

Neonatal mortality rate in Al-ramadi province from Period (2003 to 2013), Retrospective study

Mohammed M. Hunnosh*

Maher M. H. ALAkori**

Mohamed M. Al-Ani***

MBChB , FICSM

MBChB, DCH, FICSM (ped.)

CABP

Abstract:

Background: neonatal period is the most vulnerable and high risk time in the life because of the highest mortality incidence in human life during this period. Neonatal mortality rate is defined as the number of deaths twenty seven completed days of live per 1000 live births.

Objectives: To determine the neonatal mortality rate (NMR) in Al-Ramadi province, the center of Al-Anbar Governorate, Western Iraq, from 2003-2013 with rate comparison of the two different stages of that period.

Methods: Data were collected from the births and deaths certificate center in Al- Ramadi province, Western Iraq, included; age, sex, address ,date of birth and cause of death. Data collected in two different periods, the first period from 2003- 2007 and the second period from 2008- 2013. The neonatal mortality rates (NMRs) were analyzed and compared with other studies.

Results: The neonatal mortality rate (NMR) of the first period was 34.5/1000 and neonatal mortality rates NMR of the second period was 24.3/1000. During the 11 studied years the higher rate of neonatal mortality was in 2006 (36.8/1000) and lower rate in 2012 (21.3/1000). Approximately two-third of neonatal deaths occurred during the early neonatal period and one third in the late neonatal period. Males had higher neonatal rate (NMR) than females, and rural residence higher than urban.

Conclusions: Al-Ramadi province had high neonatal mortality rate comparing with national Iraqi neonatal mortality rate (NMR) ,due to deterioration of socioeconomic and security conditions. There was significant association between NMR and residency and significant association between NMR and gender.

Key words: Neonatal mortality, early neonatal mortality rate, late neonatal mortality late.

*JFac Med Baghdad
2017; Vol.59, No .1
Receive Jan. 2017
Accepted Feb 2017*

Introduction:

The neonatal period is defined as less than 28 days of life and may be further subdivided into early (birth to less than 7 days), and late neonatal periods (7 days to less than 28 days), and it is the most vulnerable and high-risk time in life because of the highest mortality and morbidity incidence in human life during this period(1). The neonatal mortality rate (NMR), defined as the number of deaths in the first 27 completed days of life per 1000 live births. The NMR is further subdivided into early neonatal mortality rate (ENMR);defined as the number of neonatal deaths during the first seven days of life per1000 live births and late neonatal mortality rate (LNMR);defined as the number of neonatal deaths between day seven and day 28 of life per 1000 live births (2). The neonatal mortality rate (NMR) represents an important indicator of a country's wellbeing, given its relation with different factors, such as maternal health, quality and access to medical services, socioeconomic condition and public health policies. It is estimated that effective implementation and high coverage of interventions could

prevent up to 70% of neonatal deaths globally (6).The method of calculating NMR often varies widely between countries, and is based on how they define a live birth and how many premature neonates are born in the country, there is evidence of differential reporting of live births versus fetal deaths or stillbirths among countries(7,8). The reporting of vital events in the United States is more complete than in many countries, including developed countries. This situation in part explains the larger proportion of LBW/preterm infants in the United States than in other countries. Increases in recorded preterm live births, especially of the most immature infants (<500 g body weight) in the United States, result in increased neonatal mortality rate(9).In many Western societies the death of a child is a rare event, mostly occurring in hospital, and usually in an intensive care setting(10). Causes of death in the neonatal period in the developing world are poorly measured also, though major components are believed to be birth asphyxia, severe infections, complications of prematurity and tetanus (11). The rate of neonatal mortality is known to be affected by various factors such as maternal characteristics, child and birth characteristics, socio-demographic characteristics of the household, mothers and other caregivers health care seeking

