

# Pediatric emergency department: Resource exhaustion and burden of work in a resource-constrained region

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## Abstract:

**Background:** Emergency care is the care delivered in a hospital setting to any patient with an unexpected, sudden, threatening reversible condition. In countries where health care is not optimum, this type of care can represent the weakest element of the health system.

**Objective:** To explore the main causes behind the admission in the Pediatric Emergency Department (PED) of the Children Welfare Teaching Hospital (CWTH) in Baghdad and the urgency of visits.

**Patients and methods:** A cross-sectional study was carried out in the PED of CWTH in the Medical City, Baghdad. A convenient sample of five hundred visits on Sundays, Tuesdays and Thursdays of every week during the study period for patients below the age of 14 years between August and November 2017 were enrolled in this study and their data was analyzed. The perceived urgency of the visits were assessed and analyzed.

**Results:** The mean age for the patients was 3 years, with 239 males (47.8%). Of the whole group, 110 patients presented with complaints of hours in duration (22%). The most common complaint recorded was fever in 175 patients (35%). The most common comorbidities recorded were chronic respiratory diseases in 10 patients. Complete blood count was ordered for 460 patients (92%). Strikingly, blood culture was recorded in five patients only (1.0%). Reviewing the patients' files has shown that 381 patients (76.2%) were prescribed antibiotics during stay in PED. The diagnosis of the patients visiting the PED was documented in 252 (50.4%) patients' files only. Lower respiratory tract infections were the most frequently recorded diagnosis in 41 patients (8.2%). Two hundred sixty-six patients (53.2%) were justified as urgent visits, while the remaining (46.8%) were non-urgent. Most of those with comorbidities were labeled as urgent (89.4%), with a statistically significant association ( $P < 0.001$ ). Most of the patients who presented with a short duration of complaint (within hours) (89.1%) were classified as urgent. The majority of the patients who did not receive antibiotic therapy were classified as urgent (74.7%), ( $p < 0.0001$ ). The majority of the patients who were discharged (61.2%) were classified as non-urgent, while (38.8%) were urgent.

**Conclusions:** The study identifies the critical pitfalls of improper documentation of the data in the PED. It also delineates the resource exhaustion from the non-urgent visits. This may call for the need of structured training of physicians in the PED to improve efficiency, and reduce the cost through reducing the investigations to those necessary only which will improve the standards of service. A triage system should be implemented in CWTH PED.

**Keywords:** Iraq, children, emergency room, urgency, complaints

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## Introduction:

In 2000, world leaders convened at the Millennium Summit of the United Nations to set the Millennium Development Goals (MDGs) for 2015. Peculiar to

pediatrics, goal 4 aimed to reduce under-5-year mortality rates by two-thirds. Despite the success in some countries, the progress in others remains insufficient to meet the goal (1).

In 2015, the world leaders met again to adopt a historic decision for a comprehensive, far reaching and people-centered set of transforming goals, the Sustainable Development Goals (SDGs) for 2030. The third goal addresses the importance of offering healthy environment to all age groups, with special emphasis on children and adolescents (2)

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Most of the deaths among children in the emergency setting result from reversible causes, including lower respiratory tract infections, and diarrheal diseases (3, 4). Delay in identification, advanced referral, and shortage of resources make the first 24 hours of hospital admission the most vulnerable period (5). The development of solid pediatric emergency services in resource-limited countries can significantly reduce mortality in children under 5 years (6, 7).

Emergency care can be defined as all care given in hospital to patients with sudden, serious reversible disease. In resource-limited countries, this part has been noticed as one of the most friable parts of health systems (8). The shortfall of the services appears as the patient arrives to the hospital. There is usually poor prioritization of patients, no formal triage system if any, and physicians see the patients in the order they arrive (9).

**Patients and methods:**

A cross-sectional study was carried out in the Pediatric Emergency Department (PED) of the Children Welfare Teaching Hospital (CWTH) in the Medical City, Baghdad. A convenient sample of five hundred visits on Sundays, Tuesdays and Thursdays of every week during the study period for patients below the age of 14 years between August and November 2017 were enrolled in this study and their data was analyzed. Patients visiting the PED during the morning shift (8:00 AM-2:00 PM) were registered consecutively. The patients' demographic features were recorded. Then, the complaint and its characteristics, associated comorbidities, investigations carried out in the PED, treatment received, diagnosis, and the status at discharge from PED all were recorded and analyzed.

