**Challenges to the provision of emergency obstetric care in Iraq**

**Abstract**

**Background:** To assess the availability of, and challenges to the provision of emergency obstetric care in order to raise awareness and assist policy-makers and development partners in making appropriate decisions to help pregnant women in Iraq.

**Methods:** Descriptive and exploratory study based on self-administered questionnaires, an in-depth interview and a Focus Group Discussion. The setting was 19 major hospitals in 8 out of the 18 Governorates and the participants were 31 Iraqi doctors and 1 midwife. The outcome measures were Availability of Emergency Obstetric Care (EOC) in hospitals and challenges to the provision of EOC.

**Results:** Only 26.3% (5/19) of hospitals had been able to provide all the 8 signal functions of Comprehensive Emergency Obstetric Care (CEOC) in the previous three months. All the 19 hospitals provided parenteral antibiotics and uterine evacuation, 94.7% (18/19) were able to provide parenteral oxytocics and perform manual removal of retained placenta, magnesium sulphate for eclampsia was available in 47.4% (9/19) of hospitals, 42.1% (8/19) provided assisted vaginal delivery, 26.5% (5/19) provided blood transfusion and 89.5% (17/19) offered Caesarean section. The identified challenges for health care providers include difficulties travelling to work due to frequent checkpoints and insecurity, high level of insecurity for patients referred or admitted to hospitals, inadequate staffing due mainly to external migration and premature deaths as a result of the war, lack of drugs, supplies and equipment (including blood for transfusion), and falling standards of training and regulation.

**Conclusions:** Most women and their family do not currently have access to comprehensive emergency obstetric care. Health care providers recommend reconstruction and strengthening of all components of the Iraqi health system which can only be achieved if security returns to the country.

**Key words: Emergency Obstetric Care, medical training, Iraq health systemBackground**

The health system in Iraq has been paralysed by decades of wars and embargo – war with Iran from 1980 to 1988, the first Gulf war in 1991, more than 12 years of United Nations (UN) sanctions from 1991 to 2003 and the United States led invasion in March 2003. [1]Damage to the health facilities, restricted access to healthcare facilities that are functioning, violation of medical neutrality by military forces, frequent incidences of kidnap and suicide bombing, external migration of health professionals and lack of drugs, supplies and equipment have all contributed to the rising maternal and infant mortality in Iraq. [2] This paper reports on the current challenges to the provision of emergency obstetric care (EOC).

Iraq has an estimated population of 28,221,180. The Iraqi Ministry of Health provides an overseas the health system. There are 12 beds per 10,000 population and the private sector constitutes a rising minority of all beds and medical visits. [3] In 1998 there were 4.7 doctors and 3.0 nurses per 10,000 population which is less than the regional average ratios of about 10 per 10,000 and 30 per 10, 000 respectively. There are 269 hospitals (public and private), 1570 health centres and 308 health insurance clinics. In 2004, a third (550) of the country’s health facilities were equipped to provide emergency obstetric care. [3, 4] Maternal health care services are free of charge at the point of service in public hospitals but private hospitals charge user fees. [4, 5]

About 80% of deliveries are facility based. However following the collapse of the health system the number of deliveries conducted at home by midwives or relatives has increased. In 2004 WHO estimated that about 65% of births are attended to by skilled birth attendants, 25% of pregnant women attend at least one antenatal visit and contraceptive prevalence rate was 32%. [5] In 2007 WHO estimated Maternal Mortality ratio to be 300 per 100,000 live births.[6] The available skilled manpower in the country is likely to be much lower than it was pre-invasion, and it is likely that many more women are giving birth at home without skilled attendance, fewer will have antenatal care, and these situations may be worse in the rural areas compared to the urban areas.The referral system has also collapsed meaning that women with obstetric complications that need referral are unable to reach facilities that provide EOC and Newborn Care.

Since the 2003 invasion of Iraq little has been published about the health situation despite the appeal from Iraqi doctors to help publish facts about the medical and social conditions. [7] With the collapse of the health system and external migration of senior staff, it is not surprising that there are few published reports on health care and health status. The aim of this study was to assess the availability and challenges to the provision of emergency obstetric care as experienced by health care providers in Iraq in order to raise awareness and assist policy-makers and development partners in making appropriate decisions to address the needs for maternal and newborn health in Iraq.

