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PRIMARY HEALTH CARE PROJECT

OPERATIONAL RESEARCH ON

Recording and Reporting of Maternal Deaths in Iraq

October 2012

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SUMMARY

This is a report of an operational research study examining the recording and reporting of maternal deaths by hospitals, forensic medicine units, and the Directorate of Health (DOH) death registry office at the governorate level in Iraq.

The first objective looked at misclassification of maternal death records in hospitals. The review of hospital mortality records for 2011 found 345 hospital deaths occurring among women aged 15-49 years. Of these, initially there were 64 deaths recorded as occurring during pregnancy, and nine cases unclassified. With intensive review of case notes, deaths due to incidental causes during pregnancy but not caused by pregnancy were removed, leaving 44 maternal deaths. On review, the unclassified cases reduced from nine to three, and an additional 13 maternal death cases were found. The final classification was 57 maternal deaths, and three unclassified. This amounts to a misclassification of maternal death by hospitals of 22.8%. In all, using this corrected value, 16.5% of all hospital deaths among women aged 15-49 years were deaths due to maternal causes. In the review process, concerns were raised about the number of surgical procedures carried out among those dying maternal deaths. From the data available, it was not clear if these deaths were complications of the procedures or of underlying conditions. It was also found that 46% of persons with bleeding listed either as a complication or case of death did not receive either Pitocin or Methergin during hospitalization. These two findings alone are strong indications for establishment of an active death review process for hospital deaths, both at the hospital level and through oversight by the Ministry of Health (MOH).

The second objective was to review records of the forensic medicine units and judicial offices in the governorates. This found that 72 maternal deaths had been recorded. The specific causes of the death were missing from 27.8% of records. The majority of these deaths were referred from hospitals, but the specific hospitals were not identified. Of the 1583 deaths that the forensic medicine unit recorded among women aged 15-49 years, 4.6% were due to maternal causes. Few cases of deaths in this age group were recorded by the judicial offices, and their records contained few if any diagnostic details.

This study was carried out in May–June 2012. Data were drawn from two hospitals each in five governorates (Ninawa, Najaf, Anbar, Erbil and Basrah) and four hospitals in Baghdad (two each in Rusafa and Karkh).

The third objective was to determine what proportion of deaths recorded by the hospitals and forensic medicine units were eventually included into the DOH death office records. Except for Anbar, and a few scattered records elsewhere, all maternal deaths recorded by hospitals and forensic medicine units were incorporated into records at the DOH death office. Of concern, however, was the discovery that maternal death records at the DOH office were of poorer quality than those recorded at the hospital for the same patients, with details having been lost in the transfer process.

Recommendations proposed include: 1) to improve record keeping, with measures to capture the maternal deaths more accurately by hospitals and forensic medicine units; 2) to improve hospital procedures and process; and 3) to establish a system of active tracking of maternal deaths to propose measures which would minimize maternal deaths in hospitals and in the community.

The study concluded that the mortality reporting system in Iraq is a very valuable monitoring tool, and measures need to be taken to improve the accuracy and reliability of this system to assess the impact of the ministry's efforts to reduce maternal deaths in Iraq.

INTRODUCTION

The Iraq maternal mortality ratio (MMR) was estimated to be 291/100,000 live births in 1999 according to IMMS.[1] In 2006-2007 the figure was estimated to be 84 per 100,000 by WHO, adjusted to 74 by UNICEF in 2012, and further readjusted to 63 by WHO in 2012.[2,3] A national mortality survey is now being planned by WHO in conjunction with the Iraq MOH. While some doubt surrounds the current MMR number, the Millennium Development Goal (MDG) #5[4] set for Iraq is 29 by the year 2015. **The MOH has undertaken a number of steps to reduce maternal mortality, and it is important to be able to measure the impact of these efforts, rather than depending only on surveys and information from a postponed national census and/or periodic and expensive national surveys.**

In Iraq almost all pregnancies are delivered in health facilities. Further, the national death registration system is capable of capturing mortality from both hospitals and communities, something unique in the region. This system, if functioning well, can be a very accurate measure of changes in maternal mortality nationally in response to the efforts of the MOH. However, the registration system is complex and there are possibilities that not all maternal deaths are captured or correctly classified. There is also the potential for misclassification of maternal deaths at health facilities. These problems must be identified and addressed before the full potential of maternal death registration can be realized in monitoring changes in maternal deaths in Iraq.

