A Comparison Survey of Paramedic Level of Confidence in Handling Paediatric Versus Adult Patients- Riyadh City

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Abstract

Background:

Emergency Medical Services (EMS) is a national network of prehospital services coordinated to provide aid and medical assistance to pediatric and adult patients. Studies indicate that a paramedic's level of confidence in handling an adult patient is higher than that in handling a paediatric patient. The study objective is to explore paramedics' levels of confidence in handling pediatric patients as compared to that in handling adult patients in Riyadh, Saudi Arabia.

Method:

A cross-sectional study targeted paramedics in different institutions in the city of Riyadh after , a self-administered questionnaire were used to measure level of confidence in handling adult compared to pediatric in different given clinical scenarios using five point Likert scale

Results:

A total of 144 participants completed the survey, with a response rate of 90%. Of these, 91.7% were male, 42.4% worked in pre-hospital care, and 43.8% worked in-hospital station. The sample was comprised of both paramedics who obtained their qualifications in the Kingdom of Saudi Arabia (KSA) (53.5%) and those who obtained their qualifications outside the KSA (46.5%). Across the sample, 97% were confident in handling adults, while 78.5% were confident in handling paediatric patients. The paramedics' levels of confidence in handling adult and paediatric patients were compared in terms of ten specific conditions and skills using a five-point Likert scale, where a set score based on response of 10 was the minimum and 50 was the maximum. The difference in confidence level with paediatric (median = 36, IQR: 29,39) and adult (Median= 47, IQR: 42,50) patients was statistically significant, with a p-value of 0.001.

Conclusions:

The findings of this study are consistent with international studies showing that paramedics are more confident in handling adult patients than pediatric patients. This study recommends the dissemination of its findings to stakeholders for advanced training in paediatric.

Background

Emergency Medical Services (EMS) is a national network that provides aid and medical assistance. They are often the first responders in cases of trauma or acute illness, with the initial intervention improving disease outcomes (1). Paramedics are advanced providers of emergency medical care and taught various subjects, such as anatomy and physiology, cardiology, medicines, and medical intervention. Paramedics receives rigorous training to conduct various medical procedures, such as providing medications, obtaining intravenous lines, performing advanced airway management, and resuscitating adult and paediatric patients who suffer critical injuries and health issues. Paediatric patients vary

significantly from adult patients in their physiological differences, unique anatomical proportions, social factors, and pharmacologic and equipment considerations. One example of a major anatomical difference is the pediatric upper airway, which is smaller in diameter and shorter in length and has a relatively large tongue, a larynx that is anteriorly located, a relatively long flappy epiglottis, and cricoid cartilage is the narrowest portion (2). Respiratory arrest is the most common cause of paediatric cardiac arrest in a prehospital setting. Managing paediatric airways is lifesaving; however, it requires specific training and skills. Furthermore, paediatric hemodynamic physiology may add to the challenges faced when handling patients in a prehospital setting, where the signs and symptoms of hemodynamic instability could be subtle and require special paediatric training and experience for optimal evaluation and intervention. Due to these medical and social differences, in addition to the need for critical interventions, the care of pediatric patients causes greater emotional anxiety for EMS providers (3). A cross-sectional qualitative study conducted on EMS personnel showed that participants commonly stated that they felt more anxious when approaching pediatric patients as compared to adult patients. However, they mentioned that they felt more confident while performing specific skills, such as managing a child with traumatic injuries as compared to treating a child presenting with a complex medical situation (3). Paramedic encounters with pediatric patients who are seriously ill or injured are very rare as compared to trauma (4);(5)(6). Paramedics often report limited clinical experience as the main factor in the low confidence levels experienced when managing paediatric patients (7).

Other factors may affect emergency practices, one of which is knowledge of using emergency equipment to provide sufficient care within an adequate time. Ambulance equipment is designed for patients of different ages and is therefore available in different sizes. Specific equipment is designed for paediatric patients, for example, incubators that provide a controlled environment for observation and care for neonates, as well as Broselow ®tape, which is a medical measuring tape used to rapidly estimate a child's weight and facilitate proper doses of medication, may not be readily available (8). The literature reports that paramedics depend on visualization when they must estimate the weight of a child in 18% of cases, whereas only 5% of them use Broselow® tape (9).

