	10.0	0.010
Cerebrovascular accident	2.5	0.002
Myocardial infarction	2.5	0.002
Overall incidence	1850.6	1.8
Total incidence excluding syncope	1227	1.2

Table 4: Cross-tabulation of different factors with gender

Questions	Male No(%)	Female No(%)	Chi s	df	P-value
Taking medical history a-Yes b- No	192(96.0) 8(4.0)	202 (96.7) 7 (3.3)	0.122	1	0.726
Performing vital signs a-Never b-once during initial visit c-every visit	87(45.1) 83(43.0) 23(11.9)	119(58.6) 64(31.5) 20(9.9)	7.388	2	0.025*
Experiencing medical emergency a-Yes b-No	107(53.5) 93(46.5)	87(41.6) 122(58.4)	5.778	1	0.016*
Number of Emergency cases 1-5 6-10 >10	87(43.5) 12(6) 8(4.0)	77(36.8) 8(3.8) 2(1.0)	8.72	3	0.033*

*=Significant

Table 5: Cross-tabulation of different factors with years of practice

Questions	<5years %	5-10years %	>10years %	Chi s	df	P-value
Taking medical History a-Yes b-No	95.9 4.1	94.4 5.6	98.7 1.3	4.139	2	0.126
Performing vital signs a-Never b-once during initial visit c-every visit	41.7 45.0 13.3	53.4 31.4 12.4	57.2 35.5 7.2	9.646	4	0.047*
Experiencing medical emergency a-Yes b-No	48.8 51.2	52.8 47.2	43.0 57.0	2.736	2	0.255
Number of Emergency cases 0 1-5 6-10 >10	51.2 41.5 4.9 2.4	47.2 43.2 7.2 4.2	57.0 37.3 3.2 2.5	4.263	6	0.641

*=Significant