e-ISSN 2805-4356
p-ISSN 2805-4364




10.5281/zenodo.13933294 Vol. 07 Issue 09 Oct - 2024 Manuscript ID: #01587

# Pattern of Childhood Mortality at Benghazi Children Hospital

**By**

**Ainas Salem Eltarhuni[1]*, Jebril S. El-Abidi[2] and Hajir Omar Tawfeeq[3]**

[1]Department of Health Services Administration, Faculty of Public Health, University of Benghazi, Libya.
[2]Department of Pediatric, Faculty of Medicine, University of Benghazi, Libya.
[3]Faculty of Public Health, BenghaziChildren Hospital, Libya.

***Corresponding Author**: 1(Ainas Eltarhuni) Email: ainas.ainas@uob.edu.ly,
Department Health Service Administration, Faculty of Public Health, University of Benghazi, Benghazi, Libya.
https://orcid.org/0000-0001-928-550X

## Abstract:

Children mortality is a major public health concern, particularly in developing countries. It is one of the most important indicators of development and a factor in determining life expectancy. It can also inform health services policy makers about matters to prioritize. This study aimed to identify the pattern and causes of childhood mortality in a tertiary public hospital (Benghazi Children Hospital) over a 3- year period. Retrospective study was undertaken at the Benghazi Children Hospital over a three-year period (January 2018-December 2020). Data was gathered from the medical records of infant and children (aged 1 month to 16 years) of age that died in the Benghazi Children Hospital. Demographic details and the main causes of deaths were reviewed.The result of this study indicated that, atotal of 691 mortalities were recorded during the study period, giving a mortality rate of 1.4%. Males constituted 353 (51.1%) and females constituted 338 (48.9%). The mortality rate was the highest in the age group of less than 1 year (58.7%).Infectious diseases (21.7%), nervous system disorders (19.8%) and disease of the respiratory system (19.4%) were the most common intrinsic causes of deaths. Extrinsic causes were responsible for smaller number of deaths (1.2%).Pneumonia was the leading immediate cause of deaths in hospitalized children among all ages.

Study results concluded that infectious diseases represented as the most common systemic cause of child mortality. Special efforts (preventive and curative) to combat the risk of childhood mortality are needed.

## Keywords:

**Causes of death, child mortality, Libya, mortality pattern, under 5 years death.**

## INTRODUCTION

Children mortality is a major public health issues worldwide, and it is considered as a sensitive indicator of a country's development and individual's well-being [1, 2].

Globally, infectious diseases, including pneumonia, diarrhea and neuronal diseases remain the leading causes of death for children under five-years, and according to the World Health Organization, 5.2 million children under the age of 5 died in 2019, many from preventable conditions that could be treated with simple healthcare interventions, almost of them in developing countries[3].

The disease pattern and the mortality rate change between different regions. Although the mortality rate in children is reducing worldwide, children continue to face widespread regional and income disparities in their chances of survival, particularly in Sub-Saharan Africa remains the highest region with under-five mortality rate[4].
There are various underlying and relating variables that have an effect on the child mortality, some of which are different age groups, the immediate cause of death, and chronic underlying diseases contributing to death[5].

In many reports, the percent of deaths during the first day of admission is greater than other days[6].

Over the last three decades, Libya made substantial progress in decreasing child mortality and improving health of children. Under five years child mortality rate in Libya was dropped gradually from 42 deaths per 1,000 live births in 1990 to 12 deaths per 1,000 live births in 2019. Furthermore, children aged from 5- to 14 years, reducing from 8 deaths per 1,000 live births in 1990 to 1 death per 1,000 live births in 2019[3].

Despite hospital-based mortality review in this study may not be an entire reflection of deaths from different causes in the community; it may give opportunities to observe the immediate and underlying causes associating to deaths happening in health facilities. This information could assist improve quality of hospital care also it is fundamental for health planning and allocation of health care resources[7,8].

