J HEALTH POPUL NUTR 2004 Dec;22(4):420-428
ISSN 1606-0997 $ 5.00+0.20

Maternal Deaths and Their Causes in Ankara,Turkey, 1982-2001

Munire Erman Akar[1,2], Elif Gul Yapar Eyi[1], Esra Saygili Yilmaz[1], Banu Yuksel[1], and Zarif Yilmaz[1]

[1]Zekai Tahir Burak Women's Education and Research Hospital and
[2]Medical School of Akdeniz University, Antalya, Turkey

ABSTRACT

This study was carried out to determine the incidence and causes of maternal deaths about a 20-year period at the Zekai Tahir Burak Women's Health Education and Research Hospital (ZTBWHERH), Ankara, Turkey. All maternal deaths from January 1982 to July 2001 were reviewed and classified retrospectively. Using a computer-generated list, 348 patients admitted to the Labour Department of ZTBWHERH during 1982-2001 were selected as controls. Medical records were reviewed for demographic data, history of antenatal care, route of delivery, referral history, and perinatal mortality. Cases and controls were compared, and standard tests were used for calculating odds ratio (OR) and 95% confidence interval (CI) for the association of demographic and delivery characteristics. During this period, there were 174 maternal deaths and 430,559 livebirths, giving a maternal mortality ratio of 40.4/100,000 livebirths. The mortality rate declined from 85.1/100,000 in 1982 to 11.6/100,000 in 2001. One hundred thirty (74.7%) deaths were due to direct obstetric causes and 24 (13.7%) were abortion-related, while 20 (11.4%) were due to indirect obstetric causes. The most common cause of direct obstetric deaths was pre-eclampsia/eclampsia, followed by obstetric haemorrhage and embolism. Abortion-related sepsis and haemorrhage, anesthesia-related deaths, obstetric sepsis, acute fatty liver of pregnancy, and ectopic pregnancy accounted for other causes of deaths. Cardiovascular disease was the leading indirect cause of death. Referral, lack of antenatal care, and foetal death at admittance were associated with 8-, 3-, and 6-fold increased risk of maternal mortality respectively (OR 8.89, 95% CI 5.7-13.8; OR 3.74, 95% CI 2.5-5.5; OR 6.38, 95% CI 3.1-13.1). Although maternal mortality ratios have declined at the hospital, especially in the past five years, the rate is still high, and further improvements are needed. The problem of maternal mortality remains multifactorial. Short-term objectives should be focused on improving both medical and administrative practices. Improving the status of women will necessarily remain a long-term objective.

***Key words*:** Maternal mortality; Eclampsia; Haemorrhage; Embolism; Prenatal care; Turkey

INTRODUCTION

Maternal mortality ratio represents the level of healthcare services, social welfare, and economic affluence of a community (1). The World Health Organization (WHO) estimates that about 500,000 women in developing countries die each year due to pregnancy-related complications where maternal mortality accounts for 99% of the world's maternal deaths (2-4).

Of all indicators used today for comparing levels of development between countries and regions, maternal mortality shows the widest disparities (2,5).

In developing countries, not all maternal deaths are reported and, thus, national mortality ratios obtained by analysis of death registrations are under-estimated (3,6,7). This is a problem even in developed countries. Although teaching hospital statistics do not present national maternal mortality ratios, they are usually more

Correspondence and reprint requests should be addressed to:
Dr. Munire Erman Akar
Department of Obstetrics and Gynecology
Medical School of Akdeniz University
Antalya, Turkey
Email: mnirea@yahoo.com

accurate and can usefully be compared with rates in similar institutions in developed countries. The contrast is stark (8).

Data obtained can be used for developing policies for reducing maternal mortality rates by increasing the quality of prenatal and obstetric care and for determining trends over a period of time.

The aim of the study was to analyze the aetiology and incidence of maternal deaths over a 20-year period at the Zekai Tahir Burak Women's Education and Research Hospital (ZTBWHERH) in Ankara, Turkey.

