

# Causes of death among hospitalized children under 5 years of age in Sulaymani Pediatrics Teaching Hospital

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## **Abstract**

**Back ground:** Knowledge about the causes of death in children is important to evaluate health system progress and provide what is needed for an efficient design of health care delivery system.

**Objective:** To find out the main causes of death in children under 5 years & evaluate the effects of different variables like: age, gender, body weight, residency, and months of year for the causes of death.

**Patient & Method:** This is a retrospective study which was carried out in order to find out the main causes of death among admitted children younger than 5 year in Sulaymani Pediatrics Teaching Hospital for the period of 5 years from of January 1<sup>st</sup> 2001 to December 31<sup>st</sup> 2005 included. The total numbers of admitted cases was 137,739 out of which 1455 had died. We obtained the information from case files of the deceased patients.

**Results:** The incidence of death among admitted patients was (1.06%), the rate was higher in male gender (59.3%), while in female it was (40.7 %), with a P-value of <0.05 which is significant statistically with male to female ratio 1.48:1.

Deaths were mainly in neonates (61.8 % of all age groups in the study) with a p-value

of <0.05. Death was mainly in those with body weights <2.5kg, which accounts for (42.1%). The main cause of death in neonate was prematurity (54.7%) while diarrhea and Acute Respiratory Infections (ARI) were main causes during infancy (57.4%, 15.9%) respectively.

Seasonal variation of died cases showed that were two peaks of death, one in June and another in November with a p-value of <0.05. The percentage of death in the rural and urban area were (64.5%, 35.5 %) respectively, with a p-value of <0.05 which is also significant.

**Conclusion:** This study has revealed that prematurity was the main cause of death among neonate while diarrhea and acute respiratory diseases were the main causes of death during infancy. Malignancy was the least common cause of death. Deaths were mainly in neonates. There was a significant association between deaths and gender, body weight, residency & the months of the year.

**Key words:** mortality rate, death cause, children under five.

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## **Introduction**

The registration of birth and death is compulsory in all developed countries but it is so in only some of the developing countries. In addition to recording the fact of death, it's useful to establish the cause of death.

In the developed countries the first year of life represent the period of highest risk for death while death rate is very low in older children<sup>(1)</sup>.

On the other hand in most of the developing countries, although the first year does represent the period of highest risk, a high mortality rate persists in older children. In 1999 the Under 5 Mortality Rate (U5MR) was 6/1000 in the developed industrialized countries but 173/1000 in Sub-Sahara and Africa<sup>(1)</sup>.

It is estimated that in the developing countries; (50 %) of total mortality occurs in the first five years of age, of this (79 %) occur in the first year of life, of which (43 %) occurs

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within the first month, and remaining (36 %) during the other eleven months (1, 2, 3).

More than 10 million children younger than 5 die each year, most of them do so from preventable causes, nearly all in poor countries. The major killers in the developing countries have been and still are diarrhea, acute respiratory infection and neonatal diseases. Diarrhea remains a common illness among infants and children throughout the world. In developing countries, diarrhea is a common cause of mortality among children aged <5 years, with an estimated 2 million deaths annually (1, 3, 4, 5, 6).

Lower respiratory tract infection (LRTI) is frequently used interchangeably to include bronchitis, bronchiolitis, and pneumonia. The World Health Organization (WHO) estimates are 150.7 million cases of pneumonia each year in children younger than 5 years, with as many as 20 million cases severe enough to require hospital admission (7, 8). The mortality rate in the developed countries is low (<1 per 1000 per year) (9, 10, 11). While in the developing countries, respiratory tract infections are not only more prevalent but are also more severe, accounting for more than 4 million deaths annually (12).

The neonatal period accounts for 38% of all deaths in children younger than five (13).

Most neonatal deaths (99 %) arise in low income and middle income countries and almost half occur at home (14).

The major direct causes of Neonatal (NN) death globally are; Infection (36%), prematurity (28 %) & birth asphyxia (23 %) (15, 16, 17).

