REPORT ON THE CONFIDENTIAL ENQUIRIES INTO MATERNAL DEATHS IN MALAYSIA 2006-2008

DIVISION OF FAMILY HEALTH DEVELOPMENT
MINISTRY OF HEALTH MALAYSIA

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PREFACE

Maternal mortality remains a critical and sensitive indicator of the state of our health system. Reviews of maternal deaths are an essential component of any maternity service. The Confidential Enquiries into Maternal Deaths in Malaysia (CEMD) was established in 1991. This report is the eight in a continuing series and will provide us with an opportunity to analyse the situation of maternal deaths for the period 2006 to 2008. The report presents an overview of topics that are of major concern in the prevention of maternal deaths and recommendations have been made to deal with the factors related to these deaths.

It is a human tragedy when a woman dies giving life and it is essential, we learn from each of these deaths. The report serves as a useful tool in identifying strengths and gaps in our maternal health services. Reducing maternal mortality ratio as envisaged by the Millennium Development Goals is going to be a real challenge and there is an urgent need for immediate actions if the goals are to be achieved.

I would like to thank all health personnel for their cooperation and dedication in investigating and reviewing maternal deaths in Malaysia.

DATO' DR. MUKUDAN KRISHNAN
Chairman
National Technical Committee for the CEMD
(2006-2008)

EXECUTIVE SUMMARY AND KEY RECOMMENDATIONS

SUMMARY

- 772 pregnancy related deaths were reported from 2006 to 2008.
- Maternal mortality ratio in 2008 was 27.3 per 100,000 live births.
- Principal cause of maternal deaths are Obstetric embolism, Medical Disorders in Pregnancy, Postpartum haemorrhage and Hypertensive Disorders in Pregnancy.
- More than 60% of the maternal deaths occurred during the postnatal period.
- The risk of maternal death was higher in women aged more than 40 years and in mothers who had already six and more children.
- Maternal deaths tagged with the green colour code increased from 26.6% in 2006 to 32.3% in 2008.

KEY RECOMMENDATIONS

- Ectopic pregnancy should be ruled out in any woman in the reproductive age who complains of abdominal pain.
- Pre-conception care should be provided for women with pre-existing medical conditions.
- Women with current or previous medical conditions should be reviewed by physicians early in the pregnancy so the management can be planned.
- Cardiologist should be involved in the management of pregnant women with heart disease.
- Senior doctors should be involved in the care of patients with medical conditions
- Regular obstetric drills should be organized for health staff managing obstetric patients.
- All at risk patients in pregnancy and postpartum period should be offered thromboprophylaxis
- Greater efforts should be made to provide family planning services to high risk women
- Postnatal nursing should focus on the ability to exclude presence of deep Vein Thrombosis and postnatal depression
- Health personnel should be trained to identify psychiatric disorders, domestic violence, substance abuse or self harm during pregnancy and postnatal period.
- Existing referral system should be strengthened through supervision and communication
- An amniotic fluid embolism registry should be established in all obstetric units to gain a better understanding of the condition

- Obstetric protocols, guidelines and manuals must be available in all labour rooms and obstetric units
- All home deliveries must be conducted by trained personnel
- Hospital staff must inform the health clinic when patients are discharged
- Home visits and defaulter tracing must be done by health staff
- Road safety should be part of antenatal education especially in the use of helmets and seat belts.
- Postmortem examination should be offered in all pregnancy related deaths and family members should be fully advised about the process of postmortem

CHAPTER 1

OVERVIEW OF MATERNAL DEATHS

1.1 Introduction

There were 772 pregnancy related deaths reported to the committee on the Confidential Enquiries into Maternal Deaths from 2006 to 2008, The number of deaths has declined from 316 in 2001 to 267 in 2008(Table 1.1).

Table 1.1: Number of pregnancy related deaths, 2001-2008

Year	2001	2003	2005	2006	2007	2008
Number of deaths	316	236	255	247	258	267

1.2 Data analysis

1.2.1 Deaths by citizenship status

All pregnancy related deaths are categorised by their citizenship status - citizens, non citizens with legal documents and non citizens without legal documents (Table 1.2). Citizens contributed to almost 75% of the deaths while non citizens with legal documents resulted in 10% and non citizens without legal documents almost 15% of the deaths. The data analysed in this report are of citizens and non citizens with legal documents. The non citizens without legal documents are analysed separately in Chapter 14.

Table 1.2: Pregnancy related deaths by citizenship status

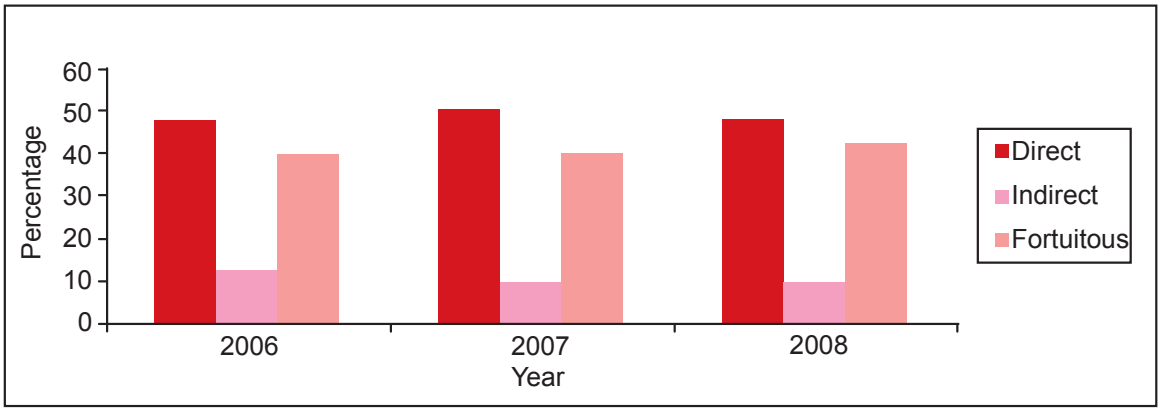
Classification	2006		2007		2008	
	n	%	n	%	n	%
Malaysian citizens	188	76.1	202	78.2	197	73.8
Non citizens with legal documents	24	9.7	28	10.9	31	11.6
Non citizens without legal documents	35	14.2	28	10.9	39	14.6
Total	**247**	**100.0**	**258**	**100.0**	**267**	**100.0**

Of these 772 pregnancy related deaths, 670 were identified in citizens and non citizens with legal documents. The percentage of death by classification has not changed significantly from 2006 to 2008. Fifty percent of the 670 deaths were classified as direct, ten percent as indirect deaths and the remaining forty percent as non pregnancy related deaths (fortuitous) (Table 1.3 & Fig. 1.1). Maternal mortality ratio (MMR) has remained virtually stationary at 27.3 per 100,000 live births (LB) in 2006 and 2008.

Table 1.3: Classification of pregnancy related deaths

Classification	2006		2007		2008	
	n	%	n	%	n	%
Direct	100	47.2	115	50.0	110	48.2
Indirect	27	12.7	21	9.1	23	10.1
Sub total	127		136		133	
MMR	**27.3**		**28.8**		**27.3**	
Fortuitous	85	40.1	94	40.9	95	41.7
Grand total	212	100.0	230	100.0	228	100.0

Fig. 1.1: Percentage of pregnancy related deaths



1.2.2 Causes of maternal deaths

The causes of maternal deaths for 2006 to 2008 are shown in Appendix 1. The main causes have remained the same as in previous reports. Direct causes from complications during pregnancy dominate maternal deaths. These include Obstetric embolism, Postpartum haemorrhage (PPH), and Hypertensive Disorders in Pregnancy (HDP). Though there has been a reduction in the number of deaths from HDP and PPH, deaths due to Obstetric embolism have increased from 14.1% in 2006 to 30.8% in 2008. Indirect causes from Associated Medical Conditions resulted in about 17% of the deaths. Heart disease was the most common indirect cause of maternal death. Only two women died from anaesthesia related complications during this period. Motor vehicle accidents and poisoning were the main cause of fortuitous deaths.

1.2.3 Maternal Mortality Ratio by states

Appendix 2 illustrates the number of maternal deaths and MMR by states. Sabah and Melaka consistently registered high MMR during 2006 to 2008. MMR in Terengganu declined significantly from 32.1 in 2006 to 4.3 in 2008. MMR in other states fluctuated during the same period of time.

1.2.4 Patient's profile

i. Age

Less than 4% of the deaths were below 19 years and those aged 45 years or more represented less than 2% of deaths (Table 1.4). Age specific mortality rate in the 20-24 age group declined from 26.6/ 100,000LB in 2006 to 17.6 in 2008, whereas, adverse outcomes in mothers above 45 years old increased from 56.1/ 100,000LB to 114.6 during the same period (Table 1.5).

Table 1.4: Maternal deaths by age group

Age group	2006		2007		2008	
	n	%	n	%	n	%
<19	5	3.9	3	2.2	3	2.3
20-24	22	17.9	16	11.6	15	11.5
25-29	19	14.8	32	23.2	29	22.1
30-34	34	26.7	39	28.3	35	26.7
35-39	30	23.4	33	23.9	31	23.7
40-44	16	12.5	13	9.4	16	12.2
>45	1	0.8	2	1.4	2	1.5
Total	**127**	**100.0**	**136**	**100.0**	**131**	**100.0**

Table 1.5: Age specific MMR

Age group	2006			2007			2008		
	n	LB	MMR	n	LB	MMR	n	LB	MMR
<19	5	15,613	32.0	3	16,207	18.5	3	17,698	16.9
20-24	22	82,755	26.6	16	82,403	19.4	15	85,216	17.6
25-29	19	151,432	12.5	32	155,808	20.5	29	161,468	17.9
30-34	34	124,847	27.2	39	126,714	30.8	35	130,876	26.7
35-39	30	67,566	44.4	33	68,335	48.3	31	69,156	44.8
40-44	16	19,557	81.8	13	19,165	67.8	16	19,674	81.3
>45	1	1,783	56.1	2	1,778	112.5	2	1,745	114.6

ii. Parity

Table 1.6 shows 60%-70% of deaths occurred in women who had delivered between 2 to 5 children . Parity specific mortality rates remained very high for women who had 6 and more children (Table 1.7).