The reduction in children mortality rates depend on early clinical interventions, and investigation for the main causes of death.Therefore, this study was conducted to understand the pattern of mortality in the main pediatric hospital in eastern part of Libya in order to reduce mortality rate inside hospital by study the different causes of death and to improve the health care system.

## MATERIALS AND METHODS

This retrospective study of deaths recorded, was carried out at the Benghazi Children Hospital in Benghazi over a 3-year period (1st January 2018 to 31st December 2020).

The hospital under study is one of the largest teaching hospitals in the eastern region in Libya, providing comprehensive specialized services. It is a tertiary referral and a 350- bed capacity with subspecialty departments for children that discharged between 12000 and 18000 children per year.

The medical records of all children (aged more than one month to 16 years) who died at the targeted hospital during the study period were reviewed. Neonatal cases were excluded from the study.

For each case file, the following data were extracted involved: age, gender, duration of hospitalization, the primary cause of death and secondary cause of death.

The cause of death was classified as intrinsic or extrinsic cause. The intrinsic diseases were coded based on ICDL 10 and diseases comprised nine groups: respiratory, neuromuscular, congenital/ genetic, gastrointestinal/ hepatic- pancreatic, cardiovascular, infectious disease, hematology, nephrology, and metabolic groups. While the extrinsic causes of death were classified as asphyxia, poisoning, or trauma. Data of children admitted to the target hospital were analyzed retrospectively.

## RESULTS

During the study period, a total of 46,993 children was admitted to pediatric wards (2018: 18011, 2019: 16220, 2020: 12762), of which (207, 239 and 245 were died, respectively), with annual overall mortality rate varied from 1.1% to 1.9%.

### Distribution of gender

A total of 691 child mortalities composed of 353 males (51.1%) and 338 females (48.9%), were recorded during the study period.

### Distribution of age

Among total death, the majority of deaths belonged to less than one year age group (N= 406, 58.7%), followed by from one to five years age group (N= 191, 27.6%). In all, (N=597, 86.3%) of the deaths occurred in the first five years of life.

### Length of stay

Regards length of stay (from admission to death), less than a quarter (19.8%) died between 24 hours to 48 hours, (13.02%) died within 24 hours while the remaining died after 48 hours of admission, in general, the majority of deaths (70.7%) occurred in the first seven days of admission and 29.3% children were hospitalized for longer than one week, before death as presented in table 1.

**Table: (1).** characteristics of children who died in Benghazi Children Hospital during 2018-2020

| **Characteristics** | **Total (N= 691)** | **Male (N= 353)** | **Female (N= 338)** |
|---|---|---|---|
| **Age interval** | **N (%)** | **N (%)** | **N (%)** |
| 1 month- ≤ 1 year | 406 (58.7%) | 204 (57.7%) | 202 (59.7%) |
| >1 year – 5 years | 191 (27.6%) | 105 (29.7%) | 86 (25.4%) |
| >5 years- 10 years | 42 (6.07%) | 21 (5.9%) | 21 (6.2%) |
| >10 years | 52 (7.5%) | 23 (6.5%) | 29 (8.5%) |
| **Length of stay** | | | |
| Less than 24 hours | 90 (13.02%) | 48 (13.5%) | 42 (12.4%) |
| 24 to 48 hours | 136 (19.8%) | 70 (19.8%) | 66 (19.5%) |
| >48 hours to 7 days | 262 (37.9%) | 132 (37.3%) | 130 (38.4%) |
| >7 days to 14 days | 116 (16.8%) | 60 (16.9%) | 56 (16.5%) |
| >14 days | 87 (12.5%) | 43 (12.1%) | 44 (13.01) |

### Months of death

The cumulative monthly mortality in the following table illustrated that number of deaths were more between January and March.

