



## **Causes and Differentials of Infant Mortality in the Pediatrics Wards in Fallujah General Hospital**

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### **Authors' contributions**

*This work was carried out in collaboration between all authors. Author SAT designed the study, performed the statistical analysis, wrote the protocol, and wrote the first and the final draft of the manuscript. Authors AAH and ZTA managed the analyses of the study and the literature searches. All authors read and approved the final manuscript.*

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### **ABSTRACT**

The aim of this study was to estimate the IMR in Fallujah General Hospital, Fallujah city/ Al –Anbar governorate/ Iraq, during the years 2007, 2008, 2009, 2010 and 2011 and to study the factors affecting it.

This is a review of patient's records involving all live births and deaths occurring from the beginning of January 2007 to the end of December 2011 in FGH. The data were collected from the hospital records, the files of the patients admitted to the neonatal and children hospital wards during the mentioned years, and from birth and death certificates recorded in the hospital. Data collected included name, age, sex, residence, socioeconomic status and date of death. The IMR was 75/1000 live births in 2007, 53.8/1000 live births in 2008, 57.6/1000 live births in 2009, 49.5/1000 live births in 2010 and 48.27/1000 live births in 2011. About 83.8% of deaths occur during the neonatal period & 16.2% in the post neonatal period. The average IMR was 57/1000 during the studied years, with an average male IMR=68.7/1000 and a female IMR= 44.37/1000.

The studied dead infants were 52.8% in the rural and 47.2% in the urban areas.

The 1st most common cause of death was the prematurity and RDS in the neonatal period and congenital malformation in the Post neonatal period.

IMR was very high during the year 2007 and it didn't show much difference during the

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years 2008 and 2009, this may reflect the bad social, health, economic services in addition to the security situation during those years.

*Keywords: Infant mortality rate; Fallujah general hospital; Iraq.*

## 1. INTRODUCTION

**Infant mortality rate (IMR)** is the number of newborns dying under a one year of age for 1000 live births. The infant mortality rate correlates very strongly with and is among the best predictors of state failure [1]. The IMR includes the neonatal and post neonatal mortality rate. Neonatal mortality rate (NMR) defined as the number of deaths in the 1st 27 days of life per 1000 live births, and the post neonatal mortality rate (PNMR) defined as the number of deaths at the age of 28 days, to the end of the first year of life, per 1000 live birth [2,3].

IMR is an accepted global indicator of health and socioeconomic status of a given population, while neonatal health is found to be related to the quality of health care services [4].

Post neonatal health is largely related to environmental factors. A high IMR, therefore, can indicate unmet health needs and unfavorable environmental factors [5,6,7]. This statistical index does not only indicates the number of deaths, but is also indicative of life quality [8]. That is why UNICEF maintains that infant mortality rate is certainly one of the most expressive indices of development concept, and this significance has taken shape for the fact that the decrease in child mortality is only possible with an improvement in living circumstances of a majority of people [9]. The rise of IMR is attributed to dissatisfied hygienic requirements; and unfavorable environmental factors, economical conditions, environmental sanitation and medical care [4,9].

Fallujah General Hospital lacks accurate information on mortality, causes of death and all related indicators. Mortality in general is under-reported.

The objective of this study is to determine the death rates and the related factors in Fallujah General Hospital during the period of 5 years (from 2007 to 2011).

## 2. SUBJECTS & METHODS

This is a review of patients records of the pediatric department in Fallujah General Hospital, Fallujah city (526,499 population according to 2009 census) in Al-Anbar province, west of Iraq. All registered live births & infant deaths occurred between January 2007 to December 2011, were included in the study. The data used were collected from the hospital records & files of the patients admitted to the neonatal & children wards & died under the age of 1 year during the years 2007-2011. We managed to collect the patients' files of the years 2010 & 2011 only to highlight the factors related to infant mortality because most of the files of the other 3 years (2007, 2008, 2009) were lost or not found because it was left in the old hospital which is under renovation (FGH moved to a new building in the center of Fallujah city in September 2009). The study include those died due to medical causes & didn't include deaths happened as a result of violence or accidents because those deaths usually not happened in the pediatrics wards & the victims may arrived dead to the emergency department & usually registered by authorities other than the hospital. The data collected

included name, age, sex, residence, cause of death, body weight, vaccination status, history of previous infant or child death in the family, type of delivery, socioeconomic status of the family & date of death. The socioeconomic status was determined according to the area of residence, the father's occupation, the family income & level of education.

### 3. RESULTS

During the 5 studied years (2007, 2008, 2009, 2010, 2011), the total number of live births was 28508, from which 14896 were males & 13612 were females (with male/female ratio of 1.09), & the total number of death was 1628, from which 1024 were males & 604 were females (male/female ratio =1.7).

