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Trends of Maternal Mortality in Last 25 Years from a Large Referral Medical Hospital in West Bengal

[1]Dr. Samrat Chakrabarti[1], Dr. Debraj Mondal[2], Prof Dr. Arup Majhi[3], Prof Dr. Amitava Das[4], Dr. Woothvasita Mondal[5]

[1]Assistant Professor, Department of Obstetrics & Gynaecology, Murshidabad Medical College and Hospital, Berhampore, West Bengal.

[2]Junior Resident, R. G. Kar Medical College and Hospital, Shyambazar, Kolkata, West Bengal

[3]Professor & HOD, Department of Obstetrics & Gynaecology, R. G. Kar Medical College and Hospital, Shyambazar, Kolkata, West Bengal.

[4]Department of Obstetrics & Gynaecology, R. G. Kar Medical College and Hospital, Shyambazar, Kolkata, West Bengal.

[5]Jenior Resident, Department of Obstetrics & Gynaecology, R. G. Kar Medical College and Hospital, Shyambazar, Kolkata, West Bengal.

Corresponding Author: Dr. Samrat Chakrabart Assistant Professor, Department of OBGY, Murshidabad Medical College and Hospital, Berhampore, West Bengal

Abstract:

Background: Maternal mortality is defined by the World Health Organization as the death of a woman from pregnancy-related causes during pregnancy or within 42 days of pregnancy, expressed as a ratio to 100,000 live births in the population being studied. **Aim:** The present study was carried out to analyze the maternal death rate and its changing trends over a 25-year period in a large referral/teaching institution in Eastern India.

Material and Methods: A retrospective analysis of maternal deaths was carried out from January 1986 to December 2010 at the Department of Obstetrics and Gynaecology, R. G. Kar Medical College and Hospital, West Bengal, India. Records were divided into four 5 yearly periods: 1986-1990; 1991-1995; 1996-2000; 2001-2005 and 2006-2010 for comparison of the trends.

Results: The cumulative maternal mortality ratio (MMR) was 539.5 per 100000 live births. Comparison between the first 5-year period (1986-1991) and the last (2006-2010) showed a statistical significant downward trend in MMR (683.6 vs. 261.34; $P < 0.001$). Deaths due to direct causes are still the leading cause, accounting for 82.09% of total deaths. Hypertensive disorders (34.52%), haemorrhage (22.27%) and sepsis (19.2%) were still the major causes of direct obstetric deaths throughout the study period. Hypertensive disorders alone showed a substantial decline after the Introduction of magnesium sulphate.

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Conclusion: There has been a remarkable decline in maternal deaths in last 25 years, although a MMR of 225(in 2010) is far above MDGS target of 109 to be achieved by 2015 Key words: maternal mortality, safe motherhood, trends.

Keywords: Maternal Mortality, Pregnancy, Childbirth

Introduction

The World Health Organization (WHO) defines maternal death as the death of a pregnant woman due to complications related to pregnancy, underlying conditions worsened by the pregnancy or management of these conditions. This can occur either while she is pregnant or within six weeks of resolution of the pregnancy.[1] The CDC definition of pregnancy-related deaths extends the period of consideration to include one year from the resolution of the pregnancy.[2] Pregnancy associated death, as defined by the American College of Obstetricians and Gynecologists (ACOG), are all deaths occurring within one year of a pregnancy resolution.[4] Identification of pregnancy associated deaths is important for deciding whether or not the pregnancy was a direct or indirect contributing cause of the death. [3]

In the year 2010 an estimated 287 000 maternal deaths have occurred, of which 284 000 were from developing countries. The risk of a women dying as a result of pregnancy or childbirth during her lifetime is about I in 150 in the poorest part of the world, compared with approximately one in 3800 in the developed world (1). The majority of these deaths are preventable. One of the eight Millennium Development Goals (MDGS) that has made some progress, albeit slow, is MDG 5: "Improve maternal health". The two targets for assessing MDG S are reducing the maternal mortality ratio (MMR) by between 1990 and 2015, and achieving universal access to reproductive health by 2015.