The current study identified 500 pediatric patients. The urgency of visits was categorized, and resource utilization, including diagnostic testing, treatment, and hospitalization within each category was analyzed. The perceived urgency of the current visit was assessed retrospectively based on the patients' files kept in the archives of PED. The patients were classified into two categories; urgent and non-urgent cases. The definition of a non-urgent case is (a visits for conditions for which a delay of several hours would not increase the likelihood of an adverse outcome) (10). Much of the data were not recorded and many of the files were missing important information. However, the classification was based on the mentioned symptoms and signs. For the purpose of the study, cases which died in the PED were excluded from the study.

Descriptive statistics were performed, while the differences between the urgent and non-urgent PED groups were assessed by bivariate analyses. All analyses were performed using IBM SPSS statistics (SPSS, Chicago, IL, USA) for mac, version 23.0 (11).

**Results**

The mean age for the patients was 3 years, the majority of patients being in the age group of < 5 years (67.8%), with 239 males (47.8%).

The duration of the complaints was classified into hours (less than 24 hours), days (24 hours to less than 7 days), weeks (7 to 30 days), and months (more than 30 days). Two hundred and sixty-two patients presented to PED with the duration of the complaint within the range of days (52.4%) (table 1)

**Table 1: Distribution of the cases by age, gender, and duration of complaints**

Data	Frequency	Percent	V percent
Age group			
< 5 years	339	67.8	70.0
5 years - < 10 years	123	24.6	25.4
> 10 years	22	4.4	4.5
Missing	16	3.2	
Gender			
Male	239	47.8	47.8
Female	261	52.2	52.2
Duration of complaint			
Hours	110	22.0	27.0
Days	262	52.4	64.4
Weeks	33	6.6	8.1
Months	2	0.4	0.5
Missing	93	18.6	
Total	500	100.0	100.0

The most frequently recorded complaint was fever in 175 patients (35%), followed by vomiting in 127 patients (25.4%), cough in 96 patients (19.2%) and shortness of breath in 94 patients (18.8%). Some reported more than one complaint (table 2).

Complete blood count (CBC) was done for 460 patients (92%), general urine exam (GUE) for 202 patients (40.4%), renal function tests (RFT) for 150 patients (30%), serum electrolytes for 116 patients (23.2%), and cerebrospinal fluid (CSF) analysis for 23 patients (4.6%). Strikingly, blood culture was recorded in 5 patients only (1.0%). Reviewing the patients' files have shown that 381 patients (76.2%) were prescribed antibiotic therapy while they were waiting in the emergency room (table 3).

The diagnosis of the patients visiting the PED was documented in 252 (50.4%) patients' files only while 248 (49.6%) patients' files were missing any information about the diagnosis or provisional diagnosis. Lower respiratory tract infections were the most frequently recorded diagnosis in 41 patients (8.2%), followed by gastroenteritis in 38 patients (7.6%), followed by sepsis (4.8%), and urinary tract infections (4.2%). The most common comorbidities recorded were chronic respiratory diseases in 10 patients (9 cases were asthma and one case was cystic fibrosis) and endocrine disorders in 9 patients (all were diabetic patients presented with either ketoacidosis or hyperglycemia); followed by cardiac diseases in 8 patients (all were congenital cardiac diseases), renal diseases in 7 patients (chronic renal

failure and nephrotic syndrome), hematology/oncology diseases in 7 patients (mainly leukemia and thalassemia), malnutrition in 7 patients (all with chronic diarrhea), neurological disorders in 6 patients (all with cerebral palsies) and lastly chronic liver diseases in 3 patients.

The total number of the visits were 500, 266 of which (53.2%) were shown to be genuinely urgent visits, while 234 (46.8%) were not. The disposition of the patients was as follows; 278 patients (55.6%) were discharged home, while 220 patients (44.0) were admitted to the hospital. Two cases were referred to surgical department for further evaluation and management.

**Table.2: The frequency of complaints for 500 patients visiting PED**

Complaint	Frequency	Percent
Fever	175	35.0
Vomiting	127	25.4
Cough	96	19.2
Shortness of breathing	94	18.8
Diarrhea	85	17.0
Abdominal pain	43	8.6
Abnormal movement	30	6.0
Jaundice	28	5.6
Poor feeding	20	4.0
Bleeding	17	3.4
Lethargy	16	3.2
Urinary symptoms	15	3.0
Allergic reaction	13	2.6
Cyanosis	12	2.4
Headache	12	2.4
Bite / sting	9	1.8
Constipation	7	1.4
Pallor	7	1.4
Altered mental status	5	1.0
Edema	5	1.0
Joint swelling / pain	5	1.0
Other*	9	1.8
Total*	500	100

\* Other includes 4 cases with poisoning, 2 neonates with fever, 2 cases with Failure to thrive / weight loss and one case with weakness.

