

Infant mortality rate in Al-Ramadi province from 2000 through 2010, retrospective study

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ABSTRACT

Objectives: To determine the IMR in Al-Ramadi province, the center of Al-Anbar Governorate, Western Iraq, from 2000-2010 with rate comparison of the three different stages of that period. **Methods:** Data collected from the birth and death certificate center in Al-Ramadi province, Western Iraq, included; name, age, sex, residence, date of birth and death, in three different stages (the first stage 2000-2002, the second stage 2003-2007, and the third stage 2008-2010) in a study period from July to December, 2010. The IMRs were analyzed and compared with other studies. **Results:** The IMR of the last 3 years of sanction was 54.3/1000, 55.7/1000 and 50.6/1000 respectively, this rate had been increased in the war and violence period to reach its maximum rate 58.6/1000 in 2006, then decreased to reach its minimum rate 44.5/1000 in 2008. Approximately two-third of deaths occurred during the neonatal period and one third in the post neonatal period. Males had higher IMR than females, and rural residence higher than urban. **Conclusion:** Infant mortality rate is still high in Al-Ramadi province, since the American invasion (2003-2007), when compared with other developing countries. This study found increase of IMR in Al-Ramadi province during that period more than other studied years.

Keywords: Mortality; Rate; Birth; Death Certificate

1. INTRODUCTION

Infant mortality rate is defined as the number of infant deaths (one year of age or younger) per 1000 live births; components of infant mortality rate include neonatal mortality rate (number of deaths in the first 28 days per 1000 live births) and post neonatal mortality rate (num-

ber of deaths at 29 days and over to the end of first year of life per 1000 live births) [1]. From all childhood (0 - 14) mortalities, 70% occur within the first year, 46% within the first month, and 35% within the first week of life [2]. The IMR varies greatly by country and it is highest in developing countries [1].

There is an inverse relationship between the improvement of the economic and social situation and the infant mortality rate. While education is often linked to income, it can also be linked to infant mortality, looking at recent data, parents with no formal education show an infant mortality rate that is twice the normal rate [3].

The method of calculating IMR often varies widely between countries, and is based on how they define a live birth and how many premature infants are born in the country [4,5].

In 2009, the US Center of Disease Control (CDC) issued a report that stated that the American rates of infant mortality were affected by the United States high rate of premature babies compared to European countries [6].

In 1977, and before starting of wars in Iraq, the estimated Iraqi national IMR was 61/1000 [7]. Target program were then implemented since 1980s, despite the Iraq-Iran War (1980-1988), to improve the infant health condition through vaccine coverage, promote breast feeding, reduce diarrheal morbidity as well as improve domestic hygiene [8]. These measures were successful and followed by accelerated decrease in the national IMR from 63/1000 in 1980, to 48.1/1000 in 1985, and 40/1000 in 1990 [9].

Since 1990 many reports recorded in Iraq suggesting significant increase rate in infant morbidity and mortality with deterioration of socioeconomic conditions and survival chance among young children under the effect of war conflicted and comprehensive UN sanction, then slightly decrease between 2000-2003, this decrease due to improvement in economic condition and decrease the effect of sanction after introduction of oil for food program [10].

The United Nation Economic and Social Commission

for Western Asia (ESCWA) reported that almost 3 quarters of the Iraqi population became poor despite the food rationing system, which was established in 1991 and that, the absolute poverty increased from 25% in urban and 33% in rural areas in 1981 to reach 72% in urban areas and 66% in rural areas in 1993 [11]. The world bank estimated (27.2%) of Iraq population living on less than 2\$ per day in 2001 [12]. Such a unique situation and extreme poverty causes the infant mortality in Iraq to increase to an upward trend never reached before (103/1000 in 1998) [13,14]. The increase prevalence of low birth weight recorded in Iraq in the past 3 decades added another factor for the increase of the IMRs [15-17].

The aim of this study is to determine IMR in Al-Ramadi province, the center of Al-Anbar Governorate, Western Iraq, from 2000-2010 and compare the rate through 3 different stages (the first stage 2000-2002, the second stage 2003-2007, and the third stage 2008-2010).

2. METHODOLOGY

This is a retrospective descriptive population record study carried out in Al-Ramadi province, the center of Al-Anbar governorate, Western Iraq.

We studied the effect of sanction, war, and violence on the IMR over 11 years composed of 3 different stages imposed on the country from 2000-2010, and applied in a study period from July to December, 2010.

