ORIGINAL STUDY

Changing Trends in Maternal Mortalities Rates—A Retrospective Study of 20 Years at a Tertiary Teaching Hospital of Uttar Pradesh

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Abstract

Though India had set a goal of reducing MMR to 200/1,00,000 live births by the year 2000 AD; it is a figure difficult to achieve even in 2005.

Majority of maternal deaths in developing countries are due to preventable causes. These deaths can be avoided if there is proper utilization of essential obstetric care, early detection of complications and efficient emergency services. A retrospective review of maternal deaths will help us to find out the faults and lacunae at various levels and help us to plan out remedial strategies for all health care workers right from the primary health care to tertiary care at teaching hospitals. So, with this in mind a retrospective study of maternal deaths occurring in the Department of Obstetrics and Gynecology, SN Medical College, Agra over last 20 years was done. This data was further analyzed to study whether there were any changing trends in the causes of maternal death over the years.

Objective: To study the changing trends in maternal mortalities rates over 20 years at a tertiary teaching hospital of Uttar Pradesh.

Study Design: A retrospective Urban based teaching hospital study over 20 years in 2 phases.

Patients and methods: A retrospective review of 676 maternal deaths out of 25,614 live births was done in the Department of Obstetrics and Gynecology, SN Medical College, Agra over a period of 20 years in two phases.

- Phase – I (1986-1995)
- Phase – II (1996-2005).

A thorough analysis of individual records of all cases of maternal death was done. *MMR for every year was calculated from the number of maternal deaths and number of live births per year*.

The causes of death were analyzed with special attention to determine the avoidable factors in each maternal death.

Results: There were 394 maternal deaths out of 13736 live births in phase I and 282 deaths out of 11,878 births in Phase II. The present study shows that hemorrhage was the most important cause of death in both the phase, 21.7% and 26.8% respectively. A decline in the percentage of death due to anemia has also been observed from 26.9% in phase I to 22.9% in phase II, but there has been no marked change in the percentage of deaths due to rupture uterus, ectopic pregnancy, ARF, heart disease, DIC and other causes. Two more important causes of death were added in phase II that is encephalitis and AIDS contributing to 0.6% of the total deaths. The clinical profile of the women in the two phases remained unaltered. Preventable factors responsible for maternal mortality have shown some decline in phase II, though preventable factors still account for 82.7% of the deaths.

Conclusion: This review shows that there has been some reduction in MMR in the last 20 years. But it is still a long way from what has been achieved in developed countries. Further reduction requires an improvement in the present health care system and their better utilization by the general population. We also have to improve the status of women through education and vocational training so that they can understand and make their voice heard in matters concerning their health.

Keywords: Maternal mortality, changing trends, phases, factors, preventable factors.

INTRODUCTION

Pregnancy and child birth is a universally celebrated event, yet for thousands of women it may end in death. The causes are many - behind the medical causes are logistic causes - failure of health care system, lack of transport, etc and behind these are social, cultural and political factors which together determine the status of women, their health, fertility and health seeking behavior. These deaths can be avoided if there is proper utilization of essential obstetric dare, early detection of complication prompt referral and efficient emergency services.

High maternal mortality has serious complications not only for the family and the society but it also deprives the child of mothers' care.

Annually about:

- 200 million women become pregnant
- 136 million bear children and

- 5,00,000 die as a result of complication of pregnancy and childbirth.
- For each woman who dies as many as 30 other develop chronic debilitating condition

The risk of maternal death in developed countries is about 1:4000 births that in developing is 1:15 to 1:50.

According to Dr Malcolm Potts – globally the current MMR amounts to one death every minute, affecting women in the prime of their life.

National population policy of GOI for 2010.

- 80% of all deliveries should be institutional.
- 100% of deliveries should be attended by trained personnel.
- MMR should be reduced below 100/100,000 live births.
- Empowering women for improved health and nutrition.

in India

- Every 5 minutes one woman dies from complication of pregnancy.
- 15% of all pregnant women develop life-threatening complications.
- 60% of all maternal deaths occur after delivery but only 1 in 6 woman receive postnatal care.

Maternal mortality is 100-200 times higher in developing countries as compared to the developed.

Maternal mortality is an index of reproductive health of the society but it seems that India is lagging far behind to be able to achieve the goal to reduce the maternal mortality rate to 200/1 lac live births by 2000 AD.