**Table 3: Types of lab studies for 500 patients visiting the PED**

Item	No.	Frequency
Investigations		
CBC	460	92.0
GUE	202	40.4
RFT	150	30.0
Electrolytes	116	23.2
CXR	88	17.6
RBS	52	10.4
CSF analysis	23	4.6
ABG	11	2.2
TSB	11	2.2
Blood culture	5	1.0
Total	500	100

\* CBC: complete blood count; GUE: general urine exam; RFT: renal function test; CXR: chest x-ray; RBS: random blood sugar; CSF: cerebrospinal fluid; ABG: blood gas analysis; TSB: total serum bilirubin.

Classifying patients as urgent or non-urgent had shown that age distribution between urgent and non-urgent visits was statistically non-significant ( $p = 0.8$ ), where more than half of the patients in each age group were classified as urgent. The age group of  $> 10$  years showed a mild predominance of urgent over non-urgent visits (57.1% versus 42.9% respectively). Most of the patients with a complaint that started within hours (98, 89.1%) were classified as urgent while only 12 patients presented for non-urgent conditions (10.9%). When the duration was for days, 155 patients were classified as non-urgent (59.2%) while 107 patients were with urgent conditions (40.8%). The association of the duration of complaint with the urgency was statistically significant with a  $p$  value of 0.001.

Noteworthy, there was a strong statistical association between prescribing antibiotics to the patients in the PED and the urgency classification. The majority of the patients who did not receive antibiotic therapy were classified as urgent (74.7%) compared to (46.4%) of those who received antibiotic therapy being classified as urgent ( $p = 0.0001$ ).

The majority of the patient who were discharged home (61.2%) were classified as non-urgent compared to (38.8%) who were classified as urgent ( $p = 0.0001$ ).

**Table (4): Association between visits urgency and other variables for 500 patients visiting the PED CWTH**

Variable	Non-urgent	Urgent	Total	P value
Total	234 (46.8)	266 (53.2)	500 (100.0)	
Age group				
< 5 years	166 (47.6)	183 (52.4)	349	0.8
5 years - < 10 years	56 (45.5)	67 (54.5)	123	
> 10 years	12 (42.9)	16 (57.1)	28	
Duration*				
Hours	12 (10.9)	98 (89.1)	110	0.001
Days	155 (59.2)	107 (40.8)	262	
Weeks	32 (96.9)	1 (3)	33	
Months	1 (50)	1 (50)	2	
Antibiotics				
No	30 (25.2)	89 (74.7)	119	0.0001
Yes	204 (53.5)	177 (46.4)	381	
Fate				
Home	170 (61.2)	108 (38.8)	278	0.0001
Ward	62 (28.1)	158 (71.8)	220	
Referred to surgery	2 (100)	0 (0.0)	2	

\* 93 patients' file were missing the duration of the complaint (34 patients with non-urgent visits and 59 patients with urgent visits)

### Discussion

Children are a vulnerable group of the population with an obvious need of care for their growth and development, anticipatory guidance, and nutrition. A range of 75 – 100 patients visit the PED of CWTH daily with different complaints being referred from other hospitals, from private clinics, or self-referred. The majority of the patients in our series were below 5 years old which agrees with Montalbano study from Kansas and Wier study from Washington but disagrees with Atiq et al study from Pakistan in which the majority of visiting patients were 10-16 years of age probably due to their wider age range (12-14). A gender balance was seen in our series, also in agreement with Montalbano. In Atiq's study, male predominance was observed (61.1%), which was seen in other studies in Pakistan and India (12,14). Wier from Washington, reported a slight male predominance (52.8%) in pediatric patients visiting the emergency room (13).