**Methods**

**Setting**

We included 19 major public hospitals from 8 out of the 18 Governorates of Iraq in this study. The eight Governorates were Baghdad, Karbala, Anbar, Ninawa, Salah Ad Din, Kirkuk, Dyala and Erbil, all from the northern and central regions of Iraq. Figure 1 presents the Map of Iraq showing the Governorates.

[Figure 1]

**Design**

This study is a descriptive and exploratory study involving self-administration of questionnaires by study participants, an in-depth interview and a Focus Group Discussion.

**Participants**

There were 32 participants all from 19 public hospitals. Of the 32 participants, there were 31 doctors and 1 midwife. The doctors were at different stages of postgraduate medical training in Obstetrics and Gynaecology. About 22% (7/31) were senior house officers (SHO), 31% (10/31) had Diploma in Obstetrics and Gynaecology (three year training), 19% (6/31) were Arabic Medical Board (AMB) or Iraqi Medical Board trainees (five year specialist training) and 25% (8/31) had completed their postgraduate training and were AMB or Iraqi Medical Board certified Obstetricians and Gynaecologists

**Data collection**

Data was collected during a four day Life Saving – Emergency Obstetric Care and Newborn Care Course (EOC&NC) organised for Iraqi doctors and midwives in Istanbul Turkey in October 2008. The Royal College of Obstetricians and Gynaecologists (RCOG) and Liverpool School of Tropical Medicine (LSTM) organised the training in collaboration with a UK based charity the Human Relief Foundation (HRF). The training was organised in Turkey because of the level of insecurity in Iraq at that time.

We used this opportunity to collect data from the course participants. We surveyed all 31 doctors who participated in the training via a self-administered questionnaire. The questionnaire had three parts: part 1 (information about the individual participant), part 2 (number and causes of facility-based maternal deaths in the last three months), and part 3 (availability of EOC signal functions). All questions were in English language. Basic and Comprehensive Emergency Obstetric Care (BEOC and CEOC) 8 were defined as shown in Table 1.

[Table 1]

In order to further explore the challenges currently faced by health care providers in Iraq, an in-depth interview was conducted with the only midwife who participated in the course in Turkey. A translator was used to make sure that the questions and replies were well understood. Focus Group Discussion (FGD) was conducted with 9 doctors. The FGD and in depth interview were conducted using a pre-specified topic guide which asked about challenges faced by doctors, midwives, patients, the community, the health system and the training of doctors and midwives in the context of EOC&NC

**Statistical analysis**

We extracted the data from the questionnaires, and entered and analysed data using the Statistical Package for Social Sciences (SPSS) programme (version 16.0, Chicago, IL, USA). We presented the results as absolute values or percentages. The FGD and in-depth interview were recorded, transcribed and analysed using the pre-specified topic guide.

**Results**

**Maternal mortality**

There were a total of 24 maternal deaths in the 19 hospitals over a period of 3 months. Nine hospitals did not record any maternal death, another nine hospitals recorded between 1 and 3 maternal deaths per hospital and one hospital had recorded 13 maternal deaths. The hospital with 13 maternal deaths was a rural hospital with two Senior House Officers working in the maternity, and no specialist Obstetrician Gynaecologist. The hospital has an average of 700 deliveries per month and there were 20 Caesarean sections in the three months preceding the study. The hospital however is not able to provide any blood transfusion services and lack of blood for transfusion was the commonest reason for referral of patients out to another facility.

The facility-based maternal mortality rate was estimated as 151 per 100,000 women (24/15900). The causes of the 24 maternal deaths reported were obstetric haemorrhage 29% (7/24), eclampsia 25% (7/24), obstructed labour 16.7% (4/24), complications of unsafe abortion 12.5% (3/24), pulmonary embolism 8.3% (2/24) and complications of anaesthesia 8.3% (2/24).

**Availability of Emergency Obstetric Care**

Only 26.3% (5/19) of hospitals had been able to provide all 8 signal functions of a CEOC facility in the previous three months. In the three months preceding the study, all the 19 hospitals provided parenteral antibiotics and uterine evacuation, 94.7% (18/19) provided parenteral oxytocics and manual removal of retained placenta, 47.4% (9/19) offered magnesium sulphate for eclampsia and severe pre-eclampsia, 42.1% (8/19) provided assisted vaginal delivery, 26.5% (5/19) provided blood transfusion and 89.5% (17/19) offered Caesarean section. [Table 2]

One hospital, which has an adequate number of qualified maternity staff, provides only out-patient antenatal care because frequent armed robbery attacks have made it very unsafe to admit women and conduct deliveries. Two hospitals can no longer operate at night because there are inadequate numbers of nurses and midwives able to remain on site to provide 24 hours maternity cover.