Periodical study and analysis of maternal mortality are therefore important to monitor progress. The present study was carried out to analyze the maternal deaths and its changing trends over a 25-year period in a large referral/teaching institution in Eastern India**.**

Material and Methods

A retrospective analysis of maternal deaths was carried out over a period of 25 years from January 1986 to December 2010 at the Department of Obstetrics and Gynaecology, R. G. Kar Medical College and Hospital, Kolkata, India. R. G. Kar Medical College and Hospital is a city based large teaching/referral hospital catering to both urban and rural areas, for mostly low and middle socioeconomic status women of adjacent four to five districts with annual deliveries ranging from 2 216 to 13 42 and abortions ranging from 3000 to 4000 annually (2). In the International statistical classification of diseases and related health problems, I(ft revision (ICD-IO) (3),

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WHO defines maternal death 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 related to or aggravated by the pregnancy or its management but not from accidental or incidental causes". We included all maternal deaths that occurred during pregnancy or within 42 days of its termination, irrespective of the duration or site of implantation.

Maternal mortality ratio (MMR) is considered 05 the maternal deaths during a given year per 200000 live births. Deaths were classified as direct or indirect obstetric deaths. Direct causes are the causes which are due to pregnancy itself life pregnancy induced hypertension. haemorrhage, sepsis, obstetric shock and obstructed labour. Indirect causes are not directly related to pregnancy, but their presence or occurrence results in death during pregnancy from conditions such as severe anemia, hepatitis, heart disease, diabetes, pulmonary embolism and anaesthetic complications. Late maternal deaths (more than 42 days but less than 1 year after the termination of pregnancy) were not included in the present study. We collected data from the records section of our institution and from previous studies conducted at the same institution. Records were divided into five yearly periods: 1986-1990; 1991-1995; 1996-2000; 2001-2005 and 2006-2010, for comparison of the initial interval from 1986 to 1990 was chosen as the reference period. we analyzed the causes of maternal deaths during the last 5eyear period on a yearly basis. The data vas analyzed using Graph Pad instat 3, for Macintosh (Graph Pad software, San Diego, CA, USA).

Results

During the study period the total number of live births was 285960. There were 1437 maternal deaths. The cumulative MMR was 539.5 per 100 000 live births. (Table 1). Comparison between the first 5-year period (1986—1991) versus the last (2006-2010) showed statistically significant downward trend in MMR (683.6 vs 261.34; $P < 0.001$). Direct causes are still the chief culprit, accounting for 80.02% of total deaths. There was no significant change in deaths due to direct causes during the first three 5-yearly periods; however, there was significant reduction of direct obstetric deaths in the last 10-year period ($P < 0.001$), especially it is more pronounced in the latest 5-years. The proportion of direct: indirect deaths are Significantly decreasing (4.84 vs. 2.14 $P < 0.001$).

Table 1: Maternal mortality ratio (MMR) and distribution of direct and indirect causes of maternal deaths, 1986-2010

Five yearly periods	19861990t	1991-1995	1996-2000	2001-2005	2006-2010	TOTAL
No. of livebirths	41837	47275	54237	60726	81885	
No. of maternal deaths	286	301		288	214	1437

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Direct	237 (82.87)	255 (84.72)	284	228 (79.17)*	146 (68.24) * *	1150 (80.02)
Indirect	49 (17.13)	46 (15.28)	64 (18.39)	60 (20.83)	68	287
Direct : Indirect	4.84	5.54	4.44	3.8	2.14	4.01
MMR/$OOOO O live births	683.6	636.7	641.6	474.3	261.34	539.5

**P < 0.001; t reference period

Hypertensive disorders haemorrhage and sepsis continued to be the major causes of direct obstetric deaths throughout the study period (Table 2). A particularly high MMR was found for hypertensive disorders accounting for 34.52% of total deaths. A statistically significant increase in deaths from hypertensive disorders was observed during second (P < 0.01) and third (P < 0.001) 5year periods when compared to the first 5-year period. During the last 5-year period, a declining trend was observed in comparison to the second and third 5-year periods (25.23% for 2006-2010 vs 40.2% and 41.09% for 1991—1995 and 1996—2000, respectively).