Estimation of mortality rate in children younger than 5 years published by WHO shows: (17.5 %) of death were due to diarrhea, (10.5 %) to pneumonia, neonatal causes

(47.9%) & for others (24.1%) (3, 7). While in the developed countries the major killers were prematurity which accounts for (32.1 %) and congenital abnormalities (17.1 %) (1, 3).

Accurate information for the causes of death is necessary for an effective health planning and evaluation of health care program (18). The United Nations Children's Fund (UNICEF) consider Under five Mortality Rate (U5MR) as the best single indicator of social development and well being, as this rate reflects; income, nutrition, health care and the basic education in the community (19).

Classification of the causes of death is always difficult; in developed countries where the registrations of all cases of death are relatively complete, necessitating international classification of diseases. While it is more difficult in developing countries, where often less than half of all cases of death are registered, the died patient often received no medical attention, either because they live too far from the health system services or because the establishment of the cause was of no interest to any one (20, 21).

**The Aim** of study is to find out the main causes of death among children less than 5 year of age, to evaluate the effect of different variables like; age, sex, weight, months of the year, residency on the cause of death & to monitor health progress and provide what is needed for an efficient design of care delivery system.

#### **Patients and Methods**

The study was retrospective and hospital based done in the Pediatrics Teaching Hospital in Sulaymani; Sulaymani is one of the three governorates in Kurdistan region of Iraq. It has an average population of 1,547,071 with 265,000 children being younger than 5\*.

The live birth rate in Sulaymani is around 1275/month\*\*.

Sulaymani pediatrics teaching hospital is the largest hospital for children in Sulaymani governorate. The average number of annual admission during the study period was 27547.8\*\*\*, and the main reasons for admission were diarrhea, ARI and neonatal problems. The turn over rate in the hospital is relatively rapid especially during late spring and summer months when the load on admission by diarrheal diseases is too high.

All deaths in infants and children from birth to 5 year of age that occurred in the Sulaymani Pediatrics Teaching Hospital from 1<sup>st</sup> of January 2001 to 31<sup>st</sup> of December 2005 were included in this study.

The final causes of death as reported on case files and death certificates were analyzed according to the number of deaths by age groups (first 28 days, >28 days-12 month, >1 year -

5 year), body weight (<2.5kg, 2.5kg - 4kg, >4kg - 10kg and >10), gender of the died child, residency (rural, urban). The hospital files (case sheets) of the deceased individuals were reviewed and relied upon for the information's required in the above mentioned analysis.

Data entry and analysis was carried out by using SPSS software version 10, correlation between dependant variable ( causes of death) and variables such as :child age ,gender, residency, body weight and the month of the year, was assessed by using chi square test, P-value, the value <0.05 was considered statistically significant.

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\* Population and target per (PHC) 2007.

\*\* Department of birth registration.

\*\*\* Department of health statistic in hospital

## **Results**

This study was carried out from 1<sup>st</sup> of January 2001 to 31<sup>st</sup> of December 2005; during this period 137739 children were admitted to Sulaymani Pediatrics Teaching Hospital. Of the admitted cases 1455 have died, which accounted for 1.06% of total admitted cases (Table 1). Nine hundred (61.8%) were younger than 28 days i.e. neonate, 427(29.3%) were infants, while the remaining 128(8.9%) were children between >1- 5 years of age as shown in (Table 2).

The death number varied from one year to another, the maximum number of deaths occurred in 2001, which accounts for 342 of total deaths and (1.44%) of total admitted cases while the minimum numbers of deaths occurred during 2003 which accounts for 217 of total deaths and (0.61%) of total admitted cases( Table 1). This variation was statistically significant with a P- value (<0.05).

By far the commonest cause of death was prematurity in 501 cases which accounts for (34.4%) of total death during this study.

Other main causes of death in different age groups were, diarrhea in 319 cases (21.9 %), respiratory diseases mainly pneumonia & bronchiolitis in 136 cases (9.3%), Cardiovascular diseases in 131 cases (9%), septicemia and meningitis in 129 (8.8%), birth asphyxia in 111 cases (7.6%), congenital anomalies in 66 case (4.5 %), and other causes apart from malignancy (trauma, poisoning, renal failure) account for 57 cases (3.9%). malignancy came at the bottom of list as a cause of death in 5 cases (0.34 %) of the total number of deaths (Figure 1).

