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Causes of Readmission to Pediatric Intensive Care Unit in King Abdul-Aziz Medical City– RIYADH

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Abstract:

***Introduction**: Pediatric intensive care (PICU) units are specialized sections in hospitals, which deal with severe conditions requiring special care. These units are operated by multifactorial teams. Many conditions require admission to PICU including respiratory conditions, neurological conditions, infectious conditions and many more. This study aims to identify the common causes of early readmission i.e. less than 48 hours post discharge in King Abdul-Aziz Medical city-Riyadh (KAMC)*
***Methods**: This is a cross sectional study at KAMC PICU between years 2009-2013. Patients chart were reviewed retrospectively from the medical records department. The data was entered to data collection sheet and finally statistical analysis was done using SPSS to calculate means, medians and Frequencies.*
***Results**: 3714 admissions to KAMC PICU between years 2009-2013. With a rate of 1.34% (50 patients) early readmitted. The highest cause of early readmission was due to respiratory conditions followed by sepsis and shock.*
***Conclusion**: knowing the causes of early PICU readmission aids a lot in the performance of PICUs as protocols can be modified to decrease future incidence of readmission. In our center respiratory conditions were the highest cause for early readmission.*

INTRODUCTION

Intensive Care Unit (ICU), also known as a Critical Care Unit (CCU), is a special section in a hospital that provides service to the patients who require more specialized care. The Pediatric Intensive Care Unit (PICU) is a 24 hours working department within a tertiary hospital. The PICU provides care to infants, children and adolescents (1). Pediatric intensive care should not only save children's lives, but also increase their quality of life (2). The PICU is usually managed by pediatric intensivists. Staff of PICU consists of doctors, nurses, respiratory therapists, physician assistants, physiotherapists, social workers and child life specialists (3).

Many conditions require admission to the PICU. For example, acute asthma in children is a major cause of admission to PICU (4). Infections such as, Staphylococcus Aureus infections (5) and malaria (Plasmodium Vivax, Plasmodium falciparum) are considered as other major causes of admission to PICU (6). Children with Head injuries are also admitted to PICU (7). Complications of surgeries such as haematopoietic stem cell transplantation can be another cause of admission to PICU is (8). Other conditions are, drug overuse, sepsis, shock and congenital or acquired cardiovascular disease are causes of admission to PICU (9).

Admission to PICU due to certain diseases is associated with increased risk of readmission. Readmission to PICU is also associated with increased risk of poor clinical outcome (9). There is a lack of studies that aims to identify independent factors that can be linked to PICU readmission. To reduce the risk of readmission and the possible poor outcome, we need to identify these factors. Readmission is defined as repeat admissions (≥ 2) of a patient to the PICU during single hospitalization. Odetola et al found out that there is a direct correlation between elevated mortality and readmission to PICU as opposed to single admission (9).There are numerous factors that are linked to readmission to the PICU. Age of the child at admission is one of the factors associated with readmission to the PICU (9). Infants (0-12 months) have high risk of readmission. Emergent admission is associated with twice the risk of readmission compared to elective admission (9). Other causes of readmission include, cardiac (congenital heart surgery complication), respiratory (pneumothorax), effusive (pleural or pericardial) (10), infection (Respiratory Syncytial Virus) (11), Unresponsiveness to prescribed treatment, drug reactions (12) and prior neonatal intensive care unit admissions (13). Children who are admitted to the PICU with chromosomal disorders have higher risk of readmission, longer mean stay and higher mortality rate than others (13). Asthma is considered to be a major cause of admission and readmission to the PICU (14). A study conducted in Aseer Central Hospital in 2005 indicated that boys are more likely to be readmitted to PICU (14). Readmitted patients who stay for very long time in the PICU (≥ 28 days) have a five times higher mortality rate than other patients (15).

The aim of this unique study is to identify the common factors associated with readmission to PICU. Identifying these factors will help reduce the incidence of readmission.