The analysis was done to study the causes of maternal mortality occurring in SN Medical College, Agra, to find out the avoidable factors and to assess how significant has been the decline in the maternal mortality by the policies of universal hospital confinement which have been promoted in the last decade in the interest of both mother and baby.

AIMS AND OBJECTIVES

The analysis was done at SN Medical College, Agra, Uttar Pradesh-*a tertiary care center*.

To study:

- The epidemiology of maternal deaths
- Age
- Parity
- Literacy level/socioeconomic status
- Mode of hospital admission
- Causes of death
- Residence
- Antenatal care
- To compare the variability of above factors in last 20 years and their changing trends
- To find out faults and lacunae at various levels of prevention
- To assess how significant has been the decline in the maternal mortality by the policies of universal hospital confinement which have been promoted in the last decade in the interest of both mother and baby.

MATERIAL AND METHODS

A retrospective review of 676 maternal deaths out of 25,614 live births was done in the Department of Obstetrics and Gynecology, SN Medical College, Agra over a period of 20 years in two phases.

- Phase – I (1986-1995)
- Phase – II (1996-2005).

A thorough analysis of individual records of all cases of maternal death was done. *MMR for every year was calculated from the number of maternal deaths and number of live births per year.*

The causes of death were analyzed with special attention to determine the avoidable factors in each maternal death.

A thorough analysis of case records of all the cases of maternal mortality was done with respect to:

- General parameters including age, parity, literacy level, socioeconomic status, residence, antenatal registration, period of gestation at admission and referral
- Cause of death
- Nature of treatment given in the hospital
- Factors operating before the patient reached the hospital
- Hemoglobin levels
- Time interval since admission and death

Maternal mortality is defined as death of any woman during pregnancy or within 42 days of delivery. Irrespective of duration and site of the pregnancy and expressed as rate per 1,00,000 live births.

OBSERVATIONS

Table 1 shows the yearwise MMR in the Department of Obstetrics and Gynecology SN Medical College, Agra. There were 394 maternal deaths out of 13736 live births in phase I and 282 deaths out of 11,878 births in Phase II.

Table 1: Yearwise MMR in the Department of Obstetrics and Gynecology, SN Medical College, Agra

Year	*Total births*	*Maternal deaths*	*MMR/1 lac live births*	
1986	1440	45	3146	Phase-I 13736
1987	1532	46	3004	live births …394
1988	1372	42	3267	maternal deaths
1989	1632	51	3119	MMR = 2868.8
1990	1597	42	2672	
1991	1419	36	2534	
1992	1284	38	2981	
1993	1085	30	2773	
1994	1129	31	2792	
1995	1246	33	2631	
1996	1314	33	2519	Phase II 11878
1997	1372	34	2439	live births …..
1998	1146	27	2361	282 live births
1999	1106	29	2688	.....

Contd...

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Year	*Total births*	*Maternal deaths*	*MMR/1 lac live births*	
2000	1200	30	2532	MMR = 2374
2001	1095	25	2271	
2002	1278	30	2394	
2003	1216	29	2459	
2004	1106	23	2110	
2005	1045	22	2168	

Table 2: Causes of maternal mortality in two phases

	Cause	*Phase I (%)*	*Phase II (%)*
Direct			
1	Hemorrhrage	21.1	26.6
	• APH	7.5	6.2
	• PPH	13.6	20.4
2	Toxemia	13.8	20.0
3	Septicemia	17.6	12.6
	• Postabortal	12.5	10.4
	• Puerperal	5.1	2.2
4	Rupture uterus	3.36	2.9
5	Ectopic pregnancy	1.64	1.2
		58.1	**63.3**
Indirect			
6	Anemia	26.9	22.9
7	ARF	0.98	0.50
8	Jaundice	6.1	7.2
9	Heart disease	3.02	1.7
10	DIC	1.7	1.9
		38.7	**34.2**
Others			
Malaria		3.2	1.2
Blood transfusion		1.8	0.5
Meningits/Encephalitis		–	0.4
AIDS		–	0.2
		5.0	**2.3**

The present study shows that hemorrhage was the most important cause of death in both the phase, 21.7% and 26.8% respectively. Direct cause of death like hemorrhage, septicemia and eclampsia and indirect causes like anemia and hepatitis remained as the important causes of death in both the phases although there has been some increase in the proportion of deaths due to obstetric causes from 56.3 to 63.5%. Eclampsia has also emerged as a major killer in phase II accounting for 20.0% deaths. Deaths due to sepsis showed a declining trend from 15.7% in phase-I to 12.6% in Phase II (Table 2).