To investigate the effectiveness of the existing maternal death recording system, this operational study was carried out in 14 hospitals representing the two parts of Baghdad and five governorates from various geographic regions of Iraq. The study consisted of three research objectives. The *first* was to examine potential misclassification of maternal deaths occurring in the hospitals selected. The *second* objective was to examine the nature of deaths reported from the community directly to the forensic medicine unit and the judicial system that issues death certificates for community deaths. The *third* objective was compare the maternal deaths recorded at the death office of the DOH in the governorate selected against maternal deaths reported from the hospitals and forensic medicine units.

This study was carried out as part of the operational research program of the USAID-funded Primary Health Care Project in Iraq (PHCPI) with valuable contribution and inputs by Dr. Gilbert Burnham, Professor of International Health and Health Systems at the Johns Hopkins University Bloomberg School of Public Health. Official permission was obtained for the conduct of this study.

1 Ministry of Health. Report on the Maternal Mortality Surveillance. Iraq, 2009.

2 UNICEF. State of the World's Children, 2012. http://www.unicef.org/sowc2012/

3 WHO, World Health Statistics, 2012.

4 MDG Goal #5 is to improve maternal health by reducing by three quarters the maternal mortality ratio and achieving universal access to reproductive health. http://www.un.org/millenniumgoals/maternal.shtml

RESEARCH PLANNING

A meeting to refine the MOH PHC research agenda was held on 25 April 2012, attended by interested parties from the MOH and the Ministry of Higher Education and Scientific Re-search (MOHESR). In this meeting it was agreed that the maternal mortality reporting mechanisms from the community and hospitals have a number of potential problem areas that may not allow the health system to fully capture the scale of maternal mortality in Iraq. As a result of very active discussion among a maternal mortality task force, two principal operational research questions identified and refined around the issues of maternal death reporting.

A third research question was then added as the study provided the opportunity to validate the completeness of reporting of maternal deaths to the DOH Death Office. The task force formed in April 2012 helped create the design and the implementation plans for the study set out here.

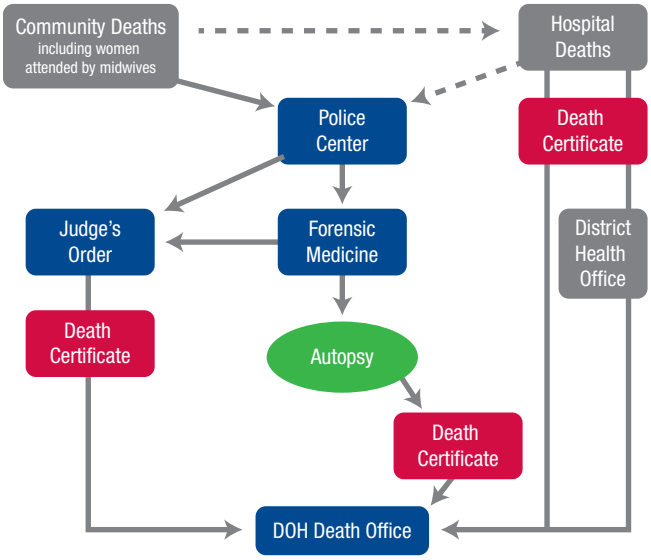
The Deaths Registration System

At the governorate level, death reports from all sources are collected at the death registration office of the DOH, from where they are forwarded to the MOH (Figure 1). Deaths from the community may come to the hospital for issuance of a death certificate if the deceased has been under hospital care for pre-existing conditions, but for maternal deaths in the community, the family will usually come to the police center, and be referred to the forensic medicine unit. The death certificate is issued based on the autopsy findings. The standard procedure is for the hospital to issue death certificates for hospital maternal deaths, unless there is uncertainty about the diagnosis or if for other reasons the hospital would prefer the forensic medicine unit to issue the death certificate. Deaths in hospitals may be reported directly to the DOH death registration office or through the district health office. In some cases the death may be referred to the judicial office, particularly if the family does not want an autopsy. The use of the judicial office for death certificates is becoming less common than in the past.

Study Sites

This study was carried out in May-June 2012, in hospitals in Baghdad (two each in Rusafa and Karkh), and two each in the governorates of Ninawa, Najaf, Anbar, Erbil and Basrah. Of the pairs of hospitals for each governorate, one was a teaching hospital and one was a general hospital. The sample sites were purposively selected as high maternity service hospitals in Baghdad and various geographic regions of Iraq. Half the hospitals selected are teaching hospitals and the other half are general hospitals.