A statistically significant decline of maternal deaths due to haemorrhage was observed during the second (p < 0.05) and third (P < 0.05) 5-year periods in comparison to the first 5-year period. But in the last 5-year period shows increase in the deaths from haemorrhage in comparison to the first 5-year period. Approximately 19.2% of women died due to sepsis, which included both puerperal and post-abortal deaths, among deaths from sepsis, there was significant reduction of deaths during the second, third, fourth and last 5-year period in comparison to the first 5-year period. Anemia is the leading indirect cause of maternal death. Deaths from anemia are still high throughout our study period accounting for 6.28% of deaths and there was a statistically significant rise observed during the third 5-year period in comparison to the first 5-year period (10.93 for 1996-2000 vs 4.61 for 1986-1990) P < 0.001 [Table 2). Table 3 shows maternal deaths in the last 5-year period. There is a noticeable increase in the live birth rate from 14172 in 2006 to 18237 in 2010, but MMR declines from 282.25 in 2006 to 225 in 2010.

Table 2: Distribution according to important causes of maternal deaths-

	1986-1990 No. (%)	1991-1995 No. (%)	1996-2000 No. (%)	2001-2005 No. (%)	2006-2010 No. (%)	TOTAL
Hypertensive disorders	87	121	157	77 25.66)	54	496 (34.52)

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Haemorrhage	30.23 (22.31)	55 (18.49) *	66 (21.11)*	70(24.84)	52 (24.3)**	320 (22.27)
Sepsis	70 (24.64)	52 (18.3)*	61	56	37 (17.29)	276 (19.2)
Anemia	13 (4.61)	16	37	22 (7.53)*	10 (4.67)*	98 (6.82)

•P < 0.05; ••p < 0.01; < 0001; > 0.05; reference period.

Table 3: Year wise maternal deaths in the last 5-year period

Year	**2006**	**2007**	**2008**	**2009**	**2010**
Total no. of live births	14172	16414	15868	17194	18237
Total no. of maternal deaths per 100,000 live births	282.25	244	271	291	225
Hypertensive DISORDERS	08 0.00) *	20 50.00)	10 (23.26)	09 (18.00)**	07 (17.00)**
Haemorrhage	13 32.50)	06 (15.00)	13 (30.23)**	10 (20.00)**	10 (24.39)**
SEPSIS	03 .50)	04 (10.00)**	12 (27.90)**	09 (18.00)	09 (21.95)**
Anemia	05 (12.50)	01 (2.50)	01 (2.33)	03 (6.00)**	

p< 0.05; < 0.01; < 0.001; > 0.05; t reference period.

Discussion

Reduction of maternal mortality is an important Millennium Development Goal of special concern in low income countries. The true status of maternal mortality in India is not known (4). The National Health Policy (1982) aimed at reducing the maternal mortality in India from 400 per 100000 live births to less than 200 per 100 000 live births by the end of year 2000. India is still lagging far behind in achieving this goal and the present MMR in India is 453/100 000 live births (61. According to Register General of India (RGI) estimates for the year 2000, the MMR for India was 407 per 100 000 live births. This means that more than 100 000 die each year in

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India due to pregnancy related causes (7).

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In our present study, we have seen that the MMR was 539.5 per 100 000 live births, which is high by international standards, but much less than from many referral institute in India, with figures from Central India pf 2642.8 between 1986 and 2000, and from Eastern India of 1692.2 between 1990 and 1998 (Khare et al., 2002; Roy et al., 2002) (8, 9). Maternal mortality at this institute has been critically analyzed in previous three studies. (2) The MMR at this institution has decreased significantly during the following years: 683.6 between 1986—1990 to 261.34 between 2006—2010 ($P < 0.001$), although the live births at our institution have increased from 41837 between 1986—1990 to 81885 between 2006—2010.

