RETROSPECTIVE STUDY OF PAST FIVE YEARS PEDIATRICS MORTALITIES IN AL-HUSSEIN UNIVERSITY HOSPITAL

By

Ayman Alsayed Osman*, Nayera Mahmoud Al-Akkad*, Khaled Mahmoud Zayed **

Pediatrics Department* Al-Azhar Faculty of Medicine

ABSTRACT

Background/aim: *Children are important assets of a nation, therefore reduction in infant and child mortality is likely the most important objective of the Millennium Development Goals (MDGs). Infant and child mortality rate is regarded as important and sensitive indicators of the health status of a community. It also reflects the general standard of living of the people and effectiveness of interventions for improving maternal and child health in a country.*

Aim: *The present work was designed to study children mortalities at paediatrics department in Al-Hussein University Hospital, in five years from the 1st of January 2013 till the end of December 2017.*

Materials and methods: *This study was done in Pediatrics Department at Al-Hussein University Hospital. It's a review of records of children mortalities that happened among inpatients of pediatrics department at Al-Hussein University Hospital from the 1st of January 2013 till the end of December 2017. All deceased cases in pediatrics department in this period were included and cases of neonatal intensive care unit were excluded.*

Collected Data were: *age, sex, residence, date of entry to hospital, date of death, duration of admission, cause of death and PICU admission. Data were fed to the computer and analyzed using IBM SPSS software package version 20.0.(Armonk, NY: IBM Corp) Qualitative data were described using number and percent. The Kolmogorov-Smirnov test was used to verify the normality of distribution Quantitative data were described using range (minimum and maximum), mean, standard deviation and median. Significance of the obtained results was judged at the 5% level. The used tests were 1 - Chi-square test for categorical variables, to compare between different groups. 2 - Monte Carlo Correction for chi-square when more than 20% of the cells have expected count less than 5. 3 -Kruskal Wallis test For abnormally distributed quantitative variables, to compare between more than two studied groups, and Post Hoc (Dunn's multiple comparisons test) for pair wise comparisons.*

Results: *The number of admitted cases was 10281 in pediatrics department of Al Hussein University Hospital during the time frame of the study, 215 cases of them died. The percentage of moralities over these five years was 2.09%. There were some data missed from 10 files. The missed data were age, weight, cause of death and residence.*

They were available only in 205 records. But other data (gender, PICU admission or not & duration of hospital stay) were available in all cases i.e. 215 records. As regard to cause of death, respiratory causes represented (21.2%), (GIT and liver) causes (20%), blood diseases (10.7%), neurological causes (9.8%), Multisystem failure (11.7%) CVS problems (3.4%), injuries (4.9%), renal diseases (2.9%) while 15.1% of cases were due to miscellaneous causes. As respect to habitation, 47.3 % were from Cairo, 14.1% were from Giza and 12.7 % were from Kalyoubeya while other 25.9 % were from different governorates. Males (57.7%) were more than females (42.3%) and under-weight for their age were 54.6 % and the normal weight for their age were 45.4 of the contemplated cases. The mortalities as indicated by death age were 63.9% in the first year of life, while 21.5% were from age of 13 – 60 months, so the absolute entirety of mortalities underneath age of 5 years were 85.4% and 14.6% were above age of 5 years. The least number of deaths was in April (6.1%) while greatest in March and October (12.1%), while in general, mortalities were (27 %) in winter, (21.4%) in spring, (22.8%) in summer and (28.8 %) in autumn. The mortalities as indicated by year of death out of 215 perished cases were least at 2013 (16.8 %) and were most extreme at 2015 (26.5%). Only 11.6% of cases were not admitted to PICU while 88.4% were admitted.

Conclusion: *The most common diseases associated with mortalities were respiratory diseases (21.2%). The mortalities were minimum at 2013 (16.8 %) and were maximum at 2015 (26.5%). All over the five years most of cases died in autumn. Most of mortalities were in the age group 1-12 months (63.9%). Mortalities from Cairo were (47.3 %) while from Giza (14.1%). (88.4%) of cases were admitted to PICU.*

Key Words: *pediatrics mortalities, Retrospective, Relation, cause of death.*

INTRODUCTION

Child mortality has significantly dropped in the last 25 years at a global level. Understanding particularities of child mortality at the national level is useful to tailor health policy to those conditions requiring more attention **(Sitoe et al., 2018)**.

Worldwide, under-fives mortality has halved since 1990 from 93 to 41 deaths per 1000 live births in 2016. However, progress has been very uneven. Child mortality is still highest in Africa (76 per 1000 live births) **(Berkley, 2018)**.

The largest disparities in child mortality were found to come from mothers who had the least education. Unimproved sanitation contributed to greater child mortality inequalities than other variables, in over two-thirds of the countries **(Kayser et al., 2019)**.

The prevalence of morbidity and mortality were significantly higher among the births of women who married before 18 years of

age compared to those births whose mother married at 18 years of age or older **(Paul, 2019)**.

The overall under five mortality (U5M) rate was 90 deaths per 1 000 live births in Uganda. The contribution and effects of childhood diseases on U5M vary by region. Majority of the under-five deaths are due to malaria, followed by diarrhoea, severe/moderate anaemia and severe/moderate malnutrition **(Makumbi et al., 2019)**.

Child mortality has declined substantially in the past decade In South Africa. Under-5 mortality in 2015 is estimated at 37 - 40 deaths per 1 000 live births, with an estimated infant mortality rate of 27 - 33 deaths per 1 000 live births. Approximately one-third of under-5 deaths occur during the newborn period, while diarrhoea, pneumonia and HIV infection remain the most important causes of death outside of the newborn period. The proportion of deaths owing to non-natural causes, congenital disorders and non-communicable diseases has increased **(Bamford et al., 2018)**.

Globally, the incidence of child pneumonia decreased by 30% and mortality decreased by 51% during the Millennium Development Goal period. These reductions are consistent with the decrease in the prevalence of some of the key risk factors for pneumonia, increasing socioeconomic development and preventive interventions, improved access to care, and quality of care in hospitals. However, Intersectoral action is required to improve socioeconomic conditions and increase coverage of interventions targeting risk factors for child pneumonia to accelerate decline in pneumonia mortality and achieve the Sustainable Development Goals for health by 2030 **(McAllister et al., 2019)**.

Prenatal and infant/toddler home visitation by nurses is a promising means of reducing all-cause mortality among mothers and preventable-cause mortality in their first-born children living in highly disadvantaged settings **(Olds et al., 2014)**.

A study done on Care-seeking patterns among families that experienced under-five child mortality in rural Rwanda summarized that, Interventions such as community health workers and insurance promote access to care, however a gap remains as many children had no contact with the health system prior to death and those who sought formal care still died. Further efforts are needed to respond to urgent cases in communities and further

understand remaining barriers to accessing appropriate, quality care **(Kagabo et al., 2018)**.