**Table: (2).** cumulative quarterly mortality

| **Months** | **Number of deaths** | **Percentage** |
|---|---|---|
| January – March | 219 | 31.6% |
| April –June | 143 | 20.6% |
| July – September | 158 | 22.8% |
| October – December | 171 | 24.7% |

**Causes of death**

The major causes of death in the 691 cases were listed in following table. A most common primary system that led to mortality was infectious diseases (21.7%), followed by central nervous system; respiratory system (19.8% and 19.4%) respectively and cardiovascular system (17.2%). Few patients died due to extrinsic causes such as poisoning, multiple trauma and asphyxia.

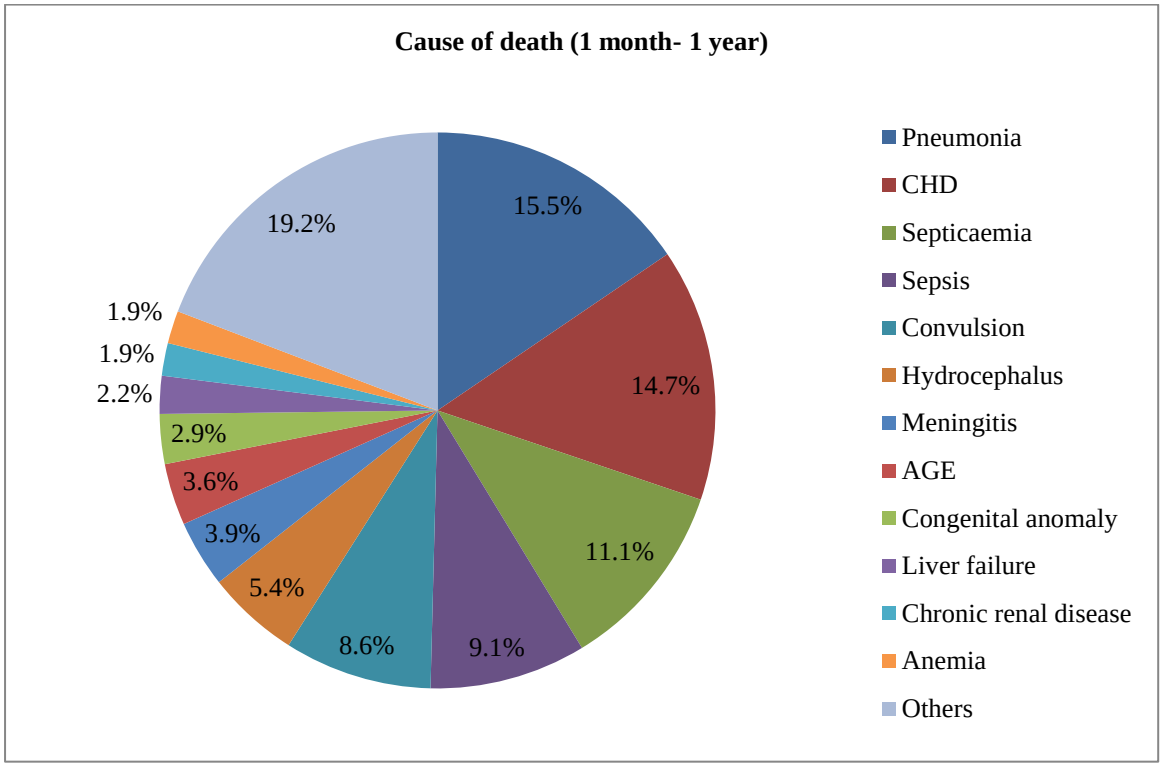
**Table: (3).** main cause of death among hospitalized children

| **Primary system involved** | **Number of death (N)** | **%** |
|---|---|---|
| **intrinsic cause** | | |
| Infectious disease | 150 | 21.7% |
| Nervous system | 137 | 19.8% |
| Respiratory system | 134 | 19.4% |
| Cardiovascular system | 119 | 17.2% |
| Gastrointestinal | 55 | 8% |
| Hematology | 29 | 4.2% |
| Renal diseases | 21 | 3.04% |
| Metabolic disorders | 20 | 2.9% |
| Congenital/ genetic | 16 | 2.3% |
| **extrinsic cause** | | |
| Traffic accident (Multiple trauma) | 3 | 0.4% |
| Scorpion bite | 1 | 0.1% |
| Poisoning | 4 | 0.5% |
| Asphyxia | 2 | 0.2% |

was the main cause of death throughout childhood.