All participants apart from the midwife could perform a Caesarean Section but 9.7% (3/31) of doctors had not performed Caesarean Section in the preceding 3 months. Despite these difficulties a total of 472 Caesarean sections and 145 assisted vaginal deliveries for breech presentation were performed by 28 participants in the 3 months preceding the survey.

**Challenges to providing emergency obstetric care in Iraq**

The FGD was found to be a good method for exploring the challenges faced by HCP. A summary is provided below arranged by key thematic area.

**Difficulties faced by the woman and her family**

The checkpoints sometimes close at 6 pm so it is very common for pregnant patients near term (especially primigravida) to come to stay in the hospital at night in case they go into labour. They then leave in the morning and return to hospital in the evening. This can go on for up to a month or two before delivery. As a result there can be significant overcrowding on the labour ward. There is a curfew at midnight, and so it is impossible for patients to get to the hospital at night, even if a woman is in labour or needs emergency care (for example due to haemorrhage) or in labour. There is a real risk of being shot if they travel at night. An example was given where a woman in labour travelling at night with her husband were both shot. The only method of getting to the hospital would be a police escort, but even this is not a guaranteed, available or safe method of travel.

*“The checkpoints in our city close at 6pm so any patients who suspect that there might be a problem at night has to come and stay in the hospital for 1 month, 2 month, in order to avoid danger of calling the police at night…. At night no one goes outside; anyone who goes outside risks being be shot even if he or she is sick or in labour or bleeding”*

The inability to travel at night has meant that patients prefer and are increasingly requesting an elective Caesarean Section. The doctors recognise that the elective Caesarean Sections has increased since the war.

*“Many of the patients will undergo Caesarean Section just because they are term or near term. Most do not feel able to wait for the onset of a normal vaginal delivery because it may occur at night. So they prefer Caesarean section – elective at any time so that they could go to hospital in the morning. One in my area a woman and her husband has been shot because the husband wanted to take her to deliver in the hospital at night”*

Previously the transfer of patients from rural to tertiary hospitals was not a problem. Now many difficulties affect this process. Ambulance drivers have been killed while transferring a patient and patients have died during transfer. Transfer time is prolonged due to the roadblocks and checkpoints. The doctors are reluctant to transfer patients for these reasons, and at night it is virtually impossible to organise a transfer. During the daytime, inter-hospital transfer is possible, but patients and their families are very reluctant to be transferred because of the risk of being killed.

*“In past times we used to refer patients to the hospitals in the city centre at any time, but now this is very difficult for us and we want to manage every case in the peripheral hospital. We can refer in the morning hours and at midday. This is very difficult for some families who don’t want to go from our area to the city centre for fear that they might be killed, this is especially so among male relatives”*

Health care providers reported that the war has had a huge effect on the psychological state of their patients. Patients who have become displaced, homeless and living in tents or lost members of their family (husbands, children) face enormous difficulties and clinical depression is common. Doctors also reported seeing more cases of intrauterine fetal death and still birth compared to the period before the war. The reasons for this are thought to include poor monitoring during labour due to inadequate staff, late presentation of patients and reluctance to refer patients due to security concerns. Infertility is widespread due to lack of drugs (e.g. drugs for sexually transmitted infections) and termination of pregnancy is common due to the collapse of the social structure and fear of childbirth.

*“We have an increased rate of intra-uterine foetal death… I am talking 2 years ago… when we saw a woman with intrauterine foetal death, all staff had great interest because it was rare, but now we see at least 3 cases of intrauterine foetal death per day. So it has become very common”*

There was a consistent feeling among participants that some patients in the rural areas are not properly investigated or treated due to the fact that senior specialists are often no longer available in these areas.

**Difficulties faced by health care providers (midwives and doctors)**

**Travel to work**

Some doctors live close to the hospitals others live far away from the hospital and will have to commute daily to work. Road blocks and check points are very common and this has resulted in increased time taken to travel to work. A journey which had previously taken an hour or so can now take up to 3 hours or more.