Table 1.6: Maternal deaths by parity

Parity	2006		2007		2008	
	n	%	n	%	n	%
Primigravida	13	10.9	28	20.3	20	15.0
Multiparous	89	69.5	85	63.1	93	70.0
Grandmultipara	25	19.6	21	15.2	18	13.5
No information	0	0	2	1.4	2	1.5
Total	**127**	**100.0**	**136**	**100.0**	**133**	**100.0**

Table 1.7: Parity specific MMR

Parity	2006			2007			2008		
	n	LB	MMR	n	LB	MMR	n	LB	MMR
Primigravida	13	155,561	8.4	28	163,222	17.1	20	174,490	11.5
Multipara	89	278,412	32.0	85	278,976	30.5	93	284,959	32.6
Grandmultipara	25	31,139	80.3	21	29,850	70.3	18	27,899	64.5

iii. Ethnic group

Maternal deaths were high in Malays (60%) followed by the Chinese and Indians. This was representative of the population distribution. The group 'others' refers to any ethnic or mixed group not classified in the traditional grouping (Table 1.8). Ethnic specific mortality rate showed deaths were high in Bajau and Murut (Table 1.9)

Table 1.8: Maternal deaths by ethnic group

Ethnic group	2006		2007		2008	
	n	%	n	%	n	%
Malay	68	53.1	78	57.4	73	54.8
Chinese	14	11.7	11	8.1	10	7.5
Indians	13	10.2	7	5.2	10	7.5
Kadazandusun	0	0	2	1.4	3	2.3
Bajau	5	3.9	8	5.9	1	0.8
Murut	0	0	2	1.5	1	0.8
Melanau	0	0	0	0	1	0.8
Iban	6	4.7	6	4.4	7	5.2
Bidayau	0	0	1	0.7	1	0.8
Orang asli Pen. Malaysia	4	3.1	3	2.2	3	2.3
Other ethnic groups Sabah/ Sarawak	4	3.1	1	0.7	5	3.7
Others	13	10.2	17	12.5	18	13.5
Total	**127**	**100.0**	**136**	**100.0**	**133**	**100.0**

Table 1.9: Ethnic specific MMR

Ethnic group	2006			2007			2008		
	n	LB	MMR	n	LB	MMR	n	LB	MMR
Malay	68	270,945	25.1	78	274,638	28.4	73	284,247	25.7
Chinese	14	84,637	16.5	11	85,229	12.9	10	84,285	11.8
Indians	13	29,525	44.0	7	29,693	23.6	10	29,636	33.7
Kadazandusun	0	9,801	0	2	9,964	20.1	3	10,815	27.7
Bajau	5	7,168	69.7	8	7,855	101.8	1	8,356	11.9
Murut	0	1,928	0	2	1,992	100.4	1	2,082	48.0
Melanau	0	2,694	0	0	2,724	0	1	2,828	35.3
Iban	6	12,486	48.0	6	11,949	50.2	7	12,397	56.4
Bidayau	0	3,369	0	1	3,349	29.9	1	3,405	29.3
Orang asli Pen. Malaysia	4	4,694	85.2	3	4,643	64.6	3		

iv. Educational level

Table 1.10 showed that about 10% of the women had no formal education while 70-80% had primary and secondary education.

Table 1.10: Maternal deaths by educational level

Educational level	2006		2007		2008	
	n	%	n	%	n	%
No formal education	14	11.0	10	7.3	13	9.8
Primary school	25	19.7	25	18.4	25	18.8
Secondary school	71	55.9	81	59.5	65	48.9
Tertiary	6	4.7	5	3.7	9	6.7
No information	11	8.7	15	11.1	21	15.8
Total	**127**	**100.0**	**136**	**100.0**	**133**	**100.0**

v. Mother's occupation

Nearly 60% of mortality occurred in housewives followed by those in the sales and service sectors (Table 1.11).

Table 1.11: Maternal deaths by occupation

Type of occupation	2006		2007		2008	
	n	%	n	%	n	%
Housewife	73	57.5	77	56.6	77	57.9
Professional/Technical	1	0.8	2	1.5	2	1.5
Administrative	3	2.3	3	2.2	1	0.8
Clerical	3	2.3	7	5.1	6	4.5
Sales & Service	34	26.8	35	25.8	31	23.3
Agriculture & Production related workers	1	0.8	2	1.5	0	0
Unemployed	4	3.2	2	1.5	0	0
Student	0	0	1	0.7	1	0.8
Unknown	8	6.3	7	5.1	15	11.2
Total	**127**	**100.0**	**136**	**100.0**	**133**	**100.0**

vi. Husband's occupation

70% of the husbands were either employed in the agriculture or sales and service related sectors (Table 1.12). Less than 10% of the husbands were employed in the Professional and administrative sections.

Table 1.12: Maternal deaths by husband's occupation

Type of occupation	2006		2007		2008	
	n	%	n	%	n	%
Professional/Technical	5	4.2	9	7.1	5	3.9
Administrative	8	6.7	8	6.3	5	3.9
Clerical	3	2.5	0	0	1	0.8
Sales & Service	79	66.4	85	66.9	80	62.0
Agriculture & Production related workers	12	10.1	12	9.4	14	10.8
Unemployed	0	0	3	2.4	1	0.8
Unknown	12	10.1	10	7.9	23	17.8
Total	**119**	**100.0**	**127**	**100.0**	**129**	**100.0**

*unmarried (2006 – 8, 2007 – 9, 2008 – 4)

vii. Marital status

Of the 396 maternal deaths, 21 (16%) occurred in unmarried mothers and marital status was not recorded in 5 cases (Table 1.13).

Table 1.13: Maternal deaths by marital status

Marital status	2006		2007		2008	
	n	%	n	%	n	%
Yes	118	92.9	126	92.6	126	94.7
No	8	6.3	9	6.7	4	3.0
Unknown	1	0.8	1	0.7	3	2.3
Total	**127**	**100.0**	**136**	**100.0**	**133**	**100.0**

viii. Family planning

The percentage of women who did not practice family planning increased from 53.1 in 2006 to 62.6 in 2008 (Table 1.14). Family planning status was unknown in 20% of the cases.

Table 1.14: Maternal deaths by family planning practice

Family Planning	2006		2007		2008	
	n	%	n	%	n	%
Ever User	30	23.6	25	18.4	24	18.3
None user	68	53.5	86	63.2	82	62.6
Don't know	29	22.9	25	18.4	27	19.1
Total	**127**	**100.0**	**136**	**100.0**	**133**	**100.0**

1.2.5 Delivery characteristics

i. Stage of pregnancy

Table 1.15 illustrates maternal deaths in postpartum period increased from 54.3% in 2006 to 62.4% in 2008, while deaths in the intrapartum period declined from 15.0% to 8.3% during the same period.

Table 1.15: Maternal deaths by stage of pregnancy

Stage of pregnancy	2006		2007		2008	
	n	%	n	%	n	%
Antenatal	27	21.3	26	19.1	32	24.0
Intrapartum	19	15.0	13	9.6	11	8.3
Postpartum	69	54.3	84	61.8	83	62.4
Early pregnancy deaths	12	9.4	13	9.5	7	5.3
Total	**127**	**100.0**	**136**	**100.0**	**133**	**100.0**

ii. Place of delivery

A significant proportion of births (70%-80%) occurred in government hospitals while 10% were non hospital births. Deliveries in the private hospitals accounted for less than 12% (Table 1.16). Specific mortality rate for home deliveries were very high as compared to hospital deliveries (Table 1.17).

Table 1.16: Maternal deaths by place of delivery

Place of delivery	2006		2007		2008	
	n	%	n	%	n	%
State hospital	31	37.4	40	42.1	43	47.2
Hospital with O&G specialist	24	28.9	23	24.2	15	16.5
Hospital without O&G specialist	8	9.6	5	5.3	9	9.9
Private hospital with specialist	7	8.5	11	11.5	10	11.0
Private hospital without specialist	0	0	0	0	1	1.1
Other hospitals	0	0	0	0	1	1.1
Home	10	12.0	6	6.3	7	7.7
Enroute	1	1.2	1	1.1	2	2.2
Others	2	2.4	3	3.2	1	1.1
Unknown	0	0	6	6.3	2	2.2
Total	**83**	**100.0**	**95**	**100.0**	**91**	**100.0**

Table 1.17: Place of delivery specific MMR

Place of delivery	2006			2007			2008		
	n	LB	MMR	n	LB	MMR	n	LB	MMR
Government hospital	63	325,334	19.4	68	335,260	20.3	67	355,743	18.8
Private hospital	7	58,417	12.0	11	72,578	15.1	11	75,055	14.6
Home	9	10,522	95.0	6	9,021	66.5	7	9,021	77.6

iii. Mode of delivery

Table 1.18 shows 40% of deaths occurred in women who had spontaneous vaginal deliveries (SVD). Deaths from vacuum-assisted deliveries declined dramatically from 9.9% in 2006 to 4.2% in 2008. Deaths in deliveries conducted by caesarean sections increased from 30.8% in 2006 to 39.6% in 2008 (Table 1.18).

Table 1.18: Maternal deaths by mode of delivery

Mode of delivery	2006		2007		2008	
	n	%	n	%	n	%
SVD	38	45.8	34	35.8	40	43.9
Vaccum	9	10.9	7	7.3	4	4.4
Forceps	4	4.8	1	1.1	3	3.3
Breech	1	1.2	0	0	0	0
Twins	2	2.4	1	1.1	0	0
Caesarean	28	33.7	44	46.3	38	41.8
Unknown	1	1.2	8	8.4	6	6.6
Total	**83**	**100.0**	**95**	**100.0**	**91**	**100.0**

iv. Attendant at delivery

Nearly 40% of the deliveries were attended by specialist. Medical officers with more than six months of O&G experience conducted 20-30% of the deliveries. Unskilled birth attendants attended to 10% of the deliveries (Table 1.19).

Table 1.19: Maternal deaths by attendant at delivery

Attendant at delivery	2006		2007		2008	
	n	%	n	%	n	%
O&G Consultant	30	36.1	34	35.8	36	39.5
O&G > 6 months experience	18	21.7	27	28.4	18	19.8
O&G < 6 months experience	6	7.2	3	3.2	6	6.6
No experience	1	1.2	2	2.1	0	0
Staff nurse	12	14.5	7	7.3	10	11.0
Community nurse/ Midwife	4	4.8	8	8.4	7	7.7
Traditional Midwife	2	2.4	0	0	2	2.2
Unattended	2	2.4	5	5.3	2	2.2
Others	7	8.5	1	1.1	6	6.6
No information	1	1.2	8	8.4	4	4.4
Total	**83**	**100.0**	**95**	**100.0**	**91**	**100.0**

v. Place of death

Table 1.20 shows that 70% of the deaths occurred in public hospitals with obstetrician. This could be due to transfer of cases from homes and private hospitals where they had delivered. The number of women who died at home increased from 3.9% in 2006 to 13.5% in 2008. Less than 6% of deaths occurred in private hospitals.

Table 1.20: Maternal deaths by place of death

Place of delivery	2006		2007		2008	
	n	%	n	%	n	%
State hospital	57	44.9	65	47.8	64	48.1
Hospital with O&G specialist	31	24.4	27	19.9	26	19.5
Hospital without O&G specialist	9	7.1	11	8.1	8	6.0
Private hospital with specialist	7	5.5	8	5.9	6	4.5
Private hospital without specialist	1	0.8	0	0	0	0
Other hospitals	0	0	2	1.4	2	1.5
Home	5	3.9	11	8.1	18	13.6
Enroute	16	12.6	10	7.4	7	5.3
Others	1	0.8	2	1.4	2	1.5
Total	**127**	**100.0**	**136**	**100.0**	**133**	**100.0**

vi. Colour coding

Tagging of antenatal mothers attending public health facilities, according to their levels of risk has been in practice for nearly two decades. 60% of the mothers who died were tagged red, yellow, green or white. Maternal deaths in those tagged green increased from 26.6% in 2006 to 32.3% in 2008. The common cause of death in this category was obstetric embolism. Those who were coded red decreased from 11.8% to 9.8% during the same period of time (Table 1.21).

Table 1.21: Maternal deaths by colour coding

Colour Coding	2006		2007		2008	
	n	%	n	%	n	%
Red	15	11.8	18	13.2	13	9.8
Yellow	17	13.4	24	17.7	17	12.8
Green	34	26.7	45	33.1	43	32.3
White	12	9.5	7	5.1	12	9.0
No information	49	38.6	42	30.9	48	36.1
Total	**127**	**100.0**	**136**	**100.0**	**133**	**100.0**

vii. Distance from health clinics and hospitals

60% of women lived within 10km from the nearest health clinics. Distance from health clinic was not recorded in 25% of the cases (Table 1.22). Those who had difficulty in accessing health facilities because of geographical barriers had the distance recorded in hours and minutes and not necessarily by kilometers. 30% of the women lived within 11km from the nearest hospital.

