Common Factors Associated With Child Deaths, at a Tertiary Care Centre in Irbid Government, Jordan

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Abstract

Background: Understanding causes of death among children is crucial to decrease mortality rate. Identifying specific causes of under-five mortality help in developing possible prioritize preventive interventions. This study aimed to identify rates and common causes associated with child deaths in a Tertiary Care Centre in North Jordan.

Materials and Methods: At a retrospective study, death registration records and certificates were reviewed for children who died in years from 2010 to 2015, at a main hospital in Irbid government, Jordan. The data collected, was including date of birth, date of death, unit of admission, medical diagnosis and death cause as recorded by a physician in the death records.

Results: According to the center's computerized death registration system, a total of 529 child deaths registered in the study period. The most related cause of child deaths was related to genetic and congenital anomalies (35%); followed by prematurity (24%), and non-communicable diseases (16%) which include cardiac, renal, respiratory and blood disorders, and cancer. Infectious diseases such as sepsis, pneumonia, encephalitis, diarrhea, meningitis, and hepatitis were the leading causes of deaths among 14% of the study sample; while, accidents including road traffic accidents, falling, blast injuries, burns, insect bites, suffocations, aspiration and sudden unexpected deaths were found to be the leading cause of 12% of total registered deaths. Child death rate was 19.2 per 1000 live births. Infant mortality rate (IMR) was 14.1 per 1000 live births, and 7.1 per 1000 live births was reported for neonates.

Conclusion: The largest contributor to child deaths was the congenital and genetic anomalies; while prematurity is the most killer of infants.

Key Words: Child, Infant mortality, Low birth weight, Maternal health, Prematurity.

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1- INTRODUCTION

Child death is a problem worldwide (1-5), and child mortality rate is a critical indicator helps to assess the National Child Health Services in any country (3, 6). Child mortality rate is reflected the number of deaths of children less than five years old per 1,000 live births, and the infant mortality rate (IMR) indicates the number of deaths of children less than one year old per 1,000 live births. While the number of deaths occurs in the first 28 days of life per total live births in a period, is representing neonatal mortality (7). According to United Nations International Children's Fund (UNICEF) report (2012), the under-5 mortality rate in Jordan is 19 per 1,000 live births, and infant mortality rate is 16 per 1,000 live births, as well, the neonatal mortality rate is 12 per 1000 live births (8). Which are still high compared to developed countries, although many of the causes of deaths are preventable (1-3, 8). Understanding causes of death among children is crucial to decrease mortality rate. Identifying specific causes of under-five mortality help in developing possible prioritize preventive interventions.

A previous study was conducted in 2011 in North Jordan, investigated early neonatal deaths in years between 2005 and 2009. The study found prematurity and multiple congenital deformities were a main leading cause of death among neonate infants in the first week of life. Furthermore, Stillbirth rate was high as 9.0 per 1000 births, and the neonatal mortality rate were 10.3 per 1000 live births (9). Not enough information was available on statistics and causes of death among children in older ages. Bataineh et al. (2008) conducted a study to determine the cause-specific for infant mortality at Prince Rashid Hospital in Irbid city, using a retrospective information data obtained from the birth and death registrations and certificates in the year of 2005. There were a total of 6,078 live births, 128 infants died. IMR was 21.1 per 1000 live births, and the neonatal mortality rate was 14.8 per 1000 live births. The primary causes of infant death were prematurity (39.1%), infectious diseases (25%), congenital disabilities (18.8%), and sudden infant death syndrome (6.3%). Also, the previous data show that about 75% of the deaths were due to preventable causes (10). The healthcare system in Jordan is modern and well-developed and encouraging research and investigation of common health problem, including child mortality to suggest possible solutions. Therefore, the study objective was to identify rates and classification of the leading causes of child death in a Tertiary Health Care Centre in Northern Jordan, for baseline information to establish solutions in future.