A decline in the percentage of death due to anemia has also been observed from 26.9% in phase I to 22.9% in phase II. There has been no marked change in the percentage of deaths due to rupture uterus, ectopic pregnancy, ARF, heart disease, DIC and other causes. Two more important causes of death were added in phase-II that is encephalitis and AIDS contributing to 0.6% of the total deaths (Table 2).

As shown in Table 3 the clinical profile of the women in the two phases remained unaltered with the mean age being 23.17 years and 25.68 years and Mean parity being 2.4 and 2.7 in phase I and II respectively. Most of the patients in both the phases were illiterate belonging to low socioeconomic status who were not aware of the benefits of proper antenatal 73.9% patients in phase I and 70.4% patients in phase II were from rural area. There was an average of 0.4 admission to some other hospital before coming to the tertiary care center in phase I and 2.5% in phase II (Table 3).

Preventable factors responsible for maternal mortality for example, suboptimal utilization of the available health services by the patient, transport problem, deficient public health care measures and negligence on the part of the peripheral health care providers have shown some decline in phase II, though preventable factors still account for 82.7% of the deaths (Table 4).

Most of the patients in phase I (80.9%) were brought to the hospital directly by the relatives as compared to phase II in which 62.6% patients were brought directly and 37.4% were referred to the hospital (Table 5).

In phase I most of the patients (65.2%) had to travel more than 40 km to reach the hospital as compared to phase II in which most of the patients came from within 40 km (Table 5).

The percentage of patients treated by trained personnel has increased from 19.3% in phase I to 32.5% in phase II. While the member of patients being treated by untrained dias has decreased from 36 to 31.3%. The percentage of patients dying before receiving any treatment has also decreased from 44.9% in phase I to 36.2% in phase II (Table 5).

Table 3: General profile of mothers who died in the hospital

Parameters	*Phase I*	*Phase II*
a. Mean age	23.17 years	25.68 years
b. Mean parity	2.4	2.7
c. Literacy level		
• Illiterate	76.4	78.1
• Literate	23.6	21.9
d. Antenatal care		
• Unbooked	94.8	92.6
• Booked	5.2	7.4
e. Socioeconomic status		
• Low	89.4	82.8
• Middle	10.6	17.2
f. Residence		
• Rural	73.9	70.4
• Urban	26.1	29.6
g. Mode of hospital admission		
• Direct	66.8	62.6
• Referred	33.2	37.4
h. Mean no. of admission to other hospital center	0.4	2.5

Table 4: Preventable factors

Factors	*Phase I*	*Phase II*
1. Patient negligence	70.5%	68.1%
2. Deficient public health facilities	60.2%	54.6%
3. Peripheral health care provider negligence	44.6%	40.7%
4. Transport	30.2%	27.7%
5. Doubtful preventability	10.9%	12.4%
6. Not preventable	13.6%	14.9%

Table 5: Factors operating before the patient reached the hospital

Factors	*Phase I*	*Phase II*
1. Sources of referral		
Brought by relatives (Direct)	80.9%	62.6%
PHC/CHC	6.7%	16.8%
Private practitioners	12.4%	20.6%
2. Distance travelled		
≤ 10 km	10.6%	25%
11-40 km	24.2%	30%
41-60 km	45.2%	30%
61-90 km	13.9%	10%
> 90 km	6.1%	5%
3. Cases treated outside by		
Doctors	17.4%	28.9%
Dais		
• Trained	2.1%	3.6%
• Untrained	36%	31.3%
No treatment	44.9%	36.2%

Table 6: Time interval in hours since admission and death

Time interval	*Phase I*	*Phase II*
0-6 hours	22.4%	26.5%
7-24 hours	39.8%	38.8%
25-72 hours	18.6%	15.64%
>72 hours	19.2%	19.06%

Table 6 shows that 62.2% and 65.3% patients died within 24 hours of admission in phase I and phase II respectively. 18.6% patients died within 25-72 hours and 19.2%. Patients died after 72 hours after admission in phase I as compared to 15.64% and 19.06% patients in phase II.