Objectives:

The primary objective of the study is to identify the major causes of readmission to PICU at King Abdul-Aziz Medical City (KAMC) - Riyadh between (2009 - 2013). The secondary objectives of the study are:
1- To determine the prevalence of readmission to (PICU) within the period of 2009-2013, and the prevalence within each year.
2- To identify patients at high risk or readmission to PICU.

METHODS

This study was conducted in pediatric intensive care unit PICU at King Abdul-Aziz Medical City (KAMC) Riyadh, Saudi Arabia between years 2009-2013; KAMC is a tertiary hospital serving the National Guard employee and their dependents. The PICU serves both medical and surgical critical patients with a total capacity of 18 beds. All children up to 14 years of age who were readmitted to PICU within 48 hours of discharge at KAMC between the years 2009 to2013were included. The Data relating to our patients was collected from the medical records department, where the charts of all patients included were reviewed. Collected data were entered into a data collection sheet. The data included: age, gender, birth weight, heart rates, respiratory rates, temperature, level of consciousness, date of both admission and readmission, causes of admission and readmission and length of stay in admission. This is a descriptive analysis. We acquired the ethical approval letter from King Abdullah international medical research center (KAIMRC) to conduct our research. All collected Data were analyzed using SPSS. Descriptive statistics included mean, median and Frequency. Statistical analysis was used to identify the prevalence of readmission in the population.

RESULTS

There were 3714 admissions to KAMC PICU between years 2009-2013. The rate of early readmission to PICU within 48 hours of admission was 1.34% (50 patients).

Patient's characteristics:

The median age among all readmitted children was 3.94 years. Fifteen of the patients (30%) were between more than 5 and 14 years of age. 14 (28%) were between more than 1 month and 1 years of age. 13 (26%) were between more than 1 years and 3 years of age. 4 (8%) were between birth & 1 year of age. 4 (8%) were between more than 3 years and 5 years of age table 1. Thirty-one (62%) of the patients were male. Nineteen (38%) were female table 2. The mean length of stay of the admitted patients was 4.7 days. The yearly total PICU admission along with the incidence of yearly early admission is shown in table 3.

Table 1: Patient characteristics, age.

Age	No.	Percentage %
0-1 month	4	8.0
> 1month- 1 year	14	28.0
>1 year - 3 years	13	26.0
>3 years - 5 years	4	8.0
> 5 years - 14 years	15	30.0
Total	50	100.0

Table 2: Patient characteristics, gender.

Gender	No.	**Percentage %**
Male	31	62.0
Female	19	38.0
Total	50	100.0

Table3: Yearly incidence of admission & readmission

Year	Total admission	Early readmission	Percentage
2009	921	11	1.19%
2010	699	12	1.71%
2011	756	9	1.19%
2012	684	14	2.04%
2013	654	4	0.61%

Factors Associated With PICU Readmission:

Many factors were associated with readmission to the PICU. In the primary admission of the selected patients to PICU, respiratory problems were the most common causes of admission (55%) followed by seizure (12%), Burn (10%), Sepsis & shock (7%), pain management/sickle cell diseases (2%), Decrease level of consciousness (2%) and other causes (12%). Other causes of admission include hydrocephalus, Ischemic encephalopathy.

The most common cause of readmission to PICU within 48 hours of discharge was respiratory problems (50%). Sepsis and shock account for 10% of the readmission followed by seizure (8%), Decrease level of consciousness (6%), pain management (4%), intubation (4%) and debridement after burn (4%). Other causes of readmission included (hydrocephalus, Ischemic encephalopathy) account for (14%) of the readmission.