The most frequently reported complaint in our series was fever in (35.0%) of patients, similar to that reported by Chen-Lim study in the children's hospital of Philadelphia (15), but in disagreement with the results of Atiq et al from Pakistan (14) in which the most frequent complaint was injury (39.4%), followed by constitutional symptoms in (18.9%) and gastrointestinal in (18.0%) and Wier study where the major cause behind ER visits was injuries and poisoning (13). The reason may be that CWTH PED does not receive cases of trauma or injuries as these cases are referred directly to surgical emergency department in the Medical City. Gastrointestinal symptoms were shown to be diarrhea, vomiting, abdominal pain and Jaundice. The latter represented 5.6% of the cases, the majority of which were thought to be acute viral hepatitis. This is in disagreement with a previous study in the same center about the causes of liver diseases which showed that Chronic liver diseases were constituting the majority of cases in 17.5%, rather than acute viral hepatitis (in 12.5%). This is possibly related to the sample size consideration (40 in Salih's study versus 500 in the current one) (16). Some of the patients presented with

more than one complaint and for the purpose of the study, the major complaint was reported in this study. After the emergency management was done, (44.0%) of the cases in our series were admitted to the hospital, which is much higher than figures reported by Hang from Taiwan who reported that (22.3%) of PED visits were admitted to the hospital (17). Patients with comorbidities admitted to the PED need to be fully evaluated and managed as those patients usually are more serious than those with a negative past medical history. The percentage of patients with associated comorbidities visiting the PED of CWTH was (11.4%), which was lower than that is reported by Anwarul study from Pakistan where the comorbidities were reported in (23.5%). The real number in our patients may be higher because of the size of missing information in the documentation of the primary diagnosis. Hence, we assumed that much comorbidity may have been missed by the resident physicians.

The primary diagnosis was documented in only (50.4%) of the cases while (49.6%) of the cases were missing the diagnosis. Out of the documented diagnoses, lower respiratory tract infections including pneumonia were the major diagnosis (8.2%), followed by gastroenteritis in (7.6%) and sepsis in (4.8%). This appears similar to figures from PED visits in Texas 2010, where pneumonia was the most common diagnosis (9.2%) (18).

There is ample evidence across many countries in the world stating that many investigations sent from the emergency department are inappropriate, thus affecting the quality of patients care. With advances in the scope and accuracy of laboratory investigations, the importance of misuse of these tests has also been felt. Evidence suggests that many investigations requested from the accident and emergency department are inappropriate (19).

The practice of sending inappropriate investigation in Iraq as a whole has led to decreased utilization of the basic skills of history taking and physical examination. It affects the quality of patient care as 'quality' means meeting the needs and expectations

of those whom we serve, most efficiently, with a minimum of waste. Currently, Iraq is under an economic setback and this influences all levels of public services including the health care system. This may add another drive to reduce the frequency of sending the investigations in PED and even other hospital wards.

In this study, 92% of patients were sent for CBC tests, which is considered as a high figure because it was not found to be justified in many cases. On the other hand, 55.6% of the cases were reassured and discharged home after providing the emergency management in the PED by the staff. Sending for unnecessary lab tests will prolong the waiting time for the patients and confuse the treating physician about the decision of disposing the patients. Just over 40% of the patients were sent for GUE, while only (4.2%) were proved to have urinary tract infections. Many guidelines were developed for blood lab works in the PED. Appropriateness of the tests was not assessed in this study.

Renal functions tests were ordered for nearly one third of the patients (30.0%) and serum electrolytes for (23.2%), a figure higher than expected in view of the number of cases with gastrointestinal and renal complaints collectively (46.3%), which might reflect the over-ordering of these tests.

Seventy-six percent (76.2%) of the patients admitted to the PED received parenteral antibiotic therapy, either for the treat-and-release cases or for the other during waiting time till admission.

A study from Wisconsin revealed that 82% of the pediatric visits to the PED are considered non-urgent and could be handled in a primary care office (20), which can lead to substantial savings (21).

The non-urgent visits in our study were shown to constitute (46.8%) of the total visits, which is lower than what was reported by Chin-Lim in the children's hospital of Philadelphia (15) which accounted to (85.0%) non-urgent visits from a total of 869 visits. Also, Anne Huang reported that (11.0%) of the total PED visits were shown to be non-urgent (17). This difference in the figures reported by different studies may be due to the differences in the assessment tools and triage filtering system. The duration of complaint was strongly associated with the urgency of visits, as patients who presented with a duration of complaint within hours were more urgent than other patients.

Treat-and-release strategy was truly represented in this study as the decision on releasing patients was strongly correlated with the urgency; the majority of those sent home were non-urgent and vice versa.

### Conclusions

Nearly half of the patients were judged to be non-urgent cases. Lower respiratory tract infection was the most commonly encountered diagnosis.