Figure 1. Flow of information on Maternal Deaths



Study Objectives: Operational Research Questions

1. What proportion of deaths, occurring in women 15-49 years old in a representative sample of Iraqi hospitals in 2011, are incorrectly recorded as not maternal deaths?
2. What is the relative proportion of death certificates for maternal deaths reaching the Death Office in the DOH from various sources indicating maternal deaths in 2011? What are the recorded causes of maternal deaths?
3. What proportion of maternal deaths reported at the hospital level reach the DOH death registration office records for forwarding to the Central MOH?

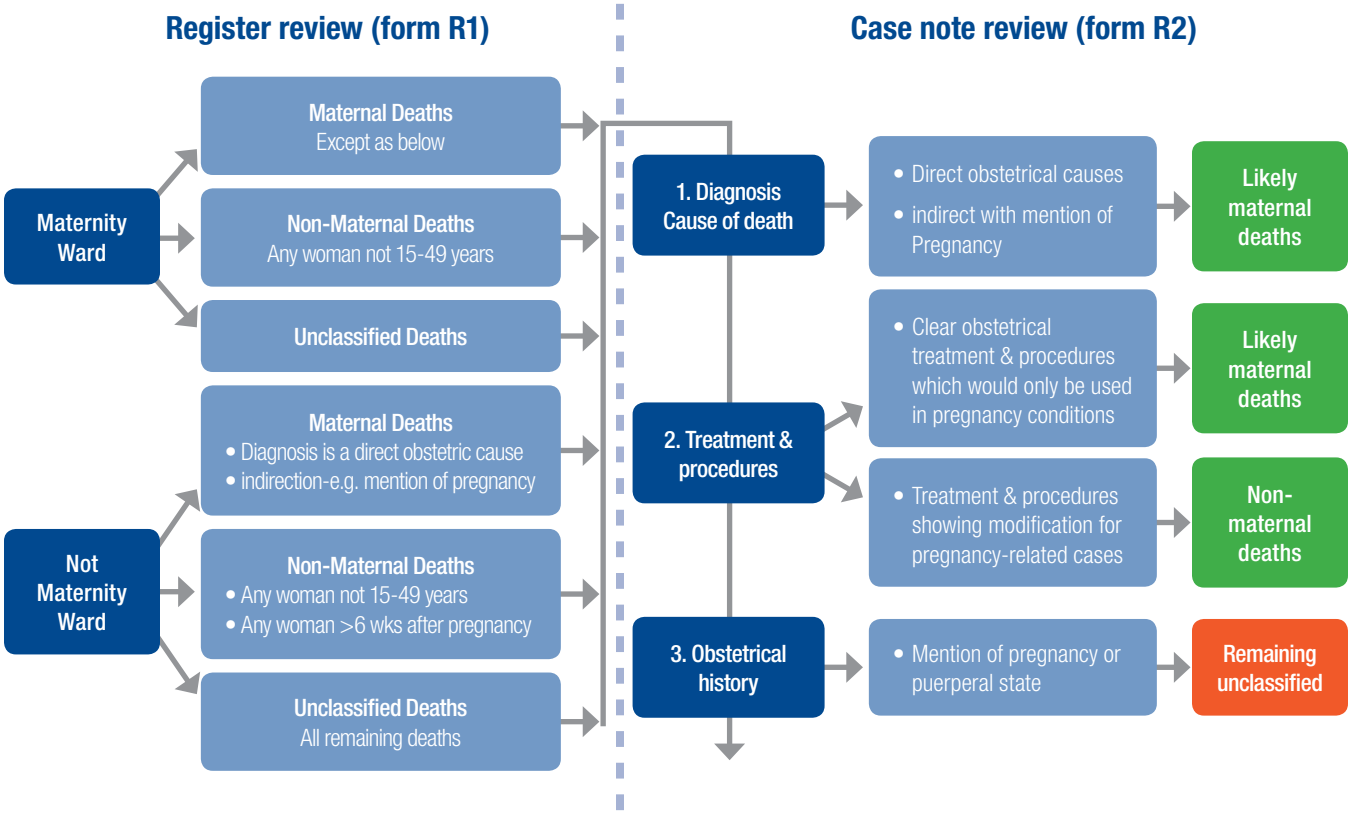
METHODS

Study teams were comprised of specialists in maternal health, statistics and public health. The project conducted training of the research teams. The initial training was for four days and included a pilot test of the forms and the classification methods. Teams worked in groups of four with two supervisors. After completing training in Baghdad the teams dispersed to the various regions of Iraq.