(Table 3) present the causes of death by age group, three age groups were chosen: First 28 days (neonate), >28 days-12 month and >1 year-5 years. The highest percent of death

occurred in the first group (28day) which accounts for 900 cases (61.8%) of total deaths, prematurity was the main cause of death among this age group which accounts for 493 cases (54.7%) of total death in this group.

While the second group constitutes for 427 cases (29.3%) and the main cause of death was diarrhea which accounts for 245 cases (57.4%) of the total deaths among the second group. The third age group accounts for 128 cases (8.9 %), still diarrhea was constituted large portion of deaths which accounts for 28 cases (21.8%). This variability was statistically significant with a p value (<0.05).

The death rate among male gender in all age groups was higher than in female gender as indicated in (Table 4). which show that in male gender 869 were dead which accounts for (59.75 %) while female deaths were 586, which accounts for (40.3 %).with male to female ratio 1.48: 1.This difference were most obvious in prematurity, birth asphyxia and malignancy which was Statistically significant with a P- value of (<0.05).

(Table 5) shows the relationship between weight of the deceased

patients and cause of death, the maximum number of death occurred among those with body weight of <2.5kg which accounts for 613 cases (42.1 %), and mainly due to prematurity; the number of death decrease as body weight increase. This is also significant statistically with a P value of <0.05).

The causes of death and number vary from one month to as it shown in (Figure 2). The peak number of death occurred in June, the main cause of death during this month was diarrhea. Another peak occurred in November; here the main cause was prematurity and respiratory illnesses. This variability is statistically significant with a P-value of (<0.001).

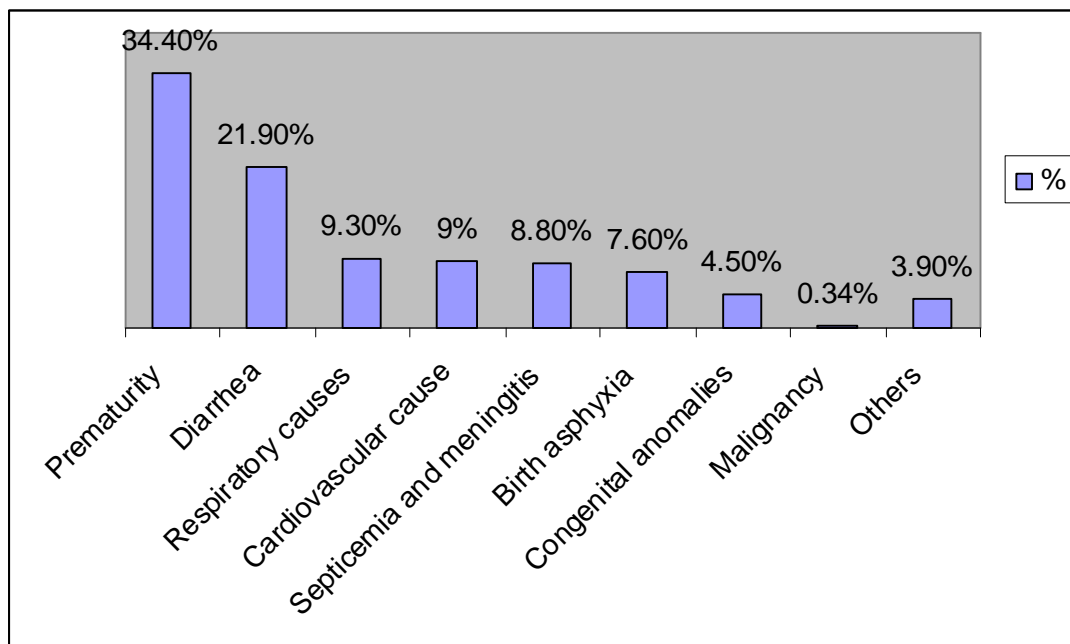
The distribution of death varies according to residency as shown in (Table 6). the largest number of death occurred in rural areas which accounts for 938 cases (64.5 %), in which prematurity was the most common cause followed by diarrhea, while in urban area death accounts for (35.5%).. The difference was significant with P-value of (<0.05).