*“No check points 1 hour, with check points 3 -4 hours, it is not safe and I reach my hospital exhausted and my family anxious and worried about me”*

Doctors and other health care workers face real danger of being killed on the way to work, as most Obstetricians and Gynaecologist doctors are female, their families are very concerned about them travelling to and from work. It is therefore usual practise to pay a driver, especially in rural areas, who also acts as a protector. Many hospital workers have been killed on the way to work. Even whilst at work, their cars may be bombed. All participants in the focus group reported facing these problems.

The area of exception is the very northern part of Iraq, which is more stable with less conflict and road/checkpoints.

The Iraqi Medical Association at the end of 2008 planned to issue new Identity Cards to doctors with a licence to carry a fire arm to protect themselves. Many of the male doctors are familiar with the use of fire arms due to compulsory national service and may already possess and carry them. There is however no plans to train the female doctors in the use of fire arms to protect themselves.

*“They [The Iraqi Medical Association] recommended holding pistols to protect us from the policemen, thieves and kidnappers”*

**Health system challenges**

Public hospitals (providing services free of charge) are preferred by patients. However the standards of care in public hospitals have fallen severely due to inadequate staff and lack of appropriate supplies and equipment. Although public hospitals do not charge user fees, ‘underground’ payment goes directly to health care providers is now common, e.g. “midwives frequently take money from the family after conducting a delivery”. In addition patients in public hospitals frequently have to buy their drugs because the drugs are not available in the hospitals. In areas with better economic status the patients often prefer the private hospitals which charge user fees and have better supplies and equipment, but this situation is restricted to few parts of Iraq, e.g. parts of Bagdad.

Replacement blood transfusion is available in many urban hospitals however due to shortages in reagents for screening, blood transfusion services are not readily available in rural hospitals. This did occasionally happen before the war, but now it is commonplace. There is a shortage of blood products generally and not all blood groups may be available.

*“The reagents are not available in rural hospital in my area, and not all the blood groups are available in our hospitals”*

The general increase in violence also affects the way in which the doctors practice. If relatives are unhappy with the treatment given to their sick relative, they have been known to shoot the provider. The doctors would not be given the opportunity to express themselves and explain the situation fully to the family. As a result there is a reluctance to take on difficult or culturally sensitive cases in the private sector. Some of the doctors mentioned that insecurity was a significant reason not to start a private clinic; Other cultural difficulties faced are highlighted by the following comment.

*“In our city no male doctor will come to our speciality [Obstetrics and Gynaecology] – he will be killed”*

**Remuneration**

Medical training is free in Iraq. Prior to 2003 the average earning for a newly qualified graduate was $2 per month for up to 10 years after qualification. Once qualified more than 10 years, they would expect to earn $5 per month. As a result the majority of doctors come from middle class backgrounds and receive significant financial help and support from their families. The income of senior doctors in the public sector was supplemented by income from private work.

Since the war things have changed. In the 7 to 8 months preceding this study salaries were increased in an effort to retain current doctors and to encourage those who have left to return. Upon graduation a doctor now earns $225 per month with an increase of 10% for every year worked. As a permanent doctor (Senior House Officer with a minimum of 2 years experience post graduation) it is approximately $700-800 per month. A specialist now earns up to $1500 per month.

Doctors reported that one of the problems with this system is that they are not paid according to the number of patients they treat or the number of hours/overtime worked, only on the number of years since graduation. Despite the improved salaries and cost of living for doctors, doctors still need security/protection at work and during travel to work which is costly.

**Training and supervision**

Since February 2006, over 70% of professors (of all medical specialties) have left the country or have been killed. Those specialists with MRCOG and Board qualification have also left; some went to Oman, Libya, Turkey and surrounding countries. Senior doctors were threatened, sent messages not to come to work, and have been killed.

*“Since 2006 about 300 doctors from all specialities have been killed and others have left the country”*

Training has been severely affected by the lack of senior doctors. They no longer have the sub-specialists to treat and investigate patients and provide services such as in-Vitro Fertilisation, Laparoscopy, Oncology or Uro-gynaecology. Therefore the trainee doctors now have less exposure to cases. The environment in which they live and work is not conducive to learning. Whilst at work they are ‘fire fighting’ due to the large number of patients and overcrowding on the labour wards. There is also severe shortage of equipment or materials for training.