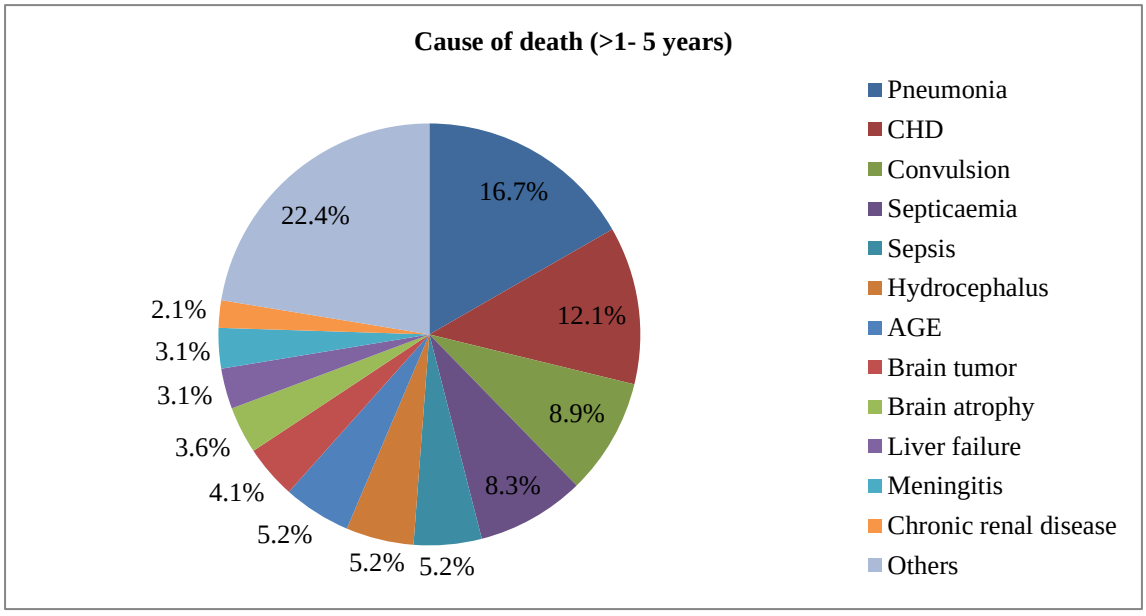
In infants, pneumonia caused the largest number of deaths (15.5%) and the second largest cause was congenital cardiac disease, then septicaemia which accounted for 14.7% and 11.1% respectively. Other important causes of death were sepsis (9.1%) and convulsion (8.6%)