As shown in Table 7—28.4% patients in phase II were treated conservatively as compared to 23.2% in phase I due to better availability of drugs and blood transfusion facilities. There was decline in the number of patients being delivered normally from 28.3% in phase I to 23.6% in phase II along with a simultaneous rise in the rate of cesarean anesthetic section from 19.6% by Phase I to 24% in phase II due to better availability of operation and anesthetic facilities. Due to a fall in the number of patients with septicemia there was a decline in patients requiring D and C. Laparotomy was done in 3.2% patients in phase I as compared to 2.4% patients in phase II. 2.8% patients in phase II required

Table 7: Nature of treatment given to the mother in the hospital

Treatment modality	*Phase I(%)*	*Phase II (%)*
1. No treatment	3.7	4.8
2. Conservative	23.2	28.4
3. Active management		
• D and C/Evacuation	8.9	5.7
• Laparotomy	2.4	3.2
• Hysterectomy		
– Subtotal	2.6	1.4
– Total	1.2	0.4
4. Normal delivery	28.3	23.6
5. Forceps delivery	8.7	6.4
6. Cesarean section	19.6	24
7. Manual removal of placenta	1.4	2.1

hysterectomy as compared to 3.8% patients in phase I due to better availability of transport facilities and early referral so that they were managed either conservatively or by cesarean section.

Table 8: Hb level of women in maternal death

Hb level	< 6	6.1-8.5	8.6-10.9	11 and above
Phase I	59%	23.5%	15.5%	2%
Phase II	53.8%	27.6%	17.6%	1%

Table 8 shows the Hb levels in gm% of the mothers who died in the hospital. It can clearly be seen that the incidence severe anemia (< 6 gm%) is still very high in both phases 59% and 53.8% respectively with only 2% and 1% with normal hemoglobin levels.

DISCUSSION

The maternal mortality rate at this institution has shown a decline being 2374/1 lac in phase II as compared to 2868.37 in phase I. But this is unacceptably high when compared to other studies from this country and the maternal average 408/1 lac live births (Park 16th edition). The high incidence at our institution is due to the fact that it is a tertiary referral centers were a large number of referred cases are being handled along with a large number of unbooked, emergency admissions, these constitute approximately 92.6% of admission at this center.

Major causes of death have remained the same in both the phases - hemorrhage, eclampsia and septicemia. A large study conducted by ICMR task force (1991-96) covering 31 hospitals from 16 states/union territories of the country showed 70.1% of deaths due to direct obstetric causes and amongst these hemorrhage was responsible in 23.6% patients, PIH in 24% and sepsis in 7.2% patients. In our study toxemia has emerged as the leading causes of death accounting for 20% of deaths in phase I as compared to 13.8% in phase I. There has been a slight decline in the incidence of deaths due to septicemia from 15.7% in phase I to 12.6% in phase II. Anemia still remains a very important cause of death although it has also shown some decline from 26.9% in phase I to 22.9% in phase II.

The general profile of the patient coming to the hospital has shown some improvement in phase II although still most of the patients who died in the hospital were illiterate, belonging to low socioeconomic status and living in rural areas who had not received any ANC antenatal care. 19.3% patients in phase I and 32.5% patients in phase II were treated outside by trained personnel before being referred. This could be due to improved general awareness among the patients leading to better utilization of public health facilities.

22.4% and 34.6% of patients died within 6 hours of admission in the two phases and another 39.4% and 30.7% patients died in the next 18 hours. This could be due to an improvement in transport facilities leading to an increase in the number of patients who were referred to the hospital before reaching terminal stage but later on died due to their complicated condition but this also shows that there are still very poor utilization of antenatal and intrapartum facilities provided by the government.

CONCLUSION

This review shows that there has been some reduction in MMR in the last 20 years. But it is still a long way from what has been achieved in developed countries. Further reduction requires an improvement in the present health care system and their better utilization by the general population. We also have to improve the status of women through education and vocational training so that they can understand and make their voice heard in matters concerning their health.

Further steps which can be taken to improve the MMR.

i. Make provision for effective contraception and safe abortion service at FRU to reduce mortalities due to unplanned pregnancies.
ii. Make transfusion facilities better available.
iii. Strengthen referral system and transport facilities to ensure timely transfer of high risk patients.
iv. Improvement of essential obstetric services:
    - Antenatal care should be more accessible.
    - Institutional deliveries or home deliveries under qualified supervision for low risk cases.
v. PHC and FRUs should be better equipped with proper instruments and trained medical and paramedical staff to handle obstetrical emergencies.
vi. Media should be utilized to promote health awareness amongst the public.

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