**Table 1: Death rate among admitted patients according to years**

Years	Admitted patients	Number of death		Percentage of death	Death / 1000
2001	23655	342		1.44	14/1000
2002	25628	330		1.28	12/1000
2003	35277	217		0.6	6/1000
2004	26446	275		1.04	10/1000
2005	26733	291		1.08	11/1000
Total	137739	1455	Mean	1.06	10.6/1000

**Table 2: Number of deaths according to the age**

Age	number of death	%
1day – 28 days	900	<b>61.8</b>
>28day-12month	427	<b>29.3</b>
>1year – 5year	128	<b>8.9</b>
<b>Total</b>	<b>1455</b>	<b>100</b>



**Figure 1: Proportions of percentages of different causes of death**

**Table 3: Relation between the age and the cause of death**

Causes of death	28 days (No.)	%	>28d-12months (No.)	%	>1y-5y (No.)	%	Total
Prematurity	493	54.7	8	1.9	/	/	501
Diarrhea	46	5.4	245	57.4	28	21.8	319
Respiratory causes	54	6.0	64	15.9	18	14.01	136
Cardiovascular causes	49	5.4	58	13.6	24	18.7	131
Septicemia and meningitis	85	9.4	26	6.0	18	14.01	129
Birth asphyxia	111	12.3	/	/	/	/	111
Congenital anomalies	53	5.8	8	1.9	5	3.9	66
Malignancy	/	/	2	0.5	3	2.3	5
Others	9	1.0	16	3.7	32	25.8	57
<b>Total</b>	<b>900</b>	<b>61.8</b>	<b>427</b>	<b>29.3</b>	<b>128</b>	<b>8.9</b>	<b>1455</b>

P-value <0.05

**Table 4: Relationship between Sex and the cause of death**

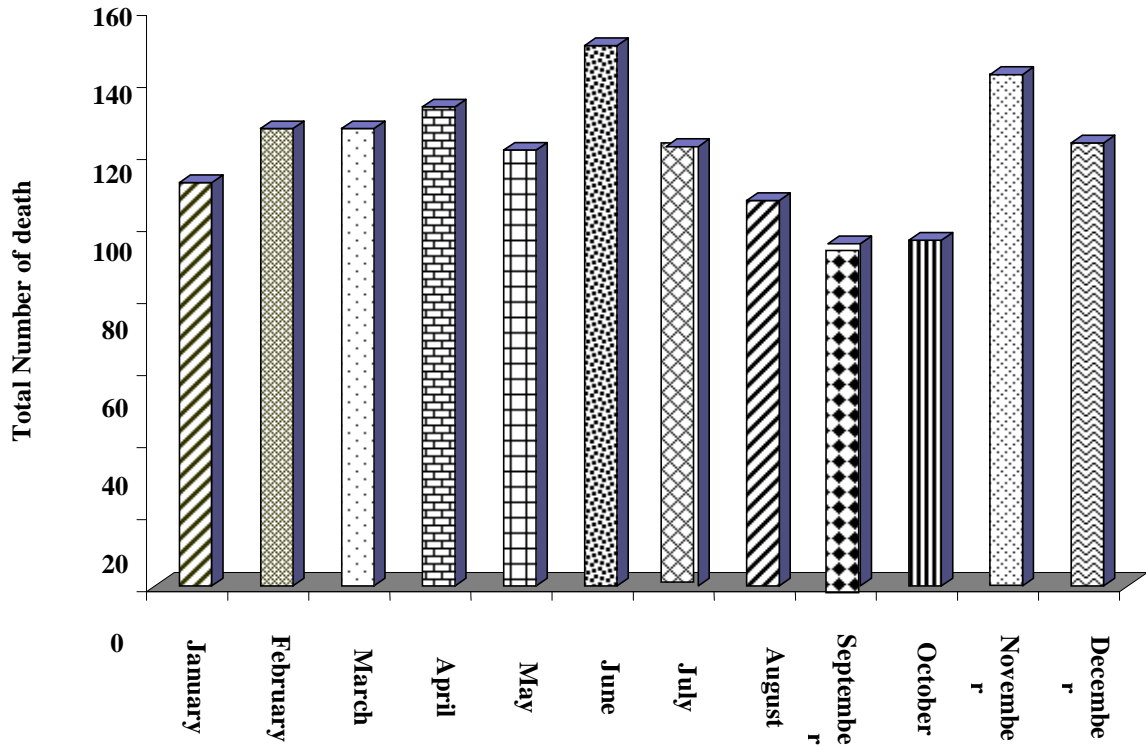
Causes of death	Male (No.)	%	Female (No.)	%	Total
Prematurity	292	58.2	209	41.8	501
Diarrhea	198	62.1	121	57.9	319
Birth asphyxia	83	74.8	28	25.2	111
Respiratory causes	80	58.9	56	41.1	136
Septicemia and meningitis	73	56.6	56	43.4	129
Cardiovascular causes	69	52.7	62	47.3	131
Congenital anomalies	41	62.0	25	38.0	66
Malignancy	3	60.0	2	40.0	5
Others	30	52.6	27	47.4	57
Total	869	59.7	586	40.3	1455