MATERIALS AND METHODS

The study was carried out in Ankara, the capital city of Turkey. Turkey, a developing country, has a population of 67,803,927. Three-fifths of its population live in urban centres, while the rest live in largely poor rural areas. Ankara, the second largest city in Turkey, has a population of 4,007,860 (9). The city lies in the Middle Anatolia region of Turkey. Crude birth rates of Turkey and Ankara are 21.3% and 19.93% respectively. The total fertility rates of Turkey and Ankara are 2.46 and 1.9 per 1,000 women of reproductive age respectively. Essential obstetric care is provided in 5 university hospitals, 3 government tertiary hospitals, 29 government district hospitals, 12 private hospitals, and 189 primary care institutions (10).

Maternal mortality in Turkey has decreased dramatically during the past half century from 208 maternal deaths per 100,000 livebirths in 1974 to 49 maternal deaths per 100,000 livebirths in 2001 (7,9) .

Data on maternal mortality rates in Ankara, referral rates from rural areas to urban areas of Ankara, and rates of deaths occurring at home were unfortunately not available.

The study was carried out at ZTBWHERH. ZTBWHERH, a teaching hospital of the Ministry of Health, has 500 inpatient beds and is located in Ankara. The hospital is also a perinatal referral centre for approximately 33 counties and several villages in Central Anatolia. 60.2% of births in Central Anatolia take place in hospital, and the rest are reported as home deliveries (11). In Ankara and its vicinity, over the period of study, 37.4% of births in hospital occurred at ZTBWHERH (10). The annual proportion ranges from 32.1% to 42.5%. No patient is refused admission.

The study population included patients who delivered (or terminated) at ZTBWHERH and included those who were transferred here after delivery elsewhere. Data were identified by reviewing all deaths of women of reproductive age that occurred in the hospital and by reviewing medical records.

During January 1982–July 2001, 177 maternal deaths and 430,559 livebirths were registered. Three of the 177 deaths were due to trauma, unrelated to pregnancy (multiple abdominal organ perforations, intra-abdominal haemorrhage due to rupture of the spleen, and intra-cranial haemorrhage), and were excluded from analysis.

Data on maternal deaths were obtained from hospital records, death registration lists, and patient files. We did not have the ability to track women who had delivered at ZTBWHERH and may have died at another hospital. Civil registration of deaths did not become the general practice in Turkey until it was undertaken as a provincial responsibility late in the twentieth century. Before that time, the only likely source for such information was local cemetery records, which did not include detailed information. All deaths must be registered, in writing, within five days after the person has died to the nearest Local District Registrar or government health centre, along with the Medical Certificate of Cause of Death, and additional information is to be provided within 14 days after the death. Patient files included all the information regarding the patients, including medical history, physical examinations, and labaratory findings.

Data collected included age, gravidity, parity, area of residence, type of antenatal care, the time from hospital admission until death, method and place of delivery, foetal outcome, and any operations performed. Gravidity and parity were based upon status at the time of death. Gravidity included the index pregnancy as did parity if the woman had delivered a live infant before her death.

A maternal death was defined as 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 relating to or aggravated by the pregnancy or its management, but not from incidental or accidental causes (12). Maternal deaths were divided into two groups: direct obstetric-related deaths resulting from obstetric complications of

the pregnancy, labour or puerperium, from omissions, interventions, incorrect treatment, or from a chain of events resulting from any of the above, and indirect obstetric-related deaths: those resulting from previous existing disease or diseases that developed during pregnancy and which were not due to direct obstetric cause, but which were aggravated by the physiological effects of pregnancy (7).

In the survey, all the deaths for which such information was available were reviewed and then classified according to the International Classification of Diseases (ICD-10) (12). The latest revision of ICD-10 recognizes that some women die as a consequence of direct or indirect causes after this period and has introduced a category for late maternal deaths defined as those deaths occurring between 42 days and one year after abortion, miscarriage, or delivery that are due to direct or indirect maternal causes (13). We could not reach data regarding maternal deaths, 42 days and one year after abortion, miscarriage, or delivery that are due to direct or indirect maternal causes in our study.

When there was more than one possible cause of death, priority was given to the primary obstetric cause judged on the basis of available information. We also assessed whether the maternal deaths might have been prevented. Since assessment of preventability is difficult (14), we attempted to identify any substandard care that appeared to us to contribute to maternal death, as defined in the Report on Confidential Enquiries into Maternal Deaths in England and Wales 1997-1999 (13). To assess any changes in the causes of maternal mortality, data from the first years and the last three years were compared.