**Training needs**

The doctors reported that it is often difficult for them to obtain the necessary papers/visa for entry to the United Kingdom for MRCOG or training and are unhappy about this is, they feel that they are thought of as terrorists.

*“We are like ordinary people”*

They have a lot of laparoscopic equipment that is currently unused as there is no one trained to use them, and no one to train them. They want people to come to Iraq to train them or be able to come to the UK for laparoscopic training.

Other advanced training programmes have suffered e.g. Oncology, Laparoscopy and In Vitro Fertilisation (IVF) due to the lack of senior doctors to train them. There is currently only one IVF centre in Iraq, and after the war all the equipment was stolen. The walls were re-painted but no new set of equipment was bought.

Commenting on the Life saving Skills – Essential Obstetric Care and Newborn care courses offered to participants, one participant said:

*“This 4-day course is equivalent to 4 years of training”*

One suggestion approved unanimously by the group was that they would benefit from assistance from International colleges such as the RCOG in assessing the training of doctors and midwives and make recommendations to the Iraqi Ministry of Health (MOH). It was felt that the Iraqi MOH would listen to an external body for example the RCOG.

Reasons given by participants for limited availability of EOC&NC in Iraq were (a) limited operating hours in some facilities due to insecurity which restricts utilisation and provision of services; (b) insufficient skills for assisted vaginal deliveries, e.g. equipment may be available but are insufficient numbers of experienced people to train staff; (c) lack of some emergency obstetric care equipment; (d) emergency obstetric care drugs and supplies are not regularly supplied to the hospitals, (e) lack of standard guidelines for management of obstetric and newborn emergencies.

One of the biggest factors though, seemed to be the security situation; the consensus was that unless this improves they feel it will be difficult to improve anything.

**Discussion**

In this study we explored the availability and challenges of providing emergency obstetric care in Iraq. We found that most hospitals (73.7%) are not able to provide Comprehensive Emergency Obstetric Care and some hospitals operate only during the day because of frequent attacks of armed robbers at night. The major challenges to the provision of emergency obstetric care include difficulties travelling to work, difficulties faced by women and their families when referred, lack of drugs, equipment and supplies (including blood for transfusion), inadequate staff due to external migration and deaths from the war, falling standards of training and regulation. Most of these challenges have been caused by decades of conflict which have paralysed the economy, social life and the health system.

Globally, the United Nations agencies recommend five priority reproductive health activities in situations of conflict: humanitarian coordination, prevention of and response to sexual violence, minimisation of HIV transmission, reduction of maternal and neonatal death and disability and planning for comprehensive reproductive health services. [5, 9] These activities are being carried out for Iraqi refugees in Jordan, [9] but security concerns have prevented proper implementation of these activities to help internally displaced women and girls in Iraq itself.

The United Nations agencies led by UNFPA had prepared for emergency reproductive health care prior to the invasion of Iraq in 2003. [10] Before the crisis the UN agencies pre-positioned emergency supplies in the region and trained staff on how to use the supplies and incorporate reproductive health care into the initial phase of an emergency response.[10] However, as the crisis prolonged the supplies have dwindled (despite sustained efforts) leaving vulnerable women and girls in the very situation that was foreseen prior to the war.

Due to the insecurity and the collapse of the health system it is difficult to conduct research in Iraq. Therefore there are very few publications in peer-review journals which have been based largely on an individual’s observation, telephone interviews and review of programme reports from humanitarian agencies or reports from Iraqi refugees living in neighbouring countries. [9, 11] Very few studies have been carried out with investigators on the ground in Iraq. [12, 13] We used an innovative approach for data collection by taking into consideration security concerns (i.e. data collection took place outside Iraq) and the need to have data from people who live and practice in Iraq. This study has some limitations, notably the possibility of recall bias and representativeness of the sample. Our data was collected based on participants recalling activities performed in their health facilities. These data were not verified from hospital records. Therefore our figures should be considered as estimates and the degree to which they are valid depends on the recall ability of the participants. A mitigating factor is the fact that there were at least two participants from most hospitals surveyed and we validated the data by comparing data from participants in each hospital. All our participants came from the northern and central regions of Iraq and all participants were provided with escorts (provided by HRF) to travel to and from Turkey. Despite the availability of escorts, the degree of insecurity in southern Iraq did not allow us to invite participants from the south. This suggests that the situation might be even worse in the south. Most doctors working in Obstetrics and Gynaecology are female and it was very unsafe especially for a woman to travel at that time.