*Dept. of Pediatric, College of Medicine/ Anbar University
kifahalani@yahoo.com

**Central Pediatric Hospital/ Al Karkh Sector/ MOH

***Dept. of Pediatric, College of Medicine/ Anbar University.

behaviors (13). From all childhood (0-14 years) mortalities, 70% occur within the first year, 46% within the first month, and 35% within the first week of life (3). It is estimated that approximately 4 million deaths occur annually in developing countries three quarters of these deaths occur in the first week, and the first day of life represents the highest risk (14,15). Deaths in neonatal period in Iraq account for more than half of under-five children deaths, highlighting urgent need to introduce health interventions to improve essential neonatal care & effective treatment for neonatal conditions. (16) The main direct causes for the neonatal deaths are pregnancy-related complications (e.g., complications of prematurity, congenital anomalies), delivery-related complications (e.g., asphyxia, birth injury) and infectious diseases (14). Global causes of neonatal death; preterm birth 27% , severe infections (mainly sepsis and pneumonia) 26%, asphyxia 23% , congenital anomalies 7%, tetanus 7%, diarrhoeal diseases 3% and other 7% (17). Live born infants delivered before 37 week from the 1st day of the last menstrual period are termed premature, and neonate with birth weight of 2500 g or less termed low birth weight (LBW). Prematurity and LBW are associated with increased neonatal morbidity and mortality (18) . A strong positive correlation exists between both preterm birth and LBW and low socioeconomic status. Families of low socioeconomic status have higher rates of maternal under nutrition, anemia, and illness; inadequate prenatal care; drug misuse; obstetric complications; and maternal histories of reproductive inefficiency (abortions, stillbirths, premature or LBW infants) (19) . The etiology of preterm include maternal diseases such as severe preeclampsia requiring elective delivery, premature rupture of membranes, uterine abnormalities, placental bleeding (abruptio, previa), multiple-fetus gestation, drug misuse, maternal chronic illnesses, fetal distress, and infection (20). The association between birth weight and mortality is among the strongest in epidemiology. Babies weighing less than 1,500g have a mortality risk at least 100- fold higher than babies at the optimum weight (the weight associated with the lowest mortality) (22). Babies with a low birth weight are also at higher risk of long term cognitive and motor impairments . Therefore birth weight is used as a very strong indicator to predict an individual baby's intact survival. The proportion of babies with a birth weight < 2500g is also used very widely as an indicator for assessing the population at risk, and historical series exist for many countries (23). The most important underlying cause of neonatal mortality and morbidity is low birth weight (LBW) . Forty to 80% of neonatal deaths occur among LBW babies (24). The increased prevalence of low birth weight recorded in Iraq in the past 3 decades added an important factor for the increase of the NMR in this country (25,26,27). Around 1% of neonates have a major congenital anomaly. Birth asphyxia is defined by the

World Health Organization as the failure to initiate and sustain breathing at birth (28) and accounts for 23% of neonatal mortality (17).

Aim of study:

To determine NMR in Al-Ramadi province, the center of Al-Anbar Governorate, Western Iraq, from 2003 to 2013 and to compare the rate through 2 different periods ,the first period from 2003 - 2007 and the second period from 2008 - 2013.

Methodology:

This study is a retrospective descriptive study and carried out in Al-Ramadi province, the center of Al-Anbar governorate, Western Iraq. All information was collected from births and deaths certificate center in Al- Ramadi province. Data collected included; age, gender, address and date of birth and death. Other information like maternal education, income and causes of neonatal deaths were not available in the records, thus excluded from this study. The age of neonate included in this study from birth to less than 28 days of life, early neonatal period (birth to less than 7 days), and late neonatal periods (7 days to less than 28 days) (1). All deaths registered in births and deaths certificate center in Al-Ramadi province including deliveries that occurred in Al-Ramadi maternity and children teaching hospital (MCTH), health centers that contain delivery room and mid-wife deliveries were included in this study, while deliveries and deaths outside Al- Ramadi province were excluded. Chi square was used for statistical analysis of neonatal mortality rate, and P-value < 0.05 was considered as significant. Bar Charts and Frequency distribution tables were used to demonstrate the NMR occurring each year and its association with address and gender.

Results:

During the 11 years studied period from 2003 through 2013, the total live births was 114507 composed of 56268 males and 58239 females, table (1), with a male/female ratio of 1/1.04, and 51682 (45.2%) rural and 62825 (54.8%) urban residences. The total neonatal deaths was 3148, composed of 1785 males and 1363 females, table (1), with a male to female ratio of 1.3/1 and their difference was statistically significant (P value < 0.01), and of 54% rural and 46% urban residences . The total neonatal deaths was 3148, composed of 1785 males and 1363 females, table (1), with a male to female ratio of 1.3/1 and their difference was statistically significant (P value < 0.01), and of 54% rural and 46% urban residences and their difference was statistically significant (P value < 0.01).