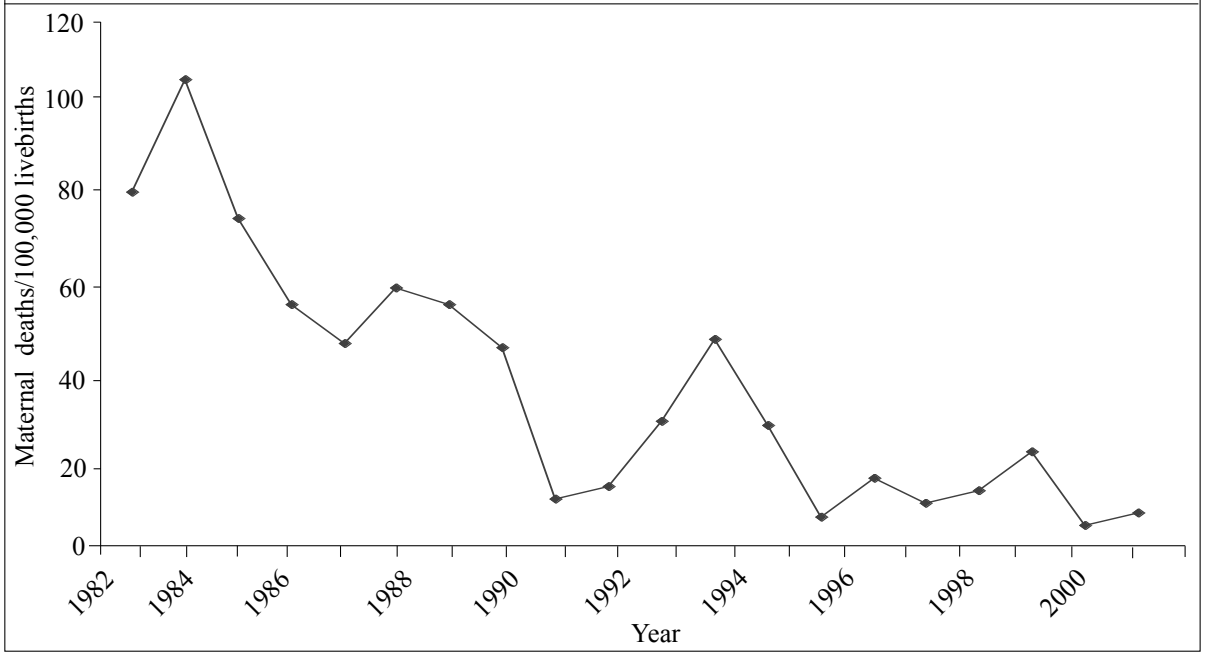
Using a computer-generated list, 348 patients admitted to the Labour Department of ZTBWHERH during 1982-2001 were selected as controls. Maternal mortality cases were compared with the control group. Standard tests were used for calculating the odds ratio (OR) and 95% confidence interval (CI) for the association of demographic and delivery characteristics.

The study was approved by the local ethics committee of the hospital.

RESULTS

During the study period, 174 maternal deaths were identified, and 431,223 women gave birth to 430,559 live children in the study hospital, yielding a maternal mortality ratio of 40.5/100,000 livebirths. The rate declined from 85.1/100,000 in 1982 to 11.6/100,000 in 2001 (Fig. 1). The majority (48.2%) of deaths occurred in the 20-29-year age group, while 65 (37.3%) were in

Fig. 1. Maternal mortality in Zekai Tahir Burak Women's Education and Research Hospital, Ankara, 1982-2001



the 30-39-year age group. Eleven cases (6.3%) were younger than 20 years, and 14 (8.0%) were older than 39 years (Table 1). All the patients were married. Of the 174 women, 55 were primiparous, 89 multiparous, and 30 grand multiparous (para>4) (Table 1). We could not evaluate the effects of previous obstetric risk factors, such as previous pre-eclampsia, caesarean history, etc., on maternal mortality due to lack of data.

