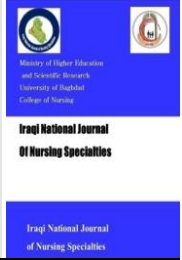




## Iraqi National Journal of Nursing Specialties

Journal homepage: <https://injns.uobaghdad.edu.iq/index.php/INJNS>



# The relationship between Attachment Style and Socio-Demographic characteristics of Pediatric Emergency Department Nurses: A Cross-Sectional Survey

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## ARTICLE INFO

### Article history:

Received: 27/05/2025

Accepted: 07/07/2025

Published: 31/12/2025

### Keywords:

*Attachment style,  
Emergency nurses,  
emergency department,  
pediatric.*

## ABSTRACT

**Objective(s):** The study aimed to assess the relationship between attachment style and socio-demographical characteristics of nurses working in pediatric emergency departments.

**Methods:** A descriptive cross-sectional survey conducted across 132 pediatric emergency nurses from three pediatric hospitals in 2024. The study utilized a tool comprised socio-demographic characteristics of pediatric emergency nurses and the 15-item Adult Attachment Scale. The Statistical Package for Social Sciences (SPSS), version 26 was used to examine the associations among the measured variables in the study.

**Results:** There was a significant relationship between the total level of attachment style of nurses in the pediatric emergency departments and their age (P-value = 0.001), marital status (P-value = 0.020); accommodation (P-value = 0.025); nursing qualification (P-value = 0.073); and their years of experiences (P-value = 0.026).

**Conclusion:** The findings could be the basis for emergency nurses to expand their roles in enhancing children health outcomes to improve their own abilities for adapting positive attachment style.

**Recommendations:** The present study recommends **implementing targeted attachment style training programs** e.g., workshops, Balint groups, narrative medicine to enhance securing behaviors and compassionate care skills.

## العلاقة بين أسلوب التعلق والخصائص الاجتماعية - الديموغرافية لمرضى قسم طوارئ الأطفال: دراسة استقصائية مقطعية

### المستخلص

**الأهداف:** هدفت الدراسة إلى تقييم العلاقة بين أسلوب التعلق والخصائص الاجتماعية - الديموغرافية للمرضى العاملين في أقسام طوارئ الأطفال.

**المنهجية:** أجريت دراسة استقصائية وصفية مقطعية على ١٣٢ ممرض/ة في طوارئ الأطفال من ثلاثة مستشفيات أطفال لعام ٢٠٢٤. استخدمت الدراسة أداة تتضمن الخصائص الاجتماعية والديموغرافية لمرضى طوارئ الأطفال ومقياس التعلق للبالغين المكون من ١٥ بنداً. استخدمت الحزمة الإحصائية للعلوم الاجتماعية (SPSS)، الإصدار ٢٦، لفحص الارتباطات بين المتغيرات المقاسة في الدراسة.

**النتائج:** أظهر تحليل البيانات علاقة دالة إحصائية بين المستوى الإجمالي لأسلوب التعلق لدى الممرضات/ات في أقسام طوارئ الأطفال وكل من: العمر (القيمة الاحتمالية = ٠,٠٠١)، والحالة الاجتماعية (القيمة الاحتمالية = ٠,٠٢٠)، والسكن (القيمة الاحتمالية = ٠,٠٢٥)، ومؤهل التمريض (القيمة الاحتمالية = ٠,٠٧٣)، وسنوات الخبرة (القيمة الاحتمالية = ٠,٠٢٦).

**الاستنتاجات:** يمكن أن تشكل هذه النتائج أساساً لمرضى الطوارئ لتوسيع أدوارهم في تحسين صحة الأطفال، وتحسين قدراتهم على التكيف مع أنماط التعلق الإيجابية.

**التوصيات:** توصي هذه الدراسة بتنفيذ برامج تدريبية مُستهدفة لأنماط التعلق مثل ورش العمل، ومجموعات بالينت، والطب السردي لتعزيز سلوكيات الأمان ومهارات الرعاية الرحمة.

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**الكلمات المفتاحية:** أسلوب التعلق، ممرض طوارئ، قسم الطوارئ، تمرير الأطفال.

### Introduction

Globally, pediatric emergency departments (PEDs) are evolving to include innovative approaches to provide care. The ability of healthcare providers to respond effectively to pediatric emergencies is contingent on their training and preparedness <sup>(1)</sup>. Delivering pediatric emergency care in diverse settings presents unique challenges.

