



## Admission Patterns and Outcome in Pediatric Intensive Care Unit at Althawra Hospital: Al-Bayda, Libya

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**Abstract:** A retrospective cross sectional descriptive study to all children from age groups (1month to 15 years) presenting with critical illnesses to the PICU at the pediatric department of Al –Thawra Hospital, from June 2015 to December 2015. A total of 1043 children were admitted to PICU at Al Thawra Hospital, 54.1% were male and 45.9% were female with ratio male to female 1.1:1. Age distribution showed that 51% were infants (1month to 1year). Respiratory system, central nervous system, and gastrointestinal diseases (32.3%, 28 %, 13 %) respectively were the most common diseases requiring PICU admission, followed by infectious diseases (7%) cardiovascular (6%), others which include poisoning and trauma (7%), and least common endocrine (2%), hematology (1.3%), nephrology (1%), metabolic ( 0.7%), and oncology (0.5%). The overall mortality rate was 30 (2.87%) with higher proportion of males (22\30) died following admission compared to admitted females (8\30) and these differences were statistically significant. Infants had the highest proportion of the total death 22\30 which was statistically significant. Sepsis was the most common cause of total death 7\30 patients ( 23.33%) followed by 6\30 patients ( 20%) for each of CHD and pneumonia followed by couple patients (6.6%) for each of cerebral palsy, convulsion and others. One patient (3.33%) each for encephalitis, acute gastroenteritis, anemia, chronic renal failure, and malignancy. Nine hundred and five patients (86.76%) improved and discharged in satisfactory condition, 92 (8.82%) patients left against medical advice (LAMA), 61 (1,53%) patients were referred to more specified hospital and 30 patients died during the studied period. The estimated fatality rate was (2.87%). Infection remains a major problem for patients in intensive care units and associated with considerable morbidity and mortality. Pneumonia and congenital heart diseases were the most next common cause of death. Therefore, these patients require early referral and timely institution of therapy for better outcome, and intensive care facilities should be expanded to decrease child mortality.

**Key words:** Pediatric intensive care unit (PICU), children and mortality, Libya

### INTRODUCTION

Intensive care is predominantly concerned with the management of patients with acute life-threatening conditions in a specialized unit. Caring for critically ill children remains one of the most demanding and challenging aspects of the

field of pediatrics because they require a very high level of monitoring of vital signs and other body functions. These patients may need mechanical ventilation invasive intravascular procedures and frequent attention by both the nursing and medical staffs (Frankel, 2004). Children having acute neurological deterioration,

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respiratory distress, cardiovascular compromise,, severe infections and accidental poisoning constitute the major admission to a pediatric intensive care unit (PICU) as shown in guidelines in 2004 (Jaimovich 2004). Disease pattern, particularly in early age group, is a sensitive indicator of the availability, utilization, and effectiveness of mother and child health services in the community. Disease pattern changes between different places and time to time even at the same place(Parkash and Das 2005). Therefore a regular review of the disease pattern in any particular setting is important for providing better services to the patients. In the past two decades, improvement in life-sustaining technologies resulted in an increase in the number of admissions to the pediatric intensive care unit. Care of the critically ill patients is an intensive resource , and 15-20% of hospital budgets are spent in the pediatric intensive care unit. The focus on the quality and safety of medical care is increasing because of the high cost of healthcare and potential for harm. There are many evaluations of mortality and incidence of complications, such as nosocomial infection in the PICU, with an increased emphasis on the quality improvement efforts and evaluation of the outcome (Chelluri, 1995, (Luce and Rubenfeld 2002, Curtis *et al.*, 2006).Therefore this study was conducted to establish a profile for patients admitted to Pediatric intensive care unit at pediatric department at Althawra General Hospital in Albaida (Albaida town is located 200 Km east of Benghazi city, the population of this town are 500.000) describing the demographics of patients, diagnosis, and outcome.

## MATERIALS AND METHODS

### Study design

A descriptive cross-sectional retrospective study was conducted from 1st of June to 31 December 2015. (Total No=1043).

### Study sitting

PICU is a part of the pediatric department at althawra central teaching Hospital in Al-Bayda (46 beds capacity). It contains 10 beds and

equipped with central oxygen supply, suction lines , infusion pumps, conventional mechanical ventilator, and patients care monitor. However, it does not have facilities for cardiac surgery bronchoscope. PICU is staffed by two resident doctors on duty supported by two trained nurses.