Table 1. Age, disease, and delivery characteristics of 174 maternal deaths

Characteristics	Cases (n=174)		Study group (n=348)		Odds ratio (95% CI)
	No.	%	No.	%	
Age (years) group					
<20	11	6.3	26	7.4	0.83 (0.40-1.73)
20-29	84	48.2	145	41.7	1.30 (0.90-1.88)
30-39	65	37.3	158	45.4	0.71 (0-49-1.04)
>39	14	8.0	19	5.4	1.51 (0.74-3.09)
Parity					
Primipar	55	32.7	136	39.1	0.72 (0-49-1.06)
Multipar	89	51.1	173	49.7	1.05 (0.73-1.52)
Grandmultipar	30	13.2	39	11.2	1.65 (0.98-2.76)
Lack of antenatal care	89	5.1	76	21.8	3.74* (2.53-5.54)
Referral of patients	92	52.8	39	11.2	8.89* (5.68-13.89)
Multiple pregnancies	4	2.2	10	2.8	0.79 (0.24-2.57)
Foetal demise at admittance	30	17.2	11	3.1	6.38* (3.11-13.08)
Caesarean delivery	50	28.7	83	23.8	0.80 (0.52-1.22)
Perinatal mortality	32	18.3	19	5.4	3.90* (2.14-7.11)

*Statistically significant in chi-quare test (<0.01); CI=Confidence interval

Sub-standard care was identified in 132 of 165 maternal deaths for which we had relatively more complete data (80%). Only 33 patients had more than four antenatal visits in the study group. It was not possible to evaluate the quality of antenatal care in the present study. Identified factors relating to healthcare included: patient's or doctor's delay in seeking or providing care, insufficient knowledge of proper treatment, interventions on patients in an unstable condition, inadequate postpartum/post-operative surveillance, lack of organization, patients' own interventions for abortion, late or inadequate transfer practices, and poor socioeconomic conditions.

Fifteen (8.6%) women died without giving birth, while 24 (13.7%) died due to abortion-related causes. The large majority (72.4%) of mothers delivered in the hospital. Ninety-two (52.8%) patients were referred from peripheral hospitals or surrounding areas, where hospitals were less accessible. Twenty-eight (18.7%) women gave birth in their homes.

Fifty-eight mothers delivered vaginally. Forty-nine had a caesarean section, and one had a post-mortem caesarean section. The caesarean section rate in the hospital was 29.4%. Hysterectomy was performed on 28 patients to combat haemorrhage, and salpingectomy for massive haemorrhage due to rupture of an ectopic pregnancy performed in one women.

Ninety (51.7%) patients died within 24 hours of admission. The mean hospitalization time for those who survived more than 24 hours was 5.48 (standard deviation: 5.3) days.

Foetal outcome was poor with 11 stillbirth term and 43 stillbirth pre-term infants. Thirteen of 87 children born alive died during the neonatal period (Table 2).

Among the causes of death, 130 (74.7%) were direct obstetric causes, and 24 (13.7%) were abortion-related, while 20 (11.4%) were indirect obstetric causes. The cause of death in six patients following caesarean section was obscure, but nonetheless, they were classified as direct obstetric deaths.

Of the direct obstetric deaths, pre-eclampsia/eclampsia (30.4%), obstetrical haemorrhage (18.3%), and embolism (10.3%) were the main causes. Of 53 women with pre-eclampsia/eclampsia, 46 had eclamptic fits. Of 32 maternal deaths secondary to obstetrical haemorrhage, 11 were due to uterine atonia, eight due to placental abruption, four due to retained placenta, four due to uterine rupture, four due to placenta accreata, and one due to placenta previa. Twenty-three deaths were due to sepsis (and haemorrhage) in relation to illegal abortion, and one was due to ruptured ectopic pregnancy. Nine deaths

Table 2. Number of deliveries and pregnancy outcomes of patients who died during 1982-2001