P-value<0.05

**Table 5: Relationship between body weight and the causes of death**

Causes of death	<2.5kg (No.)	%	2.5 - 4kg (No.)	%	>4 - 10 kg (No.)	%	> 10 kg (No.)	%	Total
Prematurity	488	97.4	13	2.6	/	/	/	/	501
Diarrhea	30	9.4	79	24	194	60.8	16	5.0	319
Respiratory causes	20	14.7	50	36.8	58	42.6	8	5.9	136
Cardiovascular causes	13	9.9	61	46.6	45	34.3	12	9.2	131
Septicemia and meningitis	31	24.0	54	41.9	33	25.6	11	8.5	129
Birth asphyxia	3	2.7	92	82.9	16	14.4	/	/	111
Congenital anomalies	23	34.9	33	50	9	13.6	1	1.5	66
Malignancy	/	/	/	/	2	40.0	3	60.0	5
Others	5	8.7	11	19.3	23	40.4	18	31.6	57
Total	613	42.1	393	27	380	26.2	69	4.7	1455

P-value<0.05



**Figure 2: Total Number of death during the months of the year**

**Table 6: Relationship between residency and causes of death**

Causes of death	Rural (No.)	%	Urban (No.)	%	Total
Prematurity	308	61.5	193	38.5	501
Diarrhea	235	73.7	84	26.3	319
Birth asphyxia	70	67.4	41	32.6	111
Respiratory causes	84	61.8	52	38.2	136
Septicemia and meningitis	87	61.8	42	38.2	129
Cardiovascular causes	81	73.1	50	36.9	131
Congenital anomalies	36	55.0	30	45.0	66
Malignancy	1	20.0	4	80.0	5
Others	36	63.2	21	36.8	57
<b>Total</b>	<b>938</b>	<b>64.5</b>	<b>517</b>	<b>35.5</b>	<b>1455</b>

P- Value (<0.05).

### **Discussions**

Up to three-quarters of the world population live in the third world and here the proportion of the world children is even greater. Children all over the world, especially in the developing countries have been and still are under life threatening risks, most of which now a day are either preventable or treatable<sup>(1,3,7)</sup>.

The great decline in the mortality among children observed in the developed countries is much less obvious in the developing countries as the availability of good medical care tend to vary inversely with the need for it in the population served<sup>(15)</sup>.

In this study the average rate of death among children less than 5 year of age was 10.6/1000 of total admitted cases, this result was obviously lower than the rate of death in children in children welfare Teaching Hospital in Baghdad, in which death rate was 88.6/1000<sup>(21)</sup>. This difference of death number may be due to absence of an oncological department in Sulaymani Pediatrics Hospital while such department is present in children welfare Teaching Hospital raising the mortalities from malignancy.