**Figure: (1).** causes of death among infant aged (1 month to 12 months)



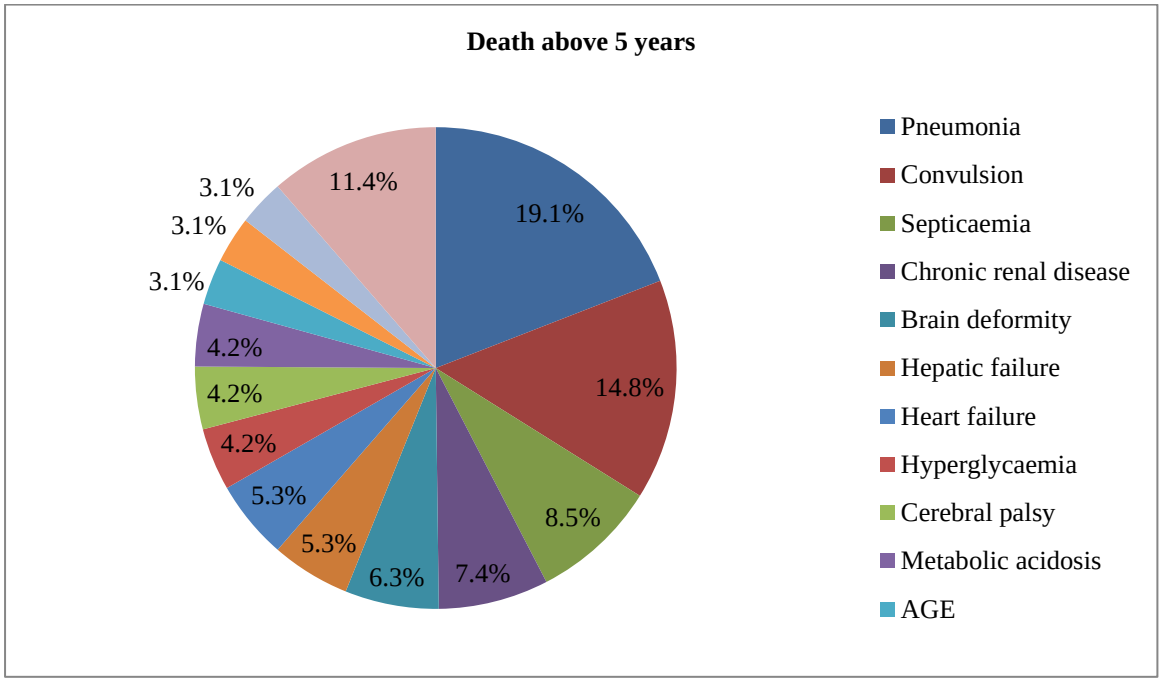

In children aged one to five years, pneumonia was also the main cause of death (16.7%), followed by congenital cardiac disease, convulsion and septicemia (12.1%, 9.8%, 8.3%) respectively.

**Figure: (2).** causes of death among children aged (>1 year to 5 years)




In older children, although the number of pneumonia deaths decreasing in age more than five years, it remained a main cause of death, followed by convulsion, septicaemia and chronic renal disease.

**Figure: (3).** causes of death among children aged above 5 years




## DISCUSSION

The current study aimed to describe the mortality pattern among ill children admitted to the Benghazi Children Hospital over a period of three years. The overall mortality of 1.4% in this study was lower than those conducted in Ibadan (9.5%), Vietnam (5.03%) and Nigeria (2.8%)[1,9,10].Lower mortality rate might return to excluding neonatal mortality from this study and not restricted only to ICU deaths which concluded all hospital wards. Despite this result was based on hospital data only, it highlighted on the significance of this issue to be a priority for healthcare planners and policy-maker(7).

According to a report in 2020, over the last three decades, the mortality rate in children has dramatically reduced, particularly in Libya, which the under-five mortality rate was declining at around 65% from 1990 to 2009 in Northern Africa. The infant mortality rate in Libya has dropped from 36 deaths per 1,000 live births in 1990 to 10 deaths in 2019(3).

Although the notable progress in decreasing child mortality rate in the worldwide, childhood survival remains a critical issue(4). In the present study, the highest proportion of deaths (86.3%) was seen in children below 5 years which aligns with two previous studies in Nigeria(1,11).

Infants (from 1 month to 1 year) were more vulnerable to death (58.7%); this may be due immature immune system. This was in the same line with all literature; a study in Vietnam reported 57.6% of deaths were occurring in the age less than 12 months(10). A study byRamnarayan et al.investigated deaths among hospitalized children over a period of 7 years which found that 57.7% of hospital deaths occurred in infants <1 year of age(12).

The proportion of deaths decreased significantly with age above 5 years (13.57%). This reduction might related to gradual maturity of children's immune system and additionally extended immunization procedures introduced to older children (A serial of vaccinations are compulsory or recommended to children from birth to 8 years. The compulsory vaccines include Bacillus Calmette-Guerin, Hepatitis B, poliomyelitis,diphtheria/pertussis/tetanus, measles, et al.)(5).