IMR was 57/1000, with male IMR=68.7/1000 & female IMR= 44.37/1000.

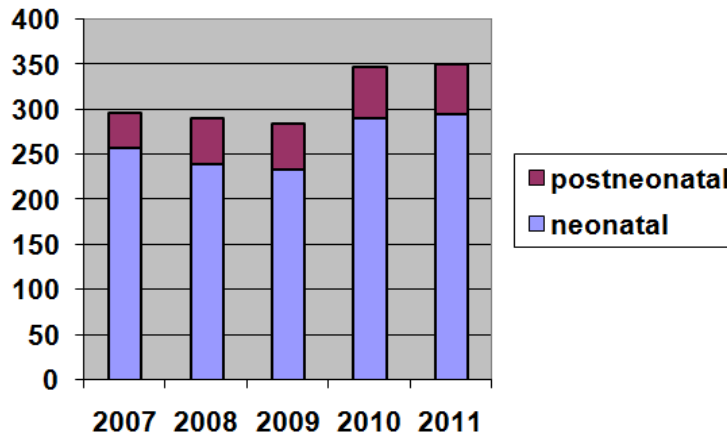
The average NMR during the 5 studied years was 49.3/1000 which is much higher than the PNMR (9.6/1000).

Table 1 Shows the number of births, deaths & IMR for each studied year.

**Table 1. Infant births, death & IMR for each of the studied years**

Year	Infant birth	Infant death	IMR
2007	3955	297	75
2008	5404	291	53.8
2009	4947	285	57.6
2010	6972	347	50.11
2011	7230	350	47.40

About 83.8% of deaths occur during the neonatal period & 16.2% in the post neonatal period. Fig. 1



**Fig. 1. Neonatal & post neonatal death of each of the 5 studied years**

During the years 2007 to 2009 the studied dead infants were 52.8% in the rural & 47.2% in the urban areas, while in the year 2010 it was 83.57% & 16.8% respectively & in the year 2011 it was 84.29% & 35.8% respectively Fig. 2.

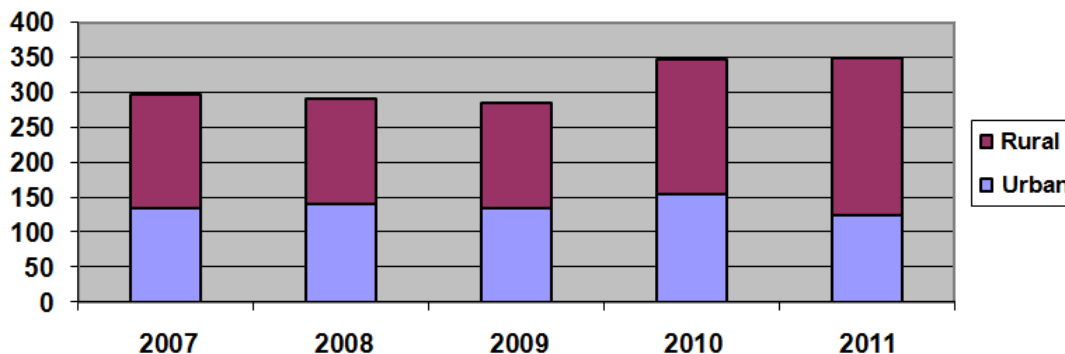


Fig. 2. Rural & urban deaths of each of the studied years

To study the factors & differentials related to infant mortality, the files of patients died in the neonatal & children wards in 2010 & 2011 were collected & their data were analyzed as shown in Table 2, 3 & 4.

Table 2. Frequency of distribution of infant death according to age at time of death

Year	2010		2011	
Age of death	Frequency of infant death/1000 live births	Percentage of total death%	Frequency of infant death/1000 live births	Percentage of total death%
Neonatal period (0-28 days)	290(41.88)	83.57	295(40.80)	84.29
Post neonatal period (29 days-12 months)	57(8.23)	16.43	55(7.61)	15.71
<b>Total</b>	<b>347( 50.11)</b>	<b>100%</b>	<b>350 (47.40)</b>	<b>100%</b>