### Statistical data and analysis

Data entry statistical analysis and calculations were performed with statistical package for social sciences (SPSS).

The data were interpreted in Tables and Figures and the numerical data were shown as percents. Chi-square test was used to find the significance of the observed differences between the studied variables, and P value <0.05 was taken as the level of significance.

## RESULTS

A total of 1043 patients were admitted to Pediatric intensive care unit. Among them, 564 (54.1%) were males and 479 (45.9%) were females, with males to females ratio 1.1:1. Age distribution ranged from one month to 15 years, and 51% of them were below one year (Table 1).

**Table(1).** Distribution of patients according to age

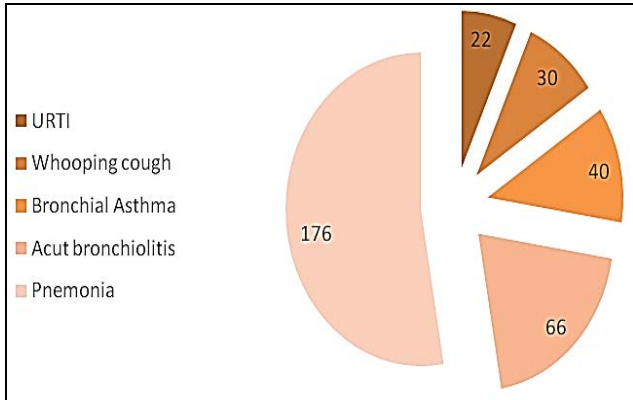
Age groups	No .of patients (%)
1month -1 year	531 (50.9%)
1 - 5 years	383 (36.7%)
6 -10 years	92 ( 8.8%)
More than1 years	37 ( 3.5%)
Total	1043

Length of stay ranged from 1 day to more than 15 days. Table (2).

**Table (2).** Distribution of patients according to length of stay

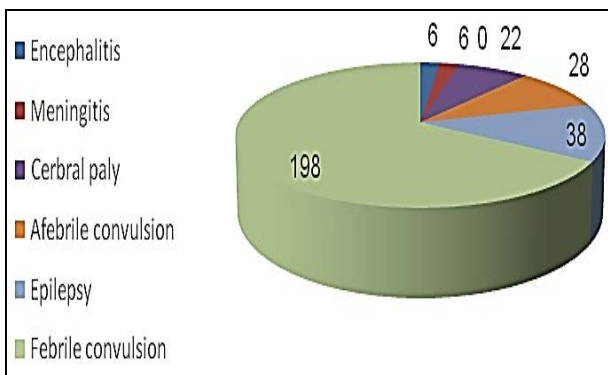
Length of stayin ICU (days)	No. of patients (%)
1-7days	998 (95.7%)
8-15 days	38 ( 3.6%)
More than 15 days	7 (0.7%)
Total	1043

Respiratory system diseases were the most common diseases admitted to PICU (337 patients, 32.3%). Commonest respiratory ICU admission included pneumonia (52.2%), acute bronchiolitis (17.5%), bronchial asthma (11.85), whooping cough (9.7%), and URTI (6.5%) as seen in (Figure 1).



**Figure (1).** Distribution of patients according to respiratory diseases

Figure (2) showed that central nervous system (CNS) 298 (28%), and gastrointestinal diseases (GIT) 137 (13%) were the next two common diseases required admission in this analysis. The admission also included infectious diseases 75 (7%), cardiovascular 61 (6%), endocrine 21 (2%), hematology 14 (1.3%), nephrology 12 (1%), metabolic 8 (0.7%), oncology 5 (0.5%), and others which includes poisoning and trauma 75 (7%) (Table 3).

