

COMMON PAEDIATRIC EMERGENCIES

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ABSTRACT

There is a wide disparity between the anatomical, physiological and biochemical makeup of children and adults, this makes the aetiology and presentation of paediatric emergencies different from emergencies in the adult population. It, therefore, follows that the management approach to paediatric emergencies by health professionals differs from the management approach to emergencies in adults.

These biological factors dictate not only the differences between children and adults but among the different age groups of children. Other factors such as the fact that children undergo clinical deterioration more rapidly cause emergency evaluation and resuscitation of paediatric patients to be more challenging.

Healthcare workers are required to have the necessary skill, knowledge and training to provide appropriate emergency care for children of all ages. A standardised and organised approach should be taken in the management of emergencies in children.

This paper discusses paediatric emergencies, their management, categories under which paediatric emergencies may fall, and the epidemiology of some common paediatric emergencies in Nigeria.

Keywords: paediatric, emergency, medical, resuscitation, ABCDE

INTRODUCTION

A medical emergency is an acute change in physiological or psychological status likely to result in death, disability or delayed recovery without prompt and appropriate treatment.^[1] An emergency could either be medical or surgical. One vital distinguishing factor of paediatric emergencies is the fact that clinical deterioration in children develops more rapidly than in adults.^[1] This calls for paediatric emergencies to be treated with an even higher sense of urgency.

Management of paediatric emergencies presents unique challenges because, as the common paediatrics axiom goes, children are not just small adults. While the physiology of an adult remains relatively constant with age, the body of the paediatric patient undergoes several stages of significant physiological as well as anatomical changes. This causes the approach to emergencies to vary considerably among children of different age groups. For instance, variations in the circulatory mechanisms and the total body water content in children at different stages of their development present a challenge in carrying out basic emergency procedures such as administration of a fluid bolus.^[2,3] Paediatric emergencies are made even more challenging because the normal values for the vital signs vary with the age of the child.^[4] In-depth anatomical, physiological and biochemical knowledge about each

stage of development is, therefore, necessary for the management of paediatric emergencies.^[5]

These anatomical and physiological differences between children and adults also tend to make paediatric emergencies more delicate. For instance, the tongue of a child is significantly larger than that of an adult in relation to the space in the oropharynx. Also, the head of a paediatric patient is larger relative to the body. Thus, the neck is flexed when they lie on a flat surface. These factors increase the probability of airway occlusion, particularly in the unconscious child.^[6,7] The relatively large tongue and higher larynx in children also make mask ventilation more difficult.^[8]

Another factor that makes paediatric emergencies more challenging is the fact that the field of paediatrics is characterized by diseases which are common in children and rare in adults e.g. acute nephritis and even some that are unique to children, never presenting among adults^[5] e.g. laryngotracheobronchitis.

In addition to this, paediatrics deals with a wide range of ages, and diseases which may subsequently develop into emergencies in paediatric patients differ in prevalence among the several different age groups. Children under the age of five years are more vulnerable to infectious

diseases such as pneumonia and malaria and are likely to be more unwell with these infections than older children are.^[9]

It is important to note also, that even when paediatric patients present with a medical emergency which is also seen in adults, there is likely to be a discrepancy in the physiological process behind the problem. This can be seen in the case of heart failure. In Nigeria, the leading cause of heart failure among adults is hypertension^[11, 12] In children, on the other hand, heart failure primarily occurs secondary to severe anaemia and Lower Respiratory Tract Infections.^[13, 14]

EPIDEMIOLOGY

Studies carried out in various paediatric hospitals around Nigeria have shown that the majority of patients presenting to paediatric emergency wards are male, the male-female ratio ranging from 1.2:1 to 1.4:1. Majority of the patients were below the age of 5 years, making up about 51% to 89.1% of the entire paediatric patient population in the hospitals in which these studies were carried out. The most prevalent cause of morbidity in paediatric emergency units in Nigeria are severe malaria, dehydration from diarrheal diseases and pneumonia.^[15-18]

MALARIA

Severe malaria is one of the most common causes of admissions into paediatric emergency wards in Nigeria. In 2015, a field study showed that 27% of Nigerian children between the ages of six months and twelve years were positive for the malaria parasite. In this study, the prevalence was much more among children who reside in rural areas than in those residing in urban areas.^[19]