For objective 1, the hospital register was first reviewed to identify deaths of women aged 15-49 years and the R1 (register review) form was used to record findings. Those deaths identified had a detailed review of case notes to determine if those classified as not maternal deaths could in fact, have been misclassified. The review of each of these records and R2 (case notes review) form was used for detailed explorations of records. Where suspected misclassified maternal death cases were found, a detailed assessment of the hospital notes were carried out and group decisions were reached. These methods followed those set out

The study followed the WHO definition of maternal death which is the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes.

Figure 2. Schematic of record review for all deaths among women aged 15-49 years.



5 http://www.immpact-international.org/toolkit/module4/rapid/index.html

in the RAPID assessment process developed by the IMPACT project, and are diagrammed in Figure 2.[5] Names and diagnoses of hospital maternal deaths were recorded to be checked against records at the DOH death registration office.

For objective 2 and 3 the same team reviewed the records of deaths of women aged 15-49 recorded at the forensic medicine units, the judicial offices and the DOH death register in the study governorates. This was done to determine what proportion of all women in this age group was classified as maternal deaths. The teams then examined the DOH death register to determine if the death records from the hospitals, judiciary office and forensic medicine units were all being recorded by the DOH. In the case of the hospitals, a list of the names and diagnoses of deaths had been recorded for comparison with the DOH death registry.

Teams spent on average seven days at hospitals reviewing records, another seven days at the forensic medicine unit, and two days at the DOH death registration office. Paper forms were then returned to Baghdad where data were entered, cleaned and analyzed. Deaths were classified as maternal deaths, not maternal deaths (which include deaths during pregnancy due to other incidental causes), or undetermined.

FINDINGS

Hospital deaths

Among the 14 hospitals, there were 345 deaths recorded among women aged 15-45 years during 2011 (Table 1). From these initial hospital records there were 64 (18.6%) classified by hospitals as having died during pregnancy. In nine (2.6%) cause of death was unclear. Removing incidental and accidental causes of death unrelated to pregnancy, which were identified on record review, left 44 hospital deaths that could be confidently classified as maternal deaths. After a careful review of all the case notes for hospital deaths among all women aged 15-49 years for 2011, (following the flow chart in Figure 2) an additional 13 deaths were re-classified from non-maternal to maternal causes of death, bringing to 57 the hospital deaths classified as maternal deaths.

Table 1. Causes of Maternal deaths, verification of original classifications and following reclassification

Cause(s) of death obtained from death certificate and/or other sources	Recorded as maternal deaths, verified (n=44)		Reclassified as maternal deaths (n=13)		Total labeled as maternal death (n=57)	
	Number	*Percent*	*Number*	*Percent*	*Number*	*Percent*
Not recorded (Missing)	0	0.0	1	7.7	1	1.8
Genital tract injury	4	9.1	0	0.0	4	7.0
APH/Complications of abortion	2	4.5	0	0.0	2	3.5
PPH	14	31.8	0	0.0	14	24.6
Ectopic pregnancy	1	2.3	0	0.0	1	1.8
Eclampsia / pre-eclampsia	4	9.1	0	0.0	4	7.0
Other complications associated with labor	4	9.1	0	0.0	4	7.0
Hypertensive disorders	1	2.3	0	0.0	1	1.8
Diabetic complications	2	4.5	0	0.0	2	3.5
Sepsis/infection	1	2.3	2	15.4	3	5.3
Burns	0	0.0	3	23.1	3	5.3
Bullets / Shells (blast injury)	0	0.0	0	0.0	0	0.0
Thrombosis/Bleeding/Blood disorders	5	11.4	2	15.4	7	12.3
Shock	8	18.2	0	0.0	8	14.0
Pulmonary embolism	4	9.1	0	0.0	4	7.0
Respiratory disease	0	0.0	0	0.0	0	0.0
CVA	4	9.1	3	23.1	7	12.3
Cardiac disease	8	18.2	0	0.0	8	14.0
Tumor/Malignancy	0	0.0	1	7.7	1	1.8
Hepatic conditions	5	11.4	1	7.7	6	10.5
Renal conditions	4	9.1	3	23.1	7	12.3
Abdominal emergency	2	4.5	1	7.7	3	5.3
Other conditions	2	4.5	0	0.0	2	3.5

There were 15 (26.8%) who died on the day of admission, 21 (37.5%) who died the day following admission, 12 (21.4%) who died later in the first week of admission, and finally 8 (14.3%) who died after the first week in hospital. Among those who died on the first day and for whom data are recorded, 8 (53.4%) died within the first two hours. Data for time of death were missing for 15 of the 56 died in hospital with adequate records. Among deaths with age data (7 of 57) deaths 15 (31.9%) were under age 25 years (median 21), 22 (46.8%) were between 25-35 years (median 32) and 10 were aged over 35 (median 39).