Table (1): yearly live births and neonatal deaths with their gender distribution during the 11 studied years.

year	Births No. %	Male	Female	Deaths No. %	Male	Female
2003	8666 (7.5)	4134	4532	263 (8.3)	145	118
2004	8180 (7.2)	4079	4101	274(8.6)	157	117
2005	6711 (5.8)	3203	3508	246 (8.3)	139	107
2006	6735 (5.9)	3265	3470	248 (7.8)	138	110
2007	7213 (6.3)	3501	3712	258 (8.2)	143	115
2008	9589 (8.4)	4688	4901	277 (8.8)	156	121
2009	13120(11.5)	6459	6661	397 (12.5)	216	181
2010	12981(11.3)	6381	6600	288 (9.1)	158	130
2011	13560(11.8)	6775	6785	302 (9.6)	170	132
2012	13765(12.1)	6880	6885	294 (9.3)	173	121
2013	13987(12.2)	6903	7084	301 (9.5)	190	111
Total	114507	56268	58239	3148	1785	1363

Table (2) shows the early and late neonatal mortalities and their rates of each of the 11 studied years. The overall early mortality rate was 18.4/1000 and late overall motility rate was 9.1/1000 live births.

Table (2): Yearly neonatal deaths (ND), early neonatal deaths (END), late neonatal deaths (LND), and their early neonatal mortality rate (ENMR) and late neonatal mortality rates (LNMR).

Year	ND	END	LND	ENMR	LNMR
2003	263	176	87	20.3	10
2004	274	179	95	21.8	11.6
2005	246	167	79	24.8	11.8
2006	248	165	83	24.4	12.4
2007	258	168	90	23.2	12.5
2008	277	188	89	19.6	9.2
2009	397	267	130	20	10.2
2010	288	194	94	14.9	7.2
2011	302	207	95	15.2	7
2012	294	194	100	14	7.3
2013	301	200	101	14.2	7.3
Total	3148	2105	1043	18.4	9.1

About two thirds (66.8%) of deaths were during the early neonatal period and one third (33.2%) during the late neonatal period, figure (1).

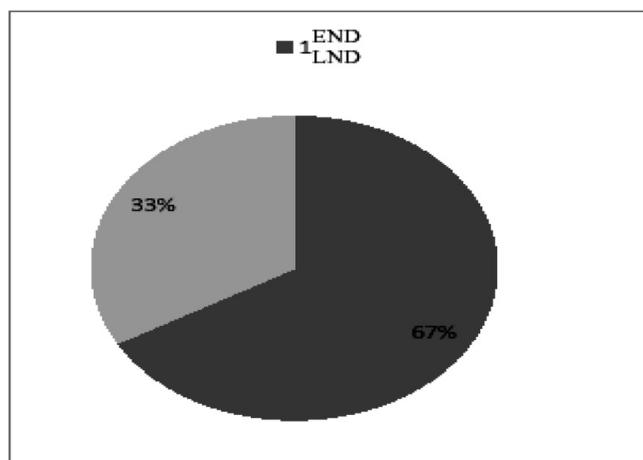


Figure (1): early and late neonatal deaths of the 11 studied years.

Regarding the stages, table (3) compares the live births, neonatal deaths, and residence between the first and second stages of the 11 studied years.

Table (3): live births and neonatal deaths of the first and second stages of the 11 studied years

period	live	Deaths	Rural	Urban
2003-2007	37505	1289	704	585
2008-2013	77002	1859	998	861

Figure (2) compare the NMR of the first and second stages of the 11 studied years. The highest rates of the whole 11 years was recorded in the first stage in 2006 (36.8/1000) and then declined to reach lowest rate which was in second stage in 2012 (21.3/1000).