Compared to those of intact families, children of divorced parents experience higher estimated mortality risks under age 5 and a lower probability of entering school, even after controlling for various other factors. This effect is large and significant during the first two years after the divorce. The death of the father is also found to greatly reduce a child's likelihood of entering school, but its effect on mortality is not significant. Hence, the family context plays an important role in determining two important aspects of children's welfare: their probabilities of dying before age 5 and of entering school **(Gnoumou Thiombiano et al., 2013)**.

Arthi and Fenske, 2018 found statistically significant positive relationship between polygamy and child mortality in the modern period, and a statistically insignificant positive relationship in the historical data. Although there is a limited role for polygamist-specific intrahousehold dynamics and behavioural practices in shaping the mortality of children in such households, the sensitivity of the polygamy-child mortality correlation is consistent with an important role for selection into polygamy, particularly on unobservable characteristics **(Arthi and Fenske, 2018)**.

Cluster randomised trial done by **Murray et al., 2018** revealed that health radio campaign increased under-five consultations at primary health centres for malaria, pneumonia and diarrhoea (the leading causes of post neonatal child mortality in Burkina Faso) and resulted in an estimated 7.1% average reduction in under-five mortality per year. These findings suggest important reductions in under-five mortality can be achieved by mass media alone, particularly when conducted at national scale **(Murray et al., 2018)**.

The implementation of fiscal austerity measures in Brazil can be responsible for substantively higher childhood morbidity and mortality than expected under maintenance of social protection—threatening attainment of Sustainable Development Goals for child health and reducing inequality **(Rasella et al., 2018)**.

On another hand, **Olper et al., 2018** mentioned that, trade liberalization significantly reduced child mortality. The average

reduction is around 9% ten years after the liberalization. But there is significant heterogeneity in the impact. For the cases for which Synthetic Control Method (SCM) could provide a reliable counterfactual, trade liberalization significantly reduced child mortality in approximately half the cases. In most other cases there was no significant effect. In the majority of the significant cases, the reduction in child mortality was more than 20%. On average, trade liberalization reduced child mortality more (a) in democracies compared to autocracies, (b) when incomes were higher and (c) when it reduced taxation of farmers **(Olper et al., 2018)**.

There is a strong link between access to immunization and reduction in mortality. The results show a robust inverse relationship between child immunization and child mortality. Literacy of mothers emerges as an important determinant of demand for child immunization. It is argued that improving girl-child education would increase demand for child immunization and reduce child mortality in rural Nigeria **(Adeoti and Oni, 2017)**.

Park et al., 2018 hypothesized that social practices and biological factors play an important role, but this might differ by gender: while girls enjoyed genetic advantages, boys received more social care. Hence, sex differences in child mortality could reflect the relative strength of these two competing forces. First, maternal death increased child mortality substantially, and the association was stronger among boys than girls. Secondly, birth order was positively associated with child mortality, and this association was stronger among boys than girls. Thirdly, sibling size had a non-linear relationship with child mortality, and this association was slightly stronger among girls than boys. Finally, the implications of sibling composition differed by sex: having young siblings increased child mortality among boys and having old siblings reduced it among girls **(Park et al., 2018)**.

There was high infant mortality rate and under-5 mortality among Scheduled Caste and Scheduled Tribe in India, while it is much lower among non-SC/ST population in 2011 census. The result of logistic regression suggests that caste has significant impact on access to institutional delivery and child immunization, adjusted for other socio-economic variables. All the castes are more likely to gain access to both institutional delivery and child immunization compared to

scheduled tribe population **(Vishwakarma et al., 2019)**.

Public health expenditure has a statistically significant effect on reducing the infant and under-five mortality rates, which were mostly facilitated in the Southern African Development Community (SADC) region. Improvements in water source and female literacy also statistically significantly contributed to prevent deaths of infants and under-five children, whereas Gross domestic Product (GDP) per capita and immunization did not. HIV prevalence was found a significant adverse factor to cause child mortality **(Nyamuranga and Shin, 2018)**.

On the same context **Ali Khan et al., 2018** found probability of child mortality decreases with greater birth-interval, child's large size at birth, more family members, mother's education, mother's ownership of assets and mother's decision-making at the household level. Policy makers can work to improve mothers' characteristics such as fertility behaviour, education, empowerment and decision-making at the household level, to reduce child mortality **(Ali Khan et al., 2018)**.

MATERIALS

Study settings: This study was conducted in Paediatrics Department at Al-Hussein University Hospital.

Target Population: The study is a record review of children mortalities that took place among inpatients of pediatrics department at Al-Hussein University Hospital from the 1st of January 2013 till the end of December 2017.

Inclusion criteria: All deceased cases in Paediatrics Department from the 1st of January 2013 till the end of December 2017 at Al-Hussein University Hospital.

Exclusion criteria: Cases of Neonatal Intensive Care Unit (NICU).

METHODS

Study Design: The current work was a retrospective study, carried out by reviewing the registers of all children mortalities that took place among inpatients of paediatrics department at Al-Hussein University Hospital in the last 5 years.

Collected Data: age, sex, weight, residence, date of admission, date of death, duration of admission, cause of death and PICU admission.

Statistical analysis of the data: Data were fed to the computer and analyzed using IBM SPSS software package version 20.0.(Armonk, NY: IBM Corp) Qualitative data were described using number and percent. The Kolmogorov-Smirnov test was used to verify the normality of distribution Quantitative data were described using range (minimum and maximum), mean, standard deviation and median. Significance of the obtained results was judged at the 5% level.

The used tests were:

1. **Chi-square test.** For categorical variables to compare between different groups.
2. **Monte Carlo correction.** Correction for chi-square when more than 20% of the cells have expected count less than 5.
3. **Kruskal Wallis test.** For abnormally distributed quantitative variables, to compare between more than two studied groups, and Post Hoc (Dunn's multiple comparisons test) for pairwise comparisons.

Ethical consideration:

1. Awritten consent was obtained from Hospital administration to review records.
2. An approval by the local ethical committee was obtained before study.
3. The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.
4. All the data of the records and results are confidential.

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RESULTS

During the study period 10281 patients were admitted to pediatrics department of Al-Hussein University Hospital, 215 cases of them died. The mortality percentage over the last five years was 2.09 % (Table 1).

There were some data missed from 10 files. The missed data were age, weight, cause of death and residence. They were available only in 205 records. But other data (gender, PICU admission or not & duration of hospital stay) were available in all cases i.e. 215 records.