The first stage was the last three years (2000, 2001 and 2002) of comprehensive UN economic sanction (1991-2003). The second stage from 2003 to 2007, started after the coalition forces occupation of the country, and despite lifting of the sanction in this period, there were successive different wars and increased violence inside most of Iraqi cities leading to loss of security and destruction of most of the health services and facilities. The third stage was from 2008 to 2010 when violence decreased, and health facilities and security improved in most Iraqi cities including Al-Ramadi province.

All information were collected from birth and death certificate center in Al-Ramadi province and statistic unit in Al-Ramadi maternity and children teaching hospital for each year.

Data collected included; name, age, gender, residence and date of birth and death. Other information like education, income and causes of infant deaths were not available in the records, thus excluded from this study.

Deliveries occurred in Al-Ramadi maternity and children teaching hospital (MCTH), health centers and mid-wife deliveries, and all deaths registered in births and deaths certificate center in Al-Ramadi province included in this study. Deliveries and deaths outside Al-Ramadi province were excluded.

Frequency distribution tables and Bar Charts were used to demonstrate the IMR occurring each year and its

association with sex and residence. Chi square was used for statistical analysis, and P-value < 0.05 was considered as significant.

3. RESULTS

During the 11 studied years the total number of live births in Al-Ramadi province was 98307, composed of 49646 females and 48661 males giving a female to male ratio of 1.02:1.

The total number of infant deaths was 5031 composed of 2867 males, and 2164 females, giving a male to female ratio of 1.3:1.

The overall IMR of the 11 years was 51.2/1000 live births, 58.9 for males and 43.5 for females/1000 live births. Their difference was statistically significant (P-value < 0.01).

Table 1 shows the number of infant births, deaths, and IMRs in Al-Ramadi province for each of the 11 studied years. The highest rate was seen in the American invasion and violence period (second stage 2003-2007) when it reached 58.6/1000 in 2006 during the peak of violence. While the lowest rate was seen in the third stages (2008-2010); the stage of improvement of security and health conditions, in which the rate declined to 44.5/1000 in 2008 that was the lowest recorded rate of all the 11 studied years.

Table 2 and **Figure 1**, show the IMR in the both neonatal and post neonatal period during the 11 studied years. Two thirds (67%) of reported deaths during the neonatal period (43% in the early neonatal and 24% in late neonatal periods), and one third (33%) during the post neonatal periods of infancy.

Distribution of IMR among rural and urban residence areas was shown in **Table 3** and **Figure 2**, which demonstrate that 53.5% of the studied dead infants were found

Table 1. Total live birth, total infant death and IMR for each year, 2000-2010 in Al-Ramadi province.

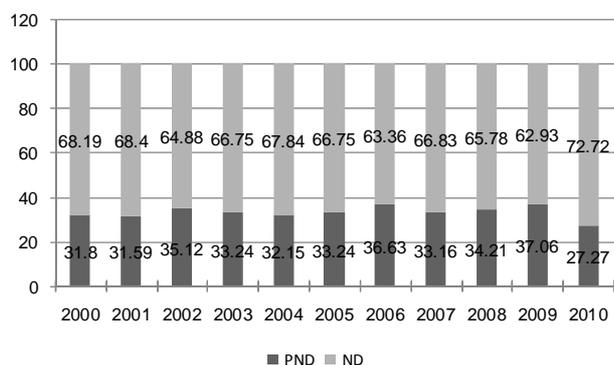
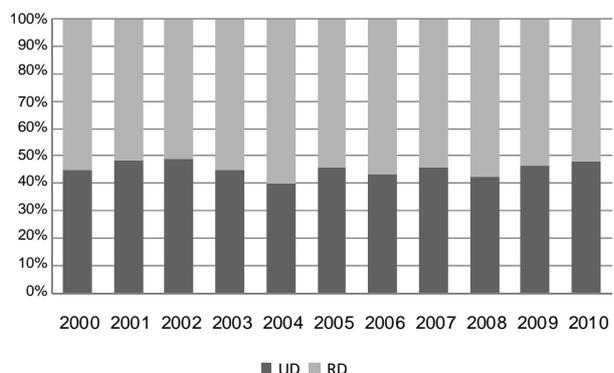
Year	Total live birth	Total infant death	IMR/1000
2000	8243	448	54.3
2001	7689	429	55.7
2002	9180	456	50.6
2003	8666	395	45.5
2004	8180	405	49.5
2005	6711	373	55.5
2006	6735	395	58.6
2007	7213	391	54.2
2008	9589	427	44.5
2009	13,120	633	48.2
2010	12,981	679	52.3
Total	98,307	5031	51.2

Table 2. Neonatal (early and late) and post neonatal death for all included years, 2000-2010.