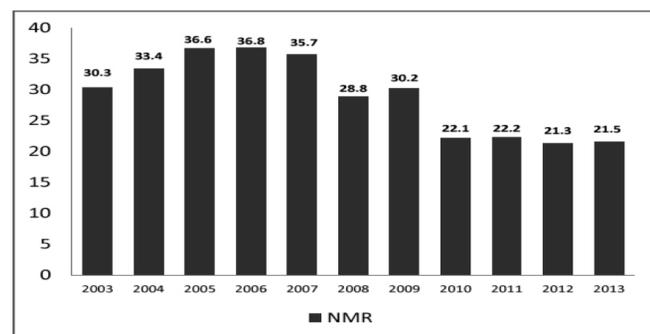


Figure (2): Neonatal mortality rates of the first and second stages of the 11 studied years

Discussion:

Neonatal mortality accounts for a large proportion of child deaths in many countries, especially in low-income settings, mortality during neonatal period is considered a good indicator of both maternal and newborn health and care⁽⁴¹⁾. In this study the neonatal mortality rate during the first period of the study period (2003-2007), the period of war and violence was 34.4 /1000 live births which was higher than the NMR in Al-Ramadi province during the second period, the period of decrease war confliction and improvement of security condition (2008-2013), which was 24.3/ 1000 live births, most probably because of after the invasion of Iraq by the Coalition forces militaries by 2003 and despite the lifting of sanction, the invasion added a disastrous 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 province, and the spreading of this violence from one region to another which forced people to either migrate or face life tragedies (30), lead to increase NMR in Al-Ramadi province during the first stage of the 11 studied years, the stage of violence and confliction (2003-2007). During the period of violence and confliction (2003-2007), 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 NMR in Al-Ramadi province reached a high rate during that period. Moreover, Al- Ramadi province at that time, still safety unsecured compared with other areas of Iraq because of terrorism groups (hot region) which made the global health care professionals unable to visit Al-Ramadi province and provide their essential health services. All might be the cause of increment of NMRs during the first stage (2003-2007). The decreasing in the NMRs in Al-Ramadi province during the second stage (2008 -2013),was due to decrease of violence and confliction and improvement of security conditions when the tribes and security forces united against terrorist and were able to impose security in the region and reconstruction of infrastructure, health centers and hospitals and improvement of social and economic conditions and most people return their homes, all these lead to improvement of health condition and most doctors and medical staff return to work and people had an easy access to health centers and hospitals. During the 11 studied years the highest mortality was seen in 2006 when it reached 36.8/ 1000 , most probably because of the peak of violence and confliction during that year ,while the lowest rate was in 2012 (21.3/1000),most probably because of the stability of security condition and improvement of economic state reach its peak during that year. In this study the total NMR in Al-Ramadi province in the 11 studied years (2003-2013) was 27.49/1000 live births which was higher than the national total NMR of Iraq of the same period (20.48/1000) (30) , most probably because of the west of Iraq including

Al-Ramadi province was more affected by war confliction and violence during the first stage (2003-2007),while in the second stage in spite of improvement of health and security conditions the NMR of Al-Ramadi province was still higher than the national NMR 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 (25,26,27) which added another factors for the increasing of the NMR. While the national NMR continued decreasing in its rate(30) , as shown in figure (3), as these are hospital based studies, their registration may be less affected during the loss security conditions and perinatal mortalities are related directly to the health of mother during pregnancy, and different than the NMR which is more related and affected by post neonatal environment and security conditions. However, the actual NMR may be higher than the reported NMR, 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(31). The neonatal mortality rates of Al-Ramadi province during the 11 studied years were in fluctuating pattern with higher rate in 2006 (36.8/1000) and lower in 2012 (21.3/1000 live births),the difference between the national NMRs of Iraq and NMRs of Al-Ramadi province during the 11 studied years was shown in figure(4).

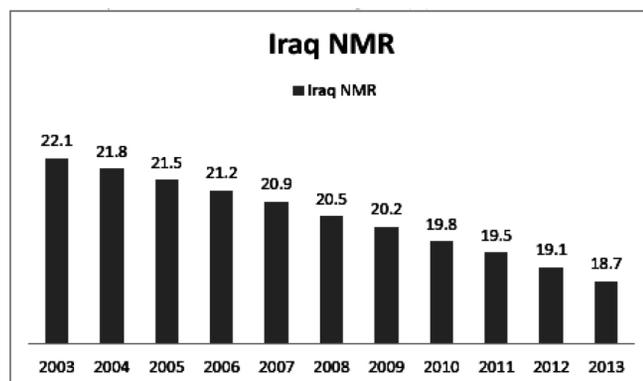
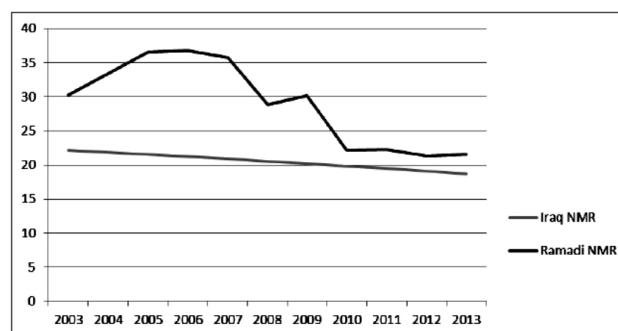


Figure (3) the national Iraqi NMRs from 2003 through 2013⁽⁴⁵⁾.