70.7% of the deaths occurred within the first seven days of admission including around a third of these deaths occurred within 48 hours of arrival in hospital where 29.3% of deaths occurred after a week of admission, this finding was similar to earlier study in Ibadan[9].In contrast, a study by Hao et al. showed that most of the deaths occurred after 48 hours from arrival at the pediatric intensive care unit[10].Another study found that more than half of the deaths occurred within 24 hours of arrival[13].

The seasonal variation in mortality, deaths occurred between January and march more than other seasons. Mortality increased during the raining season might because the main causes of deaths such as bronchopneumonia and diarrhoea happened more commonly during the wet season[1].

Almost of all deaths were intrinsic causes, which consistent finding with a study done in Japan by Ishihara and Tanaka, (2019) [14].

The study results showed that infectious diseases, accounting for 21.7% of total deaths, were the most common cause of death in children. The infectious disease such as sepsis, septicaemia, meningitis remained very important problems, particularly among the under-five years children.

The finding of septicaemia and sepsis were responsible for 11.1% and 9.1% of deaths for less than 1 year and 8.3% and 5.2% in the age 1- 5 years respectively. The comparable value of study byAyoola et al. (2005)septicaemia was 16.1% and 4.9% in the age group less one year and 1-5 years respectively[9].

The nervous system was the second leading of death (19.8%), convulsion was the common nervous disease among all the age group in the study (8.6%, 8.9% and 14.8%) in the in the age group less one year, 1-5 and 6- 16 years respectively. It is notable that percentage of deaths due to convulsion increases with age groups.

The third leading cause of death was respiratory system (19.4%) followed by the cardiovascular system (17.2%). Obiorahin his study found cardiovascular diseases (29.8%) as most common cause of death in a tertiary hospital in Nigeria, then infectious diseases (18.9%) were the second cause of death[7].

This study found that congenital heart disease (14.7%) was the second most reason of death observed in children under 1 year of age, and the proportion decreased dramatically with an increase in age.Another study in India by Sarangi mentioned that the main causes of death among under 5 years children were nervous system infection (25.5%) followed by acute respiratory tract infections (ARI) (19.5%) and complicated malaria (17.2%) and the risk of mortality was significantly higher among partially and not immunized children than the immunized children[2]. Lower respiratory tract infection, central nervous system (CNS) infection, and malnutrition were the three most common causes of death in the study ofBucens et al. (2013)[15].

Globally, infectious diseases, including pneumonia, diarrhea and malaria, remain a leading cause of under- five deaths[3].A study by Zhu in a Chinese hospital in Shanghai reported that pneumonia was the ‘top killer’ of children[5].

The predominance of pneumonia was also reported in our study throughout childhood, whereas diarrhoea was not a common cause of death in all age groups in this study, which accounted for 3.6% less than 1 year, 5.2% 1-5 years. This lower percentage might reflect the awareness of the importance of hygiene practice, rotavirus vaccine and boiling water[5].

On the other hand, the number of patients with extrinsic causes of death was tiny. In this study, extrinsic causes were asphyxia, poisoning, traffic accidents caused multiple trauma and scorpion bite.

The study had a few limitations. It was a retrospective study, which depended on previous data might have some bias that could lead to incomplete data.The numbers of children died at home after discharge with a terminal disease or children refused admission and die elsewhere are unknown (have not been determined). This study a hospital based study will not reflect the true mortality rate in the general population.

## CONCLUSION

Infectious diseases constituted the most common systemic cause of mortality among children, followed by central nervous system and respiratory system. The mortality rate decreased with age more than 1 year. Pneumonia was the main immediate cause of death throughout childhood.

Special efforts to combat the risk of childhood mortality through improving healthcare system capacity for providing preventive and curative child healthcare are needed. Focus on preventive measures such as regular immunization, also early diagnosis and treatment of diseases should be enhanced.