Table 1.22: Maternal deaths by distance from nearest health clinics and hospitals

Distance in KM	2006		2007		2008	
	n =127	%	n=136	%	n=133	%
Nearest health clinic						
0-5	56	44.1	60	44.1	52	39.1
6-10	19	15.0	27	19.9	31	23.3
11-20	15	11.8	15	11.0	9	6.8
>21	6	4.7	7	5.1	10	7.5
Unknown	31	24.4	27	19.9	31	23.3
Nearest hospital						
0-5	14	11.0	24	17.6	27	20.3
6-10	15	11.8	21	15.5	15	11.2
11-20	25	19.7	28	20.6	30	22.6
>21	42	33.1	36	26.5	30	22.6
Unknown	31	24.4	27	19.8	31	23.3

1.3 Remediable/ contributory factors

The enquiry classified factors contributing to maternal deaths as Remediable clinical, Remedialble non-clinical and patient factors.

The common remediable clinical factors were failure to appreciate severity, failure to diagnose and failure to inform seniors. Poor team work and failure in communication with specialists in other specialty was identified in some of the cases. Inappropriate delegation to junior staff, lack of clinical knowledge and skills resulted in failure to recognize early warnings. Remoteness and inaccessibility in terms of geographical isolation associated with distance and limited access due to road conditions were the common remediable non-clinical factors. The presence of patient factor such as unbooked case, non compliance to advice, admission and therapy was also identified as a contributory factor to the death of the patient. The financial constraints delayed some patients from seeking care through indirect cost such as transportation or opportunity costs in terms of lost wages.

1.4 Discussion

The reduction of maternal mortality has been highlighted as an important goal for several initiatives, including MDG 5. Although maternal mortality has steadily improved over the years, recent statistics shows a stagnation of around 27 per 100,000 live births.

The epidemiological and clinical profile of maternal deaths has not changed very much since the last report. Much more needs to be done in the area of reproductive health. The use of contraceptives has not improved since 2001 resulting in pregnancies for those at risk especially with medical conditions and grandmultipara. Special attention must be emphasized on contraceptive practice as well as the unmet need for contraception. More health care providers need to be trained in the provision of family planning service. There is an urgent need to inform and educate women on the need for contraception. The high number of deaths during postnatal period is a justification to improve quality of care in the postpartum period. Renewed efforts must be put into ensuring the protocols and guidelines are known, available and used by health personnel handling obstetric cases.

Reduction in maternal deaths remains a top priority for the Ministry of Health. Considerable efforts are required to achieve MDG5 by 2015.Health care providers have an obligation to ensure that a pregnant woman is healthy and delivers safely a healthy baby.

Appendix 1

Causes of maternal deaths

STATES	2006		2007		2008	
	n	%	n	%	n	%
Postpartum Haemorrhage	24	18.9	23	16.9	26	19.5
Hypertensive Disorders in Pregnancy	22	17.4	25	18.4	14	10.5
Obstetric Embolism	18	14.2	24	17.7	40	30.0
Associated Medical Conditions	24	18.9	20	14.7	24	18.0
Obstetric Trauma	6	4.7	6	4.4	5	3.8
Antepartum Haemorrhage	5	3.9	2	1.5	2	1.5
Puerperal Sepsis	2	1.6	3	2.2	4	3.1
Abortion	3	2.3	6	4.4	3	2.3
Ectopic	9	7.1	7	5.1	3	2.3
Unspecified complications of pregnancy & puerperium	5	3.9	8	5.9	2	1.5
Associated with anaesthesia	0	0	1	0.7	1	0.8
Others	9	7.1	11	8.1	9	6.7
Total	**127**	**100.0**	**136**	**100.0**	**133**	**100.0**

Appendix 2

Maternal mortality ratio by states

STATES	2006			2007			2008		
	No. of maternal deaths	LB	MMR	No. of maternal deaths	LB	MMR	No. of maternal deaths	LB	MMR
Perlis	0	3,870	0	2	3,927	50.9	1	4,152	24.1
Kedah	8	33,673	23.7	10	33,630	29.7	9	35,116	25.6
P. Pinang	4	21,779	18.4	8	22,196	36.0	8	22,764	35.1
Perak	7	36,289	19.3	6	35,990	16.7	11	36,543	30.1
Selangor	24	91,036	26.4	22	93,124	23.6	22	96,854	22.7
F. T KL	5	24,732	20.2	2	25,031	8.0	5	25,290	19.7
F. T Putrajaya	0	970	0	0	1,200	0	0	1,550	0
N. Sembilan	4	16,431	24.3	4	16,866	23.7	7	17,104	40.9
Melaka	5	12,780	39.1	5	13,260	37.7	6	13,454	44.6
Johor	21	55,848	37.6	24	56,865	42.2	11	57,080	19.3
Pahang	9	24,640	36.5	6	24,725	24.3	9	25,511	35.3
Terengganu	7	21,807	32.1	5	22,213	22.5	1	23,257	4.3
Kelantan	7	33,564	20.8	8	33,646	23.8	13	34,663	37.5
Sabah	15	43,977	34.1	21	45,979	45.7	15	49,456	30.3
Labuan	0	1,567	0	0	1,556	0	0	1,668	0
Sarawak	11	42,149	26.1	13	41,840	31.1	15	42,884	35.0
MALAYSIA	**127**	**465,112**	**27.3**	**136**	**472,048**	**28.8**	**133**	**487,346**	**27.3**

Source:Live births from Department of Statistics

CHAPTER 2

POSTPARTUM HAEMORRHAGE

2.1 Introduction

Postpartum haemorrhage (PPH) is defined as blood loss from the genital tract in the post partum period in excess of 500ml or enough to cause hypotension and shock. Haemorrhage occurring within the immediate 24 hours following the delivery is defined as primary postpartum haemorrhage. Excessive bleeding that occurs thereafter but within the postpartum period is defined as secondary postpartum haemorrhage.

Postpartum haemorrhage is still one of the leading cause of maternal deaths in Malaysia but with a fluctuating trend. There were 27 deaths in 2001, 16 deaths in 2003, 17 deaths in 2005, 24 deaths in 2006, 23 deaths in 2007 and 26 deaths in 2008 (Table 2.1). The cause specific MMR had a fluctuation pattern and did not show much improvement.

Table 2.1: Number of maternal deaths from PPH

Year	2001	2003	2005	2006	2007	2008
Number	27	16	17	24	23	26
Percentage	15.9	13.1	13.6	18.9	16.9	19.5
Total no. of live births	515,985	480,083	466,208	465,112	472,048	487,346
Cause specific MMR (per 100,000 LB)	5.2	3.3	3.6	5.2	4.8	5.3

2.2 Data analysis

2.2.1 Causes

Primary postpartum haemorrhage was the main cause of postpartum haemorrhage. During 2006-2008, there was no case of secondary post partum haemorrhage. There is slight decline in the trend of primary postpartum haemorrhage from retained/adherent placenta to uterine atony. Post partum coagulation defects remained low with only one case documented in 2008 (Table 2.2).

Table 2.2: Causes of PPH

Causes	2001		2005		2006		2007		2008	
	n	%	n	%	n	%	n	%	n	%
Retained/ Adherent placenta	13	48.2	9	52.9	13	54.2	11	47.8	11	42.4
Uterine Atony	14	51.8	8	47.1	11	45.8	12	52.2	14	53.8
Postpartum Coagulation Defects	0	0	0	0	0	0	0	0	1	3.8
Total	**27**	**100**	**17**	**100**	**24**	**100**	**23**	**100**	**26**	**100**

2.2.2 Patients' profile

i. Age

Postpartum haemorrhage related deaths were high in mothers between 30-39 years of age, with 41.6% in 2006, 74% in 2007 and 53.9% in 2008 (Table 2.3).

Table 2.3 Maternal deaths from PPH by age group

Age (years)	2006		2007		2008	
	n	%	n	%	n	%
<19	1	4.2	1	4.3	0	0
20-24	1	4.2	0	0	3	11.5
25-29	6	25	1	4.3	5	19.3
30-34	4	16.6	7	30.5	6	23.1
35-39	6	25	10	43.5	8	30.8
40-44	6	25	4	17.4	3	11.5
>45	0		0	0	1	3.8
Total	**24**	**100**	**23**	**100**	**26**	**100**

ii. Ethnic group

Based on the distribution of ethnicity, the percentage of postpartum haemorrhage related deaths were higher in the Malay population compared to other ethnic groups. Of the total numbers, Malay patients contributed to 33.4% in 2006, 60.9% in 2007 and 50.2% in 2008 (Table 2.4).

Table 2.4: Maternal deaths from PPH by ethnic group

Ethnic group	2006		2007		2008	
	n	%	n	%	n	%
Malay	8	33.4	14	60.9	13	50.2
Chinese	5	20.8	1	4.3	1	3.8
Indians	3	12.5	0	0	0	0
Kadazandusun	0	0	1	4.3	1	3.8
Bajau	0	0	1	4.3	1	3.8
Iban	0	0	1	4.3	2	7.6
Orang Asli Pen. Malaysia	2	8.3	1	4.3	3	11.5
Other Pribumi Sabah/ Sarawak	1	4.2	1	4.3	0	0
Others	5	20.8	3	13.3	5	19.3
Total	**24**	**100**	**23**	**100**	**26**	**100**

iii. Parity

In terms of parity, women in multipara (parity 2-5) group appeared to have the highest percentage in postpartum haemorrhage mortality, contributing 50% in 2006, 69.6% in 2007, 61.6% in 2008(Table 2.5).

Table 2.5: Maternal deaths from PPH by parity

Parity	2006		2007		2008	
	n	%	n	%	n	%
1	4	16.6	1	4.3	2	7.6
2-5	12	50	16	69.6	16	61.6
6 and above	8	33.4	5	21.8	8	30.8
Unknown	0	0	1	4.3	0	0
Total	**24**	**100**	**23**	**100**	**26**	**100**

iv. Educational level

Patients with higher educational levels, had lower incidence of postpartum haemorrhage mortality in comparison to the others. Patients with tertiary education (including university and college) accounted for a minor percentage of postpartum haemorrhage deaths throughout the studied years, contributing to 12.5% in 2006, and 7.6% in 2008 (Table 2.6).

Table 2.6: Maternal deaths from PPH by educational level

Educational level	2006		2007		2008	
	n	%	n	%	n	%
Never attended school	6	25	0	0	6	23.2
Primary School	4	16.6	3	13.1	7	27
Secondary School (Form 3)	4	16.6	7	30.5	1	3.8
Secondary School (Form 5)	4	16.6	9	39	8	30.8
Secondary School (Form 6)	1	4.2	1	4.3	2	7.6
Tertiary	3	12.5	0	0	2	7.6
No information	2	8.3	3	13.1	0	0
Total	**24**	**100**	**23**	**100**	**26**	**100**

v. Occupation

Similar to the findings of the previous years, majority of the postpartum haemorrhage mortality were noted among mothers who were housewives. It contributed to 54% in 2006, 65.3% in 2007 and 57.8% in 2008 (Table 2.7).

Table 2.7: Maternal deaths from PPH by occupation

Occupation	2006		2007		2008	
	n	%	n	%	n	%
Housewives	13	54	15	63.5	15	57.8
Professional/ Technical	1	4.2	1	4.3	0	0
Administrative	1	4.2	1	4.3	0	0
Clerical	1	4.2	1	4.3	2	7.6
Sales & Services	6	25	3	13.1	7	27
Student	1	4.2	0	0	1	3.8
No Information	1	4.2	2	8.7	1	3.8
Total	**24**	**100**	**23**	**100**	**26**	**100**

2.3 Delivery characteristics

2.3.1 Place of delivery

There is a noticeable shift in the place of delivery for the postpartum haemorrhage mortality from the previous years. There were more deaths occurring in the hospitals in comparison to previous trend of home deliveries. Among the hospitals, the state hospital had the larger number of deaths with 39.1% in 2007 and 34.8% in 2008. This can be attributed to the recognition of high risk cases and its complications resulting in referral to the hospitals with specialist care. Changing trend in the patient's knowledge and perception towards hospital delivery has resulted in a lesser number of home deliveries (Table 2.8).