More than two-thirds of the cases of severe malaria were seen in children below the age of five years.^[20, 21] The commonest features of severe malaria among children were found to be: prostration, impaired consciousness/coma, respiratory distress, convulsions and severe anaemia. Other less common presenting factors are acute renal failure, shock and abnormal bleeding.^[20,22] During the rainy season, in the second half of the year, the occurrence of malaria in children undergoes a significant increase relative to other times of the year.^[20,23] The difference in malaria prevalence by sex of the child is not significant.^[19]

PNEUMONIA

More than half of the world's annual new childhood pneumonia cases are concentrated in just five countries and Nigeria is one of these countries. About 6 million new pneumonia cases occur annually in children in Nigeria.^[24] Pneumonia alone claims the lives of over 177,000 children under five years old in Nigeria every year.^[25]

The large majority of the burden of pneumonia in children in Nigeria is borne by those between the ages of 1-11 months. Studies have also shown a higher occurrence of the disease in male children than in female children.^[26]

DIARRHEAL DISEASES

Each child in the sub-Saharan region of Africa, Nigeria inclusive, is estimated to have about five episodes of diarrhoea every year.^[27] Diarrheal diseases are the leading cause of childhood morbidity and mortality in developing countries. Every year in Nigeria, diarrhoea kills about 15,000 children below the age of five years. The prevalence of childhood diarrhoea is 18.8% in Nigeria^[28] and studies have shown that its occurrence is higher among male children than among females.^[27]

Incidence of diarrhoea among the population of children has also been shown to have a relation to age. It is highest in the first two years of life and declines as the child grows older.^[28]

In addition to these diseases which present very frequently in paediatric emergency units, there are other causes of emergencies in children which are much less common among paediatric patients and as a result, may not immediately suggest themselves to the emergency paediatric physician such as ectopic pregnancies in older children which may present as menorrhagia, Diabetes Mellitus presenting as severe dehydration

MANAGEMENT OF PAEDIATRIC EMERGENCIES

Paediatric emergency signs are heterogeneous and can be caused by a wide range of clinical conditions. Deaths of children in hospitals often occur within the first 24 hours and these deaths can be prevented if life-threatening problems are promptly identified and treated.^[29] Therefore, physicians, nurses and other practitioners in the paediatric emergency unit are required to have the necessary skill, knowledge and training to provide an emergency evaluation and resuscitation of children of all ages.^[30]

The assessment and treatment of a critically ill or injured child are done in a stepwise manner and requires regular re-evaluation to ensure the success of each stage of intervention. This is achieved by applying the ABCDE algorithm to assess for life-threatening problems. The mnemonic "ABCDE" stands for Airway, Breathing, Circulation, Disability, and Exposure. This algorithm improves speed and quality of treatment.^[31] It is important to first assess for responsiveness as a firm and gentle stimulation may be enough to stimulate responsiveness.^[32]

AIRWAY MANAGEMENT

Signs of airway obstruction include difficulty with breath-

ing, inability to speak or a silent cough. Snoring may be noticed in unconscious patients. [31] The most common cause of airway obstruction in children is the tongue. [32] Other causes of airway obstruction in children are foreign body aspiration, meconium aspiration in newborns, pneumonia, asthma, food bolus. The measures taken to restore airway patency include positioning, suctioning, removal of foreign body, and the use of airway adjuncts. [33]

To open the airway, a head tilt and chin lift is done with visual inspection to identify foreign bodies. However, head tilt is avoided in trauma patients with a suspected cervical spine injury. A jaw thrust with stabilization of the head and neck is done for such patients. [33] If a foreign body is responsible for the obstruction, it should only be removed under direct vision as blind probing may impact the object further. [32] The airway may need suctioning and if the patient is unresponsive, endotracheal intubation to secure the airway.

BREATHING

To assess respiration;

- i. The chest and abdomen are checked for movement
- ii. The mouth and nose are felt for air movement
- iii. Breath sounds are listened for over the airway

The patient may be found to have tachypnea, an irregular or increased respiratory effort seen as flaring of the nose, or use of accessory muscles of respiration. Pulse oximetry is important to rule out hypoxemia and children with an oxygen saturation of <90% should be placed on oxygen therapy. [34] If percussion notes are dull (with reduced breath sounds), a pleural effusion may be responsible which could be as a result of an infection. On auscultation, abnormal lung sounds may be heard such as stridor, wheeze, reduced or absent breath sounds. Different inferences can be deduced from these which will, in turn, determine the line of management. All children with breathing difficulties should receive high flow oxygen through a non-rebreather face mask once the airway is assessed to be patent. [35]

These signs could be caused by several conditions such as asthma, pneumonia, etc. [31]

Airway and breathing should be repeatedly reassessed to ensure responsiveness.