Table (1): Distribution of Total inpatients according to year (n=10281)

Year of study	Total inpatients (10281)	(100) %
2013	1956	(19.02%)
2014	2102	(20.4%)
2015	2176	(21.16%)
2016	2182	(21.22%)
2017	1865	(18.14%)

Table (2): Distribution of the studied mortality cases according to year (n=215)

Year	Recorded mortalities	
	No. 215	(100) %
2013	36	16.7
2014	43	20.0
2015	57	26.5
2016	37	17.2
2017	42	19.5

The mortalities according to year of death out of 215 deceased cases were minimum at 2013 (16.8 %) and were maximum at 2015 (26.5%) (Table 2).

Table (3): Distribution of the studied mortality cases according to demographic data

	Mortalities / 5 years	
	No.	**(100) %**
Age (months) (n= 205)		
1 –12	131	63.9
13 –60	44	21.5
≥61	30	14.6
Min. – Max.	1.0 –204.0	
Mean ± SD.	29.53 ±47.99	
Median	8.0	
Weight (n = 205)		
Normal for age	93	45.4
Under-weight for age	112	54.6
Sex (n=215)		
Male	124	57.7
Female	91	42.3
Residence (n = 205)		
Cairo	97	47.3
Giza	29	14.1
Kalyobeya	26	12.7
Al fayoum	10	4.9
Others	53	25.8

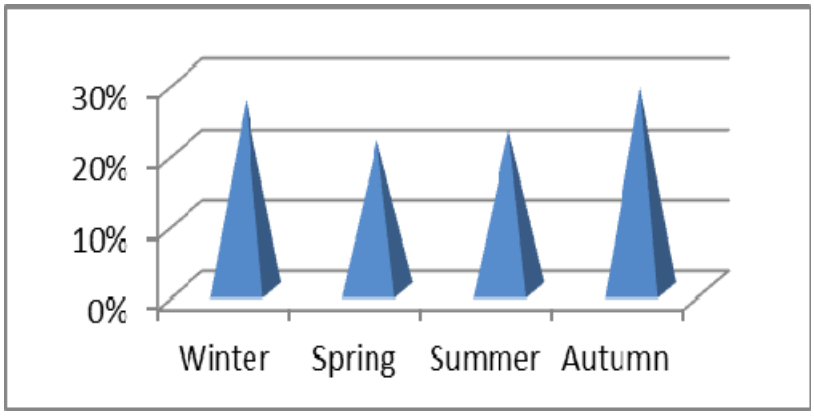
(63.9 %) of mortalities (131) that took place any time of the year were in the age group 1-12 months, while 21.5% (44) were in the age group between 13-60 months (Table 3).

Table (4): Distribution of the studied mortality cases according to month of death (n=215)

Month of death	No. 215	(100) %
1st quarter(Winter)	**58**	**27.0**
January	15	7
February	17	7.9
March	26	12.1
2nd quarter(Spring)	**46**	**21.4**
April	13	6.1
May	16	7.4
June	17	7.9
3rd quarter(Summer)	**49**	**22.8**
July	17	7.9
August	12	5.6
September	20	9.3
4th quarter(Autumn)	**62**	**28.8**
October	26	12.1
November	18	8.4
December	18	8.4

The mortalities according to month of death were minimum in April (6.1%) while maximum in March & October (12.1%) (Table 4).

Figure (1): Distribution of the studied cases according to seasons



Mortalities were (27 %) in winter, (21.4%) in spring, (22.8%) in summer and (28.8 %) in autumn (Table 4) (Figure 1).

Figure (2): Distribution of the studied cases according to age

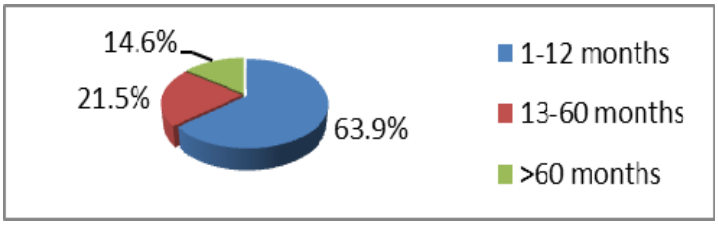


Figure (3): Distribution of the studied cases according to their weight for age

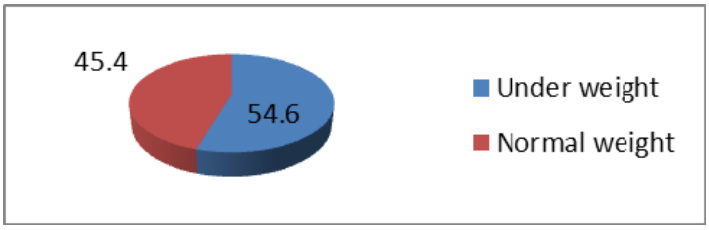
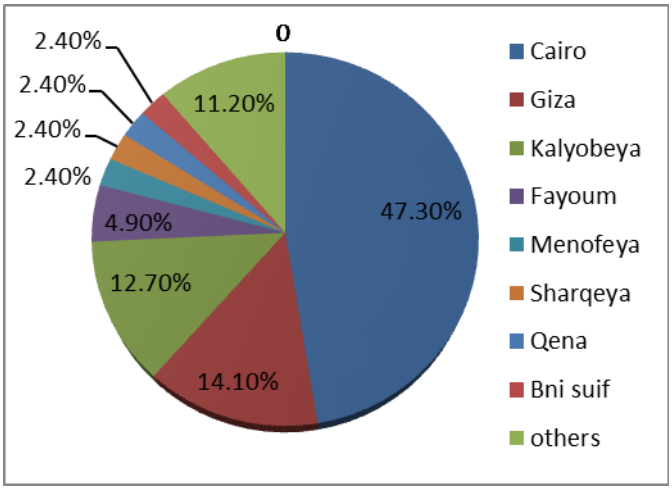


Figure (4): Distribution of the studied cases according to residence



As regards to residence, 47.3 % were from Cairo, 14.1% were from Giza and 12.7 % were from Kalyoubeya while 25.9 % were from other governorates (Table 3) (Figure 4).

Table (5): Relation between age and diseases associated with mortality cases. (n=205)

Diseases associated with mortality cases	Age (months)								χ^2	p
	1 –12 (n = 131)		13 –60 (n = 44)		≥61 (n = 30)		Total (n = 205)			
	No.	%	No.	%	No.	%	No.	%		
Blood diseases	19	86.4	0	0.0	3	13.6	22	10.7	8.758*	^{MC}p=0.008*
Renal diseases	2	33.3	2	33.3	2	33.3	6	2.9	3.324	^{MC}p=0.145
Chest disease	32	72.7	8	18.2	4	9.1	44	21.5	2.140	0.343
Trauma	1	10.0	7	70.0	2	20.0	10	4.9	14.709*	^{MC}p<0.001*
GIT & liver	26	63.4	8	19.5	7	17.1	41	20.0	0.301	0.860
CVS disease	3	42.9	3	42.9	1	14.3	7	3.4	2.048	^{MC}p=0.273
Neurological	11	55.0	6	30.0	3	15.0	20	9.8	1.236	^{MC}p=0.540
Miscellaneous causes	18	58.1	7	22.6	6	19.4	31	15.1	0.772	0.680
Multisystem Failure	19	79.2	3	12.5	2	8.3	24	11.7	2.746	0.253
χ^2(^{MC}p)	33.060*(0.003*)									