Table 2.8: Maternal deaths from PPH by place of delivery

Place of Delivery	2006		2007		2008	
	n	%	n	%	n	%
State Hospital	5	20.8	9	39.1	9	34.8
Hospital With O&G Specialist	7	29.3	5	21.8	1	3.8
Hospital Without O&G Specialist	0	0	0	0	2	7.6
Private Hospital With Specialist	4	16.6	2	8.7	4	15.4
Other hospital	0	0	0	0	1	3.8
Home	4	16.6	4	17.4	5	19.4
Enroute	1	4.2	0	0	2	7.6
Others	2	8.3	2	8.7	1	3.8
No Information	1	4.2	1	4.3	1	3.8
Total	**24**	**100**	**23**	**100**	**26**	**100**

2.3.2 Mode of delivery

The majority of patients who died from postpartum haemorrhage had spontaneous vaginal delivery (SVD). They accounted for 58.2% in 2006, 47.8% in 2007 and 53.9% in 2008 (Table 2.9).

Table 2.9: Maternal deaths from PPH by mode of delivery

Mode of Delivery	2006		2007		2008	
	n	%	n	%	n	%
SVD	14	58.2	11	47.8	14	53.9
Vacuum	1	4.2	0	0	0	0
Caesarean	8	33.4	10	43.5	8	30.7
No information	1	4.2	2	8.7	3	15.4
Total	**24**	**100**	**23**	**100**	**26**	**100**

2.3.3 Accoucher

The category of staff conducting delivery varied among all groups and it is difficult to draw any conclusion from this. A relatively large number of postpartum haemorrhage deaths occurred in mothers who were delivered by untrained birth attendants, by a relative or who were unattended during delivery. This group accounted for 29.2% in 2006, 17.4% in 2007 and 30.7% in 2008 (Table 2.10).

Table 2.10: Maternal deaths from PPH by accoucheur

Accoucheur	2006		2007		2008	
	n	%	n	%	n	%
O&G Specialist	9	37.4	9	39.1	7	27
Medical Officer <6 months experience	1	4.2	1	4.3	0	0
Medical Officer >6 months experience	3	12.5	3	13.1	7	27
Staff Nurses	3	12.5	2	8.7	3	11.5
Midwives/Community Nurses	0	0	3	13.1	0	0
Traditional Birth Attendants	1	4.2	0	0	1	3.8
Unattended	1	4.2	4	17.4	2	7.6
Others	5	20.8	0	0	5	19.3
No information	1	4.2	1	4.3	1	3.8
Total	**24**	**100**	**23**	**100**	**26**	**100**

2.4 Case illustrations

Case 1 (Distance from medical facilities)

A 27 year old Penan in her 5th pregnancy had only 2 antenatal visits. Her first booking was during the Flying Doctor Service (FDS) at 24 weeks period of amenorrhoea (POA) and the second was at a government clinic. Antenatally, no obvious abnormality was detected and she was not tagged as a high risk case. On the way for her 3rd antenatal visit, the patient went into labour and delivered. She had PPH with retained placenta and died before reaching the clinic.

This case illustrates the difficulties of many indigenous communities who live far from medical facilities. Pregnant mothers awaiting delivery should be advised to stay close to medical facilities to prevent possible complications such as retained placenta and PPH.

Case 2 (Grandmultiparity with retained placenta)

A 38 year old Malay woman was in her 10th pregnancy at 42 weeks POA. She had 7 previous home deliveries with the last 2 complicated with anaemia and her 7th pregnancy with retained placenta. She went into labour at home and delivery was conducted by her husband but was complicated with retained placenta. The health staff was informed of the delivery and upon arrival at the patient's house found her vital signs stable and estimated blood loss of 500cc. However, the patient's condition deteriorated during transfer and collapsed before arrival at the hospital. Resuscitation was commenced but failed to revive the patient.

Grandmultiparity with history of retained placenta are risk factors for PPH. Anaemia worsens the tolerance of patient to PPH. Home delivery should not have been an option for this patient. She should have been managed in a hospital with active

management of third stage. If there was an issue with distance to the hospital, the patient should be advised to be hospitalized early to await labour.

Case 3 (Placenta Accreta)

A 36 year old Malay lady was booked at 6 weeks POA with a private obstetrician. She had past history of emergency LSCS for fetal distress and D&C for incomplete abortion. She had recurrent per vaginal (PV) spotting and was diagnosed to have low lying placenta at 27 weeks POA. She had another episode of PV bleeding requiring admission at 29 weeks in a government hospital. At 32 weeks she started to have heavy PV bleeding and patient consented for emergency LSCS and keeping in view of hysterectomy. The medical officer encountered difficulties during the operation and placenta accreta was found encroaching into the bladder. There was substantial amount of blood loss and the specialist was called in but patient had bled more than 1.5litres and blood pressure (BP) was low. A sub-total hysterectomy was done, however patient was in DIVC and the consultant on call was informed. The abdomen/pelvis was packed and the 1st cycle of DIVC regime was secured from another hospital. Her condition deteriorated despite CPR and blood resuscitation and eventually succumbed.

This case clearly illustrates improper delegation of duties. This case should be performed by a specialist or a consultant and decision for hysterectomy should have been done early. Patients with placenta praevia with previous scars or procedures in the uterus require careful assessment in looking for possibility for placenta accreta. Where possible, doppler studies by trained personnel would be ideal to detect early abnormally attached placenta. A decision for subtotal hysterectomy is inappropriate and a complete hysterctomy should have been the choice.

Case 4 (Delay due to unavailability of ambulance)

A 43 year old Indian lady in her 7th pregnancy had her booking and antenatal (ANC) follow up in a private medical center. Patient was admitted to the same private center at 38 weeks in labour. She had assisted delivery via Ventouse by the obstetrician for fetal bradycardia. The procedure was uneventful and there was slight oozing after delivery but no active bleeding from the vagina or uterus. The oozing continued and within 2 hours, her BP dropped. She was referred and transferred to a government hospital but there was a delay in the arrival of the ambulance. The ambulance arrived 1 hour later with only 2 medical assistants who continued the CPR but failed to revive patient.

Private medical centres should ensure that there is ambulance available at all times to transfer ill patients. The severity of the condition should be communicated to the receiving hospital to ensure that the retrieving team consists of senior medical officer or specialist capable to assess the patient and resuscitate well. Possibility of taking emergency blood and early transfusion during transfer should be considered.

Case 5 (Uterine fibroid with atony)

A 42 year old Chinese lady in her second pregnancy had her first booking of 16 weeks POA. She had 11 antenatal checks and all were uneventful except one when a uterine fibroid was found during ultrasound examination. Patient was referred and

assessed at the O&G clinic where a repeat scan was done and no fibroid was seen. Subsequent scans did not mention any fibroids. The patient went to a private practitioner in early labour at 39 weeks POA and multiple uterine fibroids were seen on ultrasound. Labour was induced via prostin insertion and pregnancy progressed uneventfully. Patient delivered normally and IM syntometrine was given. After removal of placenta, excessive bleeding was seen and exploration of uterine cavity did not reveal placenta or clots. Patient was resuscitated and IM Hemabate given. She was sent to a general hospital and enroute was resuscitated with fluids but arrived at the hospital in a state of hypovolaemic shock. Bleeding could not be arrested despite resuscitation with blood products. Patient became unresponsive and was intubated and resuscitated before being taken to the operation threatre. A laparotomy with hysterectomy and internal artery ligation was done. Patient was transferred to intensive care unit (ICU). Patient went into irreversible shock and succumbed 7 hours later.

This case illustrates several problems. First, pregnancy with fibroids is a high risk case and patient should be delivered in a tertiary hospital centre with adequate blood bank facilities. Second, uterine fibroids tend to flatten out and may not be easily visible to inexperienced eyes, therefore patient should be managed at specialist level at early stage. Decision for induction of labour with prostaglandin should be done with caution after proper assessment. Elective Caesarean should have been considered.

2.5 Discussion

Postpartum haemorrhage remains one of the leading causes of maternal mortality in Malaysia. It constitutes an average of 19% from 2006 till 2008. Uterine atony and retained/ adherent product of conception accounts for almost all the cause of postpartum haemorrhage mortality. Similar to the previous years, the increase in maternal mortality correlates with multiparity (para 2 to para 5), maternal age of more than 30 years, accoucher (untrained or unqualified birth attendant) and occupation (housewife). There is reduced number of mortality seen in women with tertiary education level. The issue of home delivery being conducted by untrained/unqualified birth attendants needs to be seriously addressed. This is further hampered by geographical remoteness and inaccessibility for immediate healthcare.

There are already ongoing initiatives, in our health care system to anticipate the postpartum haemorrhage risk, such as;

- Red alert system in goverment hospital since 1993
- Regular refresher training using the training manual in management of PPH since 1999
- Introduction of Obstetric flying squad (retrieval squad)
- Colour coding of antenatal cards for risk assessment

However, the Red alert system needs to be remodeled to cater the current needs and the other initiatives consolidated. Junior doctors should be exposed to regular labour room drill to coordinate and handle emergency situation involving postpartum haemorrhage. Importance of early recognition and prompt communication with senior consultants should be given priority. Consideration should be given to trainee specialist to be competent in performing hysterectomies for postpartum haemorrhage and perform 'simple conservative surgery', including compression sutures.

With a well coordinated and planned effort in our healthcare system, it is possible to reduce the maternal mortality from post partum haemorrhage in most hospitals.

2.6 Recommendations

2.6.1 There is a need to emphasis on proper risk assessment during the antenatal care and appropriate planning for delivery in high risk cases. Early referral to a tertiary centre with facilities and a specialist assessment is vital in cases anticipated to have postpartum haemorrhage.

2.6.2 Adequate preconception counseling and contraceptive methods should be offered in cases deemed to be high risk of having postpartum haemorrhage in subsequent pregnancy.

CHAPTER 3

OBSTETRIC TRAUMA

Summary

In the 3 year period there were a total of 17 reported maternal deaths due to obstetric trauma. This accounted for 4.3% of all maternal deaths in 2006-2008. In the 1997-2000 and 2001-2005 report on Confidential Enquiries into Maternal Deaths in Malaysia, obstetric trauma accounted for 6.7% and 4.7% respectively. Comparing these data, there seem to be a general downward trend and this reflects favorably on the state of obstetric services in the country. The main cause of obstetric trauma was still uterine rupture both before and during labour which is similar to previous reports, it accounts for 41% or 7 out of 17 maternal deaths. Remedial clinical factors were present in a significant number of deaths. Failure to diagnose, failure to appreciate severity, inadequate, inappropriate or delayed therapy and delay or failure of referral remained important issues.

3.1 Introduction

Maternal mortality from obstetric trauma refers to deaths associated with injury to the genital tract before or during labour. It can happen either during spontaneous delivery, instrumental delivery or during caesarean section. These deaths are associated with haemorrhage but are not classified as primarily being caused by the bleeding.

Over the 3 year period from 2006 to 2008, the annual rate of maternal deaths caused by obstetric trauma ranged from 4.7% in 2006 to 3.8% in 2008, with the lowest rate in 2008 and highest rate in 2006 (Table 3.1). The annual average rate over the 3 year period was 4.3%. The percentage of deaths from obstetric trauma is declining from 1997 (Table 3.2).

Table 3.1: Number and percentage of maternal deaths due to obstetric trauma

Year	2006	2007	2008
Number of cases	6	6	5
Percentage	4.7	4.3	3.8

Table 3.2: Percentage of maternal mortality due to obstetric trauma, 1997-2008

Year	Percentage
1997-2000	6.7
2001-2005	4.7
2006-2008	4.3

The total number of live births in 2006, 2007 and 2008 was 465,112, 472,048 and 487,346 respectively. The cause specific MMR for obstetric trauma was 1.29, 1.28 and 1.03 for every 100,000 live births in 2006, 2007 and 2008 respectively (Table 3.3) These figures compares favorably to the previous report which was 3.7 in 2001,

2.9 in 2002, 1.9 in 2003, 1.9 in 2004 and 2.4 in 2005.