Year	Deliveries	Maternal deaths	Outcome				
			Liveborn term	Liveborn pre-term	Stillbirth term	Stillbirth pre-term	Unborn‡
1982	25,833	22	2	7*	-	6	2
1983	24,246	27	3	11*	2	7	-
1984	20,142	16	4	2	1	3	2
1985	18,755	11	1	2	1	3	2
1986	20,076	10	4	2	-	1	1
1987	20,940	13	6	1	1	3	1
1988	20,356	12	4	3	-	2	1
1989	24,642	12	4	1	1	3	2
1990	21,455	3	1	-	-	2	-
1991	17,843	3	1	-	-	2	-
1992	18,753	6	2	2	-	3*	-
1993	17,513	9	1	5†	1	3	1
1994	19,004	6	3	-	-	2	1
1995	18,998	2	1	-	1	-	-
1996	20,770	4	2	-	2	-	-
1997	23,537	3	1	-	1	1	-
1998	24,317	4	1	1	-	1	-
1999	24,145	6	2	3	-	1	-
2000	23,410	2	1	1	-	-	-
2001	25,824	3	1	1	-	-	1

*Twin pregnancy; †Triplet pregnancy; ‡One post-mortem caesarean was performed

were related to anaesthesia, six to obstetric sepsis, and six to acute fatty liver of pregnancy. Of the 20 indirect obstetric causes, 13 were associated with cardiovascular diseases, two with stroke, and one each with pneumonia, tuberculosis, diabetic ketoacidosis, Krukenberg tumour, and systemic lupus erythematosus.

When the women who died during 1982-2001 were compared with 348 control women, no significant differences were noted in the mode of delivery, age, or parity. However, delayed referral, lack of antenatal care, hypertension, birth at home, and perinatal mortality rates were all significantly more common in relation to maternal deaths (Table 1).

Referral, lack of antenatal care, and foetal demise at admittance were associated with 8-, 3-, and 6-fold increased risk of maternal mortality respectively (OR 8.89, 95% CI 5.7-13.8; OR 3.74, 95% CI 2.5-5.5; OR 6.38, 95% CI 3.1-13.1).

By far the strongest predictor of maternal mortality was the place of residence. Mothers living in rural areas and beyond 60 km radius from urban centres were eight times more likely to die. The second most significant predictor of mortality was the lack of antenatal care. Another predictor of maternal mortality was foetal demise at admittance.

When we compared the data from the first years (1982-1984) and the latter years (1999-2001) of the study, we found that the number of maternal deaths showed a declining trend from 92.5% to 14.9% (Fig. 2). There was 72% and 68% reduction in deaths due to eclampsia and haemorrhage respectively. No deaths occurred due to infection, abortion, anaesthesia, and embolism in the last three years.

DISCUSSION

Although maternal mortality rates are a reflection of safety of childbearing, it is hard to measure the rate precisely due to various factors.

Hill *et al*. reported that in countries with less-developed statistical services, maternal death rates are under-recorded (5). Not to miss any maternal deaths, they suggested using the proportion of deaths of women of reproductive age, rather than the maternal mortality ratio (4,5). Data collected using one of these methods indicated implausible recent increases in adult female mortality in most countries studied (5,7,15).

Unfortunately, Turkey is one of the 55 countries in the world with undeveloped statistical systems, where accurate data for evaluating national mortality rate are still lacking (5).