The World Health Organization with the Iraqi Ministry of Health reports that while the likelihood of dying among children aged 5-14 per 1000 children aged 5 decreased from 8 to 5, the number of deaths among children aged 5-14 in Iraq increased from 4,000 in 1990 to 5,000 in 2017. Critically ill children in the emergency department are more likely to be deteriorated in health with poor recovery, the need for institutional care, and an increased risk of death. Furthermore, it has been documented that children with critical condition in the emergency department are more likely to develop complication. This can then lead to a prolonged stay, with a greater financial and economic burden on the patient and caregivers. Despite the expression of

empathy and attachment style are importance with the availability of various screening tools, these variables remain at the lowest level of detection.

The modernization of pediatric emergency departments is a key priority for improving global health outcomes. It is crucial to emphasize the importance of integrating evidence-based practices, patient-centered care models, and innovative technologies into PEDs <sup>(2)</sup>. From infancy to adulthood, the attachment that develops in the parent-child bond is carried over into romantic relationships in adulthood and can influence behavior, emotions, and thought processes <sup>(3)</sup>. As a unique emotional relationship, attachment necessitates a comfort exchange. Adult attachment styles are a reflection of a person's thought, emotion, and behavior patterns in intimate relationships that stem from their early connections with caregivers <sup>(4)</sup>. The attachment styles have a significant impact on mental health, interpersonal behavior, and emotional control <sup>(5)</sup>.

Attachment styles are important in professional contexts like nursing as well as interpersonal interactions. A nurse's attachment style may have an impact on their capacity to treat patients with compassion, manage stress, and build sympathetic relationships with them <sup>(6)</sup>. Therefore, the study was conducted to assess the relationship between attachment style and socio-demographical characteristics of nurses working in pediatric emergency departments.

## Methods

### The Study Design and Setting

A descriptive cross-sectional survey adopted by standard questioning, which was conducted during the study period of September 2024 to April 2025. The statistical population were all nurses working in the emergency department at paediatric governmental hospitals in Baghdad and Al-Anbar Cities, Iraq. This study was conducted at Emergency departments of Welfare Pediatric Teaching Hospital of the Central Pediatric Teaching Hospital in Baghdad; plus, at Al-Anbar Teaching Hospitals (The Teaching Maternity and Pediatric Hospital and Al-Karma Hospital for Emergency and Pediatric). These hospitals are part of the leading hospitals in Iraq specializing in serving and providing immediate medical and nursing services for urgent pediatric cases with a holistic care by collaborating nursing staff with other healthcare providers. These hospitals located in the centers of the cities and serves as a crucial reference location for treatment of variety of diseases affecting children.

### Sample and sampling

A total of 132 participants were selected by convenience and voluntary sampling method with an estimation of the sample size was based on the population size and Cochran's formula. This technique involves selecting samples that are conveniently accessed to the researcher. This sampling methods was chosen to ensure that participants possessed specific criteria relevant to the objectives of the study.

The sample size of 132 participants was determine to be adequate based on several methodological considerations for correlation and structural equation modelling. Given that the total score of the three subscales of attachment styles as observed variables, the choose sample size ensures sufficient power and reliability for detecting meaningful relationships. The inclusion criteria are nurses who aged 18 years old and older, both sexes, holding any nursing certificate. Since ED nurses are inherently ad-hoc in nature, the sample was limited to those having at least one years of work experience in the paediatric emergency department that provided direct child care. These criteria were chosen to ensure participants had sufficient professional experience and a consistent baseline for assessing the study variables. The excluded criteria are nurses who working at other areas other than emergency departments, having less than a year experiences in the emergency department and those working in different nursing shifts.

### Data Collection

Data collection was divided for three parts as self-reporting questionnaire consisting of sociodemographic data (age, sex, marital status, level of nursing qualification, type of shift work, and years of experiences in the emergency department), the Jefferson Scale of Empathy health professional version, and the Adult Attachment Styles Scale.

### Questionnaire of the study

The socio-demographic characteristics of nurses including information on their age, sex, their acquired nursing qualifications, marital status, their accommodation status, years of nursing experiences in the pediatric emergency and participating in the training session.