Table (6): Relation between age and demographic data

	Age by months								χ^2	p
	1 –12 (n =131)		13 –60 (n =44)		≥61 (n =30)		Total (n = 205)			
	No.	%	No.	%	No.	%	No.	%		
Sex										
Male	75	64.7	23	19.8	18	15.5	116	56.6	0.499	0.779
Female	56	62.9	21	23.6	12	13.5	89	43.4		
Weight										
Normal weight	50	53.8	25	26.9	18	19.4	93	45.4	7.659*	0.022*
Under weight	81	72.3	19	17.0	12	10.7	112	54.6		
Residence										
Cairo	67	69.1	18	18.6	12	12.4	97	47.3	2.139	0.343
Giza	15	51.7	5	17.2	9	31.0	29	14.1	7.273*	0.026*
Kalyobeya	14	53.8	9	34.6	3	11.5	26	12.7	3.066	0.216
Al fayoum	8	80.0	1	10.0	1	10.0	10	4.9	0.804	^{MC}p=0.713
Others	27	62.8	11	25.6	5	11.6	43	21	0.440	^{MC}p=0.808

χ2: Chi square testMC: Monte Carlo p: p value for association between age and demographics data *: Statistically significant at $p \leq 0.05$.

Table (7): Relation between age, hospital stay and PICU admission

	Age by months	Test	p

	1 –12 (n = 131)		13 –60 (n = 44)		≥61 (n = 30)		Total (n = 205)		Of Sig.	
	No.	%	No.	%	No.	%	No.	%		
Hospital Stay (Days)										
Min. – Max.	1.0 –82.0		1.0 –88.0		1.0 – 55.0		1.0 – 88.0		H=0.458	0.795
Mean ± SD.	12.95 ±14.52		15.23 ±17.44		11.37 ± 12.53		13.20 ± 14.91			
Median	7.0		8.50		8.0		8.0			
PICU admission										
Not admitted	14	56.0	3	12.0	8	32.0	25	12.2	χ^2= 7.334*	0.026*
Admitted	117	65.0	41	22.8	22	12.2	180	87.8		

p: p value for association between age and and different parameters *: Statistically significant at p ≤ 0.05
χ2: Chi square test. MC: Monte Carlo.

Table (8): Relation between age and time of death (n = 205)

Time of death	Age by months.								χ^2	p
	1 –12 (n = 131)		13 –60 (n = 44)		≥61 m (n = 30)		Total (n = 205)			
	No.	%	No.	%	No.	%	No.	%		
Winter	34	64.2	12	22.6	7	13.2	53	25.9	0.146	0.929
Spring	25	72.9	14	31.8	5	11.4	44	21.5	3.648	0.161
Autumn	37	61.7	9	18.8	14	23.3	60	29.3	6.104*	0.047*
Summer	35	72.9	9	15.0	4	8.3	48	21.5	2.712	0.258

Table (9): Relation between diseases associated with mortality cases, hospital stay and PICU admission

	Diseases associated with mortality cases																				Test of sig.	p
	Blood disease (n = 22)		Renal disease (n = 6)		Chest disease (n = 44)		Trauma (n = 10)		Git & liver disease (n = 41)		CVS disease (n = 7)		CNS disease (n = 20)		Misc. Causes (n =31)		Multi.s. ailureF (n = 24)					
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%				
Hospital stay																						
Min. –Max.	1 – 24		1 – 47		1 – 82		1 – 55		1 – 59		1 – 44		1 – 73		1 – 42		1 – 88				H= 14.849	0.062
Mean ± SD.	6.8±6.7		17.7±15.6		12.1±15		19.7±17.6		13.7±13.8		14.9±16.6		16.8±20		10±12.1		17±17.4					
Median	4.5		15.0		7.5		19.0		10.0		5.0		8.5		4.0		11.5					
PICU admission																						
Not admitted	5	20.0	1	4.0	6	24.0	0	0.0	7	28.0	0	0.0	3	12.0	2	8.0	1	4.0			χ^2= 7.294	MCp= 0.454
Admitted	17	9.4	5	2.8	38	21.1	10	5.6	34	18.9	7	3.9	17	9.4	29	16.1	23	12.8				

The most common cause of death in cases admitted to PICU was GIT while the least common cause was renal. The shortest hospital stay duration was in cases with hematological diseases with a maximum duration of 24 days. (Table 9).

Table (10): Relation between year of study and time of death

Time of death	Year												□□	p
	2013 (n= 36)		2014 (n= 43)		2015 (n= 57)		2016 (n= 37)		2017 (n= 42)		Total (n= 215)			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		
Winter	11	17.7	10	17.2	15	25.9	10	17.2	12	20.7	58	26.9	0.603	0.963
Spring	8	17.4	5	10.9	8	17.4	11	23.9	14	30.4	46	21.4	9.377	0.052
Summer	6	12.2	14	28.6	15	30.6	7	14.3	7	14.3	49	22.8	4.711	0.318
Autumn	11	17.7	14	22.6	19	30.6	9	14.5	9	14.5	62	28.8	2.394	0.664

All over the five years most of the cases died in autumn (28.8%) with a statistically significant difference than other seasons. The largest number of deceased cases in winter, summer and autumn was in 2015, while in spring was in 2017 (Table10).

Table (11):Relation between year of study and demographic data.

	Year												Test of sig.	p
	2013		2014		2015		2016		2017		Total			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		