Further investigation should be carried out in multi-hospitals over all the country to generalize the results.

## ACKNOWLEDGEMENT

The authors appreciate medical information and statistic department at Benghazi Children Hospital for giving us the permission to access to the medical records.

## ETHICS

The authors declare that they have no competing interests.

## REFERENCES


1. George IO, Alex-Hart BA, & Frank-Briggs AI. Mortality pattern in children: A hospital-based study in Nigeria. Int J Biomed Sci 2009; 5(4): 369-372.
2. Sarangi R, Pattnaik L, Satpathy SK, & Sahu MC.Mortality pattern of under- five children: A hospital- based cross- sectional study in a tertiary care hospital of India. Asian J PharmClin Res 2017; 10(9): 82-84. DOI: http://dx.doi.org/10.22159/ajpcr.2017.v10i9.17895
3. Sharrow D, Hug L, Liu Y, and You D. UNICEF. Levels & Trends in Child Mortality: Report 2020, Estimates developed by the UN Inter-agency Group for Child Mortality Estimation. 2020
4. Hug L, Sharrow D, & You D. UNICEF. Levels and trends in child mortality: report 2017.
5. Zhu Y, Zhu X, Deng M, Wei H, & ZhangM. Causes of death in hospitalized children younger than 12 years of age in a Chinese hospital: a 10-year study. BMC Pediatr 2018;18(1), 1-7. DOI 10.1186/s12887-017-0981-y
6. Chopra M, Stirling S, Wilkinson D, Connolly C, & McCoy D. Paediatric admissions to a rural South African hospital: value of hospital data in helping to define intervention priorities and allocate district resources. S Afr Med J, 1998;88(6 Suppl), 785-788.
7. Deepak C, Krishna Kishore RV& Babu M. Mortality trends in a tertiary care hospital in Mysore. Int J Health Allied Sci2018; 7(2), 80-82. doi:10.4103/ijhas.IJHAS_57_1
8. Obiorah CC. Cause specific and trends of mortality in Nigeria: A six-year study of a tertiary hospital.Int J Med MedSci2020;12(1), 1-7.DOI: 10.5897/IJMMS2019.1409https://doi.org/10.5897/IJMMS2019.1409
9. Ayoola OO, Orimadegun AE, Akinsola AK &Osinusi K. A five-year review of childhood mortality at the University College Hospital, Ibadan. West Afr J Med 2005; 24(2): 175-179. doi:10.4314/wajm.v24i2.28192
10. HaoTK, Son NH.Mortality Pattern at Pediatric Intensive Care Unit Of Hue Central Hospital, Vietnam. BioMed J Sci & Tech Res 2018; 11(5): 8750-8753. DOI: 10.26717/BJSTR.2018.11.002155
11. Okoronkwo NC&Chappjumbo, AU. Pattern of morbidity and mortality of childhood illnesses at the children emergency room of Abia State University Teaching Hospital, Aba, Nigeria. The East and Central Africa Medical Journal 2015; 3, 73.
12. Ramnarayan P, Craig F, Petros A, & Pierce C. Characteristics of deaths occurring in hospitalised children: changing trends. J Med Ethics 2007; 33(5): 255-260. doi:10.1136/jme.2005.015768
13. Fajolu IB, &Egri-Okwaji MTC. Childhood mortality in children emergency centre of the Lagos University Teaching Hospital. Nigerian Journal of Paediatrics 2011;38(3):131 – 135.
14. Ishihara T & Tanaka H. Causes of death in critically ill paediatric patients in Japan: a retrospective multicentre cohort study. BMJ Paediatr Open 2019;19:3(1).doi:10.1136/bmjpo-2019-000499
15. Bucens IK, Reid A, Barreto AC, DwivediV&Counahan M. Three years of paediatric morbidity and mortality at the National Hospital in Dili, East Timor. J Paediatr Child Health 2013;49(12), 1004-1009. doi:10.1111/jp