The number of pediatric calls to emergency services is considered low, which, in turn, provides paramedics with fewer opportunities to encounter pediatric patients and thus build up their confidence levels. This is shown in a study that characterized the pattern of paediatric emergency department visits between 1997 and 2000 and reported that only 13% of EMS transportations were for paediatric patients, of which 62% of the cases were being transported due to poisoning (10). In another study conducted in 2000 by the Department of Emergency Medicine, Oregon Health Sciences University showed that paediatric patients represented only 5–10% of the EMS transports out of the total patient population and less than 5% of these calls involved life- or limb-threatening illness and injury (11).

Another factor that may influence paramedics' practice regarding pediatric patients is their level of training. A study was conducted to determine the level of training provided to paramedics and thus develop the services offered to pediatric patients throughout the US. This study found that 50% of paramedics' training takes place at colleges and universities and the remainder takes place at hospitals

and EMS agencies. Notably, 40% of the programs have less than ten hours of pediatric educational training, while 41% offer ten hours or fewer of clinical experience. The study showed that some programs do not offer training in the pediatric emergency field (12). Further, an additional assessment to paramedic knowledge in the literature had identified some skill deficiencies in pediatric resuscitation, suggesting the need for continuous education and post-graduate studies (7). The method of continuing education for paramedics skills in prehospital paediatric cases was assessed by Lammers et al., who concluded that case scenarios on low-fidelity manikins with debriefing sessions are the most effective modality for paramedic skills (13). The American Heart Association offers paediatric resuscitation courses in Pediatric Advanced Life Support (PALS) and the Neonatal Resuscitation (NRP) program; however, these programs are not designed for prehospital settings (3).

In the paediatric population, medications are based on weight calculations, which may explain why paramedics may encounter drug-dosing errors (14). During care for paediatric patients, inaccurate weight estimate could contribute to dosing errors in up to 35% of cases (15). The literature also reports that paediatric pain in prehospital settings is a challenging issue among emergency care providers due to uncertainty in pain assessment, especially in young children (16) (17). Another cross-sectional study suggested that the management of acute pain in pediatric patients transferred to emergency care by EMS providers is extremely rare, with documentary evidence suggesting that only 26% received prehospital analgesic agents (18).

A cohort study was conducted in Canada on children transported via EMS, which is the first investigation of Canadian paediatric prehospital mediations. This study showed that paramedics encountered a large number of calls for pediatric patients; the majority were not transferred cases, and only a few cases required critical transfer and admission to the emergency department. Prehospital airway management, ventilation, or intravenous medications were reported to be administered only rarely in these patients; thus, paramedics have limited opportunities to practice their skills with paediatric patients in prehospital settings (19).

Upon a review of the literature, there were limited reports explored paramedics' level of confidence when handling paediatric patients as compared to adults. The aim of this study was to explore prehospital emergency care providers' levels of confidence when dealing with pediatric patients as compared with adult patients in Riyadh city -Saudi Arabia.

Methods

This study was a cross-sectional survey with convenience sampling. A population count found 160 paramedics in Riyadh. The study adopted a convenience sampling technique, in which the questionnaire was sent to all paramedics.

Certified paramedics who agreed to participate and provided informed consent were included in the study. Physicians, EMTs, dispatchers, and EMS students and interns were excluded.

The study was conducted in Riyadh city, which is the capital city of the KSA, with a population of five million (20). The EMS system is based on the concept of load and go (the Anglo-American model), which focuses on transferring patients to a hospital under the care of the paramedics (21). The paramedics are bachelor's degree certified and licensed by Saudi health commission. The paramedic's scope of practice is to provide emergency care in a prehospital setting (the ambulance ride), as well as at hospitals stations.