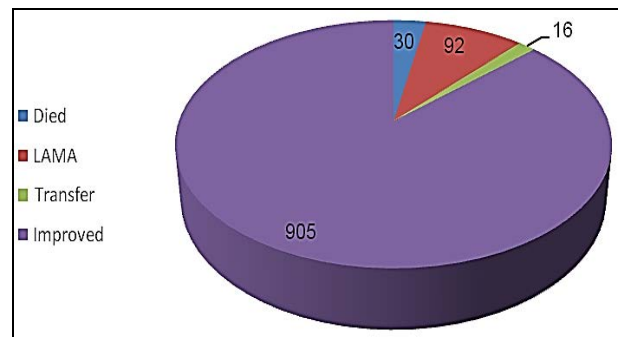


**Figure (2).** Distribution of patients according to central nervous system diseases

**Table(3).** Distribution of patients according to systems involved

System	No. of patients (%)
Respiratory	337 (32.2%)
CNS	298 (28%)
GIT	137 (13%)
Infectious	75 (7%)
Cardiology	61 (6%)
Endocrine	21 (2%)
Hematology	14 (1.3 %)
Nephrology	12 (1%)
Oncology	5 (0.5%)
Others	84 (8%)
Total	1043

Most of the patients 905(86.76%) improved and were transferred to the ward when they were not in need for intensive care or discharged home from PICU with satisfactory condition. 16 patients were referred to other specialized hospital for further management, 92 left against medical advice (LAMA), 30 died during the studied period, and 905 were improving (Figure 3).



**Figure (3).** Distribution according to outcome

Fatality rate was 2 (87 %) with higher proportion of males 22\564 (3.9%) who died following admission compared to admitted females 8\479 (1.7%) and these differences were statistically significant (P value=0.03) (Table 4).

**Table(4).** Distribution of patients according to gender and outcome

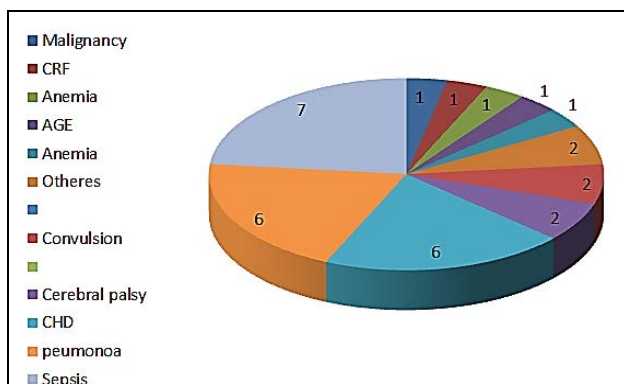
Sex	Mortality		Total
	Alive	Dead	
M	542 (96.1%)	22 (3.9%)	564 (100%)
F	471 (98.3%)	8 (1.7%)	479 (100%)
Total	1013 (97.1%)	30 (2.9%)	1043 (100%)

Infant had the highest proportion of the total death 22\30 with P value = 0.014 which is statistically significant, Table (5).

**Table (5).** Distribution of patients according to age group and outcome

Age group monthes	Mortality		Total
	Alive	Dead	
1-12	510 (96%)	21 (4%)	531 (100%)
13-60	378 (99%)	4 (1%)	382 (100%)
61-120	91 (97.8%)	2 (2.2%)	93 (100%)
More than120	34 (91.9%)	3 (8.1%)	37 (100%)
Total	1013 (97.1%)	30 (2.9%)	1043 (100%)

The studied causes of death observed that 7\30 patients ( 23.33%) were having sepsis followed by 6\30 patients (20%) each for CHD and pneumonia followed by 2 patients (6.6%) each for cerebral palsy, convulsion and others. One patient (3.33%) each for encephalitis, acute gastroenteritis, anemia, chronic renal failure, and malignancy as found in Figure (4).



**Figure (4).** Causes of death among studied patients CRF:(chronic renal failure) -AGE: (Acute gastroenteritis) - CHD: (congenital heart disease)