This amounts to 22.8% of maternal deaths being missed by the hospital classification system. The majority of the missed maternal deaths were related to incomplete or absent recording of the final diagnosis. After examining the records of the nine deaths among women 15-49 years which were originally recorded as unclassified, there were three deaths which remained for which there was not adequate information to determine a cause of death. Of all deaths, 55% were recorded from teaching hospitals. For maternal deaths, 25 of the 57 or 43.9% occurred in teaching hospitals.

Of the confirmed maternal deaths, 40 (70.2%) women came from urban areas and 16 (28.1%) came from rural areas, similar to the estimated population distribution for Iraq.[6] Maternal deaths occurred before delivery in 11 (19.6%), during delivery in 7 (12.5%), in the post-partum period in 36 (64.3%), and following abortions in 2 (3.5%).

Associated procedures

Table 2 lists the recorded procedures carried out in women with maternal deaths. Various hospital interventions were carried out among women who subsequently died and were classified as maternal deaths. There were 37 procedures recorded in the 57 women, of which 16 were caesarian sections and seven were hysterectomies. Of those for maternal deaths in which a caesarean section was carried out, there were 26 diagnoses listed, of which 15 were non-obstetrical diagnoses such as cardiovascular, renal or hepatic conditions. The same pattern was noted among the nine persons for whom a hysterectomy was carried out (15 diagnoses) and 10 maternal deaths with laparotomies (16 diagnoses). The individual causes responsible for these procedures are not clear from the data, but it does point to the need for a careful death review of all maternal deaths in hospital.

Table 2. Recorded procedures carried out in 57 cases of maternal deaths during hospitalization

	Number	*Percent*
Caesarean section (C/S)	16	28.1
Hysterectomy	7	12.3
Manual removal of placenta	1	1.8
Repair of ruptured uterus or lower GI tract	5	8.8
Removal of retained products/EOU	1	1.8
Dilatation and Curettage	1	1.8
Laparotomy	5	8.8
Others	1	1.8

Table 3. Total number of complications in 57 maternal deaths

	Number	*Percent*
Prolonged labor	5	8.8
Obstructed labor	3	5.3
Ruptured uterus	5	8.8
APH (antepartum hemorrhage)	5	8.8
PPH (postpartum Hemorrhage)	20	35.1
Pre-eclampsia	4	7.0
Eclampsia	4	7.0
Puerperal sepsis	3	5.3
Abnormal fetal presentation	1	1.8
Retained placenta	0	0.0
Retained products	1	1.8
Post-Abortion	2	3.5
Ectopic pregnancy	1	1.8
Thromboembolic events	2	3.5
Sepsis	7	12.3

6 Indexmundi. http://www.indexmundi.com/facts/iraq/rural-population

Complications during labor

Table 3 outlines the 70 complications recorded in the hospital records for the 57 persons with maternal deaths. In some cases these complications were themselves the cause of death, and in others they were contributing factors.

Use of Medications

In other cases data were missing in records. It is interesting to note that when bleeding was present, treatment with both Pitocin and Methargin was the usual practice as prescribed for majority of patients. However in 20 cases (48.7%) of cases with antepartum or postpar-tum/post abortion bleeding listed, neither drug was prescribed (Table 4). From the data available it is hard to judge further on these issues, however there

Table 4. Use of Pitocin and/or Methergin in antepartum or postpartum post-abortion hemorrhage in 41 maternal deaths

	Pitocin only	Methergin only	Pitocin & Methergin	Neither	Total
Bleeding complication recorded					
APH	2 (40%)	0	0	3 (60%)	5
PPH	1 (5%)	0	10 (50%)	9 (45%)	20
Cause of death by death certificate					
APH (5)	1 (50%)	0	0	2 (50%)	2
PPH (20)	1 (7.1%)	0	7 (50%)	6 (42.9%)	14
Totals	**5**	**0**	**17**	**20**	**41**

Table 5. The rate of selected drug usage for specific causes of death in 57 cases of maternal deaths