2- MATERIALS AND METHODS

This retrospective study was conducted at King Abdullah University Hospital (KAUH), a major hospital providing emergency and general health services in North Jordan. The research protocol was approved by the Institutional Ethics Review Board (The study was approved by the institutional research board and ethics committees at Al-Albayt University and Jordan University of Science and Technology); also was a baseline for a massive project that currently conducted to evaluate child death investigation in North Jordan. This study was conducted, using hospital's reports for children, who died between 2010 and 2015.

Information was obtained from birth and death registrations and certificates. Medical records were reviewed of all died children, who were less than 5-year of age, either hospitalized or presenting to emergency departments, who were either dead on arrival or were not resuscitated successfully and the cause of death for each child was obtained accordingly. The data collected, was including date of birth, date of death, medical diagnosis, unit

admitted, death cause as recorded by a physician in the death records. No names or identity data were collected, to maintain the highest level of privacy and confidentiality. Statistical analyses: Data was entered in data sheets checked and analyzed using SPSS statistical package (IBM, SPSS version 22.0). Descriptive statistics were performed using means, medians, standard deviations, frequencies, and proportions. Cross-tabulation was used to produce tables for frequencies and percentages for group age.

3- RESULTS

3-1. Death rates

Over a 5-year period (2010 to 2015), the total deaths registered for children aged under-5 years was 529. Over the 5 years, the highest death rate (24%) was registered for the year 2014 (**Table.1**). Out of the total 529 deaths among under-5 children, 388 (73%) were reported for children less than one year of age (**Table.2**), and more than two-thirds of total deaths number (62%) were occurring during the first six months of life. The proportions of deaths reported for under-5 age children according to age group showed that the highest percentage of deaths (37%) was found among neonates aged less than one month (**Figure.1**).

3-3. Death causes among under-5 age children

The **Figure.2** demonstrate that (35%) of under-five mortality is related to congenital and genetic anomalies, and the most common contributor was congenital heart anomalies (15%), and these includes congenital heart failure, Hypo-plastic left heart syndrome, transposition of great arteries and other heart defects. Congenital gastrointestinal problems were contributed to 8% of congenital anomalies, such as a hiatal hernia, bowel obstruction, and liver failure. Neuro-congenital deformities such as congenital hydrocephalus, encephalocele, congenital brain atrophy, spinal muscular atrophy, and Werdnig-Hoffman disease were lead to 5% of total deaths. Congenital pulmonary hypoplasia was lead to 4% of total deaths; while 3% of deaths were reported to cases of such inheritance diseases including Down Syndrome, Zellweger syndrome, Edwards syndrome, Ehlers- Danlos syndrome, Glutaric acidemia type II, and epidermolysis. Prematurity was reported the second lead of death among children, which represent 24% of total deaths; while, non-communicable diseases were lead to 16% of total deaths, and these included cardiac, pulmonary, renal, and blood disorders as well as cancer cases.

Infectious diseases such as sepsis, pneumonia, encephalitis, diarrhea, meningitis, and hepatitis were leading to 14% of total deaths; while, accidents including Road Traffic Accidents (RTAs), falls, blast injuries, burns, insect bites, drowning, suffocations, and aspiration were comprised 11% of deaths, and 1% of deaths related to unknown causes.

3-4. Reason for death per age group

3-4-1. Mortality among children aged 1 – 5 years

Total of 141 deaths was reported for children aged 1-5 years. Possible complications related to genetic and or congenital anomalies were the most killer (30%) of this age group, followed by accidents (27%) and non-communicable diseases (26%), while (17%) was found to be associated with serious infectious diseases (**Table.2**).