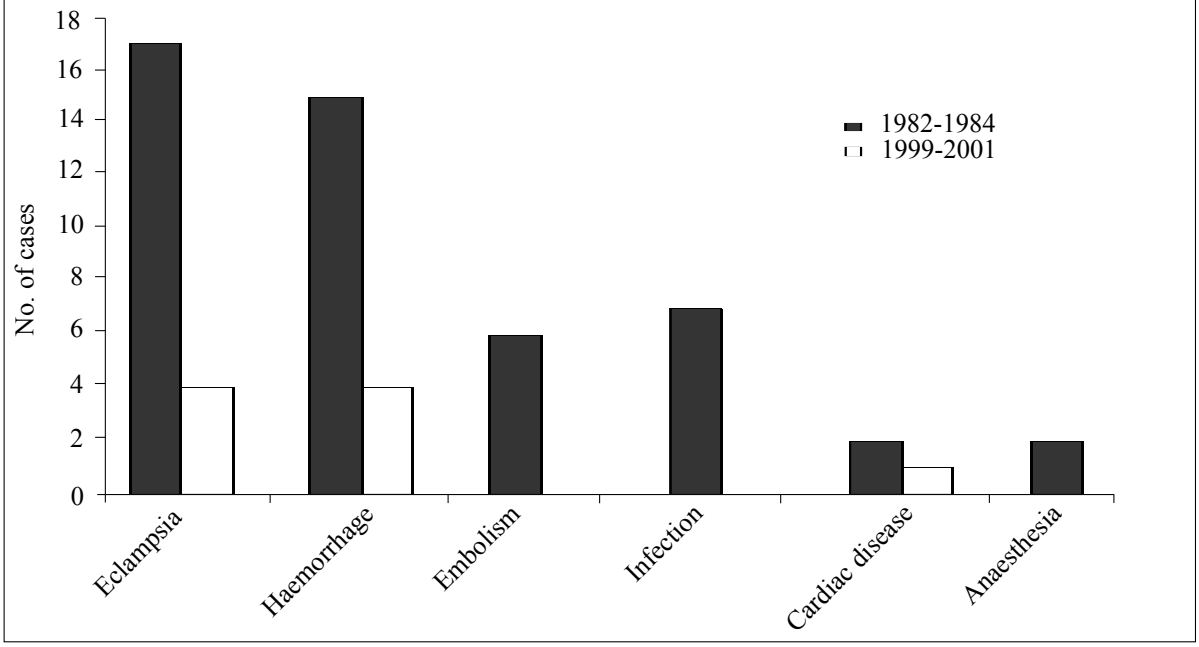
The predominant causes of deaths in our study were similar to those reported earlier (7,16-20): pre-eclampsia/eclampsia (30.4%), infection (16.1%), obstetrical haemorrhage (18.3%), and embolism (10.3%). Excluding embolism, many deaths occurred due to hypertensive diseases, infection, and obstetrical haemorrhage and can, therefore, be considered as preventable.

greatest positive contribution to reduce maternal mortality in Turkey.

Patients who had foetal demise at admittance had a higher risk of maternal mortality. These patients are more prone to developing disseminated intravascular coagulation and have bleeding and clotting problems due to disturbed liver and kidney functions after late foetal demise (22).

Haemorrhage and emboli are still among the most common causes of maternal mortality (7,18-20). The

Fig. 2. Cause-specific mortality for 1982-1984 and 1999-2001



Pregnancy-related hypertensive diseases, mainly eclampsia, are still of great clinical significance in our population in 2001. Referral of patients with eclamptic fits and its associated complications occurs too late, and the prediction of high-risk groups, improved antenatal care, and earlier referral to the high-risk pregnancy unit could all help reduce maternal mortality.

Antenatal care has its greatest impact on deaths due to hypertensive diseases (21). Lack of antenatal care, illiteracy, insufficient knowledge of proper treatment, especially in rural areas, patient's and doctor's delay, and late or inadequate transfer practices contribute to many of the maternal deaths caused by pregnancy-related hypertensive diseases in the present study. We believe that improved provision for meeting basic health needs combined with improved antenatal care will make the speed with which obstetric haemorrhage can become life-threatening emphasizes the need for women at known high risk of haemorrhage to be delivered in a hospital. Thromboprophylaxis for emboli can be considered in patients with a past or personal family history of thromboembolism or other risk factors for deep vein thrombosis.

The medical causes of maternal death represent only the most visible dimension of a multi-layered problem. Usually, factors relating to health service determine whether a woman with pregnancy-related complications survives or dies. Lack of access to skilled healthcare for complicated pregnancies or for emergencies is often the root cause of death. Barriers can be physical (distance, lack of transport), economic (lack of resources to pay for

transport, care, or drugs), or sociocultural (low status which empedes women's ability to take decisions to seek care and which may impose restrictions on their mobility).

Even when a woman reaches a health facility, various health service factors can prevent her from receiving appropriate care in a timely manner. These include shortages of drugs and equipment, lack of safe blood supplies for blood transfusion, and shortage of skilled personnel. In some cases, a woman may not receive care simply because providers fail to realize the gravity of her condition and act appropriately (23).

Complicated deliveries of mothers living in the remote and neglected rural areas have to be managed on site due to physical, social and economic barriers which often preclude referrals to higher levels of care. Services for the management of complications should be available as close as possible to where women live. Certain interventions, such as caesarean delivery or blood transfusion, require skills and equipment normally available only at the first referral or district hospital.