The study questionnaire was developed by a panel consisting of pediatric emergency consultants, EMS faculty, and EMS students. The questionnaire's validity was assessed by a panel of experts consisting of emergency consultants and EMS faculty members to assess the questions' logical sequence and content. The questionnaire was developed in English and validated by conducting a pilot study prior to the actual study. The questionnaire was distributed in the study areas, which included Saudi red crescent authorities, major hospitals under the Ministry of Health, National Guard Health Affairs, and the other major hospitals in the city of Riyadh. The questionnaire contained three sections. Section One dealt with demographic data. Section Two included close-ended questions about overall confidence when dealing with paediatric versus adult. participants can also write a free comment. Section Three lists ten clinical scenarios and skills for adults and pediatric patients, and participants then rate their levels of confidence using a five-point Likert scale (Appendix 1).

Statistical analyses

The data were coded and entered into Microsoft Excel. For statistical analysis, the data were exported to the Statistical Package for the Social Sciences version 20 (SPSS, Inc., Chicago, IL, USA). The data were analyzed by reporting the frequency as a percentage for categorical data. To assess numerical data, mean, median, and standard deviation were used. A chi-squared test was used to test the association between the confidence level and study variables (age, gender, place of graduation, and place of work). The questionnaire is based on a five-point Likert scale and is used to calculate the mean score for each study participant out of a potential 50, which is awarded if a participant indicates strong confidence in all the ten given scenarios and skills. An agreed preset score range of 40–50 was considered as the confident zone, and a score of 10–40 was considered to indicate less confidence.

This study used a Wilcoxon signed-rank test because we expect that the data will be nonparametric, so this test can be used to compare mean scores. Because each participant had two scores, for paediatric and adult cases and skills, we used the Wilcoxon signed-rank test to compare them. Each participant was given a score based on their level of confidence. The study posits the hypothesis that paramedics are more confident when dealing with adult patients than paediatric patients. A spearman correlation was used to test the correlation between the number of calls and paramedics' confidence levels. Statistical significance was set at $p < 0.05$.

Results

The total number of participants was 160. Of these, 144 participants completed the required information in the questionnaire, with a response rate of 90%. Of the participants, 91.7% were male, and 8.3% were female, and the mean ($\pm$ SD) age of the participants was 30 ($\pm$ 5.21) years. Of the participants, 42.4% worked in prehospital settings, and 43.8% worked in hospitals stations and provided care while transporting patient during intra- and inter-hospital transfers. The majority (94.4%) of the paramedics held a bachelor's degree, 53.5% of them obtained their qualification in the Kingdom of Saudi Arabia (KSA), and 46.5% received their qualifications outside the KSA. Most participants (98.6%) were certified in Basic Life Support, while 69.4% were certified in the PALS. Around 79.9% of the paramedics regularly renewed their course certifications (Table 1).

Table 1
Demographic characteristics of participants

Section 1	Frequency	Percentage
Age mean ($\pm$ SD)	30 ($\pm$ 5.21)	
Sex:	132	91.7%
Male	12	8.3%
Female		
Institution of employment:	47	32.6%
MOH	39	27.1%
SRCA	21	14.6%
NGHA		
Place of work:	61	42.4%
Pre-hospital	63	43.8%
In-hospital		
Courses:	100	69.4%
PALS	142	98.6%
BLS	135	93.8%
ACLS		
Years of experience:	81	56.3%
<5	63	43.8%
≥ 5		
Place of graduation:	77	53.5%
KSA	67	45.5%
Others		
Section 2		
Paramedic confidence when dealing with paediatric patients	113	78.5%
Confident	31	21.5%
Not confident		
SD = standard deviation, MOH = Ministry of Health, SRCA = Saudi Red Crescent Authority, NGHA = National Guard Health Affairs, PALS = Pediatric Advanced Life Support, BLS = Basic Life Support, ACLS = Advanced Cardiovascular Life support, KSA = Kingdom of Saudi Arabia		