3-4-2. Mortality among infants (0 – 1 year)

Table-1: Frequencies and percentages of total child deaths/year

Year	Frequency	Percent (%)
2010	95	18
2011	92	17
2012	105	20
2013	109	21
2014	128	24
Total	529	100

Table-2: The some reason of death frequency in studied children

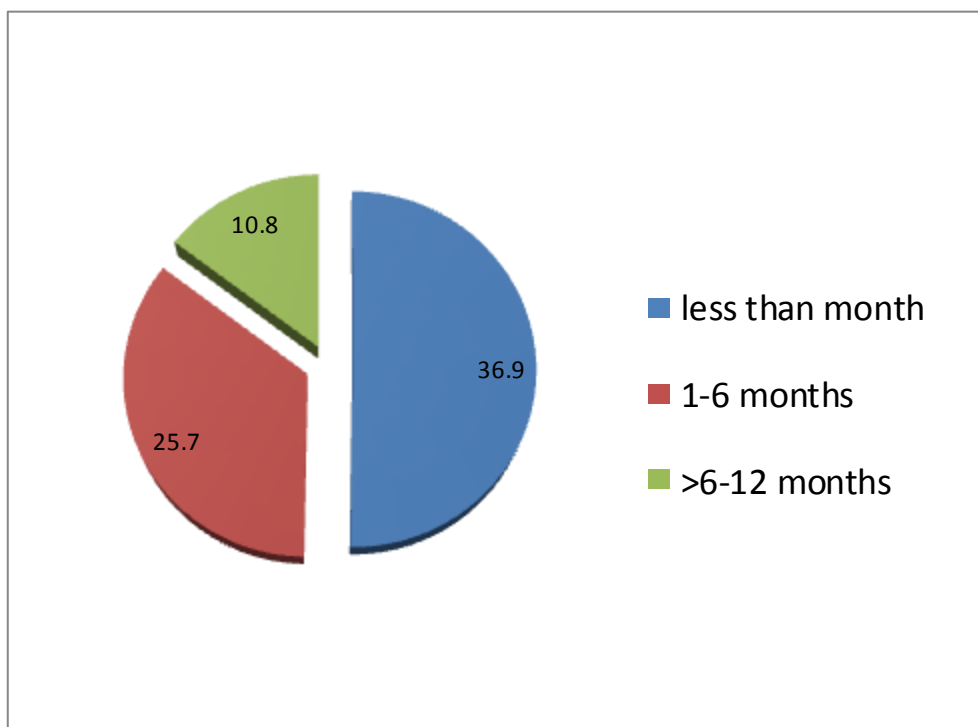| Reason	Age		1-5 year		Total Number (%)
	Less than year				
	Count	Within the group (%)	Count	Within the group (%)	
Congenital	144	37	42	30	186 (35)
Premature	123	32	0	0%	123 (23)
Non-communicable	51	13	36	26	87 (16)
Infection	48	12	24	17	72 (14)
Accidental/ injuries/ suffocation/ aspiration/ unexpected	22	6	39	27	61 (12)
Total	388	100	141	100	529 (100)

Fig.1: Proportion of deaths among infants (KAUH, 2010-2014).

3-4-2-1. The proportion of infants' deaths

Out of the total 529 deaths among under-5 children, 388 were reported for children less than one year of age. Almost two-thirds of total deaths were occurring during the first six months of age, and the highest percentage of deaths (37%) was found among neonates aged less than one month (**Figure.2**). Genetic and congenital anomalies were associated with the highest proportion (35%) of the deaths among infants, and prematurity is the second lead of infant death (32%), followed by non-communicable disease which contributed to (13%) of deaths within this age group, and (12%) was associated with infectious diseases; while (6%) was associated with accident, injuries, RTA, aspiration, and unexpected sudden death (**Figure-3**).

3-4-3. Mortality among neonates (aged less than one month)