Table 3.3: Obstetric trauma specific MMR

Year	2006	2007	2008
Total number of deaths from obstetric trauma	6	6	5
Total number of live births	465,112	472,048	487,346
Cause specific maternal death ratio (per 100,000 LB)	1.29	1.28	1.03

3.2 Data analysis

3.2.1 Causes

Uterine rupture either before or during labour remained the most frequent cause of death due to obstetric trauma, with a total number of 7 out of 17 cases over the 3 year period or 41.2%. The second leading cause was obstetrical laceration of the cervix with 4 cases, 2 cases each in 2006 and 2007. This was followed by uterine inversion, obstetric damage to pelvic organs and other specified obstetrical trauma with 2 cases each for the 3 year period (Table 3.4).

Table 3.4: Causes of obstetric trauma

Causes	2006		2007		2008	
	n	%	n	%	n	%
Rupture of uterus before labour	0	0	1	16.7	1	20.0
Rupture of uterus during labour	2	33.3	1	16.7	2	40.0
Obstetrical laceration of cervix	2	33.3	2	33.3	0	0
Inversion of uterus	1	16.7	1	16.7	0	0
Obstetric damage to pelvic organs	0	0	1	16.7	1	20.0
Other specified obstetrical trauma	1	16.7	0	0	1	20.0
Total	**6**	**100**	**6**	**100**	**5**	**100**

3.2.2 Patient's profile

i. Age

It may be difficult to draw any firm conclusion with regards to the age of the mother as a risk factor as the number of mothers who died from obstetric trauma in the 3 year period was relatively small. Almost 59% of the total deaths occurred between the ages of 30-39 years, with 35.3% occurring in the 30–35 years group (Table 3.5). Unfortunately, 4 died in the 20–24 years group, which accounted for 23.5% of deaths due to obstetric trauma.

Table 3.5: Number of maternal deaths from obstetric trauma by age group

Age (years)	2006	2007	2008
20-24	2	2	0
25-29	1	0	0
30-34	1	3	2
35-39	2	1	1
40-44	0	0	1
>45	0	0	1
Total	**6**	**6**	**5**

ii. Ethnic group

Malays appear to form the largest ethnic group of deaths from obstetric trauma in 2006-2008. They account for 8 out of 17 cases or 47.1% of the total deaths attributable to obstetric trauma, Chinese accounts for 23.5%, while others account for 23.5% of cases (Table 3.6). However, these figures should be compared to the total live births rate by ethnic group. The ethnic specific MMR for obstetric trauma was high in Bajau in 2006 and in Chinese in 2008 (Table 3.7).

Table 3.6: Number of maternal deaths from obstetric trauma by ethnic group

Ethnic group	2006	2007	2008
Malay	3	2	3
Chinese	1	1	2
Bajau	1	0	0
Others	1	3	0
Total	**6**	**6**	**5**

Table 3.7: Ethnic specific MMR for obstetric trauma

Ethnic group	2006			2007			2008		
	n	LB	MMR	n	LB	MMR	n	LB	MMR
Malay	3	270,945	1.1	2	274,638	0.7	3	284,247	1.0
Chinese	1	84,637	1.2	1	85,229	1.2	2	84,285	2.4
Bajau	1	7,168	13.9	0	7,855	0	0	8,356	0

iii. Parity

The majority of deaths occurred among mothers of between parity 2-5 (Table 3.8). This group however also represents the group with the largest number of live births.

Table 3.8: Number of maternal deaths from obstetric trauma by parity

Parity	2006	2007	2008
0	0	1	1
1	1	1	1
2-5	4	3	2
6 and above	1	1	1
Total	**6**	**6**	**5**

iv. Educational level

The majority of mothers who died from obstetric trauma had secondary school education (Table 3.9).

Table 3.9: Maternal deaths from obstetric trauma by educational level

Educational level	2006		2007		2008	
	n	%	n	%	n	%
Never attended school	1	16.7	1	16.7	0	0
Primary school	1	16.7	2	33.3	2	40.0
Secondary school (Form 3)	1	16.7	0	0	1	20.0
Secondary school (Form 5)	3	50.0	2	33.3	0	0
No information	0	0	1	16.7	2	40.0
Total	**6**	**100**	**6**	**100**	**5**	**100**

3.4 Delivery characteristics

i. Place of delivery

State hospitals had the highest number of maternal deaths from obstetric trauma with 7 out of 17 cases or 41.2% (Table 3.10). However, with the overall small number of deaths in state hospitals and other health facilities made it difficult to draw any conclusions from the statistics. The high number of deliveries and high risk cases that are managed in state hospitals would contribute to this. There were only 2 recorded deaths following home deliveries in the 3 year period between 2006 till 2008, both these patients were transferred but later died in a health facility. A similar number of deaths following home deliveries which were attributed to obstetric trauma occurred in the 2001-2005 period. Again, due to the small numbers, it is difficult to draw conclusions.

Table 3.10: Maternal deaths from obstetric trauma by place of delivery

Place of delivery	2006		2007		2008	
	n	%	n	%	n	%
State Hospital	3	50.0	1	25.0	3	60.0
Hospital With O&G Specialist	0	0	1	25.0	1	20.0
Hospital Without O&G Specialist	1	16.7	1	25.0	0	0
Private Hospital With Specialist	0	0	0	0	1	20.0
Private Hospital Without Specialist	0	0	0	0	0	0
Home	2	33.3	0	0	0	0
Others	0	0	1	25.0	0	0
Total	**6**	**100**	**4**	**100**	**5**	**100**

*2 deaths in 2007 occurred before delivery

ii. Mode of delivery

Most of the maternal deaths from obstetric trauma were spontaneous vaginal delivery, followed by instrumental deliveries and caesarean sections (Table 3.11). The number of deaths from obstetric trauma associated with caesarean section as a mode of delivery has reduced from 39.2% in 2001-2005 to 26.7% in 2006-2008 despite a rising trend in the rate of caesarean sections.

Table 3.11: Maternal deaths from obstetric trauma by mode of delivery

Mode of delivery	2006		2007		2008	
	n	%	n	%	n	%
Vaginal Delivery	4	66.6	1	25.0	0	0
Vacuum	1	16.7	2	50.0	1	20.0
Forceps	1	16.7	0	0	0	0
Caesarean Sections	0	0	1	25.0	3	75.0
No information	0	0	0	0	1	25.0
Total	**6**	**100**	**4**	**100**	**5**	**100**

iii. Accoucheur

66.7% or 10 out of 15 deliveries were conducted by doctors, 6 of those by specialists. 20% or 3 cases of maternal death due to obstetric trauma which occurred in 2006-2008 were delivered by either a staff nurse, midwife or a community nurse (Table 3.12). This compared favorably to the 2001-2005 period where 30% of the maternal death due to obstetric trauma were delivered by staff nurse, midwife or community nurse. It is important that all levels of staff require adequate training and supervision in handling obstetric emergencies.

Table 3.12: Maternal deaths from obstetric trauma by accoucher

Accoucheur	2006		2007		2008	
	n	%	n	%	n	%
O&G Specialist	1	16.7	1	25.0	4	80.0
MO >6 months experience	2	33.2	2	50.0	0	0
Staff Nurse	1	16.7	0	0	0	0
Midwife/Community Nurse	1	16.7	1	25.0	0	0
Unattended	1	16.7	0	0	0	0
No Information	0	0	0	0	1	20.0
Total	**6**	**100**	**4**	**100**	**5**	**100**

iv. Place of death

Most of the mothers who died from obstetric trauma died in state hospitals. In part, the higher number of deaths in state hospitals was due to patients who delivered elsewhere and were then referred to state hospitals in a moribund state after they developed complications secondary to obstetric trauma (Table 3.13).

Table 3.13: Maternal deaths from obstetric trauma by place of death

Place of death	2006		2007		2008	
	n	%	n	%	n	%
State Hospital	5	83.3	2	33.3	3	60.0
Hospital With O&G Specialist	1	16.7	3	50.0	2	40.0
Hospital Without O&G Specialist	0	0	1	16.7	0	0
Total	**6**	**100**	**6**	**100**	**5**	**100**

3.5 Case illustrations

Case 1

A 32 year old Malay housewife in her 5th pregnancy, delivered a 3kg healthy baby in an ABC (alternative birthing centre) at 1.50am. The delivery was conducted by a trained Community health nurse. She had a retained placenta and was referred to the nearby hospital. Uterine inversion was diagnosed but the medical officer was unable to reduce it. The patient was subsequently referred to a specialist hospital but had to take a detour as the patient's condition deteriorated and she needed to be resuscitated. She finally arrived at a state hospital 5 hours after delivery and was in hypovolaemic shock. She was actively resuscitated. The inversion was reduced and placenta removed manually. Unfortunately, she did not respond to the resuscitation and succumbed.

Mismanagement of the third stage of labour still occurs but the incidence is on a decreasing trend. Regular training among nurses and midwifes on the appropriate management of the third stage need to be carried out, as well as regular drills in managing obstetric emergencies among medical officers in specialist and non specialist hospitals.

Case 2

A 23 year old primigravida was admitted in labour to a state hospital at 39 weeks period of amenorrhea. Cardiotocograph trace (CTG) showed early decelerations when she was 6cm dilated and it was associated with moderate meconieum stained liquor (MMSL). The medical officer managing the case continued with the same management despite the CTG showing persistent decelerations. When she was fully dilated at station 0 with a caput of 1 plus, the medical officer successfully performed a ventouse delivery to a baby boy weighing 3.4kg, with an APGAR score of 4 in 1minute and 7 at 5 minutes.

Soon after delivery, the patient's blood pressure dropped to 80/50mmHg with a pulse rate of 140bpm. Patient was noted to be pale and drowsy by the medical officer. However, the uterus was noted to be contracted with no active per vaginal bleeding. 2 pints of blood was ordered and given but during the second pint, her blood pressure dropped again to 86/35mmHg with a pulse rate of 160bpm. The medical officer noted a small cervical tear and attempted but failed to repair it in the labour room. After failing to repair the cervical tear, the medical officer finally decided to inform the specialist on-call. Examination under anaesthesia was planned but patient collapsed on arrival in the OT. Red alert was initiated and the patient was started on dopamine. A cervical tear was noted by the specialist but it was not actively bleeding at the time. The uterus was noted to be atonic and a decision to perform hysterectomy was undertaken. Intra-operatively, she collapsed again and could not be revived. The uterus which was sent for histological examination and cervical tear was confirmed.

This case illustrates several substandard management issues. It could be argued that in the presence of MMSL and persistent CTG abnormalities in a primigravida, an earlier delivery by caesarean section may be warranted in this case. The medical officer should have discussed the case with a specialist before deciding to manage it by himself. The junior medical officer performing the ventouse delivery should have been supervised to reduce the risk of complications occurring. Most significantly, the medical officer did not know his limitations as well as the severity of the post partum haemorrhage. The specialist on-call was informed too late as the patient had already developed intractable haemovolemic shock and succumbed to it. This was a preventable death.

Case 3

A 30 year old Indonesian lady, G3P1+1 who was unsure of her date was brought to a hospital with O&G specialist by her husband at 9.45pm. She was unresponsive with unrecordable blood pressure and pulse. Her pupils were fixed and dilated. She was pronounced dead at 10.20pm.

An ultrasound scan performed earlier revealed fetal parameters corresponding to 22 to 24 weeks and per abdomen the uterine symphisio-fundal height corresponded to 26 weeks. Fetal heart activity was not detected. Her husband said his wife was not feeling well that day, he also revealed that she had dilatation and curettage in a private clinic 7 months earlier for a miscarriage.