Short-term interventions to be taken are reducing the number of high-risk and unwanted pregnancies, reducing the number of obstetric complications, and reducing deaths among women who develop complications. We can distinguish three types of services for resolution of life-threatening maternal conditions: treatment, risk identification, and prevention. Treatment could be provided for such conditions as post-partum haemorrhage, obstructed labour, and abortion-related complications. Risk identification involves services that lead to identifying such cases, recognizing the onset of complications or distinguishing those at risk early. Prevention is more general: providing interventions, such as counselling about danger signs, that are potentially useful against these conditions or family planning. Family planning is an important service for controlling the proper growth in the economic, educational and health sectors (24).

Greater efforts should be directed to developing indicators of maternal health that can be monitored regularly and compared across populations and over a period of time.

Both health intervention policies and global policies are important to reduce maternal mortality in the world (8). Universal formal education seems to be the most effective factor against social inequity (25). It also has a favourable influence on reproductive behaviour. Educated women bear fewer children and achieve better child survival.

Comparison between data from the early years (1982-1984) and the latter years (1999-2001) of the study showed that the number of maternal deaths declined from 92.5% to 14.9%. The number of deaths due to eclampsia, haemorrhage, infection, and anaesthesia decreased. This is an indication of progress in the management of preventable causes of maternal deaths.

Home deliveries associated with severe haemorrhagic complications and obstetric infections have largely been prevented by improved care in hospital. No complications of untreated, obstructed labour have been seen in the last 11 years. The harmful traditional practice of sitting on soil immediately after delivery that used to cause severe maternal infection, maternal septicaemia, and neonatal tetanus even at the beginning of 1980s in the rural areas has largely been abandoned, and recently we have seen no such patients.

Appropriate antibiotic treatment in sepsis-implicated patients has effectively decreased the number of maternal deaths due to infection in the last years.

Self-induced or clandestine abortions are now very rarely encountered. With the legalization of abortion up to the 10th week of pregnancy in May 1983 and within the establishment of safe, free and legal services for termination of unwanted pregnancies, deaths due to criminal abortions and septic shock have largely been prevented.

This study of maternal deaths at ZTBWHERH gives a good illustration of the problems facing the country as a whole. The present study has drawbacks because it is retrospective (excluding the last three years). There may have been some misclassification of deaths due to lack of necropsy validation, and under-reporting of patients who died after discharge from the hospital or were referred to other institutions. Another limitation of the study is: maternal deaths, 42 days and one year after abortion, miscarriage, or delivery that are due to direct or indirect maternal causes, could not be included in the study. The resulting total is still an underestimate of the actual number of pregnancies, since these figures do not include other pregnancies which miscarry early, those who are not admitted to hospital or indeed those who may not even know that they are pregnant. These kinds of omitted data might have affected the indirect estimate of maternal mortality in our study.

Moreover, hospital data can over-estimate maternal mortality for there may be high-risk referrals and emergency cases (5,7,10). Nonetheless, because of the high proportion of all the births in Ankara and Central Anatolia which take place in our hospital, our data are likely to be the most reliable compared to other available data.

The number of maternal deaths is still unacceptably high compared to the WHO goal of a maternal mortality rate not exceeding 5 per 100,000 livebirths for any country or ethnic group by 2000 (7). The goal could not be achieved even by 1995, and there are still missing data (3). We hope that the new global health policy of WHO "Health for All in the 21st Century" can be achieved by 2020, and that the maternal mortality rate can be brought down under 5 per 100,000 livebirths (26).

The problem of maternal mortality remains multifactorial. Factors which can be improved include not only medical but also administrative practice. Establishment of a system of confidential inquiries may result in better estimation of the dimensions of the problem and may lead to improvements in case management and reductions in sub-standard care.

Standards of antenatal care should be established and implemented country-wide. Postgraduate training is important as is the assessment of standards of care to make recommendations for improvement.

Although some maternal deaths appear to be unavoidable, detection of sub-standard factors in 80% of cases shows that there is still a great deal to do.

Maternal mortality ratios have declined in our hospital, especially in the last five years. However, the rate is still high, and further improvements are needed. Short-term objectives should focus on improvements not only in medical but also in administrative practice. Improving the status of women will necessarily remain a long-term objective.