Total of 195 cases was reported among neonates, aged less than one month. Prematurity was associated with a higher proportion (51%) of deaths among neonates, and specific cause of death was associated with Respiratory Distress Syndrome (RDS) and lungs immature. Multiple congenital anomalies were contributed to (38%) and sepsis was leading to (7%) of total deaths (**Figure.3**).
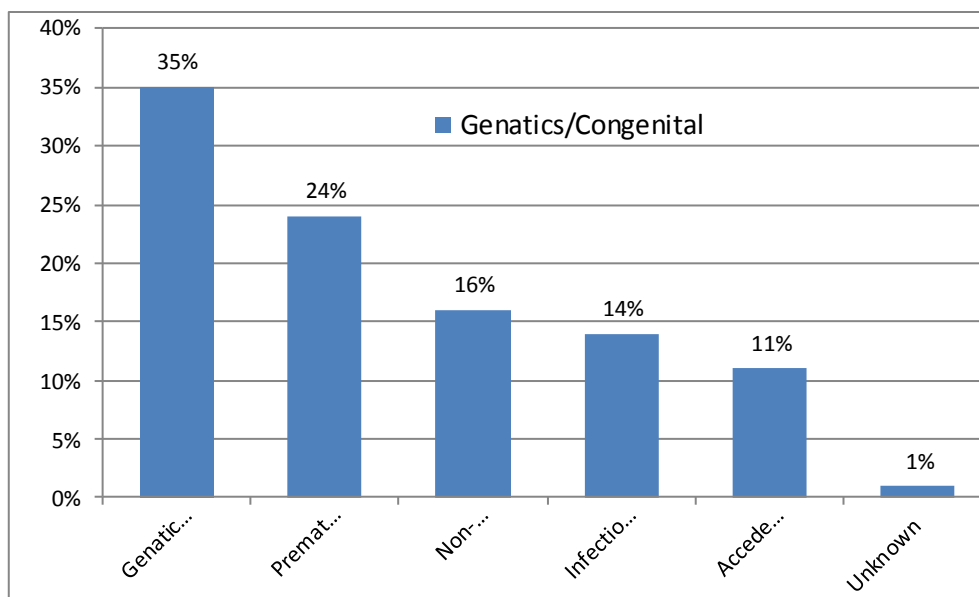

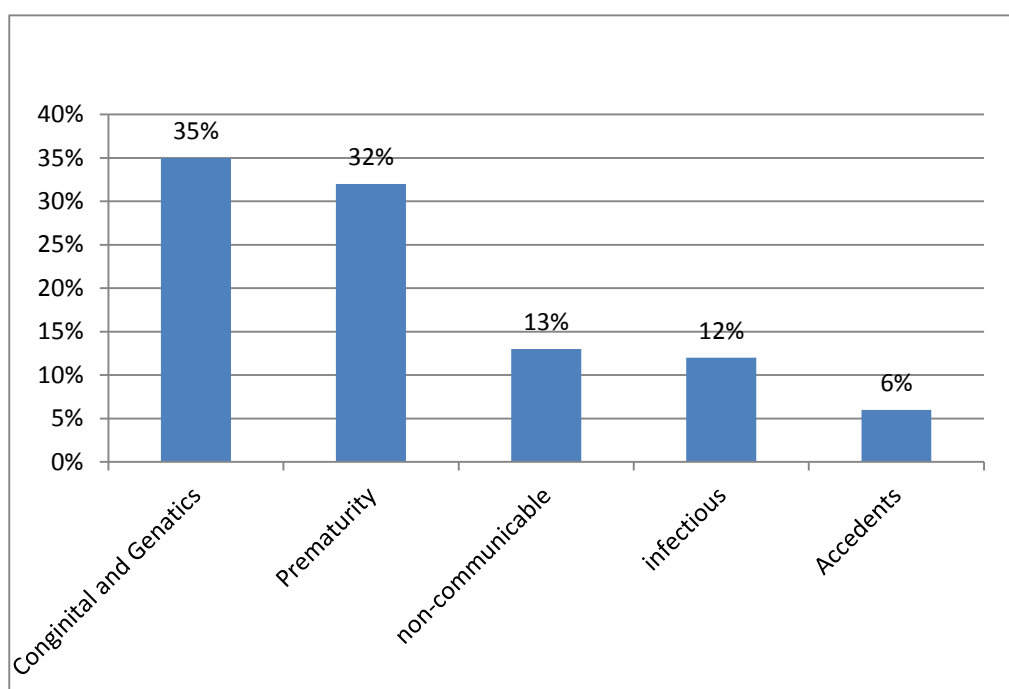**Fig.1**: Proportion of deaths among infants (KAUH, 2010-2014).