In children 0-1 month of age respiratory diseases were the only causes of readmission (100%). Respiratory problems still the major cause of readmission (71.4%) in children between more than 1 month and 1 year followed by decrease level of consciousness (14%) and other causes account for (14%) of the readmission. 23.1 % of readmitted children between more than 1 year and 3 years had sepsis or sepsis complications followed by respiratory problems (15.4%) , seizure (15.4%), intubation (15.4%), decrease level of consciousness (7.7%), debridement (7.7%) and other causes account for (15.4%). Majority of readmitted children between more than 3 years and 5 years had respiratory problems (50%). Sepsis and seizure account for the other 50% of cases readmitted in children between more than 3 years and 5 years. 46.7% of children between 5 years and 14 years readmitted because of respiratory problems. Sepsis, seizure and debridement account for 6.7% respectively of the readmitted cases. Other causes account for 20% of the cases.

DISCUSSION

With a total number of 3714 patients admitted to the PICU between the years 2009 to 2013, the total number of patient readmitted early to the PICU was 50 patients (1.34 %). The prevalence of early readmissions varies between centers. Centers in the United States of America showed similar prevalence varying from about 1.2% to about 1.95 % (Edwards et al, cazaja et al, Bernard etal). This is probably because the PICU center at KAMC is well equipped and it strictly adheres to protocols that are similar to those in North America leading to the similar prevalence. Most of the readmissions were for the age groups of 5 to 14 years of age 30% followed by 1 month to 1 year and 1 year to 3 years (28%, 26% respectively). In a previously conducted study by Edwards et al, both age and gender did not show significant difference in terms of earlier readmission rates (16). Meanwhile, the study by Angela S. et al revealed that those who are under the age of 6 months were associated with higher risk (17).

30 % of the studied sample in this study suffered from chronic conditions. Bronchial asthma was the most frequent chronic condition (22%) followed by sickle cell anemia with a percentage of 6%. However, the incidence of sickle cell anemia varies among different regions of Saudi Arabia with the highest rates in both the eastern province and southern parts of the kingdom. The fact that this study is focused on a single center in Riyadh might not reflect the overall prevalence of early readmission of sticklers. Previous studies also showed that chronic conditions had higher risk of early readmission (18,19). Interestingly, chronic liver disease among all conditions was associated with the highest risk of readmission with an odds ratio of 3.35 (17).

Respiratory conditions like bronchial asthma exacerbation, bronculitis and others accounted for 50% of the readmitted patients. Similarly, the respiratory causes had the highest percentage of readmissions in previous studies (16, 20-22). This is expected because of the high incidence of respiratory conditions during at the first couple years of life. Furthermore, Riyadh has a diminished role of primary health care service. The frequent sandstorms that strike Riyadh may also lead to higher rates of asthma exacerbations giving the pulmonary diseases the utmost percentage of admissions.

Sepsis and shock on the other hand, were the second cause of early readmission (10 %). Followed by seizures (6%) and no cardiovascular readmission noted in the other hand, cardiovascular and neurological conditions came second place in khan el at and Bernard et al respectively. This variation in the cardiovascular readmission prevalence could be attributed to the advanced cardiac center and neonatal screening tools in both Saudi Arabia and the west and the presence of a cardiac critical care unit in our center, Which may play a role in such low rates of readmission.

To our knowledge, this study is the first study to assess the early readmission to the PICU in Saudi Arabia. The major theme of this study was to focus on the disease groups that brought the patients back early to PICU. One of the major limitations of this study is the small sample size. This issue hindered us from performing a thorough statistics in order to have a better picture of what is going on in PICU. This limitation can be overcome by including more years or other centers in Riyadh or different hospitals in the kingdom. Another limitation is the retrospective fashion of the study, which made it difficult to assess many helpful factors in PICU care, like nursing to patient ratio, which can add a lot to the value of the study and the involvement of other PICU teams.

CONCLUSION

Studying the early PICU readmission aids a lot in the performance of PICUs. Knowing the causes and factors of readmission may provide further protocols to decrease future incidence of readmission. Many factors are associated with early readmission. Patients with underlying chronic conditions have higher incidence of early readmission. Respiratory diseases followed by shock were among the highest causes of early readmission in the PICU department at King Abdul-Aziz Medical City- Riyadh

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