The third part of the questionnaire was the 15-item Adult Attachment Scale developed by Collins and Read <sup>(7)</sup> measured three attachment styles, namely secure (6-items), anxious (3-items) and avoidant (6-items). The items were scored based on 5-point Likert, ranging from strongly disagree to strongly agree. The numerical values of the expressions associated with each of the three attachment styles are combined together and

divided by five to ascertain each person's attachment style. The maximum and minimum scores were 15 and 75, respectively. Elevated scores on the first two domains reflect a secure attachment whereas low scores are an expression of the avoidant attachment style. The assessment level of total mean of (1.2 to 2.33) indicates low level of attachment, (2.34 to 3.66) indicates moderate level of attachment, while the assessment level of score of (3.67 to 5) reveals high level of attachment.

The Cronbach's alpha coefficients of secure, avoidant and ambivalent subscales were calculated as 0.86, 0.84 and 0.85 respectively. Additionally, test-retest reliability was robust, with coefficients of 0.82, 0.78, and 0.75 for secure, avoidant, and ambivalent styles, respectively<sup>(8)</sup>.

### Ethical Considerations

This study seeks to obtain an ethical approval from the scientific research ethics committee in the College of Nursing, University of Baghdad as well as from Institutional Review Board (IRB) of the chosen settings (Approval No. UOB.CON.43.008) on 21 April 2024.

The study protocol including a completed review of the objectives and the study questionnaires was sent to the Ministry of Health, Iraq. Correspondingly, official approvals for conducting this study then obtained from the included hospitals. Subsequently, a formal consent form was sent to the Pediatric Emergency Departments of these hospitals to facilitate data collection from pediatric nurses. The participants were all informed that after turning in study, their identity would no longer be traceable.

### Data Analysis

The Statistical Package for Social Sciences (SPSS; Version 26.0, Chicago, IL, USA) was used to examine the associations among the measured variables in the study. Nurses' sociodemographic characteristics were considered as independent variables, whilst their attachment styles and empathy were deemed dependent variables. The Pearson correlation coefficient was used to examine the relationship between two quantitative variables with a normal distribution. The significance level was set at 0.05 for all statistical analyses.

## Results

**Table 1.** Socio-demographic characteristics of nurses in pediatric emergency department (No.= 132)

| Socio-demographical Characteristics | Groups                   | Frequency | Percent |
|-------------------------------------|--------------------------|-----------|---------|
| 1. Sex                              | Male                     | 69        | 52.3%   |
|                                     | Female                   | 63        | 47.6%   |
| 2. Age groups                       | 18-27                    | 68        | 51.5%   |
|                                     | 28-37                    | 46        | 34.7%   |
|                                     | 38-47                    | 16        | 12.1%   |
|                                     | 48 and above             | 2         | 1.5%    |
|                                     | <b>M±SD (29.15±6.91)</b> |           |         |
| 3. Marital Status                   | Married                  | 69        | 52.3%   |
|                                     | Single                   | 48        | 36.4%   |

|                                                                  |                          |    |       |
|------------------------------------------------------------------|--------------------------|----|-------|
|                                                                  | Divorced/Separated       | 9  | 6.8%  |
|                                                                  | Widowed                  | 6  | 4.5%  |
| 4. Accommodation                                                 | Live alone               | 11 | 8.3%  |
|                                                                  | With husband/wife        | 56 | 42.4% |
|                                                                  | With others              | 65 | 49.2% |
| 5. Nursing Qualification                                         | Nursing school           | 33 | 25%   |
|                                                                  | Diploma Certificate      | 63 | 47.7% |
|                                                                  | Bachelor Certificate     | 33 | 25%   |
|                                                                  | Postgraduate Certificate | 3  | 2.3%  |
| 6. Years of Nursing Experience in Pediatric Emergency Department | 1 -5 Years               | 88 | 66.7% |
|                                                                  | 6-10 Years               | 23 | 17.4% |
|                                                                  | 11-15 Years              | 10 | 7.6%  |
|                                                                  | 16-20 Years              | 6  | 4.5%  |
|                                                                  | 21 Years and above       | 5  | 3.8%  |
|                                                                  | <b>M±SD (1.61±1.06)</b>  |    |       |
| 7. Participating in the Training Sessions                        | Yes                      | 73 | 55.3% |
|                                                                  | No                       | 59 | 44.7% |

Table 1 shows that more than half (52.3%) of nurses in the pediatric emergency departments were males, their mean age was (29.15) years old with more than half (51.5%) of them were between the ages (18-27) years old, more than half (52.3%) were married, and 49.2% of them were lived with others, other than their family. This table also shows that less than half of nurses 47.7% held a diploma certificate in nursing, they had mean years of experience of 1.61 years ranging from (1-5) years among 66.7% of them, and more than half (55.3%) were participating in the training sessions about how to express attachment and deal with children in the emergency departments.