Cause of death obtained from death certificate and/or other sources	Selected drugs used for the total sample											
	Magnesium Sulphate		Pitocin		Methergin		Hydralazine		Triple antibiotics		Anesthetic drugs	
	#	%	#	%	#	%	#	%	#	%	#	%
Not recorded (Missing)	0	0.0	0	0.0	0	0.0	0	0.0	1	100	0	0.0
Genital tract injury	0	0.0	2	50.0	2	50.0	0	0.0	3	75.0	3	75.0
APH/Complications of abortions	0	0.0	1	50.0	0	0.0	0	0.0	1	50.0	0	0.0
PPH	0	0.0	8	57.1	7	50.0	1	7.1	7	50.0	5	35.7
Ectopic pregnancy	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Eclampsia/Pre-eclampsia	1	25.0	2	50.0	0	0.0	0	0.0	2	50.0	2	50.0
Other complications associated with labor	0	0.0	4	100	2	50.0	0	0.0	4	100	2	50.0
Hypertensive disorders	0	0.0	1	100	0	0.0	0	0.0	1	100	0	0.0
Diabetic complications	0	0.0	1	50.0	0	0.0	0	0.0	2	100	0	0.0
Sepsis/Infection	1	33.3	1	33.3	0	0.0	0	0.0	3	100	1	33.3
Burns	0	0.0	0	0.0	0	0.0	0	0.0	3	100	0	0.0
Bullets/Shells (blast injury)	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Thrombosis/Bleeding/Blood disorders	0	0.0	5	71.4	5	71.4	0	0.0	4	57.1	4	57.1
Shock	0	0.0	7	87.5	6	75.0	0	0.0	7	87.5	3	37.5
Pulmonary embolism	1	25.0	1	25.0	1	25.0	0	0.0	2	50.0	2	50.0
CVA	1	14.3	1	14.3	1	14.3	0	0.0	6	85.7	3	42.9
Cardiac disease	0	0.0	3	37.5	1	12.5	0	0.0	6	75.0	5	62.5
Tumor/Malignancy	0	0.0	0	0.0	0	0.0	0	0.0	1	100	0	0.0
Hepatic conditions	0	0.0	2	33.3	0	0.0	0	0.0	5	83.3	1	16.7
Renal conditions	1	14.3	2	28.6	2	28.6	0	0.0	6	85.7	3	42.9
Abdominal emergency	0	0.0	1	33.3	1	33.3	0	0.0	1	33.3	2	66.7
Other conditions	0	0.0	1	50.0	0	0.0	0	0.0	2	100	2	100

may have been patient management issues involved. Regular death reviews would be an important tool to investigate these at the time of occurrence, and where appropriate, feed this information back into altering patient management practices.

Table 5 lists the key medications prescribed for the 41 women classified as maternal deaths using the WHO criteria and for whom bleeding was noted as a complication or a cause of death in the case notes.

Deaths classified by forensic medicine units and judicial offices

Many deaths occurring in the community received death certificates from the forensic medicine unit or the judicial office. Of the 3,312 deaths among women aged 15-49 years from all causes recorded for 2011 at the DOH death registration office for all study areas, 1686 or 50.9% of reports came from the forensic medicine unit, 1,548 (46.7%) from hospitals, and only 78 (2.4%) from judicial offices. From the judicial offices there were no data on whether these deaths were due to maternal or non-maternal causes.

Table 6. Registered cause of death from forensic medicine units among 72 women classified as maternal deaths

	Number	*Percent*
Not recorded (missing)	20	27.8%
Genital tract injury	15	20.8%
Antepartum hemorrhage/ Complications of abortion	6	8.3%
Postpartum or post abortion hemorrhage	23	31.9%
Ectopic pregnancy	2	2.8%
Eclampsia/Pre-eclampsia	3	4.2%
Other complications associated with labor	16	22.2%
Sepsis/Infection	5	6.9%
Shock	1	1.4%
Pulmonary embolism	3	4.2%
Respiratory disease	2	2.8%
Cardiac disease	5	6.9%
Abdominal emergency	2	2.8%

From the forensic medicine units there were 1583 deaths among women where it could be verified that age was between 15 and 49 years, and that the cause of death was either maternal or non-maternal. In addition there were 42 deaths classified as due to unknown causes and another 61 where the findings were not recorded. Although death from unknown causes is a plausible diagnosis, 3.6% of records being incomplete seem a very high rate. Of the 1583 deaths that could be divided into maternal and non-maternal causes, 4.6% of these were due to maternal causes, and these are listed in the Table 6. Some of these maternal deaths came from the hospitals, but it is not clear whether they were the same hospitals in which maternal deaths records were reviewed by the teams. However when the DOH death registration data is reviewed under objective 3, it seems that these data on causes of maternal deaths occurring in hospital are sent directly on to the DOH office, and not being sent back to the hospitals for inclusion in hospital data.