REFERENCES

1. Sule-Odu AO. Maternal deaths in Sagamu, Nigeria. *Int J Gynaecol Obstet* 2000;69:47-9.
2. World Health Organization. Revised 1990 estimates of maternal mortality—a new approach by WHO and UNICEF. Geneva: World Health Organization, 1996:1-21.
3. Harrison KA. Maternal mortality in developing countries. *Br J Obstet Gynaecol* 1989;96:1-3.
4. Royston E, Lopez AD. On the assessment of maternal mortality. *World Health Stat Q* 1987;40:214-24.
5. Hill K, AbouZahr C, Wardlaw T. Estimates of maternal mortality for 1995. *Bull World Health Organ* 2001;79:182-93.
6. Cates WC, Jr., Smith JC, Rochat RW, Grimes DA. Mortality from abortion and childbirth: are the statistics biased? *JAMA* 1982;248:192-6.
7. AbouZahr C, Wardlaw T, Stanton C, Hill K. Maternal mortality. *World Health Stat Q* 1996;49:77-87.
8. Stokoe U. Determinants of maternal mortality in the developing world. *Aust NZ J Obstet Gynaecol* 1991;31:8-16.
9. State Institute of Statistics. Statistical yearbook of Turkey, Ankara. Ankara: Prime Ministry Republic of Turkey, 2001:3-74.
10. Statistical yearbook of Turkey. Ankara: State Institute of Statistics, 2003:132-51.
11. Health statistics yearbook of Turkey (1995-2002). Ankara: State Institute of Statistics, 2003:46-154.
12. World Health Organization. International classification of diseases (ICD-10). International statistical classification of diseases and health related problems. 10th rev. Geneva: World Health Organization, 1992;1:123-8.
13. Lewis G. Report on confidential enquiries into maternal deaths in England and Wales, 1997-1999. London: RCOG Press, 2001:190-4.
14. Schuitemaker NW, Gravenhorst JB, Van Geijn HP, Dekker GA. Maternal mortality and its prevention. *Eur J Obstet Gynecol Reprod Biol* 1991;42:31-5.
15. Walker GJA, Ashley DEC, McCaw AM, Bernard GW. Maternal mortality in Jamaica. *Lancet* 1986; 1:486-8.
16. Barno A, Freeman DW, Bellville TP. Minnesota maternal mortality study; five-year general summary, 1950-1954. *Obstet Gynecol* 1957;9:336-44.
17. Kaunitz AM, Hughes JM, Grimes DA, Rogat RW. Causes of maternal mortality in the United States. *Obstet Gynecol* 1985;65:605-12.
18. Yanik FF, Malatyalioglu E, Kocak I, Yanik A, Bolat I, Kokcu A. Analysis of the pregnancy-related deaths within the last two decades: a university hospital-based study from Turkey. *Eur J Obstet Gynecol Reprod Biol* 1999;87:143-5.

19. Tuncer RA, Erkaya S, Sipahi T, Kutlar I. Maternal mortality in a maternity hospital in Turkey. *Acta Obstet Gynecol Scand* 1995;74:604-6.

20. Ayhan A, Bilgin F, Tuncer ZS, Tuncer R, Yanik A, Kisnisci HA. Trends in maternal mortality at a university hospital in Turkey. *Int J Gynaecol Obstet* 1994;44:223-8.

21. Kaunitz AM, Spence C, Danielson TS, Rochat RW, Grimes DA. Perinatal and maternal mortality in a religious group avoiding obstetric care. *Am J Obstet Gynecol* 1984;150:826-31.

22. Lurie S, Feinstein M, Mamet Y. Disseminated intravascular coagulopathy in pregnancy: thorough comprehension of etiology and management reduces obstetricians' stress. *Arch Gynecol Obstet* 2000; 263:126-30.

23. Fortney JA *et al*. Causes of death to women of reproductive age in Egypt. East Lansing, MI: Michigan State University Working, 1984. 15 p. (Working paper no. 49).

24. Mahler H. Family planning in the service of human development. *WHO Chron* 1984;38:239-42.

25. Harrison KA. Maternal mortality in Nigeria: the real issues. *Afr J Reprod Health* 1997;1:7-13.

26. Visschedijk J, Siméant S. Targets for health for all in the 21st century. *World Health Stat Q* 1998; 51:56-67.