This is due to the fact this institution deals with good number of high risk patients and often the women are only referred to hospital when they develop life threatening complications, which is too late and swells the number of hospital deaths. In the present analysis, hypertensive disorders were responsible for 34.52% of deaths, followed by haemorrhage (22.27%) and sepsis (19.2%). Evidence suggests that direct consequences of pregnancy and childbirth continue to account for most maternal deaths in developing countries (12). In a systematic review of studies of maternal mortality by the Word Health Organization, severe bleeding, hypertensive diseases, and infections were the dominant causes (12). From Western India, Chhabra has reported hypertensive disorders in 27.4%, hemorrhage in 12.9% and sepsis in 9.5% of cases of mortality.(4) From Eastern India, Goswami has reported hypertensive disorders in 29.8%, haemorrhage in 16.8% and sepsis in 28.2% of cases of mortality. (13)

From Eastern India, Pal et al. have reported hypertensive disorders in 50.56%, haemorrhage in 9.72% and sepsis in 18.17% Of cases of mortality (14). Although a statistically significant rise Of deaths for hypertensive disorders was observed during the second ($P < 0.01$) and third ($P < 0.001$) 5 year periods in comparison to the first 5 year period, a declining trend was observed during the last 5-year period in comparison to the second and third 5-year period (25.23% for 2006—2010 vs 40.2% & 41.09% for 1991—1995 and 1996—2000 respectively). Deaths due to hypertensive disorders showed a statistically significant downward trend in last 10 years from 2001 -(öko.05). One recent study on eclampsia has clearly demonstrated this reduction of deaths from eclampsia on comparing the previously reported study (15).

The dramatically decreased rate of. deaths from eclampsia over the last S-year period has been due to exclusive use of magnesium sulphate for the control of convulsions. Among haemorrhage, statistically significant decline of maternal deaths were observed during the second ($P < 0.05$) and third ($P < 0.05$) 5-year period in comparison to first 5-year period. But in the last 5-year period, reduction of deaths were not statistically significant ($P = 0.5334$) in comparison to the

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first 5-year period. Sepsis was still one of the most important causes (49.2%) of death in spite of legalization of medical termination of pregnancy (MTP) and advent of antibiotics.

Ignorance and lack of awareness of the patients regarding MTP and contraceptive devices, untrained personnel performing illegal and unsafe abortion, deliveries under unsafe conditions and referring the patients late in tertiary care centre are still the root causes of deaths due to sepsis. Deaths from anemia are still high throughout our study period accounting for 6.82% of deaths and a statistically significant rise of deaths from anemia was observed during the third 5-year period in comparison to the first 5-year period (10.93 for 1996-2000 vs 4.61 for 1986-1990; $p < 0.001$).

This rise is partly relative, which is due to the reduction of deaths from direct causes and partly due to the fact that prevalence of anemia is still high in developing countries. Persistence of anemia is a matter of great concern as it reveals the failure of anemia prevention programs. Almost a fifth of all maternal deaths have been reported to be related to anemia in India. However there is no maternal death from anemia in the last year 2010

Conclusion

The present study indicates that there has been a decline of maternal mortality, but at a very slow pace. The dramatic reduction of maternal deaths in eclampsia after introduction of magnesium sulphate clearly shows the need for evidence based interventions. Deaths from other causes have not shown a similar decline. Medical causes of maternal deaths are largely dependent on the various social factors. such as socioeconomic status, literacy, high parity and health status of women, which should be properly addressed. Maternal mortality still remains very high in tertiary referral care centers, mainly due to high percentage of referred cases from periphery. Though institutional deliveries are safer, it is not possible for all cases, A health centre focused intrapartum care strategy can be justified as the best way to bring down high rates of maternal mortality. Ensuring appropriate provision of emergency obstetric care at peripheral first referral level hospitals can reduce the number Of moribund patients crowding the tertiary teaching hospital.

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