Figure(4) the difference between NMRs of Al-Ramadi province and of Iraq⁽¹⁴⁾.

From 2007 through 2009, the NMR of Al-Ramadi province (31.5/1000 live birth) was lower than NMR of Falluga city (57.3/1000 live births) (30), most probably because of Falluga city was more affected by war and violence. Recent reports have drawn attention to increases in congenital birth anomalies and cancer in Fallujah Iraq blamed on teratogenic, genetic and genomic stress thought to result from depleted Uranium contamination following the battles in the town in 2004(31).

Conclusions:

Al-Ramadi province had high neonatal mortality comparing with national Iraqi NMR, due to deterioration of socioeconomic circumstances and security conditions, especially during the period of war and violence. There was significant association between NMR and residency with higher rate of neonatal mortality among rural than urban areas with significant association between NMR between NMR and gender with higher rate among male sex.

Authors contributions:

Mohammed Mosleh Hannosh: acquisition of cases collection
Maher Mohammed Hassan: acquisition of data analysis
Mohammed Mahir Al-Ani: acquisition of statistics.

References:

- 1- Stanton, B. and Behrman, R.E. *The field of pediatrics, history of infant and child health*. In: Behrman, R.E., Kliegman, R.M. and Jenson, H.B., Eds., *Nelson Textbook of Pediatrics*(2008); 18th Edition, Saunders Company, Philadelphia.
- 2- World Health Organization *The World Health Report, Health systems: Improving performance*. World Health Organization, Geneva, Switzerland (2011) (<http://www.who.int/healthinfo/morttables>)
- 3- Logan, S. *Epidemiology of child health*. In: Logan S., McIntosh, N., Helms, P. and Smyth, R., Eds., *Forfar and Arneill's Textbook of Pediatrics*(2003); 6th Edition, Churchill Livingstone, Oxford.
- 4- Levy BS, Sidel VW. *Adverse health consequences of the Iraq War*. *Lancet* (2013) ;381: 949–958.
- 5- Martines J, Paul V, Bhutta ZA, Koblinsky M, Saucet A, Walker N. *Neonatal survival: a call for action*. *Lancet* 2005; 365: 1189-97.
- 6- J. E. Lawn, S. Cousens, Z. A. Bhutta. *Why are 4 million newborn babies dying each year?* *The Lancet* (2004); vol. 364, no. 9432, pp. 399–401.
- 7- Joseph KS, Liu S, Rouleau J, Lisonkova S, Hutcheon JA. *Influence of definition based versus pragmatic birth registration on international comparisons of perinatal and infant mortality: population based retrospective study*. *BMJ* (2014) ;344: e746 doi:10.1136/bmj.e746.
- 8- Alice Chen, Emily Oster, Heidi Williams. *Why is infant mortality higher in the US than in Europe*. *American Economic Journal* August 12, 2015
- 9- Mohangoo AD, Buitendijk SE, Szamotulska K, Chalmers J, Irgens LM. *Gestational age patterns of fetal and neonatal*

mortality in Europe: results from the Euro-Peristat project. *PloS one* (2011);6(11): e24727. doi: 10.1371/journal.pone.0024727

10- Kenneth Hill, Yoonjoung Choi. *Neonatal mortality in the developing world*. *demographic-research* (2006) ;volume 14, article18, page 429-452 published 23 may <http://www.demographic-research.org>

11- Victor Y.H. Yu. *Global, Regional and National Perinatal and Neonatal Mortality*. *Turkish Journal of Perinatology* (2003) Vol: 11, Number: 3- 4/September-December

12- Golenerg RL, jobe AH. *Prospects for research in reproductive health and birth outcomes*. *JAMA* (2001) 285:633-639.