A police report was made and the postmortem revealed a rupture in the posterior wall of the uterus. Placenta percreta was noted at the site of the rupture. The fundus and posterior wall of the uterus was also noted to be thin. 1.8 liter of blood and blood clot was noted in the abdominal cavity. A 400gm fetus was noted in the uterus.

The cause of death was noted as ruptured uterus secondary to placenta percreta.

Case 4

A 38 year lady in her 5th pregnancy at 38 weeks period of amenorrhoea, was admitted to a hospital with obstetrician after she had leaking liquor at 1.30am. She was admitted to the labour ward at 2.30am and vaginal examination revealed a 5cm dilated cervix. One hour later, she was fully dilated and encouraged to push. After several attempts, she complained of lethargy and rapidly became cold and clammy. Her blood pressure was low and she was tachycardic. Fetal heart activity was not heard. Fluid resuscitation was started and the patient was intubated but did not recover and was pronounced dead at 6.35am.

She was not a large lady at 148cm tall and with a booking weight of 63.5kg. She had 4 previous spontaneous vaginal deliveries and the heaviest baby weighed 2.5kg. Dating scan had confirmed her date and at 32 weeks she was noted have an increased amniotic fluid index (AFI) of 19. Modified Oral Glucose Tolerence Test (MOGTT) was not ordered. Repeated scan at 34 weeks however showed a normal AFI of 11. She was noted to be anaemic at 36 weeks and was treated with double haematinics. She had a total of 15 antenatal visits. Postmortem was performed and revealed a ruptured uterus at the posterior lower segment and the fetus was a fresh stillbirth weighing 3.9kg.

There was a failure to diagnose both macrosomia and uterine rupture by the medical officer managing the above case. However, the risk for uterine rupture was low in this case as she did not have a previously scarred uterus, it was a spontaneous labour and she progressed very well without the use of pitocin augmentation. MOGTT was indicated and should have been done during her antenatal period. Poorly controlled gestational diabetes would have explained the macrosomic baby as her heaviest previous baby was only 2.5kg.

3.6 Discussion

Obstetric trauma remains the fifth commonest cause of maternal death in the 2006 to 2008 period. This has not changed compared to the previous data in the 1997-2000 and 2001-2005 report on the Confidential Enquiries into Maternal Deaths. However, the incidence has reduced from 6.7% (1997-2000) to 4.7% (2001-2005) to 4.3% (2006-2008).

Uterine rupture before and after delivery at 41.2% remained the most frequent cause of death due to obstetric trauma. Uterine rupture was also the commonest cause of death due to obstetric trauma in the 1997-2000 and 2001-2005 periods at 58% and 37% respectively. Cervical laceration is the second commonest cause of death attributable to obstetric trauma. Compared to the 2001-2005 period the incidence of uterine inversion as a cause of death due to obstetric trauma had decreased from an average of 16.6% to 11.1% for the 2006-2008 period.

Obstetric trauma is generally associated with some form of substandard clinical care and this is the case in a significant number of maternal deaths that occurred in 2006-2008. Among the common substandard clinical factors include the failure to inform specialists, the failure to appreciate severity and inadequate, inappropriate or delayed therapy. The majority of deaths due to obstetric trauma in during this period occurred in hospitals with obstetricians. Inexperienced medical officers in specialist hospitals who failed to recognize their limitations and failed to inform specialists earlier were noted in several of the cases. While there was a reasonably high percentage of obstetricians input in the management of cases that resulted in maternal deaths in specialist hospitals, the medical officers managing these cases left it late before referring the cases to specialists or some of these cases were referred to the specialist hospitals from other health facilities in a moribund state or and their intervention did not change the outcome.

There is some evidence to suggest that the overall management of obstetric emergencies secondary to obstetric trauma has improved based on decreasing incidence of maternal deaths, decreasing number of deaths that occurred at home, health centers and non specialist hospitals. Increasing specialist input and supervision in the management of obstetric cases has also contributed significantly to this. Decreasing incidence of death occurring from uterine inversions may also mean a general improvement in the management of the third stage of labour as well as the management of uterine inversions.

Overall, significant improvements have been made with regards to reducing the incidences and in the management of obstetric traumas in Malaysia. However, there is still work to be done as a number of the maternal deaths due to obstetric trauma that occurred have elements of substandard clinical care. Among the issues that need to be addressed includes better supervision of junior medical officers and increased specialist input.

3.7 Recommendations

3.7.1 Regular updates and drills in obstetric emergencies needs to be organized for medical officers managing obstetric patients. This would improve their ability not only to identify and diagnose a problem but to be able to manage obstetric patients appropriately. Courses such as the 'Advance Life Support in Obstetrics' (ALSO) would be hugely beneficial for medical officers as well as nurses caring for obstetric patients.

3.7.2 Head of departments need to ensure that junior or inexperienced medical officers are supervised and have guidelines in place on when they need to inform or consult the obstetrician on duty.

3.7.3 Increasing the number of obstetricians in busy hospitals should improve direct specialist input and posting obstetricians to more district hospitals would make specialist care more accessible to those living in remote areas.

3.8 References

1. Report on the Confidential Enquiries into Maternal Deaths in Malaysia, 1997- 2000
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CHAPTER 4

HYPERTENSIVE DISORDER IN PREGNANCY

Summary

There were 396 maternal deaths reported from 2006 until 2008 and 61 cases or 15.4% were related directly to complications of Hypertensive Disorders in Pregnancy (HDP). The average incidence of HDP deaths per year was 20 cases and the trend was not declining over the last decade. The majority of these deaths were seen among mothers age whose age was more than 30 with the minority group such Iban and Orang Asli being the commonest ethnic group. Housewives and those who received secondary level of education were more commonly affected.

4.1 Introduction

Improving maternal health and reducing maternal mortality have been key concerns of several international summits and conferences since the late 1980s. In developing countries: pre-eclampsia/eclampsia impact 4.4% of all deliveries[1] and may be as high as 18% in some settings in Africa.[2] If the rate of life threatening eclamptic convulsions (0.1% of all deliveries) is applied to all deliveries from countries considered to be the least developed, 50,000 cases of women experiencing this serious complication can be expected each year[3]. According to WHO, the 585,000 maternal deaths annually 13%, or 76,050, are due to eclampsia.

Hypertensive pregnancy disorders in (HDP) complicates 10% of all pregnancies and covers a spectrum of conditions, namely pre-eclampsia, eclampsia, and chronic and gestational hypertension. These disorders occur frequently among pregnant woman and are important contributors to maternal and perinatal morbidity and mortality worldwide.

The previous CEMD reported that HDP was the second commonest cause of maternal deaths after PPH in Malaysia. Since 2006, it is down to the third or fourth common cause after obstetric embolism and PPH. Despite being less common, the incidence does not show a decreasing trend since the last decade. Several shortfalls similarly seen and addressed in previous editions were repeatedly seen during in analysis made by the committee. Failure to appreciate severity, diagnose and delay in consultation, instituting treatment and referral continued to be the main avoidable clinical factors identified. Concerted efforts with better supervision, monitoring and frequent medical audits of all HDP cases by local healthcare authority is needed to further reduce maternal deaths from HDP.

4.2 Data analysis

i. Classification

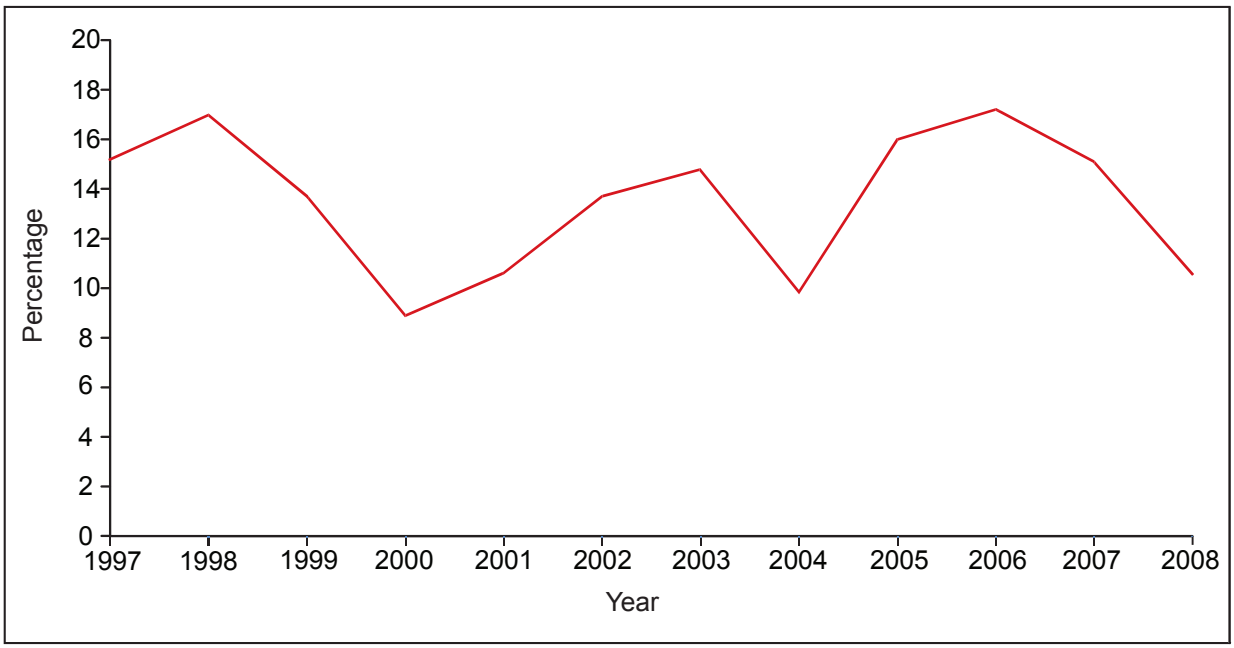
HDP remains one of the commonest cause of maternal deaths in Malaysia for more than a decade. From 1997-2008, there were 238 cases of death related to HDP with

an average incidence of 13.6% per year. The highest mortality incidence was reported in 2006 and lowest in 2000 as shown in Table 4.1 and Fig. 4.1.

Table 4.1 : Total number of deaths from HDP, 1997-2008

Year	Number of deaths	Percentage
1997	24	15.2
1998	31	17.0
1999	23	13.7
2000	13	8.9
2001	18	10.6
2002	18	13.7
2003	18	14.8
2004	12	9.8
2005	20	16.0
2006	22	17.4
2007	25	15.1
2008	14	10.6
TOTAL	**238**	

Fig.4.1: Percentage of deaths from HDP,1997-2008



Similar findings were found in the analysis of HDP complications between 2006- 2008 with eclampsia being the most commonest contributing factor in terms of HDP classification. In this series, 38 out of 61 cases (62.3%) developed eclampsia secondary to HDP with majority occurring during antepartum period leading to further complications and death whereas the rest non-eclamptic patients developed other complications related to multi-organ failure (Table 4.2).

Table 4.2: Classification of HDP

Causes	2006	2007	2008
Pre-existing hypertension complicating pregnancy	1	0	0
Gestational HPT without significant proteinuria	0	0	1
Moderate pre eclampsia	2	1	0
Severe PE	7	7	3
Pre-eclampsia – unspecified	0	0	1
Eclampsia in pregnancy	9	16	9
Eclampsia in labour	1	1	0
Eclampsia in puerperium	2	0	0
Total	**22**	**25**	**14**

ii. Gravida and age

As shown in Table 4.3, Gravida 2-5 with HDP had higher number of deaths as compared to primigravida and grandmultipara but it cannot be verified as no statistical test is carried out. The commonest incidence of maternal death associated with HDP were seen among mothers aged above 30 years old as compared to younger ones (41 versus 20 cases) as shown in Table 4.4

Table 4.3: Number of maternal deaths from HDP by gravida

Gravida	2006	2007	2008
1	2	6	6
2-5	13	14	7
6 and above	7	5	1
Total	**22**	**25**	**14**

Table 4.4: Number of maternal deaths from HDP by age group

Age (years)	2006	2007	2008
<19	0	0	1
20-24	3	4	2
25-29	0	6	4
30-34	8	6	3
35-39	6	9	1
40-44	4	0	3
>45	1	0	0
Total	**22**	**25**	**14**

iii. Ethnic group

Although the Malays recorded the majority of HDP deaths (Table 4.5), if it were to be translated into ethnicity risk incidence, the minority groups such Iban and Bajau will be the highest in view of the small number of deliveries recorded by these groups.