 **Conclusion**

We conclude that access to emergency obstetric care in Iraq is very poor since most hospitals currently cannot provide all the eight signal functions of a comprehensive emergency obstetric care facility. The challenges to providing emergency obstetric care are many and include difficulties travelling to work due to frequent checkpoints and insecurity, high level of insecurity to patients referred or admitted to hospitals, inadequate staff due to external migration and premature death, lack of drugs, supplies and equipment (including blood for transfusion), and falling standards of training and regulation. Most women and girls in Iraq do not currently have access to comprehensive emergency obstetric care. The current situation represents a complete collapse of the health system and therefore the ultimate solution will be the reconstruction and strengthening of all components of the Iraqi health system. A prior condition to the establishment of a long lasting solution is security and peace in the country and region.

**Competing interest statement**

All authors declare that we have no competing interest form and therefore have nothing to declare.

**Acknowledgements**

We acknowledge Human Relief Foundation United Kingdom for providing the funding for training the health care personnel from Iraq in Life Saving Skills and Emergency Obstetric and Newborn Care.**References**

1. UNICEF. *Iraqi Health Update: conflict fuels Iraqi health crisis.* [<http://iraq.undg.org/index.cfm?Module=Static&page=w&s=backgroundlogistic>] Accessed on 03 June 2009
2. Medact. *Rehabilitation under fire: health care in Iraq 2003-7*. London: Medact, 2008
3. UNDG, World Bank. ***Health and Health Care System in Iraq****: An Overview and Options for the Future Iraq Health System*. UNDG/World Bank Joint Need Assessment for Iraq Reconstruction. [<http://iraq.undg.org/index.cfm?Module=Static&page=w&s=backgroundlogistic>] Accessed on 03 June 2009
4. Alwan A. ***The current situation. Our vision for the future and areas of work***. Second Edition Iraq Ministry of Health. 2004
5. WHO, Iraq Ministry of Health**. *Vision for the Iraqi Health System****.* Unpublished draft document. April 2004 [Online] Available from [<http://www.emro.who.int/Iraq/moh_vision.htm> ] Accessed on 26 May 2009
6. WHO. ***Maternal mortality in 2005: estimates developed by WHO, UNICEF, UNFPA and the World Bank****.* Geneva, WHO, 2007
7. Al-Araji A. Iraqi doctors appeal for help from doctors in other countries. *BMJ* 2001; 323:53
8. WHO. ***Monitoring emergency obstetric care***. A handbook. Geneva. WHO: 2009
9. Chynoweth SK. The need for priority reproductive health services for displaced Iraq women and girls. *Reproductive Health Matters* 2008; 16(31): 93-102
10. McKenna M.[***Preparing for war in Iraq: making reproductive health care a priority***](http://www.popline.org/docs/195344). *Global HealthLink* 2003; 121: 20-30
11. [Salvage J](http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=Search&Term=%22Salvage%20J%22%5BAuthor%5D&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_DiscoveryPanel.Pubmed_RVAbstractPlus). '***Collateral damage': the impact of war on the health of women and children in Iraq***. *Midwifery* 2007;23(1): 8-12.
12. [Burnham et al., 2006](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6WN9-4N0PG0M-1&_user=6693808&_rdoc=1&_fmt=&_orig=search&_sort=d&view=c&_acct=C000044499&_version=1&_urlVersion=0&_userid=6693808&md5=2416a06a961b75ee9c20400e32fdd9b2#bbib2) G. Burnham, R. Lafta, S. Doucy and L. Roberts, ***Mortality after the 2003 invasion of Iraq: a cross-sectional cluster sample survey***, *Lancet* 2006;**368**:1421–1428.
13. [Roberts et al., 2004](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6WN9-4N0PG0M-1&_user=6693808&_rdoc=1&_fmt=&_orig=search&_sort=d&view=c&_acct=C000044499&_version=1&_urlVersion=0&_userid=6693808&md5=2416a06a961b75ee9c20400e32fdd9b2#bbib11) L. Roberts, R. Lafta, R. Garfield, J. Khudhairi and G. Burnham, ***Mortality before and after the 2003 invasion of Iraq: cluster sample survey***, *Lancet* 2004;**364**:1857–1864.