CIRCULATION

The goal of this step is to assess for cardiovascular function and tissue perfusion, ensure an effective circulating volume, and if present, control bleeding. [35] The pulse rate which varies with age and the pulse quality of the central and peripheral pulses should be palpated. Capillary refill time which may be normal or prolonged should be done centrally to reduce the effect of environmental

factors. The blood pressure may be decreased as seen in shock patients and the recorded blood pressure should always be compared with the age-appropriate value. The patient's skin colour and temperature should be checked to assess tissue perfusion while looking for signs of internal and external bleeding. [36]

The interventions that are needed to restore circulation and cardiovascular function include cardiac compressions, defibrillation, establishing venous access, administration of fluid bolus in shock patients and drugs in rhythm disturbances. [33]

If the child is unresponsive with a weak central pulse or bradycardia, cardiopulmonary resuscitation should be started. This provides blood flow to the vital organs and improves survival. [33]

Vascular access is necessary for the administration of fluid and drugs. However, intraosseous access should be attempted if peripheral vascular access cannot be secured within 90 seconds or after three attempts. [33, 35, 37]

This intraosseous access is only maintained until vascular access is established. [38] The recommended puncture site is the medial aspect of the proximal part of the tibia, about 1-2cm below the tibia tuberosity. [35] If intraosseous access cannot be established, a central line should be sited (femoral access is preferred). [33] The first line fluid for resuscitation is any isotonic saline crystalloid. [39] Blood samples are collected and sent for a full panel screening which includes full blood count, liver function test, clotting profile, blood culture, blood gases, blood glucose, clotting profile, grouping and cross-matching.

DISABILITY

In this step, the patient's level of consciousness is assessed using the AVPU (Alert, response to Verbal stimuli, response to Pain, Unresponsive) scale or the Paediatric Glasgow Coma Scale. An altered level of consciousness may be a sign of cerebral oedema. A decreased level of consciousness due to hypoglycaemia should be corrected immediately with oral or infused glucose. [31] Pupillary light reflex is examined to evaluate the brainstem, the size and pupil equality are also assessed. Movement and sensitivity should be checked in all limbs.

EXPOSURE

Proper exposure is necessary to examine the whole body for hidden injuries, rashes or earlier missed signs. The presence of rashes may indicate an allergic reaction or an infection. [36] The child should be carefully exposed to minimize heat loss and to respect the patient's modesty.

THE SERIOUSLY ILL CHILD

Children in this category can be classified into two broad groups based on the underlying cause of the illness:

respiratory factors which present with difficulty with breathing; circulatory factors which present with pulse and rhythm abnormalities. However, in some cases, there may be an overlap between these two groups.

Paediatric emergencies due to respiratory factors are caused by several conditions which might be chronic, an infection, allergic reaction or foreign body obstruction. They are characterized by three main presentations: dyspnoea, wheezing and stridor.^[40]

Cardiac emergencies commonly encountered in paediatrics include cardiopulmonary arrest, shock, arrhythmias.^[41] Hypovolemic shock is the most common type of shock in childhood and it is usually caused by a persistent loss of fluid in diarrhoea.^[40] Other causes of circulatory failure include burns, vomiting, sepsis, etc.

There are algorithms for the management of these conditions which must be followed once a diagnosis is made.

THE CRITICALLY INJURED CHILD

Trauma is a leading cause of mortality and morbidity in childhood and the causes vary with age from burns, drowning and falls in infancy to road traffic accidents in older children. It is essential to provide trauma patients with a rapid and well-organized assessment. A primary survey is carried out to identify and treat life-threatening conditions using the ABCDE approach with cervical spine stabilization.^[42] The patient is assessed for intrathoracic and intrabdominal injuries some of which might have been identified during the primary survey. Pain should be assessed using age-appropriate scales and properly managed. It is also important to prevent hypothermia in children as they are more prone to hypothermia than adults.^[42]

CONCLUSION

Paediatric emergencies have a better outcome when the managing team have the necessary knowledge, skills and resources. It is a challenging field as it caters for a wide range of ages with physiological differences which the managing team must fully understand. However, to ensure optimum delivery of care, a structured approach is used irrespective of the presenting symptoms and signs. The goal of this approach is to identify and treat life-threatening conditions and to stabilize the patient as it prioritizes the initial clinical interventions, after which definitive care is given. Therefore, all paediatric emergency teams must be properly trained and skilled in resuscitation as a delay in a critical intervention may be disastrous.

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