The maximum number of deaths in this study was in the first 28 days of life which accounts for (61.8 %) of total deaths. This rate is compatible to the fact which says that in areas where Under Five Mortality Rate (U5MR) <35/1000<sup>(3)</sup>, the bulk of death occur during neonatal period. This number is higher than that which was found in a developed country like England and Wales in 1999 were (46%) confined to neonatal age<sup>(1,22)</sup>, this difference due to defective management of neonates and premature with lack of essential medicine like ( surfactant) , absence of modern medical equipments and inadequate antenatal care.

The degree of mortality was inversely proportional to the age. This

finding was compatible with both developing and developed countries<sup>(1)</sup>.

In this study the main cause of death was prematurity this accounts for (34.4%) of total causes, which contributed to increase in the number of death during neonatal period; at the same time prematurity was found to be the main cause of death in this age group, which constitute (54.7 %) of death during neonatal period . In comparison to England and Wales in 1999 were prematurity constitute (32.7 %) of death during neonatal period<sup>(1,22)</sup>. this higher rate of death from prematurity in sulaymani is due to lack of well equipped neonatal intensive care unit, Surfactant therapy, mechanical ventilation and defects in the subspecialized medical and nursing staff for neonates.

Beyond the neonatal period diarrhea was the commonest cause of death, which accounts for (21.9 %). Approximately five billion episodes of diarrhea occur worldwide annually, accounting for (15 to 30%) of all deaths in some countries<sup>(4, 5, 6, 7)</sup>. This may be due to poor sanitation, using well water & incompliance with WHO program.

It is worth mentioning the hospital specialty when causes of death are considered, the malignancy as a cause of death comes at the top of most lists (23.8%) in children welfare study as it is one of referral hospital in Baghdad for malignant cases in Iraq & other studies<sup>(21, 23)</sup>, while malignancy was a rare cause in this study because malignant cases were not usually treated in sulaymani due to lack of facilities, making malignancy accounts for (0.34 %) only.

The result have shown a male to female ratio among deceased children to be 1.48:1. This may be due to increased susceptibility of male babies to septicemia illness<sup>(24, 25)</sup>, and higher



incidence of Hyaline Membrane Disease (HMD) among male babies<sup>(1)</sup> in this study. This result is similar to study performed in children welfare Teaching Hospital in Baghdad in 2003<sup>(21)</sup>. The same fact has also been noticed in the other developing countries<sup>(26)</sup>.

The death rate was inversely proportional to the body weight in this study particularly in premaures; this finding was similar to studies conducted in developing and developed country<sup>(1, 14,22)</sup>.

The number and the causes of deaths in children varied from one month to another. There were two peaks of death one in June and the other in November as it is common to have a large number of acute diarrheas in spring and summer while a large number of acute respiratory infections (ARI) in autumn and winter this result is similar to a study conducted in Ramadi<sup>(2)</sup>.

Relatively the largest proportions (64.5 %) of died children were from rural area, while only (35.5%) was from urban. This indicates a better family income, clean water supply, good sanitation, housing, and medical care in the urban children or could be due to long distance between the rural area and the hospital especially in this area leading to delay in bringing patients to the hospital. This fact is similar to the result in many similar studies carried in other developing countries including Iraq<sup>(2,17, 26,27)</sup>.

### **Conclusions**

This hospital based study has revealed the death number was significantly lower than previous study in other hospital in the same country. The major causes of death were prematurity followed by diarrhea. The maximum number of death occurs in the neonatal period.

The death rate was higher in males than females.

The death rate was higher among children from rural areas than urban areas.

Seasonal variance in both numbers and causes of death.

The death rate inversely proportional to body weight.

The death rate inversely proportional to age.

### **Recommendations**

We recommend enhancement of antenatal care, planning to build a neonatal care unit that is well equipped with modern medical devices& services, improving medical care provided to rural area, encouragement of health care provider for effective management of diarrhea, acute respiratory diseases following WHO instructions and finally attempt to apply 10 revisions of international classification of disease and cause of death in order to standardize recording system.

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