Infant age	Early neonatal deaths	Late neonatal deaths	Post neonatal deaths
Number	2123	1247	1661
%	43%	24%	33%

Table 3. The effect of residence for all years 2000-2010.

Residency	Total live births	Total infant death	IMR
Urban	55,051 (55%)	2340 (46.5%)	48.6
Rural	43,256 (45%)	(53.5%) 2691	62.2

**Figure 1.** Rates of neonatal death (ND) and post neonatal death (PND) for each year 2000 to 2010.**Figure 2.** Numbers of infant deaths according to residence (urban deaths UD, rural deaths RD), for each year 2000-2010.

in rural (IMR 62.2/1000) and 46.5% of urban residences (IMR 48.6/1000), the difference was statistically significant (P -value < 0.01).

4. DISCUSSION

In most cases, war-affected areas will experience a significant increase in infant mortality rates, some studies provided strong evidence that the Gulf war and trade sanctions caused a threefold increase in mortality among Iraqi children [18,19].

During the first stage (the last three years of sanction)

the IMR in Al-Ramadi province was 54.3/1000 in 2000 and 55.7/1000 in 2001, this high rate of infant mortality could be explained by deterioration of health services and the socioeconomic conditions of population under the effect of comprehensive UN Sanction.

The IMRs of Al-Ramadi province in that years were lower than the national Iraqi IMRs, 62.4/1000 in 2000 and 60/1000 in 2001, most probably because the center and south of Iraq were severely affected by the 1991 post Gulf War uprising, and the health and social services were looted or destroyed during these events when compared with other parts of country. Such uprising did not occur in Al-Ramadi province and other districts of Al-Anbar Governorate.

In 2002 the rate of infant mortality slightly decrease to reach 50.6/1000 due to slight improvement of economic conditions and decrease the effect of sanction after introduction of oil for food program (under Security Council Resolution 986) [20], which provided the humanitarian needs of the Iraqi people.

Following the Gulf War and its 13 associated sanction years, several events, conflicts and incompilance between the Iraqi government and UN members, especially USA and UK, ended finally with another disaster, the invasion and occupation of Iraq in March 2003 by the Coalition Forces Militaries [21].

The invasion despite the lifting of sanction, added a disastrous second destruction of the remaining weak infrastructure and health facilities, causing further loss of health services, resources, and security conditions. This was also the cause of increasing violence and terror in most Iraqi cities including Al-Ramadi city, and the spreading of this violence from one region to another which forced people to either migrate or face life tragedies [22].

The IMR in Al-Ramadi province during the second stage was 45.5/1000 in 2003, increased in 2004 (49.5/1000) and 2005 (55.5/1000) with maximum rate of 58.6/1000 in 2006, and slightly decreased in 2007 to reach 54.2/1000 live births. During this period of violence and war, the health facilities and services became poor in Al-Ramadi province and many doctors and health employers left the province migrating to other safer areas inside or outside the country, where as people stayed in the province were more prone for explosions, malnutrition and difficulties in reaching health centers and hospitals thus the IMR in Al-Ramadi province reached a high rate during that period.

With the beginning of improvement of health and security conditions and decreasing of violence (third stage) the recorded IMR decrease to reach 44.5/1000 in 2008, then increased in 2009 and 2010 to reach 48.2/1000 and 52.3/1000 respectively, this increase of rate during the improvement of health and security conditions was due

to improvement of registration of births and deaths in the province and also the recorded high rate of Perinatal mortality, low birth weight, premature, and births defect associated deliveries in the province in the last years was noticed by many studies [23-25], which added another factors for the increasing of the IMR.

However, the actual IMR may be higher than the reported IMR, because it is possible that deaths were not reported, because families might wish to conceal the death or because neonatal deaths might go without mention [26]. In comparing the IMR of Al-Ramadi province with that of the Iraqi national rate, the national rate shows decreasing pattern from 2000-2010 [27], while that of Al-Ramadi province show fluctuating pattern as illustrating in **Figure 3**. The World Health Organization (WHO) reported that the estimated IMR/1000 live births for both sexes in the year 2000 and the year 2010 in the developing countries as follow: Saudi Arabia (22/1000, 15/1000), Kuwait (10/1000, 10/1000), Qatar (11/1000, 7/1000), Bahrain (11/1000, 9/1000), Syria (20/1000, 14/1000), Lebanon (25/1000, 19/1000), Jordan (25/1000, 18/1000), Iraq (34/1000, 31/1000), Iran (35/1000, 25/1000), Turkey (33/1000, 12/1000), Egypt (37/1000, 19/1000), Bangladesh (63/1000, 38/1000), Algeria (41/1000, 31/1000) [28].