**Table 2.** Mean of scores of nurses' Attachments Style in the Paediatric Emergency Departments (No.= 132)

| No            | Attachment Style Items                            | Mean   | SD      | Level of attachment |
|---------------|---------------------------------------------------|--------|---------|---------------------|
| <b>Secure</b> |                                                   |        |         |                     |
| 1             | I am comfortable depending on others              | 2.0682 | 1.14714 | Low                 |
| 2             | I know that others will be there when I need them | 3.0833 | 1.02668 | Moderate            |
| 3             | I do not often worry about being abandoned        | 3.5076 | 1.16236 | Moderate            |
| 4             | I find it relatively easy to get close to others  | 3.4773 | 1.09451 | Moderate            |

|                                  |                                                                               |                |                |                 |
|----------------------------------|-------------------------------------------------------------------------------|----------------|----------------|-----------------|
| 5                                | I do not often worry about someone getting close to me                        | 3.1439         | 1.22401        | Moderate        |
| 6                                | I am comfortable having others depend on me                                   | 3.1818         | 1.38044        | Moderate        |
| <b>Total Secure Attachment</b>   |                                                                               | <b>18.4621</b> | <b>3.33706</b> | <b>Moderate</b> |
| <b>Anxious</b>                   |                                                                               |                |                |                 |
| 7                                | I am not sure that I can always depend on others to be there when I need them | 2.9318         | 1.24908        | Moderate        |
| 8                                | I find others are reluctant to get as close as I would like                   | 2.5682         | 1.15377        | Low             |
| 9                                | My desire to merge sometimes scares people away                               | 2.5455         | 1.20662        | Low             |
| <b>Total Anxious Attachment</b>  |                                                                               | <b>8.0455</b>  | <b>2.40503</b> | <b>Low</b>      |
| <b>Avoidant</b>                  |                                                                               |                |                |                 |
| 10                               | I find it difficult to allow myself to depend on others                       | 3.3561         | 1.23642        | Moderate        |
| 11                               | People are never there when you need them                                     | 2.7576         | 1.17948        | Low             |
| 12                               | I find it difficult to trust others completely                                | 3.1061         | 1.24947        | Moderate        |
| 13                               | I am somewhat uncomfortable being close to others                             | 2.5152         | 1.24474        | Low             |
| 14                               | I am nervous when anyone gets too close                                       | 2.4167         | 1.21719        | Low             |
| 15                               | Often, people want me to be more intimate than I feel comfortable being       | 3.1894         | 1.19242        | Moderate        |
| <b>Total Avoidant Attachment</b> |                                                                               | <b>17.3409</b> | <b>3.93231</b> | <b>Moderate</b> |

No. = Number, SD= Standard Deviation, **Level of attachment style** = (1-1.8 to 1.9-2.7) = Low, (2.8-3.6) = Moderate, (3.7-4.5 to 4.6-5) = High.

Table 2 shows that the total mean attachment style of nurses in the pediatric emergency departments was at moderate level in the most domains, with a total mean score of their secure attachment  $M \pm SD = (18.46 \pm 3.33)$ ; anxious attachment  $M \pm SD = (8.04 \pm 2.40)$ ; and avoidant attachment  $M \pm SD = (17.34 \pm 3.93)$ .

**Table 3.** The relationship between participants socio-demographic and their total attachment style with children in the emergency department.

| Nurses Characteristics          | N  | %     | Chi-Square | df | P-Value |
|---------------------------------|----|-------|------------|----|---------|
| <b>1. Sex</b>                   |    |       | 19.794     | 27 | .839    |
| Female                          | 63 | 47.6% |            |    |         |
| Male                            | 69 | 52.3% |            |    |         |
| <b>2. Marital Status</b>        |    |       | 109.148    | 81 | .020*   |
| Married                         | 69 | 69%   |            |    |         |
| Single                          | 48 | 48%   |            |    |         |
| Divorced/Separated              | 9  | 9%    |            |    |         |
| Widowed                         | 6  | 6%    |            |    |         |
| <b>3. Accommodation</b>         |    |       | 76.238     | 54 | .025*   |
| Live alone                      | 11 | 8.3%  |            |    |         |
| With wife/husband               | 56 | 42.4% |            |    |         |
| With others                     | 65 | 49.2% |            |    |         |
| <b>4. Nursing Qualification</b> |    |       | 100.180    | 81 | .073*   |
| Nursing school                  | 33 | 25%   |            |    |         |
| Diploma Certificate             | 63 | 47.7% |            |    |         |
| Bachelor Certificate            | 33 | 25%   |            |    |         |