13- J. E. Lawn, S. Cousens, and J. Zupan. *4 Million neonatal deaths: when? Where? Why?*. *The Lancet* (2005) ;vol. 365, no. 9462, pp. 891–900, 2005.

14- Zupan J, Aahman E. *Perinatal mortality for the year 2000: estimates developed by WHO*. Geneva: World Health Organization; 2005.

15- Awqati NA, Ali MM, Alak M. *Causes & differentials of childhood mortality in Iraq*. *BMC pediatrics*(2009); June 22; 9 (1): 40.

16- Joy E Lawn, Katarzyna Wilczynska-Ketende and Simon N Cousens. *Estimating the causes of 4 million neonatal deaths in the year 2000*. *International Journal of Epidemiology* (2006);35:706–718

17- World Health Organization. *Preterm birth fact sheet*. WHO, Geneva, Switzerland 2012 (<http://www.who.int/mediacentre/factsheets/fs363/en/>).

18- Bhutta, Z.A., S. Cabral, C.W. Chan, and W.J. Keenan. *Reducing Maternal, Newborn, and Infant Mortality Globally: An Integrated Action Agenda*. *International Journal of Gynecology and Obstetrics* (2012);119(Suppl 1): S13-17.

19- Simmons LE, Rubens CE, Darmstadt GL, Gravett MG. *Preventing preterm birth and neonatal mortality: exploring the epidemiology, causes, and interventions*. *Semin Perinatol* (2010); 34:408–415.

20- Rev. Latino-Am , Rene Mauricio Barria-Pailaquilen, Yessy, et al. *Trends in Infant mortality rate and mortality for neonates born at less than 32 weeks and with very low birth weight*. *Enfermagem Original Article* (2011) July-Aug.;19(4):977-84 .www.eerp.usp.br/rlae

21- Fort, A.L., M.T. Kothari, and N. Abderrahim. *Association between Maternal, Birth and Newborn Characteristics and Neonatal Mortality in Five Asian Countries*. *DHS* (2008) Working Papers No. 55. Calverton, MD, USA: Macro International.

22- Norman JE, Greer IA. *Preterm labor: managing risk in clinical practice*. Cambridge University Press(2011)

23- Bassuni W, Abbag F, Asindi A, Al Barki A, Al Binali A M. *Neonatal deaths in the Asir region of Saudi Arabia experience in a referral neonatal intensive care unit* *Annals of Saudi Medicine* (1997);17(5) :12-14.

24- Abdul Latif BI, Al-Diwan JK, Al-Hadithi TS, Al-Hadi AH. *Low birth weight and prematurity in the neonatal unit of a*

maternity and pediatrics hospital in Iraq. *J Trop Pediatric* (2006);52: 148-150.

25- Said NI. Trend of perinatal mortality (rate and leading causes). *Iraqi Journal of Community Medicine* (2003); 12: 28-30.

26-Al-Hiali, S.J., Al-Ani, Z.R, Al-Kaseer, E. and Al-Ani, E.R. Low birth weight in western Iraq. *The Iraqi Post-graduate Medical Journal* (2010) ; 9, 312-315.

27- Glinianaia SV, Rankin J, Sturgiss SN, .The North of England Survey of Twin and Multiple Pregnancy. *Twin Res Hum Genet*(2013) Feb;16(1):112 6. doi:10.1017/thg.2012.65. Epub 2012 Oct 9.

28- Al-Ani ZR, Al-Hiali SJ, Al-Mashhadani WS. Perinatal mortality rate in Al- Ramadi Maternity and Children's Hospital, western Iraq. *Saudi Med J* (2009); 30: 1296-1300.

29- Al-Ani ZR, Al-Hiali SJ, Al-Mehimdi SM. Neural tube defects among neonates delivered in Al-Ramadi Maternity and Children's Hospital, western Iraq. *Saudi Med J* (2010); 31: 163-169.

30-Samira T. Abdulghani. Infant Mortality Rate from 2007-2009 in Falluja City, Western Iraq. *Iraqi J. Comm. Med., Jan.* (2012) (1)

31-Samira Alaani, Muhammed Tafash, Christopher Busby, et al. Uranium and other contaminants in hair from the parents of children with congenital anomalies in Fallujah, Iraq. *Conflict and Health* (2011); 5:15 doi:10.1186/1752-1505-5-15.