While the national IMR continued decreasing in its rate, as these are hospital based studies, their registration may be less affected during the loss security conditions than population based studies, and also the low birth deliveries, neural tube defect, and perinatal mortalities are related directly to the health of mother during pregnancy, and different than the IMR which is more related and affected by post neonatal environment and security conditions.

However, a marked decline in infant mortality rates was reported in all Arab countries from 1990 to 2009. The decline in infant mortality rates ranged from 10.2% to 66.7%. A sharp decline in rates was especially seen in the member countries of the Gulf Cooperation Council (GCC), Tunisia, Egypt and Jordan [3]....

For all included years (2000-2010), IMR of Al-Ramadi province (51.2/1000 live births) was higher than IMR of Haditha province (38.9/1000 live births) for the same period [29] most probably because of registration in the births and deaths in Al-Ramadi province still

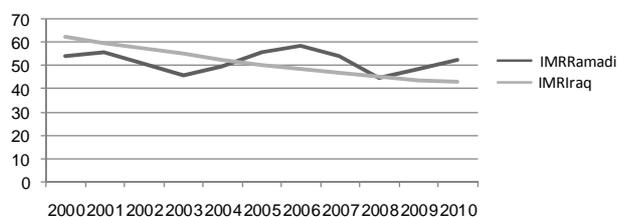


Figure 3. The IMR of Al-Ramadi province and the IMR of Iraq.

working during the period of war and violence, and could be the registration of data in center of governorate more than other cities. In addition to improvement of registrations, many reasons may be behind the elevation of IMR in 2009, 2010 in Al-Ramadi, these may be due to the low availability of equipments and efficacy medications for the sake of early diagnosis and detection, mismanagement due to lack of facilities necessary for fetal management, and trained personnel's leading to medical malpractice Organic Maternal causes with stressful life that may lead to restricted fetal growth and other morbidities which determined by low pregnancy body mass index, low gestational weight gain, the same findings noticed by other studies [24]. The appearance of incidences of congenital anomalies was recorded mostly at that period as a complication of war. Moreover, Al-Ramadi at that time, still safety unsecured compared with other areas of Iraq a little bite safer, because of terrorism groups (hot region) may lead the global health care professionals not to visit Al-Ramadi and provide their essential health services. All these events may lead to increase of IMR at that period.

In this study the mortality in neonatal period show increase rate when compared with post neonatal period which was consistent with Iraqi [27] and Brazilian studies [30]. It was seen that the first month of life was associated with problems related to infant and pregnancy such as preterm delivery, low birth weight and birth defect, while after the first month of life was greatly associated with social and environmental factors such as infection and access to health care facilities [31].

This study showed that IMR is significantly higher in males than females which was consistent with other studies [18,19]. In the present study, there were a male infants had higher mortality than female infants, this observation was consistent with observation of other studies in developing countries, particularly Asia of an imbalance in the sex ratio in infant mortality favoring males led researchers to hypothesize that environmental factors have encountered. It was also reported that male infant fatality rate higher than female infant, and this may attributed to many etiological factors like sepsis, G6PD deficiency, and x-linked disorders which were more prevalent in male gender. In a study was done in Al-Ramadi from 2010-2011, which showed that the number of Congenital Anomalies (CAs) was found significantly more in males than females in total birth and live birth deliveries [32]. Surprisingly, the rise of IMR may be related to the social trend of this tribal populated area to pay more attention and care for boys rather than girls, this may lead to over estimation of male gender. Moreover, boys were found to be 60% to be born prematurely and suffer from pre-term birth condition such as neonatal respiratory distress syndrome [33].

We record higher IMR among infants from rural areas than urban areas, this was in agreement with other studies [18,19,30]. This is expected since poverty, poor health services and facilities are more common in rural than urban areas [34].

In conclusion: the study limited by the fact that it did not record the causes of infant deaths which will clarify whether deaths were due to malnutrition and medical diseases of sanction, or the trauma or injuries of wars or both.

Whereas, Iraq still has a high IMR comparing with other developing countries, due to deterioration of socioeconomic circumstances and survival chance among young children under the effect of war conflicts and American invasion.

However, there is an increase in neonatal mortality rate more than post neonatal mortality rate and increase in early mortality rate more than late mortality rate, probably due to poor antenatal care, increase rate of premature deliveries, and absence of modern facilities in the neonatal care unit.

In addition to a significant association between IMR and Rural residence, and an association between IMR and Male gender.

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