|                                                               |             |           |                   |           |                |
|---------------------------------------------------------------|-------------|-----------|-------------------|-----------|----------------|
| Postgraduate Certificate                                      | 3           | 2.3%      |                   |           |                |
| <b>5. Participating in the Training Sessions</b>              |             |           | 43.740            | 54        | .840           |
| <b>Yes</b>                                                    | 73          | 55.3%     |                   |           |                |
| <b>No</b>                                                     | 59          | 44.7%     |                   |           |                |
|                                                               | <b>Mean</b> | <b>SD</b> | <b>Chi-Square</b> | <b>df</b> | <b>P Value</b> |
| <b>6. Age (years)</b>                                         | 29.15       | 6.91      | 168.154           | 81        | .000**         |
| <b>7. Years of Experiences in pediatric emergency (years)</b> | 1.4470      | .49907    | 138.459           | 108       | .026*          |

N= Number, %= Percentage, df= degree of freedom, \* P value=  $\leq 0.05$ .

Table 3 shows that the total mean attachment style of nurses in the pediatric emergency departments was at moderate level in the most domains, with a total mean score of their secure attachment  $M \pm SD = (18.46 \pm 3.33)$ ; anxious attachment  $M \pm SD = (8.04 \pm 2.40)$ ; and avoidant attachment  $M \pm SD = (17.34 \pm 3.93)$ .

## Discussion

The current study findings reveal that more than half of nurses in the pediatric emergency departments were males and their mean age was (29.15) years old with more than half (51.5%) of them were between the ages (18-27) years old. These results are agreed with a results of previous study found that most of the PED were between the age 25-29 years ( $n = 265$ , 46.5%)<sup>(9)</sup>. Another study confirm that nurses working in the PED were between the age 21 and 35 years old among 49% of them<sup>(10)</sup>. Surprisingly, all studies in the PED indicated that female nurses were dominant to work in the emergency department<sup>(11)</sup>. This confirmed by an oppose results were found in previous study revealed that the majority of the ED nurses were female<sup>(12)</sup>.

The current research shows that more than half (52.3%) of pediatric emergency nurses were married, and 49.2% of them were lived with others, other than their family. These results is agreed with a results of previous study found that 62.8% of the PED were married<sup>(9)</sup>. Also, the current study result is similar to another study revealed that 53% of nurses were married.

This research also shows that less than half of nurses 47.7% held a diploma certificate in nursing and had mean years of experience of

1.61 years ranging from (1-6) years among 66.7% of them. A previous cross-sectional study found that the majority (81%) of the nurses certified with a bachelor's degree in nursing<sup>(13)</sup>. Additionally, they found that 54% of PED nurses has 0-5 years of experiences in the pediatric ED<sup>(10)</sup>. While another study stated that the mean years of nursing experiences in the PED was 9.34<sup>(13)</sup>. In addition, a recent study found that (59.6%) of nurses, or more than half of the responders, had less than five years of experience in the pediatric critical care<sup>(14)</sup>.

Moreover, the current research highlights that more than half (55.3%) of them participating in the training sessions about how to express empathy and deal with children in the emergency departments. According to an Australian study, emergency nurses' were participated in the national Emergency Education Kit (81.1%), locally offered training (74.9%), and clinical supervision (75.4%) were the main training components for emergency nurses<sup>(15)</sup>. Another study reveals that more than half of nurses participating in the training programs to enhance empathetic communication<sup>(16)</sup>.

The current research finding reveals that the total mean attachment style of nurses in the pediatric emergency departments was at moderate level in the domains (secure