## DISCUSSION

In various studies, it has been shown that intensive care has a positive outcome for the vast majority of critically ill children. However, caring for the critically ill children is a challenge in developing countries where health needs often outstrip available resources. Necessary equipment is scarce and often malfunctioning, and trained manpower is limited. Management of critically ill patients requires significant human, infrastructural and financial resources. These resources are typically limited in low-income countries (Watters 1993, Gemke *et al.*, 1995, Oke 2001). This study was undertaken in order to document the most common type of diseases with which the children are admitted to the ICU in the pediatric department at Althawra hospital. The total number of admissions during the study period was 1043. We noticed that infants (1 month to 1year) and children up to 5 years were the most vulnerable age group in representing the majority of admitted patients to PICU; this is consonant with study documented in Cairo by (Rady 2014). In a study done in Bangladesh by ((Hoque *et al.*, 2012) the results showed that 93.3% of patients were below 5 years of age. Another study in India by (Abhulimhen-Iyoha *et al.*, 2014) found that 72.7% were below 5 years of age. Male babies outnumbered their female counterpart with a ratio of 1.1:1, it reflects a gender bias in parental health-seeking behavior regarding their children or alternatively there might be an epidemiological reason for male susceptibility to infection or other conditions requiring admission. The male predominance at admission is consistent with an Indian study (Shah *et al.*, 2014) who found that 63% of the represented infants were male. Similarly in a study done in Ethiopia (Abebe and Girmay 2015) where they observed that admission of male children was more than females children 93 vs. 77. As well as other studies (Eck *et al.*, 2006, Kam-lun and Nelson 2006, Khan *et al.*, 2006). Respiratory illness was the most common involved system (32.3%) in total admission, and pneumonia represented (52.2%). Acute bronchiolitis, bronchial asthma, and whooping cough were the commonest indication for admission in our set and could be a reflection of disease prevalence under five years of

age .this may be decreased by incorporating pneumococcal and DPT vaccines in national immunization program . The predominance of respiratory diseases at admission in our study also showed that respiratory diseases 40%, followed by neurological illness 27% as common causes of admission and that was similar to studies in Egypt (Rady 2014) and Bangladesh (Hoque *et al.*, 2012). In the present study, neurological diseases (28%) were the next common diseases required PICU admissions, which was similar to other illness studies reported by (Klem *et al.*, 1990, Singhal *et al.*, 2001). Our study demonstrated that acute gastroenteritis represented only 13% of the total admission which was lower than other studies. This could be due to incorporating Rota viral vaccine in national vaccination program in our country. Study from India. (Abhulimhen-Iyoha *et al.*, 2014) showed that diarrheal diseases 26.8% followed by respiratory tract illnesses 19.9% as commonest indication of admission to their PICUI. In the current study, cardiovascular diseases represented (6%) of total admission and 96% of them were congenital heart disease, where as in studies done in India (Singhal *et al.*, 2001, Abhulimhen-Iyoha *et al.*, 2014) represented 41.1% and 6.5 respectively. Septicemia observed in 7% in our study whereas in study from India (Khan *et al.*, 2006) septicemia represented 14.8% of admission. Out of 1043 child admitted, 905 (86.8%) improved and were shifted to the ward or discharged home in satisfactory conditions. 61 patients were referred to other specialized hospitals to surgical and trauma center, and cardiac patients who were in need for cardiac surgery. 92 (8,8%) left against medical advise, the main reasons were domestic including lack of facilities and lack of confidence on the level of care provided to these children where in study done in Bangladesh (Hoque *et al.*, 2012), they found 6 out of 119, (5%) left against medical advice for the same reasons Thirty patients died during the course of admission, giving an ICU mortality rate of (2.9%) and this mortality rate could be underestimated because some of the referred children were very sick and we do not know their fate, and some cases received died but were not registered for medico-legal causes. This value is lower than that documented in Hong Kong

(Khilnani *et al.*, 2004, Choi *et al.*, 2005) . Therefore, less than an overall mortality of 16.7% recorded by (Klem *et al.*, 1990), 15% mortality rate documented in Brazil (de Araujo Costa *et al.*, 2010) and 9.7%. reported by (Volakli *et al.*, 2011). Mortality rate in our study was the highest among infants up to 1 year old 21/30 (70%), this was higher in percentage than in the study done by (Rady 2014). In the current study we found that the percentage of males 3.9% who died were more than the percentage for females 1.7%, this was closer to a result that was reported by (Abhulimhen-Iyoha *et al.*, 2014) in which a higher proportion of males 2.5% died following admission compared to females 1.5%. The commonest conditions leading to death in our study was sepsis (23.3%) followed by pneumonia and congenital heart diseases (20% each) and this was similar to studies done in Cairo (Rady 2014), and India (Shah *et al.*, 2014) in which pneumonia also was the commonest condition leading to death. The Case fatality was higher for septicemia (33.3%) followed by pneumonia (24.0%) as reported by (Hoque *et al.*, 2012) which is similar to our result.