**Table 3. Frequency of infant related variables (2010 & 2011)**

	Variable	2010		2011	
		No.	Frequency (%)	No.	Frequency (%)
1	Sex				
	F	158	45.5	140	40
	M	188	54.2	210	60
	Ambiguous genitalia	1	0.3	0	0
2	<b>Residence</b>				
	Urban	155	44.7	126	36
	Rural	192	55.3	224	64
3	<b>Body weight</b>				
	< 3rd centile	127	36.6	145	41.4
	3rd – 10th centile	6	1.7	77	22
	> 10th centile	316	91.1	128	36.6
4	<b>Vaccination</b>				
	Full according to age	25	7.2	27	7.7
	Partially vaccinated	6	1.7	11	3.1
	Not vaccinated	316	91.1	312	89.1
5	<b>Type of labour</b>				
	Vaginal	229	66	223	63.7
	C-section	118	34	127	36.3
6	<b>Socioeconomic status</b>				
	Low	113	23.7	226	64.6
	Middle	212	61	76	21.7
	High	22	6.3	48	13.7
		347	100%	350	100%

**Table 4. Frequency of distribution of cause of death according to age in the time of death during the years 2010 & 2011**

No.	Cause of death	2010			2011		
		Neonatal death frequency %	post neonatal death frequency %	Total freq-%	Neonatal death frequency %	post neonatal death frequency %	Total freq-%
1	Prematurity & RDS	116(40)	0	33.4	139(47)	0	39.7
2	Birth asphyxia& meconium aspiration	67(23)	0	19.3	58(19.7)	0	16.6
3	Congenital anomalies	46(15.9)	21(36.2)	19.3	44(14.9)	14(25.5)	16.6
4	Sepsis	41(14)	8(14)	14	22(7.5)	11(20)	9.4
5	Gastroenteritis	1(0.3)	14(24.6)	4.3	2(0.7)	6(10.9)	2.3
6	CNS infection	2(0.7)	5(8.8)	2	2(0.7)	4(7.3)	1.7
7	Pneumonia	9(3)	6(10.5)	4.3	17(5.8)	12(21.8)	8.3
8	Pneumothorax	3(1)	0	0.9	2(0.6)	0	0.63

**Table 4 continues ...**

9	Hepatitis	0	0	0	0	1(1.8)	0.23
10	Kernicterus	2(0.7)	0	0.6	3(1)	0	0.8
11	Congenital infection	1(0.3)	0	0.3	0	1(1.8)	0.28
12	Hydrops	1(0.3)	0	0.3	0	0	0
13	Malignancy	0	1(1.8)	0.3	0	2(3.6)	0.63
14	Bronchiolitis	0	1(1.8)	0.3	0	0	0
15	Kerosine poisoning	0	1(1.8)	0.3	0	0	0
16	Intracranial hemorrhage	1(0.3)	0	0.3	3(1)	1(1.8)	1.4
17	Hypoxic ischemic encephalopathy	0	0	0	1(0.3)	0	0.28
18	Cold injury	0	0	0	1(0.3)	0	0.28
19	Hypoplastic anemia	0	0	0	0	1(1.8)	0.28
20	Diabetic ketoacidosis	0	0	0	0	1(1.8)	0.28
21	Heart failure	0	0	0	0	1(1.8)	0.28
22	Unknown cause	0	0	0	1(0.3)	0	0.28
<b>Total</b>		<b>290(41.88)</b>	<b>57(8.23)</b>			<b>295(40.80)</b>	<b>55(7.61)</b>

#### 4. DISCUSSION

In the developing countries, IMR constitute more than 20% of all deaths [10], about half of these deaths are in the first month after birth (neonatal) and half of these occur in the first week after birth [10]. The infant mortality rate (IMR) is one of the most important indicators of the socioeconomic and of the health status of a community and is considered as an index of differentials in health and socioeconomic condition in a community [10].

Low rates are found in Singapore (2.65/1000 live births), Bermuda (2.46/1000 live births), Sweden (2.74/1000 live births), Japan (2.21/1000 live births), Hong Kong (2.92/1000 live births)(1,11). Moderate rates are recorded in Qatar (6.81/1000 live births), United Arab Emirates (UAE) (11.59/1000 live births), Bahrain (10.2/1000 live births), Malaysia (14.57/1000 live births), While higher rate were recorded in Angola (83.53/1000 live births), Sierra Leone (76.64/1000 live births), Afghanistan (121.63/1000 live births)(1,11).

In Kurdistan/Iraq, IMR was found to be 26/1000 live births & in the south centre it was about 44/1000 live births during the year 2005 [15] & in Iraq it was 36/1000 live births during the year 2009.

IMR in Fallujah is high compared to that of Iraq [13], Kurdistan, south Iraq & Iraq neighbor countries, Iran(41.11/1000 live births), Syria (15.12 deaths/1000 live births), Turkey (23.07 deaths/1000 live births), Jordan (15.83 deaths/1000 live births), Saudi Arabia(15.61 deaths/1000 live births), Kuwait(7.87 deaths/1000 live births)(1,5,6,10).