Sex	**(n= 36)**		**(n= 43)**		**(n= 57)**		**(n= 37)**		**(n= 42)**		**(n= 215)**			
Male	18	14.5	20	16.1	38	30.6	23	18.5	25	20.2	124	57.7	χ^2=5.316	0.256
Female	18	19.8	23	25.3	19	20.9	14	15.4	17	18.7	91	42.3		
Weight	**(n= 33)**		**(n= 43)**		**(n= 53)**		**(n= 37)**		**(n= 39)**		**(n= 205)**			
Normal weight	17	18.3	16	17.2	21	22.6	19	20.4	20	21.5	93	45.4	χ^2=3.449	0.486
Under weight	16	14.3	27	24.1	32	28.6	18	16.1	19	17.0	112	54.6		
Age (months)	**(n= 33)**		**(n= 43)**		**(n= 53)**		**(n= 37)**		**(n= 39)**		**(n= 205)**			
1 – 12	18	50.0	20	69.8	36	63.2	23	62.2	24	57.1	131	60.9		
13 – 60	10	27.8	9	20.9	7	12.3	7	18.9	11	26.2	44	20.5	χ^2=8.365	0.399
≥ 61	8	22.2	4	9.3	14	24.6	7	18.9	7	16.7	40	18.6		
Min. – Max.	1.0 – 168.0		1.0 – 180.0		1.0 – 180.0		1.0 – 204.0		1.0 – 180.0		1.0 – 204.0			
Mean ± SD.	30.45±45.14		22.40±39.07		32.66±53.35		36.0±58.87		26.21±40.73		29.53±47.99		H=0.946	0.918
Median	10.0		6.0		9.0		8.0		8.0		8.0			
Residence	**(n= 33)**		**(n= 43)**		**(n= 53)**		**(n= 37)**		**(n= 39)**		**(n= 205)**			
Cairo	16	16.5	18	18.6	26	26.8	20	20.6	17	17.5	97	47.3	χ^2=1.487	0.829
Giza	2	6.9	10	34.5	6	20.7	6	20.7	5	17.2	29	14.1	χ^2=5.250	0.263
Kalyobeya	7	26.9	4	15.4	4	15.4	4	15.4	7	26.9	26	12.7	χ^2=4.783	^{MC}p=0.307
Al fayoum	4	40.0	4	40.0	1	10.0	1	10.0	0	0.0	10	4.9	χ^2=7.708	^{MC}p=0.055
Almenofeya	0	0.0	1	20.0	2	40.0	1	20.0	1	20.0	5	2.4	χ^2=46.246*	^{MC}p<0.001*
Al sharqeya	1	20.0	2	40.0	2	40.0	0	0.0	0	0.0	5	2.4	χ^2=2.918	^{MC}p=0.582
Qena	1	20.0	1	20.0	1	20.0	1	20.0	1	20.0	5	2.4	χ^2=0.974	^{MC}p=1.000
Bnisuif	0	0.0	0	0.0	3	60.0	0	0.0	2	40.0	5	2.4	χ^2=4.640	^{MC}p=0.190
Other	2	8.7	3	13.0	8	34.8	4	17.4	6	26.1	23	11.2	χ^2=2.999	^{MC}p=0.566

The highest percentage of deaths for males was in 2015 with 30.6% and females were in 2014 with 25.3% (Table 11) (Figure 5). The highest percentage of deaths of normal weight was in 2015 (22.6%) while the lowest was in 2014 (17.2%), the highest percentage of deaths of underweight was in 2015 (28.6%) while the lowest was in 2013 (14.3%) (Table 11) (Figure 6). The highest percentage of deaths in Cairo was in 2015, while the highest percentage of deaths in Giza was in 2014 (Table 11) (Figure 8).

Table (12): Relation between year of study, PICU admission & hospital Stay

	Year												Test of sig.	p
	2013 (n=36)		2014 (n=43)		2015 (n=57)		2016 (n=37)		2017 (n=42)		Total (n=215)			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		
PICU admission														
Not admitted	2	8.0	3	12.0	7	28.0	7	28.0	6	24.0	25	11.6	χ^2=4.247	^{MC}p= 0.371
Admitted	34	17.9	40	21.1	50	26.3	30	15.8	36	18.9	190	88.4		
Hospital stay													H=0.795	0.939
Min. – Max.	1.0 – 82.0		1.0 – 88.0		1.0 – 59.0		1.0 – 38.0		1.0 – 73.0		1.0 – 88.0			
Mean ± SD.	14.33±17.74		14.77±16.57		12.46±14.42		11.57±10.41		14.21±15.93		13.42±15.10			
Median	8.0		10.0		7.0		9.0		9.0		8.0			

The highest percentage of deaths admitted to PICU was in 2015 (26.3%), while the lowest was in 2016 (15.8%) (Table 12) (Figure 9). The maximum mean duration of hospital stay was in 2014 (14.77 days), while the lowest was in 2016 (11.57 days) (Table 12).

Table (13): Relation between year of study and diseases associated with mortalities

Diseases	Year		p

associated with mortalities	2013 (n= 33)		2014 (n= 43)		2015 (n= 53)		2016 (n= 37)		2017 (n= 39)		Total (n= 205)			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		
Blood diseases	4	18.2	3	13.6	7	31.8	5	22.7	3	13.6	22	10.7	1.786	$^{MC}p=0.787$
Renal diseases	3	50.0	0	0.0	2	33.3	1	16.7	0	0.0	6	2.9	5.395	$^{MC}p=0.135$
Respiratory diseases	5	11.4	10	22.7	10	22.7	12	27.3	7	15.9	44	21.5	4.000	0.406
Trauma	4	40.0	1	10.0	1	10.0	1	10.0	3	30.0	10	4.9	5.392	$^{MC}p=0.190$
GIT & liver diseases	6	14.6	7	17.1	12	29.3	6	14.6	10	24.4	41	20.0	1.778	0.776
Cardiovascular diseases	0	0.0	1	14.3	3	42.9	0	0.0	3	42.9	7	3.4	18.018*	$^{MC}p<0.001^{*}$
Neurological diseases	1	5.0	4	20.0	6	30.0	3	15.0	6	30.0	20	9.8	3.273	$^{MC}p=0.519$
Miscellaneous causes	5	16.1	8	25.8	9	29.0	6	19.4	3	9.7	31	15.1	2.261	0.688
Multisystem Failure	5	20.8	9	37.5	3	12.5	3	12.5	4	16.7	24	11.7	5.950	0.191

The respiratory causes were the most common. - 44 cases- (21.5%) while the renal causes were the least common 6 case (2.9%). (Table 13)2

Figure (5): Relation between year of study and Sex

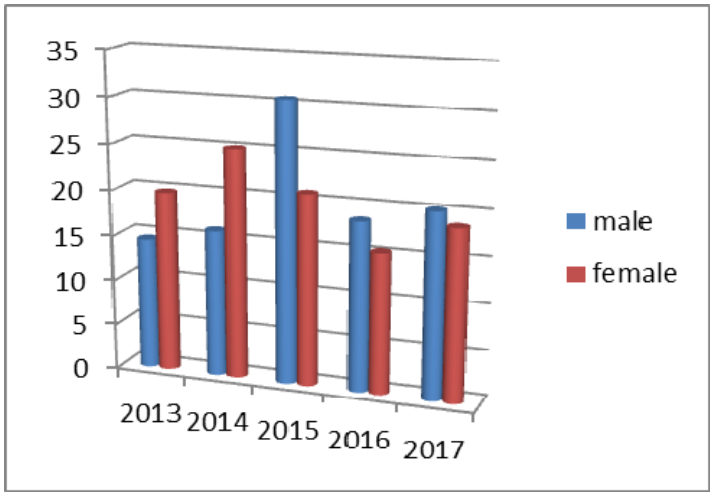


Figure (6): Relation between year of study and weight

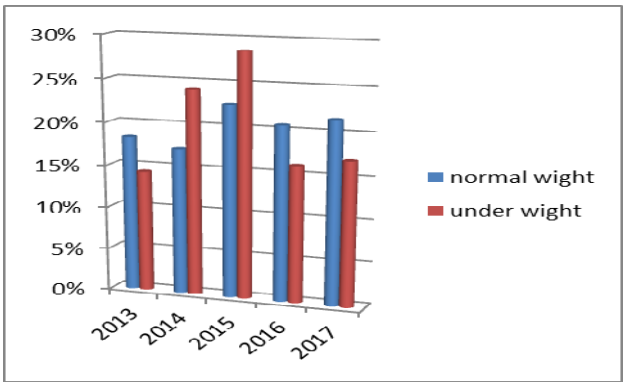


Figure (7): Relation between year of study and Age (months)