Section 1	Frequency	Percentage
Paramedic confidence when dealing with adult patients	140	97.2%
Confident	4	2.8%
Not confident		
Paramedic need to have more training in paediatrics	119	82.6%
Yes	25	17.4%
No		
Paramedics who had resuscitated paediatric patient over the last two years	90	62.5%
Yes	54	37.5%
No		
Paramedics' preferred method of estimating paediatric body weight to calculate a medication dosage		39.6%
• Broselow tape		29.9%
• Visual estimation		42.4%
• Ask parents		15.3%
• Specific formula		
SD = standard deviation, MOH = Ministry of Health, SRCA = Saudi Red Crescent Authority, NGHA = National Guard Health Affairs, PALS = Pediatric Advanced Life Support, BLS = Basic Life Support, ACLS = Advanced Cardiovascular Life support, KSA = Kingdom of Saudi Arabia		

Regarding levels of confidence, the majority of the paramedics scored higher when managing adults than when managing paediatric patients. While 78.5% of the paramedics who participated in the study were confident in managing pediatric patients, 97.2% were confident in managing adult patients. Moreover, 82.6% of the participants believed that they required continuous training and education in pediatric management. The study's paramedic participants indicated that 62.5% of them had resuscitated at least one arrested pediatric patient in the preceding two years.

The study's paramedic participants reported the most common type of pediatric call that required dispatch was seizures (47%), followed by motor vehicle accidents (MVAs) (45%), as shown in Figure 1.

A five-point Likert scale was used to measure the paramedics' levels of confidence when handling paediatric and adult patients in different cases, requiring varying skills. The confidence levels and the resuscitative skillsets of the paramedics are reported to be improved when handling adults as compared to paediatric patients, as shown in Figure 2. The participants obtained scores ranging from 10 to 50, with 40 to 50 representing a high level of confidence, and comparisons were made with a Wilcoxon Signed-Rank test, as illustrated in Table 2. A statistically significant difference was observed between the levels

of confidence when handling paediatric and adult patients ($p = 0.001$). Comparing the participant scores in each pediatric and adult case scenario, the average score for the participants when handling pediatric patients was 36, while that when handling adults was 47. Mean score of 50 was the maximum score, as shown in Table 2.

Table 2
Comparison of the confidence levels of participating paramedics when managing pediatric and adult patients, utilising specific skills.

Confidence level of paramedics in management of:	Median (IQR)	Test statistic Wilcoxon signed-ranks test	P-value
Pediatric Patients	36 (29.39)	Z= -9.726	0.001*
Adult Patients	47 (42.50)		
*Significant at 5%			

A Spearman correlation was used to test the correlation between the number of calls and confidence level. A positive correlation was observed between the mean of the total number of calls (107) received per month and confidence in handling paediatric patients ($r = 0.278$, $p = 0.001$). Of the participants, 36.1% reported that they encountered a paediatric patient more than four times per month. A statistically significant association was found between place of graduation and the confidence levels of the paramedics, indicating that 89.6% of the participants who graduated outside the KSA were more confident in dealing with paediatric cases as compared to those who graduated from the KSA (68.8%) ($P = 0.003$). The remaining study variables (age, gender, and place of work) were not significantly associated with one another.

Discussion

In the present study, paramedics' levels of confidence were assessed in handling adult and paediatric patients. Confidence levels were significantly higher in the management of adult patients than in that of paediatric patients. Confidence levels were higher regarding all given clinical scenarios and skills when managing adult patients as compared to paediatric patients. This was true in multiple situations, such as cardiac arrest, respiratory distress, motor vehicle accidents, shock, seizures, and poisoning. It was also observed in our study that paramedics' confidence levels in skills such as endotracheal intubation and intravenous vascular access were also higher for adult patients. This finding may reflect the amount of training, clinical exposure, and postgraduate training received. Across the entire sample of participants, 62.5% of the paramedics had resuscitated paediatric patients in the last two years. In comparison with a previous study performed by Well, Barnes, and Vincent–Lambert in Johannesburg, South Africa, our study presents different findings in terms of paramedics' practices. That study showed that 18% of the paramedics depended on visualization to determine pediatric weight and 5% of them used the Broselow

tape (9). In contrast, our study showed that 29.9% of the paramedics used visual estimation and 39.6% used Broselow tape (Table 1).