In view of the following observations from the study: The critical pitfalls of improper documentation of the data in the PED, and The resource exhaustion from

the non-urgent visits. We feel that we must emphasize the following:

The need of structured training of physicians in the PED to improve efficiency,

The need to reduce the cost through reducing the investigations to those necessary only which will improve the standards of service, and

The need to introduce a triage system in the CWTH PED.

### Authors' contribution

Hasanein H. Ghali: Study design and conception, Mustafa A. Al-Shafie: Data collection, Hayder M. Al-Musawi: Drafting manuscript

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## قسم طوارئ الأطفال: إستنفاد الموارد وعبء العمل في منطقة محدودة الموارد

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### الخلاصة:

**الخلفية:** تعرف رعاية الطوارئ بأنها الرعاية المقدمة في المستشفى لأي مريض يعاني من حالة صحية مفاجئة وقابلة للعلاج. في البلدان التي تفتقد للرعاية الصحية المثالية، قد يمثل هذا النوع من الرعاية العنصر الأضعف في النظام الصحي.

**اهداف الدراسة:** معرفة الأسباب الرئيسية خلف الدخول الى قسم الطوارئ في مستشفى حماية الأطفال التعليمي في بغداد، وكذلك دراسة مدى عجلة الزيارات.

**المرضى والطرق:** أجريت دراسة مقطعية في قسم الطوارئ في مستشفى حماية الأطفال التعليمي في مدينة الطب، بغداد. ادخل خمسمائة مريض تحت سن الرابعة عشر إلى الدراسة للفترة بين أغسطس ونوفمبر ٢٠١٧ وتم تحليل النتائج. تم تقييم وتحليل العجالة الملموسة للزيارات.

**النتائج:** كان معدل العمر للمرضى ٣ سنوات، وشكل الذكور ٢٣٩ (٤٧,٨٪) من العينة. من أصل المجموع الكلي، زار ١١٠ مريض الطوارئ بعراض يمتد الى فترة الساعات (٢٢٪). كان العارض الأكثر شيوعا ارتفاع الحرارة في ١٧٥ مريض (٣٥٪). كان الاعتلال المصاحب الأكثر شيوعا الامراض التنفسية المزمنة في ١٠ مرضى. تم طلب تحليل فحص الدم الشامل ل ٤٦٠ مريض (٩٢٪). ومن اللافت للنظر ان زرع الدم تم طلبه في خمسة مرضى فقط (١٪). أظهرت مراجعة الملفات ان ٣٨١ مريضا (٧٦,٢٪) تم وصف مضادات حيوية لهم اثناء رقدتهم في قسم الطوارئ. تم توثيق التشخيص للمرضى الزائرين لقسم الطوارئ في ٢٥٢ ملف فقط (٥٠,٤٪). كانت التهابات الجهاز التنفسي هي الأكثر شيوعا بين التشخيصات في ٤١ مريضا (٨,٢٪). كانت زيارات مئتان وست وستون مريضا (٥٣,٢٪) عاجلة بينما كانت البقية (٤٦,٨٪) غير عاجلة. تم تصنيف معظم المصابين باعتلالات مصاحبة على أنهم عاجلون (٨٩,٤٪)، مع ارتباط ذي دلالة إحصائية ( $P < 0.0001$ ). تم تصنيف معظم المرضى الذين ظهروا بشكوى ذات أمد قصير لساعات على أنهم عاجلون (٨٩,١٪). تم تصنيف غالبية المرضى الذين لم يتلقوا المضادات الحيوية في قسم الطوارئ كعاجلين (٧٤,٧٪)، ( $P < 0.0001$ ). صنف غالبية المرضى الذين خرجوا من المستشفى على أنهم غير عاجلين (٦١,٢٪)، بينما (٣٨,٨٪) كانوا عاجلين.

**الاستنتاجات:** حددت الدراسة المزالق الحرجة للتوثيق غير السليم في قسم طوارئ الأطفال. حددت الدراسة أيضا إستنفاد الموارد من الزيارات غير العاجلة. توضح نتائج الدراسة الحاجة الى تدريب منظم للأطباء في قسم طوارئ الأطفال لتحسين الكفاءة وتقليل الكلفة من خلال ترشيد طلب التحليلات المختبرية للحالات الضرورية فقط والذي سيحسن من معايير الخدمة. يجب تطبيق نظام الفرز في قسم طوارئ الأطفال في مستشفى حماية الأطفال التعليمي.

**مفتاح الكلمات:** العراق، اطفال، ردهة الطوارئ، طوارئ، مريض الطوارئ