Fig.2: Common contributors of infant deaths (KAUH, 2010-2014).

4- DISCUSSION

Child mortality rate is reflected the number of deaths of children less than five years old per 1,000 live births, and the infant mortality rate indicates the number of deaths of children less than one year old per 1,000 live births; while the number of deaths occurs in the first 28 days of life per total live births in a period, is representing neonatal mortality (7). As indicated in previous studies, the yearly average birth in Irbid government (Jordan) was estimated about 5,500. The estimated total births over 5- year period are about (5 X 5,500, n= 27,500), the calculated mortality rates accordingly as follows:

- Number of deaths/ No. of total birth x 1000 =
- Child death rate= (529/27,500) x 1000 = 19.24 per 1000 live births.
- Infant mortality rate (IMR) = (388/27,500) x 1000 = 14.2 per 1000 live births.
- Neonatal mortality rate= (195/ 27,500) x1000 = 7.1 per 1000 live births.

The study indicated stability in the rates of child death over the years from 2012 to 2015. According to United Nations Children's Fund (UNICEF) statistics report (2012), the under-5 mortality rate in Jordan was estimated as 19 per 1,000 live births (2). However, IMR reduced over the years from 2005 to 2015; Infant mortality rate (IMR) was reported as 21.1 per 1000 live births in 2005 (10), and 16 per 1,000 live births in 2012 (8); while the recent rate was found as 14.2 per 1000 live births in 2015. This study also shows a remarkable reduction in the neonatal deaths comparing to previous studies; the neonatal mortality rate was 14.8 per 1000 live births in 2005 (10), and 10.3 per 1000 live births in 2009 (9); while the current rate for 2015 is 7.1 per 1000 live births. This finding indicative enhancement of health care services provided in Jordan. It also shows survival for neonates for long ages in infancy and childhood. These results confirmed the other regions study findings that showed child mortality had

been globally reduced to half since 1990 (2). According to death records at the hospital, the death rates of children less than 5 years were ranged between 18-24% over years from 2010 to 2015. Out of the total 529 deaths among under-5 children, the highest proportion (73%) was reported for children less than one year of age, and almost two-third of total deaths were occurring during the first six months of age. Common causes of under-five child deaths were linked to genetic and congenital anomalies. These anomalies were included congenital heart failure, Transposition of great arteries, liver failure, Hydrocephalus, epidermolysis and Down syndrome. Prematurity was the second lead of child deaths.

There is a trend in the cause of death as related to increasing with age. As the cause of death related to non-communicable diseases such as cardiac, renal, cancer, blood, and respiratory disorders are increasing as the age of child increases. Similarly, the rate of death as a result of an accident is also increasing with child age. The rate of mortality due to infectious diseases such as sepsis, pneumonia, encephalitis, diarrhea, meningitis and hepatitis is higher in children at the first year of age compared to more than one year. The highest proportion of deaths was reported among neonates. Infants who are nearly one month old have more strains to die as a result of prematurity as compared with other older age groups. Prematurity was responsible for almost one-third of total deaths that occurred among neonates in north Jordan over last five years from 2010 to 2015. These findings similar, to studies conducted for international child death records that indicated the majority of under-five age child deaths were take place during the neonatal period and prematurity were the most marked cause of death (2). This study found that prematurity is a serious problem in Jordan, which need further consideration. Modifiable risk factors associated with prematurity such as maternal smoking, malnutrition, teenage pregnancies, and short inter-pregnancy intervals are common in Jordan (8, 9, 11, 12-16). This finding is similar to a previously conducted study which findings that highlighted prematurity as a leading cause of deaths among neonate in north Jordan (15). Even in such neighboring developing countries, such as Pakistan, prematurity are the main leading cause of admissions for neonates and the leading deaths of neonates (16). The risk of death associated with prematurity is inversely related to birth weight and gestational age. The risk is increased when the birth weight and/or the gestation age are small (17-21).