This is a very important finding as the consequence is an underrepresentation of hospital maternal deaths. However, care would need to be taken to prevent double counting if the data were to appear both from both the forensic units and the hospitals.

Recording of death records by the DOH Death Registration Office

The names of those dying of maternal causes in hospitals visited by the research team were noted at the time of the hospital study and then checked against the deaths recorded by the DOH death office. In all locations except Anbar, the death office in the DOH had captured almost all maternal hospital deaths with just a few missing. In Anbar a larger proportion were missing, and some deaths were included which were not noted in the hospital records. Although almost all maternal hospital deaths in the other governorates were recorded by the DOH death office, the diagnoses and other details were often recorded incompletely, with important details being lost in the transfer and copying of data in the reporting process.

DISCUSSION

The information on maternal deaths in Iraqi hospitals is a very powerful monitoring tool to measure the impact of the MOH's efforts to reduce maternal mortality in Iraq. From a management and programmatic standpoint, a well-functioning death reporting system will be much more useful than a periodic cross-sectional national survey of maternal mortality in Iraq in tracking efforts to reduce maternal deaths. It is in the interest of the MOH to make this reporting system for maternal deaths as complete and effective as possible. This study was undertaken to identify possible problem areas in the collection and recording of maternal death information and to identify improvements needing to be made.

Determining the extent of misclassified maternal deaths in hospital

Of deaths occurring in hospitals among women aged 15-49 years, 64 (18.8%) were deaths during pregnancy and 12.8% met the definition of maternal deaths. The initial examination of the records using the RAPID approach showed that 13 cases (22.8%) of maternal deaths were incorrectly classified in the hospital death records as non-maternal deaths that served as the basis for reporting to the DOH death registration office. With this reclassification, 16.5% of all hospital deaths in the selected hospitals among women ages 15-49 during 2011 were maternal deaths. This misclassification results in an underrepresentation by about a fifth of the true picture of maternal mortality in the study hospitals. At the same time there were some cases incorrectly classified as maternal deaths, whereas in reality, the cause of death was incidental to the pregnancy. It is reasonable to assume that the same problems are present in other hospitals not included in this study. It appears that the majority of these incorrectly reported deaths are related to carelessness in the recording process at the hospital. This difficulty needs to be addressed by the MOH as a matter of priority.

Also of concern is the multi-stage process of transferring data to the MOH from hospitals, and the potential at each step to compound errors, or miss data completely, as was found in several locations in this study. The reporting of death in Iraq would lend itself very well to a web-based computer recording system, provided that the data were entered correctly at the first site. By having a series of options to navigate through in the reporting of maternal deaths in an electronic database, some of the simple errors of incomplete data entry can be prevented.

However there are other concerns that these data uncover, and warrant more detailed analysis. Although the complications listed and the causes of death are what might be expected in maternal deaths, it appears that the majority of maternal deaths also had some surgical procedures carried out during hospitalization and prior to death. The majority of these procedures were caesarian sections. These procedures do not entirely line up with the complications listed and the causes of death specified. This could indicate that further assessment of quality of services provided in obstetrical emergencies should be assessed. Some deaths may have been caused by complications arising during the procedure, but others could be possibly attributed to an underlying co-morbid cause. In any case, these diagnoses associated with maternal deaths point to the need for an active maternal death review process.

Reviewing the use of Pitocin and Methergin in women with bleeding listed as either a complication or a cause of death revealed that 46% of these women had received neither drug during their hospitalization. Without a case-by-case review it is not possible to make conclusions; however, concern should be raised that there may be quality of care issues involved in those untreated with oxytocic drugs. This is a further indication for the need for an active death review process. Another concern is the origin of some of the 72 causes of maternal deaths diagnosed by the forensic medicine units. It appears that at least 49 of these came from hospitals. From the list of causes of death recorded by these units, it is not clear why many of these diagnoses would not have been made in the hospitals themselves. If these were indeed hospital maternal deaths for some reason sent to the forensic medicine unit for diagnosis, the true maternal mortality rates in hospitals would probably be considerably higher than records would show. Further it appears that when the diagnosis is made by the forensic medicine units, the results are not being referred back to the hospitals for inclusion in their records. This could be intentional. Out of these data for the first objective, reviewing the classification of hospital maternal deaths, several recommendations can be made.