Table 4.5: Number of maternal deaths from HDP by ethnic group

Ethnic group	2006	2007	2008
Malay	9	13	7
Chinese	3	0	0
Indians	4	0	0
Kadazandusun	0	0	1
Melanau	0	0	1
Bajau	1	3	0
Iban	3	3	1
Other pribumi Sarawak/ Sabah	0	1	0
Others	2	5	4
Total	**22**	**25**	**14**

iv. Educational level and occupation

In Table 4.6, only one case was seen where the mother received tertiary education. More deaths (36 cases) were recorded among mothers who received secondary level of education as compared to those who have never attended school (6 cases) and in primary school (12 cases). Deaths among housewives (Table 4.7) were more as compared to others and hence emphasize is needed to target this group of mothers. Healthcare provider should provide additional attention to those housewives who develop hypertension during their antenatal visit in terms of their follow up, optimizing medical treatment and early referral to hospital.

Table 4.6: Number of maternal deaths from HDP by educational level

Educational Level	2006	2007	2008
Never attended school	2	3	1
Primary School	7	5	0
Secondary School (Till Form 3)	7	4	2
Secondary School (Till Form 5)	5	9	7
Secondary School (Till Form 6)	0	0	2
Tertiary	1	0	0
No information	0	4	2
Total	**22**	**25**	**14**

Table 4.7: Maternal deaths from HDP by occupation

Occupation	2006	2007	2008
Housewives	13	15	8
Professional/ Technical	0	0	1
Clerical	0	2	1
Sales & Services	7	0	3
Agriculture & Production Related	2	4	0
Unemployed	0	1	0
No Information	0	3	1
Total	**22**	**25**	**14**

4.3 Discussion

Maternal mortality ratio has decreased at the global level at an average of less than 1% annually between 1990 and 2006.[6] Hypertensive disorders of pregnancy (HDP) remains one of the leading cause of maternal and fetal morbidity and mortality. In the Global Burden Disease (GBD) report 1990 by WHO, hypertensive disorders of pregnancy ranked 75th in terms of DALYs and were responsible for 6% of the burden of all maternal conditions.[7] It was estimated that deaths due to hypertensive disorders of pregnancy represented 13% of all maternal deaths

In 2006-2008, HDP represented 15.4% of total numbers of maternal death, the fourth main cause in Malaysia after obstetric embolism, PPH and other medical non HDP conditions. Although the incidence was lesser than reported by GBD 2000 but it has not yet shown signs of declining trend over the last decades despite concerted efforts.[4,5] A total of 61 deaths were related to HDP during this period and eclampsia (62.9%) was still the commonest type of HDP that lead to these deaths. Majority of this eclamptic fit occurred during antenatal period that succumbed to death as result of its sequelae. Comparing with previous reports, mothers above 30 years old and housewives continued to be the major group commonly involved in these deaths. Avoidable clinical factors highlighted in the previous series were seen again in this report. Although patient factors may have indirectly contributed to the cause of death, failure to appreciate the severity of HDP should not have occured as such events are avoidable clinical factors.

The therapeutic goals of managing HDP are essentially adequate treatment of hypertension and seizure prophylaxis with magnesium sulphate in severe type of pre- eclampsia to prevent maternal cerebrovascular complications. If delivery is indicated, it should be performed, regardless of the gestational age.

4.4 Case illustrations

Case 1

A 30 years old G5P4, booked at 15 weeks POA with blood pressure 130/90

mmHg and weighed 93kg. She was diagnosed as Gestational Diabetes Mellitus (GDM), on diet control at 24 weeks with twin pregnancy. Her blood pressure and sugar profile were within the normal range during antenatal visits. At 34 weeks POA, patient was admitted to Patient assessment centre (PAC) with complaints of severe dyspnoea and epigastric pain. The patient was alert and conscious. Her BP was 190/120mmHg, pulse: 90/min, respiratory rate: 30/min., Glascow coma scale (GCS) 15/15 and noted to have bilateral pedal oedema. Lung showed reduced air entry bilaterally with crepitations heard. A diagnosis of Acute Pulmonary Oedema secondary to Severe Pre-eclampsia was made. The specialist was informed and patient was admitted to labour room to start IV Hydrallazine infusion, IV frusemide 40mg, insert urinary catheter and monitor pulse oxymetry. After one hour of admission her condition deteriorated and she became very tachypnoeic. She was intubated by the anesthetist but was a difficult intubation as a lot of secretions were coming out from the mouth. SPO2 was 77%. The BP was 185/64 mmHg, pulse 118/min and urine albumin was 3+. An ultrasound was performed and bradycardia (60bpm) was noted in both twin. The consultant was informed and a decision was made for delivery by caesarean section. The BP was recorded as 218/70 mmHg and pulse rate of 125/min before being transfered to the operation theatre (OT). On the OT table, she became asystole. CPR was commenced for 30 minutes but failed to revive her and she was pronounced dead.

Case 2

A 31 years old Iban G2P1 was booked at 15 weeks at a health clinic and during her 4th antenatal visit, BP was 180/64 mmHg with pedal odema but was not referred instead given an appointment one month later. 5 days prior to her next antenatal appointment, she complained of severe headache with nausea and vomiting and went for traditional treatment. On the following day she developed fits with loss of consciousness (LOC) at home and was brought to health clinic where she was attended by the assistant medical officer. On arrival she was unconscious with BP 150/90 mmHg. She was then referred to the nearest hospital. On arrival, she was still unconscious with BP 186/77 mmHg, GCS 3/15 and she was intubated and referred to tertiary hospital. She was admitted to ICU and sent to the operation theatre for emergency caesarean section. Intra-operatively: blood pressure was between 175-210/ 195-115 mmHg. It was an uneventful operation. CT scan brain was done one hour post-operation and showed extensive acute right subdural haemorrhage including the tentorium interhemispheric fissure, right temporal subarachnoid haemorrhage and mild contralateral hydrocephalus. Craniotomy and evacuation of clots was performed but abandoned due to high intracranial pressure and there was prolapse of a small portion of the brain matter. Three hours post craniotomy her BP dropped despite inotropes support and abdomen became increasingly distended and tense. Hemoglobin dropped and clotting profile were deranged. Ultrasound abdomen showed free fluid up to the subphrenic region. She had exploratory laparotomy done and hemoperitoneum of 3 litres was noted with blood oozing from rectus muscle and perforators. However, there was no bleeding from uterine incision

sites. Drains were inserted and post-operatively her vital signs were more stable while on minimal inotropic support. Her GCS did not improve and remained 5/15.Patient's condition deteriorated and finally succumbed to her illness.

Case 3

A 32 years old factory worker, G5P2+2 was booked at 11 weeks gestation with BP 110/70mmHg and weight of 68.5kg. She remained relatively well until the sixth visit at 31 weeks when she presented with significant weight gain of almost 4 kg. in 2 weeks. The BP was between 130/90 and 120/80mmHg and she was given a repeat appointment in a week's time. When seen exactly a week later, she was asymptomatic and the BP was 120-130/90mmHg. Alternate day BP check was advised in view of sustained hypertension and very significant proteinuria. She was admitted to a tertiary hospital and oral Labetolol 100mg. tds was commenced. Doppler flow study showed absent end diastolic flow. She was induced with prostin and later artificial rupture of membrane (ARM) was done. However, caesarean section was done for fetal distress Post delivery she was transferred to the postnatal ward (PNW) where she had an eclamptic fit .The BP was 189/112mmHg and Red Alert was initiated. CPR was attempted but to no avail.

4.5 References

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CHAPTER 5

OBSTETRIC EMBOLISM

5.1 Introduction

As in the previous years, this chapter deals with maternal deaths due to obstetric embolisms which includes both blood clot and amniotic fluid embolism. These are classified under the ICD 10 classification as O88.1 for amniotic fluid embolism and O88.2 for blood clot embolisms. In the period being reported, obstetric embolisms formed 14.2%, 17.7% and 30.0% of direct and indirect deaths from 2006 to 2008 respectively. It has become the leading cause of maternal death in 2008. It was also the leading cause in the years 2001 to 2005 before declining in incidence in the year 2006. For comparison obstetric embolisms formed 20.6%, 17.6%, 23% and 20% of direct and indirect maternal deaths in the years 2001 to 2005 respectively.

Malaysia now reflects the change that occurred in the evolution of maternal deaths in Western countries in that deaths from postpartum haemorrhage have been overtaken by deaths from obstetric embolisms.

5.2 Data analysis

5.2.1 Cause

Table 5.1 shows the total number of deaths by year due to obstetric embolisms. There were a total number of 82 deaths in the 3 years being reviewed in this report. Most cases were clinically diagnosed and only 18 deaths (22%) had a post-mortem examination to determine the cause of death. Of these 18 post-mortems, 16 cases were full post-mortems and 2 were partial postmortems.

Table 5.1: Number of maternal deaths from obstetric embolism

Year	2006	2007	2008
Number	18	24	40

Table 5.2 illustrates the types of embolic phenomena that accounted for maternal deaths in the various years. By proportion amniotic fluid embolism formed 50%, 71% and 42.5% of embolic deaths for the years 2006 to 2008. This was generally in line with previous years when amniotic fluid deaths formed the major portion of embolic deaths.

Table 5.2: Causes of obstetric embolism

Causes	2006	2007	2008
Amniotic Fluid Embolism	9	17	17
Obstetric Pulmonary Embolism	9	7	23
Total	**18**	**24**	**40**

The mortality rates of the two conditions were calculated using the data of registered live births for the years concerned. The data for death rates seemed to improve especially for blood clot embolism till the unexpectedly high rates for amniotic fluid embolism in 2007 and for both types of embolism in 2008 (Table 5.3).

Table 5.3: Obstetric embolism by cause specific MMR (per 100,000 live births)

Obstetric embolism	2006	2007	2008
Amniotic fluid embolism	1.9	3.6	3.5
Blood clot embolism	1.9	1.5	4.7

5.2 Patient's profile

i. Age

Obstetric embolism deaths occurred across all age groups as noted in Table 5.4. The data confirmed that when age specific death rates were calculated, the risk was higher for patients aged more than 35 years

Table 5.4: Number of maternal deaths from obstetric embolism by age group

Age (years)	2006	2007	2008
<19	1	0	1
20-24	6	1	3
25-29	2	6	8
30-34	3	6	14
35-39	4	7	8
40-44	2	3	6
>45	0	1	0
Total	**18**	**24**	**40**

ii. Parity

Table 5.5 shows that obstetric embolism deaths were noted among all parities. Although embolic deaths were more common in higher parities, this was not borne out by the data for the years 2006-2008. Disaggregated data among the parity group 1 to 5 was not available to enable analysis whether it was true for the parities 4 to 5.

Table 5.5: Number of maternal deaths from obstetric embolism by parity

Parity	2006	2007	2008
0	2	0	6
1-5	14	19	28
6 and above	2	5	6
Total	**18**	**24**	**40**

iii. Ethnic group

The majority of the deaths occurred in the Malays as seen in Table 5.6. However, ethnic specific death rates by different racial groups are seen in Table 5.7.