attachment and avoidant attachment) and low level in the anxious attachment. These results are similar to an Australian study result found that the participants attachment style were as follow: mean score of secure attachment was 3.57, anxious attachment= 3.40, and avoidant attachment= 2.67 <sup>(17)</sup>. Further, a correlation study conducted in Thailand revealed that nurses' attachment styles were moderate, with mean scores of 0.306 (SD = 0.765) for preoccupied attachment, 0.742 (SD = 0.869) for dismissing attachment, -0.647 (SD = 0.961) for fearful attachment, and 0.863 (SD = 0.720) for secure attachment <sup>(18)</sup>. Similar results from Italy showed that participants' scores for insecure and secure attachment styles were lower for those who expressed more discomfort with intimacy <sup>(19)</sup>. Another cross-sectional study has different results and found that critical care nurses had the greatest insecure attachment style scores, while paramedic had the highest secure attachment style scores <sup>(20)</sup>. This finding is similar to the recent results of Salehi et al. <sup>(21)</sup> research found that the level of nurses attachment style was moderate with a total mean score of  $12.8 \pm 2.57$  (secure),  $8.87 \pm 1.98$  (avoidant), and  $9.30 \pm 3.07$ . (ambivalent) attachment styles, respectively. Previous studies have shown that avoidant and disordered attachment styles provide serious hazards when nurses are exposed to traumatic events, while secure attachment can serve as a protective buffer against trauma <sup>(22)</sup>. Its reported that nurses emotional regulation issues were associated with anxious and insecure attachment style, which affect nurse-patient social performance <sup>(23)</sup>. In fact, these results suggest that nurses with an anxious attachment style have a higher risk of burnout <sup>(24)</sup>.

Unattachment among nurses was connected to poorer patient outcomes and experiences because unattached nurses depend on walk-in emergency departments for urgent critical care <sup>(25)</sup>. However, the ED departments are designed for acute, immediate care, lessen continuity and comprehensiveness, and this generating concerns about nurses' care efficiency, the implications of their narrow scope and the understudied impacts of this style of care delivery <sup>(26)</sup>. These findings

implied that children who are not actively participating in their care may suffer greater pain and discomfort, lose control, and have fewer senses of security than others <sup>(27)</sup>. This clarified that nurses who communicate effectively will enable children to seldom ever participate in conversations about their own care, and in turn, make nurses feel secured.

The current study indicates a significant relationship between the total, anxious, and avoidant level of attachment style of nurses in the pediatric emergency departments and their age, marital status; accommodation; nursing qualification; and their years of experiences. These findings are agreed with cross-sectional and longitudinal studies indicated that nurses' overall attachment styles were strongly impacted by their age. When compared to younger nurses, older nurses showed better secure attachment scores <sup>(28)</sup>. Furthermore, the study results were similar to the results of recent study stated that attachment styles and marital status were substantially correlated. When it came to stable attachment types, married nurses were more likely than their unmarried colleagues <sup>(29)</sup>.

Similarly, another study found that compared to nurses who lived in cities, those who had lived in villages or towns for the greatest period of time were more likely to adopt the scared attachment type. According to this, attachment styles are influenced by accommodation <sup>(28)</sup>. Also, recent study highlighted nurses' years of experience influenced their attachment styles. Nurses with more years of experience tended to have more secure attachment styles <sup>(29)</sup>. According to these studies, nurses' attachment styles are substantially correlated with professional and demographic characteristics as age, marital status, housing, nursing credentials, and years of experience. Since attachment patterns can affect stress management, interactions between nurses and patients, and general job performance, it is imperative to comprehend these linkages.

The study has a limitation when convenience and voluntary sampling were chosen to ensure participants met specific criteria; this method

can limit the generalizability of the findings to a broader population of pediatric emergency nurses.

## Conclusion

This first nurses' attachment style evaluation has revealed a variety of perspectives regarding pediatric ED nurses' cognitive orientations that future nursing authorities might need. The study revealed that there is reciprocal dynamics of attachment styles despite the low level in pediatric ED nurses. There is still a significant lack of knowledge on the consequences of attachment status changes, despite the low level among wealth of data on the effects of attachment, access, and care continuity in the setting of pediatric emergency departments.

## Recommendations

The present study recommends **implementing targeted attachment style training programs** (e.g., workshops, Balint groups, narrative medicine) to enhance securing behaviors and compassionate care skills. Also, **explore interventions** (e.g., mindfulness, peer support) to strengthen secure attachment and resilience in PED.

## Acknowledgments

The authors express gratitude to the pediatric ED nurses who participated in the study and also appreciate the assistance provided by the managerial authorities of the included pediatric hospitals.

## Conflict of interest:

None

## Funding

None.

## Data availability statement

The data that support the findings of this study are available from the authors, but restrictions apply to the availability of these data, which were used under license for the current study and are not publicly available. However, the data can be obtained from the

authors upon reasonable request and with appropriate permissions.

## Author contribution

MH designed, conducted, and analyzed the study, and drafted the manuscript. AHAA supervised the research and provided critical review.

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