The rate of preterm birth and low birth weight is increasing in developing countries (22, 23). Even in developed countries, studies indicated that the rate of preterm birth in the developed countries has been increasing over the last couple of years (24). Preterm birth is well recognized as a risk factor for infant death, rates of deaths increase as gestational age decline (17, 18, 25, 26). Prematurity is considered as a risk factor also for sudden death as it put the baby at a risk of the immature brain at delivery (27). The incomplete brain development will put the child at risk of losing control over automatic processes such as breathing and heart rate (25). It has been reported that well-nourished mothers with adequate weight gain during pregnancy were associated with lower risk of low-birth weight, small for gestational age, preterm birth and prematurity, that could reduce the risk of neonatal death (14, 15, 28, 29). Furthermore, adequate antenatal care helps in reducing the risk of infant mortality and improving the health of the mother and her fetus (13, 15, 28). Research linked a number of antenatal care visits with gestational age and birth weight of the baby, which help to decrease the incidence of prematurity and other adverse

outcomes, as well as, reduce the risk of neonatal death (15, 20, 21). Mothers who received adequate antenatal care and have optimum and regular antenatal care visits were less likely to have a low-birth-weight and small for gestational age infant compared with women who did not report receiving the optimum and regular antenatal care visits (9, 15, 20, 21, 23). Pregnancy conditions and maternal health associated with neonatal mortality. Pregnancy with twins, triplets, multifetal or spacing less than 6 months between pregnancies, smoking cigarettes and poor nutrition are among the most common risk factors in Jordan associated with prematurity (20, 24, 29-31). Furthermore, some chronic conditions, such as high blood pressure and diabetes among mothers are associated with higher risk of having premature infants (16). This could reflect the high prematurity rates in Jordan, as related to the high incidence of diabetes and hypertension among Jordanian mothers (13, 17, 22, 24, 26).

Child death rates are higher in economically impoverished communities (31). Mothers of lower socio-economic status have a higher incidence of child deaths as they do not have regular antenatal care visits, poor delivery services, poor hygiene and poor nutrition during pregnancy (15, 1). Furthermore, mothers of lower socioeconomic status have a higher incidence of early pregnancy and common inter-pregnancy-intervals of less than one year (17, 19). Those factors increase the risk of obstetric complications, which have a negative impact on the fetus that leading to increasing rate of infant mortality (29-31). Child death rates are higher in developing countries compared to developed countries (2). Factors which are leading to increasing the risk of obstetric complications were found to have a negative impact on the fetus that leading to increased rate of neonatal mortality.

Furthermore, children that die in the first 28 days of life suffer from diseases and conditions that are often associated with quality of care around the time of childbirth and are readily preventable or treatable, with proven, cost-effective interventions (2). It is also essential to identify factors such as inadequate antenatal care, poor delivery services, poor hygiene and poor nutrition during pregnancy in future research and health programs. Policymaker should consider the effects of these factors in planning for improving the child survival and control of child mortality (5). There is limited information regarding demographical data for died children, and not enough information was collected regarding mothers' demographics and health profile, which is limiting the study.

However, this study is the first of its kind that reviewing death certificates and registrations for children aged less than five years and provided a snap view of common leading causes of death among children. Furthermore, this study provided a baseline data could support for investigation death cases in future, focusing on child subgroup ages and shed lights on death rates for a period.

5- CONCLUSION

Almost two-thirds of total deaths were occurring during the first six months of age. The highest death rates were reported among neonates. The most leading cause of death among neonate is related to congenital/genetic diseases, and prematurity. This study provided a literature base and highlighted child death as a vital problem in Jordan, required further action from researchers, policymakers, and stakeholders to implement solutions and to develop such feasible interventions which may reduce the incidence of child death and help in preventing the modifiable risk factors.

6- AUTHOR CONTRIBUTION

7- CONFLICT OF INTEREST

The authors declare no conflicts of interests with respect to the research, authorship, and/or publication of this article.

8- ACKNOWLEDGMENT

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