An intensive pediatrics training may help by working closely with general pediatricians, training residents and nurses in advance procedures, and by developing and updating unit protocols taking into consideration human, logistic, and financial resources. The intense visits may also be helpful for training peripheral units on stabilization and transportation of sick children. These facts highlight the necessity to strengthen the existing health care system and develop facilities for a proper transportation and treatments of critically ill children. This would allow identifying the magnitude of each illness that needed intensive care and redistribution of resources.

## CONCLUSION

diseases including infections were the predominant conditions leading to PICU admissions in our setting. Most of the children who died suffered from a preventable and curable disease. This highlights the importance of addressing critically ill children and expanding intensive care facilities in the region.

Improvement in health resources as well as the great experience of caregivers lead to increasing the number of survivors from pediatric intensive care which has major financial implications for the individual, the family, and to the whole community.

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## أنماط الدخول والنتائج في وحدة العناية المركزة للأطفال في مستشفى الثورة: البيضاء، ليبيا - 2015

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**المستخلص :** دراسة مقطعية بأثر رجعي لجميع الأطفال من الفئة العمرية (من شهر إلى 15 سنة) الذين تعرضوا لأمراض حرجة والمحولين إلى وحدة العناية المركزة في قسم طب الأطفال بمستشفى الثورة، في الفترة من يونيو 2015 إلى ديسمبر 2015. حيث بلغ عدد الأطفال المقبولين في وحدة العناية المركزة في مستشفى الثورة 1043 طفلاً، 54.1% من الذكور و 45.9% من الإناث وبنسبة الذكور إلى الإناث 1.1:1. وأظهر التوزيع العمري أن 51% من العدد الكلي هم من الرضع (1 شهر -1 سنة). بينت الدراسة أن نسبة إصابات الجهاز التنفسي والجهاز العصبي المركزي و الجهاز الهضمي (32.3%، 28%، 13%) على التوالي وتعتبر هذه الأمراض من الأمراض الأكثر شيوعاً والتي تتطلب دخول وحدة العناية المركزة، تليها الأمراض المعدية (7%)، والأمراض القلبية الوعائية (6%)، والبعض الآخر الذي يشمل التسمم والصدمة (7%)، وأقلها شيوعاً الغدد الصماء (2%)، أمراض الدم (1.3%) أمراض الكلى (1%)، الأيض (0.7%) والأورام الخبيثة (5%). من الدراسة تبين أيضاً أن معدل الوفيات الإجمالي 30 (2.87%) وكانت نسبة الوفاة أعلى في الذكور 22 \ 30 مقارنة بالإناث 8 \ 30 وكانت هذه الإحصائيات مختلفة معنوية. وشكل الرضع أعلى نسبة من مجموع الوفيات 22 \ 30 مع فروق معنوية عالية. كان تعفن الدم السبب الأكثر شيوعاً للوفاة حيث كان 7/30 مريضاً (23.33%) يليهم 6/30 مريضاً (20%) لكل من أمراض القلب والالتهاب الرئوي تليها عدد اثنان من المرضى (6.6%) لكل من الشلل الدماغي والتشنج وغيرهما. مريض واحد (3.33%) لكل من التهاب الدماغ، التهاب المعدة والأمعاء الحاد، وفقر الدم، والفشل الكلوي المزمن و الأورام الخبيثة. تسعمائة وخمسة مرضى من العدد الكلي (86.76%) تحسنت حالتهم ، و 92 مريضاً (8.82%) غادروا بدون المشورة الطبية ، وأحيل 61 مريضاً (1،53%) إلى مستشفى أكثر تحديداً، وتوفي 30 مريضاً بمعدل نسبة الوفيات (2.9%). كان الالتهاب الرئوي وأمراض القلب الخلقية أكثر الأسباب شيوعاً للوفاة. ولا تزال العدوى تمثل مشكلة رئيسية بالنسبة للمرضى في وحدات العناية المركزة وترتبط بمعدلات اعتلال ووفيات كبيرة. ولذلك، يحتاج هؤلاء المرضى الإحالة المبكرة وفي الوقت المناسب لمؤسسة العلاج من أجل نتائج أفضل؛ وينبغي توسيع مرافق الرعاية المركزة لتقليل وفيات الأطفال.

الكلمات المفتاحية: وحدة العناية المركزة، مستشفى الثورة ، البيضاء.

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