The differences between adult and pediatric body anatomy and physiology are well known. In addition, there is a recognized variance among the pediatric age groups. The current study confirms a positive correlation between the confidence level of paramedics and pediatric age. A recent study conducted by Yuknis et al. showed that the most common pediatric case in emergencies in ambulatory practices setting was respiratory, while our study's participants reported that the commonly encountered pediatric cases during pre-hospital and inter-hospital calls were seizures (47%), followed by MVAs (45%), and respiratory distress (31%) (22). This finding may be biased because it was found using paramedics who mainly referred patients to level I trauma centers.

In a previous study conducted in the UK to evaluate the extent of paramedic knowledge and attitudes regarding pediatric equipment, the majority of the instances show that there is a deficiency in paramedics' knowledge about how to use and apply pediatric equipment of appropriate sizes, although they are available in their area (23). Our study explored paramedics' confidence level when using paediatric equipment as compared to adult equipment and reported a higher confidence level when using adult equipment (Figure 2).

Our study further supports the findings of Vroman, who found that most paramedics are not familiar with paediatric medication doses (24), as indicated by the participants' very low confidence levels when asked about paediatric medication dosages. This should likely be addressed during training.

Airway management is an essential skill in the prehospital management of critically ill patients. The findings of this study show that paramedics have low confidence levels in performing paediatric advanced airway procedures as compared to performing the same procedures on adult patients. These basic findings are consistent with a previous study conducted in Canada, which showed that paramedics lack experience with pediatric airway management (19).

A study conducted in the Children's Hospital of Buffalo, NY, reported that paramedics have a high success rate in establishing intravenous lines in children in the field (25). A second study conducted in the US showed that paramedics attempting endotracheal intubation, intravascular access, and the administration of epinephrine were significantly less successful in paediatric patients as compared to adult patients. Because the current study examined levels of confidence in specific skills, such as intravenous access and endotracheal intubation, and indicated low levels of confidence across the study cohort in pediatrics as compared to adult patients, we suggest a further exploration of success rates in future studies, similar to those in the published literature (26).

Although this study presents valuable findings, the generalizability of the study is limited because the sample was collected from a single city (Riyadh) due to limited access to participants in other regions. This study is unique because it is one of the initial studies in Saudi Arabia to explore paramedics' confidence levels when managing paediatric patients as compared to adult patients. More importantly, it

is an attempt to increase paramedics' and stakeholders' knowledge, levels of confidence, and skills when dealing with paediatric patients. The study findings may support decisions to incorporate structured trainings and skill requirements, especially when services are intended for the pediatric population.

Conclusions

The results of this study show that paramedics are less confident in handling paediatric patients as compared to adult patients in various emergency scenarios requiring specific skills. Further studies at the international and national levels should explore paramedics' confidence when managing different paediatric cases, particularly paediatrics resuscitation, using appropriately sized equipment and medication in weight-based doses. Advanced, continuous training and additional paediatric management courses should be implemented in EMS faculty improvement projects for paramedics.

Declarations

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Contribution

Author Nesrin Allharthy is the corresponding author. Mohammed Almutairi contributed in critical intellectual manuscript revision, Sara Al suwais contributed in Analysis and interpretation of results.

Study design and data collection was the contribution of Ethar Alfraih , Atheer Alenazi, Reem Alaiban and Rahaf Alanazi.

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Conflict of interest

None declared.

Ethics

Ethical approval was granted by King Abdullah International medical research – Riyadh, Saudi Arabia. Approval from the Institutional Review Board (IRB), with reference # SP19/248/R, was obtained in September 2019.

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Figures

Figure 1

The proportions of the most common cases managed by paramedics

Figure 2

High confidence levels of the paramedics in specific cases/skills required for adult and paediatric patients

Figure 3

Supplementary Files

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- [questionnairelastcopyAppendix1.pdf](#)