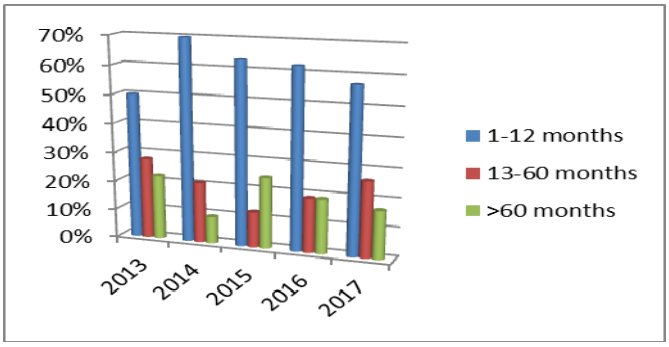
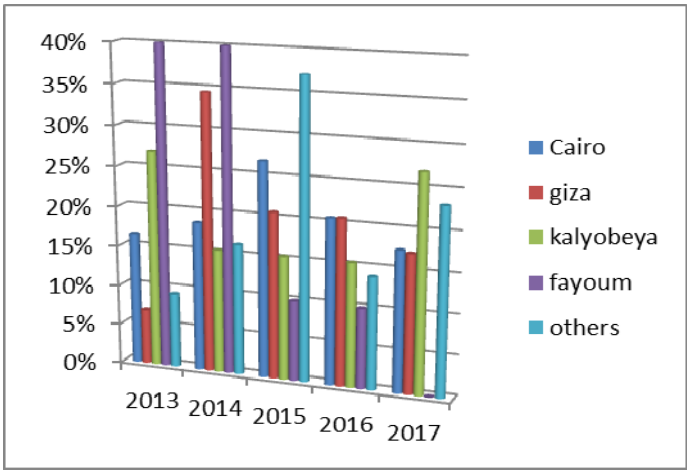
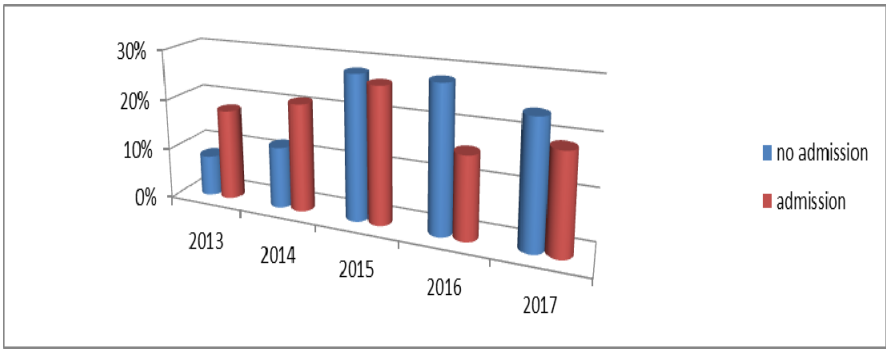


Figure (8): Relation between year of study and Residence





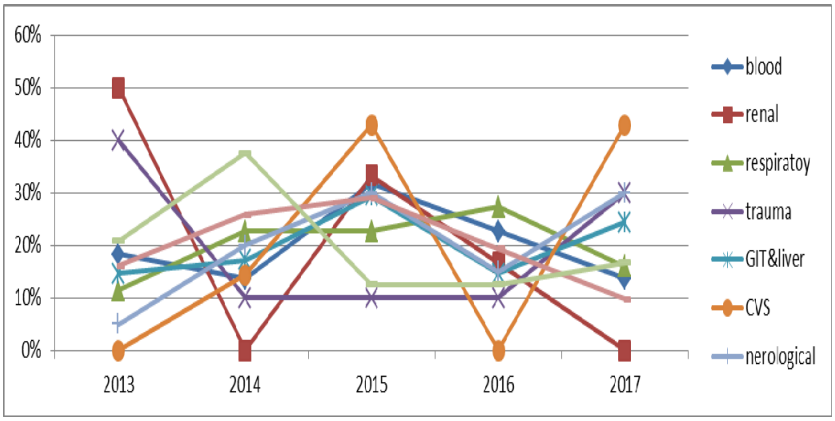


Figure (9): Relation between year of study and PICU admission

Figure (10): Relation between year of study and cause of death

As regard to cardio vascular system (CVS) causes of death, the highest percentage was (4 2.9%) in 2015 & 2017 while the lowest percentage was (0 %) in 2013 and 2016. As regard to neurological causes of death, the highest percentage was (30%) in 2015 & 2017 while the lowest percentage was (5 %) in 2013. According to renal causes of death, the highest percentage was (50%) in 2013 while the lowest percentage was (0 %) in 2014 and 2017. According to multisystem Failure causes of death, the highest percentage was (37.5 %) in 2014 while the lowest percentage was (12.5%) in 2015 & 2016. According to miscellaneous causes of death, the highest percentage was (29 %) in 2015 while the lowest percentage was (9.7%) in 2017 (Table 13) (Figure 10).

DISCUSSION

The current work showed that, during the study period 10281 patients were admitted to paediatrics department of Al-Hussein University Hospital, 215 cases of them died. The mortality percentage over the last five years was 2.09 % (Table I).

There were some data missed from 10 files. The missed data were age, weight, cause of death and residence. They were available only in 205 records. But other data (gender, PICU admission or not & duration of hospital stay) were available in all cases i.e. 215 records.

Mortality pattern of hospitalized children in a referral hospital from Upper Assam, north east India: a record based retrospective analysis done by Panyang **Kataki et al., 2017** showed that, the most common cause of post neonatal death is respiratory tract infections (24.1%) which agree with our

study, and septicaemia (24.1%). females percentage (41.3%) among mortalities is less than males (58.7%) that also agree with our current study **(Panyang Kataki et al., 2017)**.