Recommendations

1. Ensure more careful entry of data concerning maternal deaths in hospital. Providing some training in appropriate medical terminology for hospitals in the death classifications would be appropriate. This would not be too big a task as most deaths occur in the hospital maternity units.
2. Conduct careful on-going death reviews in hospital for maternal deaths by hospital staff, perhaps with the MOH creating guidelines for these death audits. There are likely qualities of care issues which will be uncovered and which can be addressed at the individual hospitals.
3. Ensure that data about hospital maternal deaths which were diagnosed by forensic medicine units be included as hospital maternal deaths, though efforts would have to be done to ensure double counting does not occur.
4. Monitor and review hospital maternal deaths more closely. This should be done at two levels. The first would be part of a general quality improvement process that includes a robust death review committee process in each hospital as part of a certification/accreditation process. The second could be done by the MOH maternal mortality committee, perhaps through periodic audits of hospitals, using an abbreviated R1/R2 form as done in this study. This might contain a self-study component for the hospitals.
5. Consider long-term conversion to an electronic data system, at least at the hospital level initially.

Maternal deaths reported by forensic medicine units and judicial offices

The forensic medicine units reported that of 1686 women 15-49 years of age, 72 or 4.6% of cases examined were deaths due to maternal causes, where data were complete. However there were 2.5% of cases where the final diagnosis was unknown and 3.6% of cases where the records were incomplete. Of these 72 cases of death due to maternal causes, 49 had been in hospital. Data were not collected by the study team about with which hospital these cases were associated, and it may not have been any hospitals included in this study. It was not clear from the records if the deceased had been discharged and died outside the hospital or died in hospitals and the bodies sent directly from the hospital. Data recorded for these deaths by the forensic unit did not make it back to the hospital records, when the DOH death registration information was examined. If indeed, these were hospital deaths, the information should be noted there and not reported from the forensic medicine unit. There is the suspicion in some cases that the hospitals would send these maternal deaths to the forensic medicine unit to avoid making the diagnosis at the hospital, for various reasons. We have no evidence to either confirm or refute this. Of the data from the DOH death registration data, 78 deaths were certified by judges. There were no data on whether these were of maternal causes or not.

Recommendations

1. Record deaths occurring in hospitals as hospital deaths rather than from the forensic unit. Data should be referred back to the hospital for inclusion in the case notes.
2. Discourage hospitals from referring maternal deaths to forensic medicine units except under unusual circumstances.
3. Tighten record keeping so there are no missing reports at the forensic medicine units.
4. Discourage judges from certifying deaths in which there may be maternal causes, although deaths certified by this method are currently only a small number.

Assessing the proportion of hospital death records reached the DOH death office

The names of maternal deaths occurring in hospitals were recorded during the review of hospital records. This list was later compared against the records at the DOH death office. Only in Anbar were a large proportion of these missing from the DOH records. In most other sites the hospital maternal deaths were fully recorded at the DOH offices, but in some a few were missing. However, of concern was the quality of the data that were recorded in the DOH office. Relevant patient information had deteriorated considerably from that recorded at hospitals concerning the same patients. No comparisons have been made between the hospital, DOH and central MOH data to quantify this level of deterioration, though this would be an important study. This could provide important information on how poor record keeping is affecting monitoring of national maternal health initiatives and national level mortality assessments. The study did not look at the proportion of maternal death records from the forensic medicine unit which were fully, partially,

or not reported at all to the DOH death registry office. This would be another important activity, but was outside the objectives of this study.

Recommendations

1. Examine ways to ensure that all maternal death data from hospitals are included in the DOH death registry which is then forwarded to the MOH.
2. Devise approaches to ensure that details concerning deaths recorded at the hospital level are fully represented at the DOH level, and introduce a back-checking mechanism. This could be addressed with an electronic reporting system where primary data were entered at the hospital, and the risk of data degradation could be minimized.
3. Assess the completeness of data transfer from the forensic medicine units to the DOH.

CONCLUSION

This operational research study identified a number of error-prone steps in the collection and transmission of information concerning maternal deaths at selected hospitals and governorates across Iraq. If these are addressed the maternal mortality information gathered through death certificates can be a powerful monitor on MOH efforts to reduce maternal mortality in Iraq. A number of efforts focused on obstetrical providers, hospital record-keeping, information from forensic pathology units, and Department of Health death registration procedures could tighten up the loss of accuracy presently occurring. None of these require major changes. However, in the long term, a web-based record keeping system should be put in place for death registration. Quality issues in the care of pregnancies that have surfaced in this study should be followed up to detect any systematic variations from acceptable standards of treatment.

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