Our study recorded much higher NMR than PNMR; this is consistent with other studies reported in Korea [2], & Iran [9].

In our study the male IMR (68.7/1000 live births) was higher than female IMR (44.37/1000), this is consistent with another Jordanian study (22.6/1000 live births for males & 20.1/1000 live births for females) [11].

The mortality in 1<sup>st</sup> 4 weeks of age was mostly related to pregnancy & infant, while after 1<sup>st</sup> 4 wks it is related to social & environmental factors [1].

To study the factors & differentials related to infant mortality, the hospital files of patients admitted to the neonatal & children wards & died during the years 2010 & 2011 were collected & the data were analyzed.

The IMR during the 2 years was (49.5/1000 live births & 48.27/1000 live births successively) (Table 1), it is still high compared that of Iraq, Kurdistan & that of the south center, more than 80% of mortality occurred in the neonatal period, male was more than female mortality.

Regarding socioeconomic status of families of the died infants, **61%** of deaths was among the middle socioeconomic group during the year 2010, while in the year 2011, 46.6% of deaths was among the low socioeconomic group, this is consistent with the situation in other Arab countries [13].

About 91% of infants died during the year 2010 have normal body weight while most of those died during the year 2011 (41.4%) were below the 3<sup>rd</sup> centile. Most of the infant died during the 2 years were not vaccinated (91.1% & 89.1% respectively).

Concerning the cause of death, the 1<sup>st</sup> common cause of death in the neonatal period during the 2 years was prematurity & RDS (40% & 47% successively), and congenital anomalies in the post neonatal period (36.2% & 25.5% successively), this is consistent with other studies in Mosul, Iraq [10], rural Areas of Birjand, Iran [14], England & Wales [15] and USA [16].

One newborn died 3 hours after his birth (2011) due to a known cause, he was full term, born with severe shortness of breath, the mother gave history of having previous 11 similar neonatal deaths. Also in the same year, one neonatal death due to prematurity & RDS have a history of 6 previous abortions, another neonatal death due to multiple congenital abnormalities have a history of previous 3 siblings died due to the same cause. A newborn with microcephaly died at the age of 3 days have a history of previous 3 intrauterine deaths in his family, all having different congenital abnormalities. Twin male babies, with Down syndrome & congenital heart disease, died at the age of 7 days, have a history of a previous normal sibling died at the age of few days due to a known cause. In the same year, there was also a female infant with Down syndrome died at the age of 3 months have a history of older sibling died with multiple congenital anomalies. There was history of 1 previous death also in an infant died with Renal Tubular Acidosis & 4 previous deaths in another infant died due to congenital CMV infection. In 2010, only 6 of our patients have history of previous infant deaths, one of them was a case of Myotonia dystrophica.

In this study & also during the year 2011 there were 23 twins, 1 triplet & 1 quadruplet died, 10 of them were product of IVF pregnancy all were extremely premature.

Regarding maternal history, during the year 2010 there was history of maternal diabetes mellitus in 1 neonatal death. While during 2011, history of gestational hypertension was found in 14 of the 360 infant deaths, there was also 1 case of epilepsy, 1 case of ITP, 1 case of CVA & 1 case of antepartum hemorrhage. Most of the above deaths happened as a result of inadequate facilities for prompt diagnosis and treatment in the neonatal & children wards.

#### **4.1 Limitations of the Study**

The present study didn't represent the actual IMR in Fallujah General Hospital because of lack of documentation of deaths happened as result of violence & accidents. In addition one of the limitations of the study was the lack of accurate diagnosis of the cause of death, especially in congenital anomalies, which was not possible due to inadequate facilities in Fallujah Hospital.

### **5. CONCLUSIONS**

IMR was very high in Fallujah General Hospital during the year 2007 & it didn't show much difference during the years 2008 & 2009, this may reflect the bad social, health and economic services in the city in addition to the security situation during those years.

Most of the infant deaths occurred in the neonatal period which indicates the urgent need to improve the health services in the hospital especially that concerning the neonatal care. Considering the fact that many of the factors, which have a significant relationship to infant mortality, are likely to change; we can prevent many of these deaths by increasing the level of family awareness, enforcing family planning, improving pregnancy care, developing a good referring system, discovering mothers who need special care during and after pregnancy and providing special care for their infants.

#### **CONSENT**

Not applicable.

#### **ETHICAL APPROVAL**

Ethical approval was granted by the scientific committee in Fallujah hospital.

#### **COMPETING INTERESTS**

Authors have declared that no competing interests exist.

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