A retrospective study done by **Elmadhoun and Hussain, 2017** To determine the common causes of child mortality in five years period (Jan 2005 – Dec 2009) in Atbara Teaching Hospital, Sudan. The total death percentage was (2.3%) that's close to ours (2.09 %). males (62.5%) were more than females (37.5%), that also correspond to our present study where males and females represent (57.7%) and (42.3%) respectively. The under five were the majority which agree with our results. The most common cause of death is respiratory tract infections (18.2) which correspond to our current study where RTIs represent (21.2%) **(Elmadhoun and Hussain, 2017)**.

Another retrospective study done by **Abd El-fattah et al., 2017** in Alexandria University Children's Hospital, on mortalities in 5 years period of 2011 – 2015. The mortality percentage over the five years ranged between 2.0 and 2.4%. Also agree with our study. The mortalities according to month of death were minimum in April (6.5%), that correspond to ours (6.1%), maximum in December (11.1%), that disagree with our results where maximum in March & October (12.1%). while overall mortalities were maximum (29%) in autumn that also agree with our results (28.8%). The great percentage of mortalities where under five years (91.6%) and in our study (85.4%). males (56.1%) more than females (43.9%) that also agree with our study (57.7%) & (42.3%) respectively. under-weight for their age were 43.1%. that disagree with our results where they represent the great percentage (54.6 %) in our study. Only 15% of cases were admitted to PICU while 85% were not, while in our study the reverse, where the greatest percentage was admitted to PICU 87.8%. The most common cause of death was haematological diseases; while in our study was RTIs **(Abd El-fattah et al., 2017)**.

In his study "Infant and Child Mortality in Kashmir" **Bashir et al., 2018** found that, the maximum number of infant and child deaths was high among boys than girls since 2015 to 2017 that's agree with our findings **(Bashir et al., 2018)**.

Bohn et al., 2016 In Addis Ababa, Ethiopia found among 6866 admissions aged 29 days to 14 years, During 4 years from 2011-2014. In general, mortality

was 0.042. In our study the total inpatients in paediatrics department in Al Hussein University Hospital were 10281 through a period of five years with mortality percentage 2.09 %. The proportion of male admissions was significantly higher than female admissions in all age groups which match with current study. . The main causes of death were pneumonia, and in our study was RTIs.

A retrospective study done on deaths from 1 September 2011 to 31 August 2012 In Latur, India, the total number of child admissions was 3910 , 2% of them older than 1 moths died. That agrees with our current work 2.09 %, 48.65% males and 51.35% females, were recorded, while in our present study males were 57.7% and females were 42.3% **(Patil & Godale, 2013)**.

The mortalities were 9.1% under age of 14 years in South Africa in 2013. And the percentage between both genders' was to some extent the same. which mismatch with our study, the first driving reason for under 5 mortalities was GIT infections (14.6%) while in our study the 1st cause of deaths was chest causes **(Lehohla, 2014)**.

A 4 years period study done in Paediatric Hospital of Kisangani in Democratic Republic of Congo From June 2014 to June 2018 The number of deceased cases aged 1month to 16 years was 64 cases . The major number of deaths was also under age of five years (70.3%) and in our study (85.4%) and the most common cause of death were respiratory diseases that correspond to our results **(Mande et al., 2018)**.

"Prevalence and associated factors of paediatric emergency mortality at Tikur Anbessa specialized tertiary hospital: a 5 year retrospective case review study" revealed that the total number of admitted cases after neonatal period was 11280 cases, with 269 cases of them died. The percentage of mortality is (2.38%) which is close to our study (2.09%). Infant deaths represents (34.2%) 92 cases, preschool age-deceased cases represent (36.4%) 98 cases, school age cases represent (29.4%) 79 cases. the most common cause of deaths in all age groups was pneumonia as in our study and the least common cause was renal failure and in our study was renal diseases **(Jofiro et al., 2018)**.

A Chinese study done in the largest tertiary children's hospital in South China from 2011 to 2013,

the total number of mortality was 163 cases. 92 (56.4%) of them was from 1 month to 12 months , while in our study , the same age group represented 131(63.9%) . From 1 year to 5 year, the deceased number was 56 cases (34.4%) and above 5 years age group was 15 cases (9.2%) . and in our study they represented 44(21.5%), 30(14.6%) respectively. More ever, the most common cause of death was pneumonia as in our study it was respiratory problems **(Zhu et al., 2015)**.

A study done at the Princess Marie Louise Children's Hospital in Accra, Ghana with title "Under-five mortality pattern and associated risk factors" by **Tette et al., 2016** between 1st January 2011 and 31st December 2011found that the most common cause of under 5 mortality was pneumonia followed by gastroenteritis as we revealed in our present work **(Tette et al., 2016)**.

An Indian study done on Causes of death extracted retrospectively from hospital files from 17 March 2003 to 30 June 2012. There were 5815 admissions (>1 month) during the study period. Of these, 493 children died (case fatality rate 8.4%) more than our study results (2.09%). they excluded six cases whose files could not be traced. they therefore analyzed 487 deaths [237 (48.6%) one-month to 1- year, 138 (28.3%) in 1-5 years and 112 (23%) in children >5 years] but in our study we fined that [131 (63.9%) one-month to 1- year, 44 (21.5%) in 1-5 years and 30 (14.6%) in children >5 years] for disease-related causes of mortality. Pneumonia, CNS infections and diarrhea were leading disease-related causes of mortality while in our study it was respiratory tract problems followed by GIT & liver problems **(Mahajan et al., 2014)**.

We concede that our present work was restricted by the utilization of occasionally deficient manually written medical records. Additionally, we proclaim that medical document recording shifts as indicated by suppliers and may present some inclination. Subsequently, the reason for death at last composed by the clinician may not precisely mirror the whole reason for death given where dissection isn't routinely performed. In spite of the fact that these well-perceived restrictions in asset-constrained settings, we have incorporated all information for which there were satisfactory records and trust this work may give important data to clinicians and leaders in comparable clinical situations.

CONCLUSION

During the study period 10281 patients were admitted to paediatrics department of Al-Hussein University Hospital, 215 cases of them died. Respiratory causes were the most common causes of death (21.2%). The mortalities were minimum at 2013 (16.8 %) and were maximum at 2015 (26.5%) and they were not decreasing over the last five years. All over the five years most of cases died in autumn. Most of mortalities were in the age group 1-12 months (63.9%). Mortalities from Cairo were (47.3 %) while from Giza (14.1%).

RECOMMENDATION

Child death rates are not diminishing, so there is a great deal of work to be finished. Immunizations, satisfactory nutrition and expanding training will all diminish the dimensions of pediatrics mortality.

Policymakers and medicinal services administration leaders require precise and complete information on the number and reasons for child deaths to plan and screen social insurance administration conveyance and wellbeing results.

So All data of deceased cases should be carefully recorded to make benefits in future studies, and help decision makers and policy administrators to overcome future childhood medical issues.

Intersectoral and explicit general wellbeing strategies must be kept on improving living conditions and human services so as to accomplish further decrease of child death rates.

The deaths of children inside brief span after admission in a large portion of the cases high lighten the need of convenient referral and early transportation of cases for counteractive action of loss of significant lives.

Preparing for staff working in records and full computerization of records for help of research.

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دراسة استعادية لحالات وفيات الأطفال بمستشفى الحسين الجامعى خلال الخمس سنوات الأخيرة

ط. أيمن السيد عثمان ، أ.د. نيرة محمود العقاد ، أ.د. خالد محمود زايد

مكان العمل : مستشفى الحسين الجامعى

إن وفيات الأطفال مؤشر مركب يعكس البيئة الإجتماعية والاقتصادية والخدمات الصحية ومواقف تقديمها فى بلد ما.

والهدف من هذا العمل هو دراسة أسباب الوفاة والفئات العمرية الأكثر شيوعا بين الأطفال المتوفين فى قسم الأطفال بمستشفى الحسين الجامعى خلال الخمس سنوات الأخيرة.

وقد أجريت هذه الدراسة على سجلات الوفيات التي وقعت بين المرضى المحجوزين بقسم الأطفال من 1 يناير 2013 حتى نهاية ديسمبر 2017، بما في ذلك جميع الحالات المتوفاة في قسم طب الأطفال في مستشفى الحسين الجامعي ماعدا حالات حديثي الولادة.

و العمل الحالي هو دراسة استعادية، عن طريق مراجعة سجلات جميع الوفيات التي وقعت بين المرضى المحجوزين بالقسم ، وكانت البيانات التي تم جمعها هى: العمر، الجنس،محل الإقامة، تاريخ الحجز، تاريخ الوفاة، مدة الحجز، سبب الوفاة ،و ما إذا كان حُجِزَ بالعناية المركزة أم لا.

وقد تم حجز 10281 مريضا بقسم الأطفال خلال فترة الدراسة ، توفى منها 215 حالة فقط أى أن نسبة الوفيات على مدار السنوات الخمس الماضية تساوي تقريبا (2.09٪) و كان هناك بعض البيانات المفقودة من ملفات عشر حالات والبيانات المفقودة هى العمر والوزن وسبب الوفاة ومحل الاقامة حيث أن هذه المعلومات كانت متاحة فى 205 ملف فقط من ال 215 ملف قيد الدراسة بينما البيانات الأخرى كالجنس وفترة البقاء بالمستشفى والحجز بالرعاية المركزة للأطفال من عدمه كان متاحا لكل الحالات ال 215.

وقد كانت النسبة الأقل بين الوفيات فى عام 2013 بينما النسبة الأعلى كانت فى عام 2015 وبالنسبة للشهور حظى شهرا مارس وأكتوبر بنصيب الأسد بينما شهر ابريل كان أقل الشهور فى معدل حدوث الوفيات خلاله وبالنسبة لفصول السنة فقد كان العدد الأكبر من الوفيات خلال فصل الخريف بنسبة بلغت (28.8%) بينما كان فصل الربيع هو الأقل فى معدلات حدوث الوفيات بين الأطفال بنسبة بلغت (21.4%).

وبلغت نسبة وفيات الأطفال فى العام الأول من العمر(63.9%) بينما من بداية العام الثانى حتى انقضاء الخامس بلغت (21.5%) وبلغت النسبة (14.6%) فوق عمر الخمس سنوات

وجدير بالذكر أن معدل وفيات الذكور (57.7%) كان أعلى من الإناث (42.3 %).

وفيما يتعلق بمحل الإقامة كانت محافظة القاهرة هى الأكبر بين المحافظات من حيث معدلات حدوث الوفيات بنسبة بلغت(47.3 %) تلتها محافظة الجيزة بنسبة بلغت (14.1%) فالقليوبية بنسبة بلغت (12.7%).

ووفقا لأسباب الوفاة، كانت الأسباب الناتجة عن أمراض الجهاز التنفسى هى الأكثر شيوعا (21.2٪) ، تلتها أمراض الجهاز الهضمى والكبد (20%) بينما المشكلات الواقعة تحت بند "أمراض متنوعة" مثّلت (15.1%) والوفيات الناتجة عن "فشل أجهزة متعددة " بلغت (11.7%) ثم أمراض الدم (10.7%) وأمراض الجهاز العصبى (9.8%) والوفيات الناتجة عن الإصابات بلغت (4.9%) وأمراض القلب بلغت (3.4%) في حين كانت الأسباب الناتجة عن أمراض الكلى هى الأقل شيوعا (2.9٪).

جدير بالذكرأيضا أن العدد الذى تم حجزة بالعناية المركزة للأطفال بلغ (88.4 %) والعدد الذى لم يدخل عناية الأطفال المركزة بلغ (11.6%) . كما أن فترة الحجز بالمستشفى تراوحت بين يوم و88 يوما بمتوسط بلغ 13.42 ±15.10 يوما.

ومن المهم أن نعرف أن(63.9%) من الوفيات التى حدثت خلال أى وقت من العام وقعت بين الفئة العمرية 1- 12 شهرا. بينما(21.6%) وقعت بين الفئة العمرية 13 - 60 شهرا. بينما العدد الأقل من الوفيات وقع بين الفئة العمرية الأكبر من 60 شهرا.

وقد كان سبب الوفاة الأكثر شيوعا بين الأطفال ناقصى الوزن هو أمراض الجهاز التنفسى بينما بين الأطفال طبيعيّ الوزن ذلك الواقع تحت بند "أسباب متنوعة".

وكان سبب الوفاة الأكثر شيوعا بين الفئة العمرية 1-12 شهرا هو أمراض الجهاز التنفسى وبين الفئة العمرية 13-60 شهرا هو أمراض الجهاز التنفسى والهضمى بالتساوى .

وكانت نسبة الوفيات الأعلى بين الذكور فى عام 2015 (30.6%) وبين الإناث فى عام 2014 (25.3%) بينما النسبة الأقل بين الذكور كانت فى عام 2013 وبين الإناث فى عام 2016 .

بينما بلغت الفئتان العمريتان 1-12 شهرا وأكبر من 60 شهرا أعلى نسب الوفيات بينهما فى عام 2015 والفئة العمرية 13-60 شهرا فى عام 2017.

وكانت نسبة الوفيات العظمى فى القاهرة عام 2015 وفى الجيزة عام 2014.

ومما سبق نجد أن معدلات وفيات الأطفال ليست آخذة في التناقص، ولذلك لا يزال هناك الكثير من العمل الذي يتعين القيام به مثل التطعيمات والتغذية الكافية وزيادة التوعية الصحية و كل ما يساعد على خفض مستويات وفيات الأطفال. كما ينبغى الأهتمام بدراسة حالات الوفيات بدقة و تسجيل كل البيانات ودراستها لتفادى حدوث تلك الأسباب فى المستقبل و أخذ الإحتياطات اللازمة.