Table 5.6: Number of maternal deaths from obstetric embolism by ethnic group

Ethnic Group	2006	2007	2008
Malay	13	15	24
Chinese	0	1	4
Indians	3	2	3
Kadazandusun	0	0	1
Murut	0	1	0
Iban	1	1	2
Bidayuh	0	1	0
Orang Asli P. Msia	0	1	0
Lain lain pribumis	0	0	1
Others	1	2	5
Total	**18**	**24**	**40**

Table 5.7: Ethnic specific MMR for obstetric embolism

Ethnic group	2006			2007			2008		
	n	LB	MMR	n	LB	MMR	n	LB	MMR
Malay	13	270,945	4.8	15	274,638	5.4	24	284,247	8.4
Chinese	0	84,637	0	1	85,229	1.1	4	84,285	4.7
Indians	3	29,525	10.1	2	29,693	6.7	3	29,636	10.1
Kadazandusun	0	9,801	0	0	9,964	0	1	10,815	9.2
Murut	0	1,928	0	1	1,992	50.2	0	2,082	0
Iban	1	12,486	8.0	1	11,949	8.3	2	12,397	16.1
Bidayau	0	3,369	0	1	3,349	29.8	0	3,405	0
Orang asli Pen. Malaysia	0	4,694	0	1	4,643	21.5	0		

iv. Educational level

Most mothers who died from this condition were educated to various levels in secondary schools (Table 5.8). The number who had no education was small reflecting the general socio-economic improvement in the country

Table 5.8: Number of maternal deaths from obstetric embolism by educational level

Educational Level	2006	2007	2008
Never attended school	1	4	1
Primary School	1	5	5
Secondary School (Up to Form 3)	4	3	5
Secondary School (Up to Form 5)	9	9	20
Secondary School (Up to Form 6)	0	0	1
College/ IPT	2	2	6
No information	1	1	2
Total	**18**	**24**	**40**

v. Occupation

As seen from Table 5.9, the majority of mothers who died from obstetric embolisms were housewives.

Table 5.9: Number of maternal deaths from obstetric embolism by occupation

Occupation	2006	2007	2008
Housewives	10	15	25
Professional/ Technical	0	1	1
Administrative	1	1	1
Clerical	0	0	3
Sales & Services	6	6	9
Agriculture & Production Related	1	1	0
No Information	0	0	1
Total	**18**	**24**	**40**

5.3 Delivery characteristics

i. Place of delivery

Table 5.10 shows that the majority of deaths from obstetric embolism occurred in hospitals with the presence of obstetricians. Deaths had occurred despite the presence of qualified personnel to treat patients with embolism. The difference in numbers of total cases from the totals in the previous tables below was due to undelivered patients.

Table 5.10: Number of maternal deaths from obstetric embolism by place of delivery

Place of Delivery	2006	2007	2008
State Hospital	4	5	15
Hospital With O&G Specialist	6	7	6
Hospital Without O&G Specialist	3	1	4
Private Hospital With Specialist	3	4	5
Home	0	1	0
No information	0	1	1
Total	**16**	**19**	**31**

ii. Mode of delivery

Generally, majority of the deaths occurred in patients who had a caesarean section for delivery (Table 5.11). This was change from previous analysis before 2000 which showed the predominance of normal deliveries. Perhaps, this reflects the increasing rates of caesarean sections for all deliveries. Instrumental deliveries occurred when the mother had already collapsed and the birth attendant decided to hasten the delivery of the baby in fetal and maternal resuscitation.

Table 5.11: Number of maternal deaths from obstetric embolism by mode of delivery

Mode of Delivery	2006	2007	2008
Vaginal Delivery	9	6	12
Vacuum	2	2	2
Forceps	0	0	3
Caesarean Section	5	10	13
Unknown	0	1	1
Total	**16**	**19**	**31**

iii. Accoucheur

Specialists and medical officers were the accoucheurs in the majority of cases (Table 5.12). Too much should not be read into this table as the fact that the specialist did not deliver such patients may not mean that they were not present at the time of delivery

Table 5.12: Number of maternal deaths from obstetric embolism by accoucheur

Accoucheur	2006	2007	2008
O&G Specialist	7	7	13
Medical Officer <6 months experience	3	0	5
Medical Officer >6 months experience	2	8	4
Staff Nurse	3	0	4
Midwife/ Community Nurse	0	2	3
No information	1	2	2
Total	**16**	**19**	**31**

iv. Place of death

Six cases died enroute while being transferred to other hospitals for further care. A total of 7 cases died in hospitals without specialists (Table 5.13).

Table 5.13: Number of maternal deaths from obstetric embolisms by place of death

Place of Death	2006	2007	2008
State Hospital	5	8	16
Hospital With O&G Specialist	7	5	8
Hospital Without O&G Specialist	1	1	4
Private Hospital With Specialist	3	3	2
Private Hospital Without specialist	1	0	0
Other hospitals	0	1	0
Home	1	3	6
Enroute	0	3	3
Others	0	0	1
Total	**18**	**24**	**40**

5.4 Discussion

Obstetric embolism deaths appear to be on an increasing trend over the three year period of this report. They are almost equally divided among amniotic fluid and blood clot embolism.

Thromboembolism

Venous thromboembolism (VTE) is the leading cause of pregnancy related maternal mortality and morbidity in the developed world. The trend in Malaysia seems to reflect this, with an increasing trend of VTE deaths and a reducing trend of PPH deaths since the inception of the CEMD inquiry in Malaysia. These deaths signify the delicate balance between coagulation and anticoagulation in pregnancy.

Doctors handling pregnant women should be aware that certain risk factors for VTE can be recognised in pregnancy. These include prior thromboembolism, age of

more than or equal to 35 years, increased parity (5 or more), increased maternal weight (>90kg or BMI > 30), instrumental deliveries or caesarean section, prolonged hospitalisation (e.g. placenta previa, pre-eclampsia, PPROM etc), smoking and the presence of an acquired or inherited thrombophilia. All pregnant mothers who have these risk factors should be commenced on low-molecular weight heparin (LMWH) soon after delivery in the absence of worrisome haemorrhage and continued at least till discharge from hospital. In some conditions such as previous thromboembolism it should be continued throughout the postpartum period.

Doctors would do well to remember the complications of VTE. These include the risk of recurrence which is about 7-12%. VTE carries a risk of pulmonary embolism and post-thrombotic syndrome. Once pulmonary embolism has occurred there is a risk of death and the occurrence of pulmonary embolism.

As emphasised in previous reports, there must be a high index of suspicion to diagnose VTE in pregnancy. Clinical evaluation alone cannot confirm or refute a diagnosis of VTE in the non-pregnant state and diagnosing VTE in pregnancy is even more challenging. Epidemiological tests have shown that exposure to radiation doses of less than a total of 5 rads has not been associated with a significant risk for fetal compromise. The diagnostic tests shown below (Table 5.13) are all below the safe limit and most combination of these tests are also below the safe limit although they may slightly increase the risks for childhood cancers. Doctors are strongly encouraged to use these tests to secure a firm diagnosis of VTE.

Table 5.13: Approximate radiation exposures of diagnostic tests for VTE

Test	Radiation exposure (rads)
Chest X-ray	0.001
Perfusion scan	0.018
Ventilation scan	0.019
Helical Chest CT	0.005
Limited venography	0.050
Pulmonary angiography	0.221
Compression U/S	None
MRI	None

The primary modality for the diagnosis of DVT in pregnancy is compressive ultrasonography. It has a sensitivity of 97% and specificity of 94% for the diagnosis of proximal DVT in the non-pregnant population.It is less accurate for symptomatic calf DVT. It is inadequate for iliac vein thrombosis for which only MRI has shown a high degree of sensitivity and specificity

Venography was widely held to be the standard for establishing a diagnosis of DV. However, exposure to radiation and the invasive nature of the test have led to its replacement by compressive ultrasonography

D-dimer measures the degradation products of cross-linked fibrin. Pregnancy itself

may increase D-dimer levels increasing with gestational age. Pre-term labour, pre-eclampsia and placental abruption can also elevate levels significantly. The main use of D-dimer is from a high negative predictive value. The approach using D-dimer is not validated in pregnancy.

Patients who on clinical evidence are likely to have thrombosis but whose initial test results are negative should undergo either venography or serial non-invasive testing. Diagnosis of pelvic vein and internal iliac vein thrombosis is difficult and may require MRI.

In the past, V/Q scan has been the primary tool for the diagnosis of pulmonary embolism in pregnant patients. Helical CT scan has become the first line imaging test in daily clinical practice. The sensitivity varies from 57 to 100% and the specificity varies between 64 and 100%.Helical CT is more sensitive for detecting emboli in the central arteries and less sensitive for detecting subsegmental emboli.

Pulmonary angiography is still the gold standard for ruling out PE Pulmonary angiography requires expertise for performance and interpretation and is invasive. It is thus used when diagnosis cannot be made or excluded on less-invasive testing.

The specific therapy of choice in pregnant women with VTE is anticoagulation. Options for prevention and treatment include warfarin, unfractionated heparin (UFH), LWMH,and danaparoid sodium. Hirudin and fondaparinux have not been evaluated in human pregnancy.

Warfarin should be avoided in pregnancy, particularly between 6 and 12 weeks gestation, because it is associated with an up to 5% risk of teratogenecity. It increases the risk of fetal and maternal haemorrhage especially at the time of delivery, neurological problems in the baby and stillbirth. Warfarin can be safely administered to mothers after delivery and during breastfeeding as it is not secreted in breast milk in a clinically significant amount.

UFH and LMWH do not cross the placenta and these agents are safe for the fetus. Heparins can be safely used in lactation as they are not secreted in the breast milk. The regimens of administration includes continuous infusion of UFH, subcutaneous injection of UFH or subcutaneous injection of LMWH. Although heparins are safe for the fetus, several maternal complications have been described. Heparin induced osteoporosis has been described with long-term UFH use. LMWH is probably associated with a lower risk of osteoporosis. Heparin induced thrombocytopenia is a immune mediated IgG-mediated reaction characterised by the development of arterial or venous thrombosis which usually occurs 5 and 15 days after the initial administration of heparin. In pregnant women who develop or have a history of heparin-induced thrombocytopenia, danaparoid sodium is recommended as a safe option because of the low cross-reactivity with heparin.

Amniotic fluid embolism

Amniotic fluid embolism is an unpredictable, often unpreventable and rapidly progressive obstetric emergency in which amniotic fluid, fetal cells, hair or other debris enter the maternal circulation and cause a multisystem reaction to toxins. The syndrome that is triggered may manifest with hypoxia, hypotension, unconsciousness, cardiac arrest and coagulopathy.

One must be aware that most cases occur during labour, sudden deaths have been reported worldwide during surgical termination of pregnancy, in the second trimester, after abdominal trauma, during caesarean section and unexpectedly in the postpartum period.

AFE has been referred to as anaphylactoid syndrome in pregnancy and sudden obstetric collapse syndrome. Whatever the aetiology, there has been no reduction in the incidence or severity of presentation and it remains an important cause of maternal death.

National registries have been set up in a number of countries in the developed world. The mortality rate in the UK register was 30%. Population based surveys showed a mortality of up to 86%. Among survivors, the incidence of severe permanent neurological dysfunction is high in this group who were previously young and healthy. The incidence of neurological damage was varied from 16% to 85% in the UK and US registries. The recent commencement of the Malaysian obstetric registry should enable us to develop better information about the Malaysian cases of amniotic fluid embolism.

Historically, the most commonly cited risk factors are maternal age, multiparity, large fetus, prolonged labour, rupture of membranes, placental abruption, uterine over-distension, use of uterine stimulants and meconium liquor. Analysis from the registries has disproved some of the commonly held associations. No relationship to age was found. No relationship between the use of oxytocics and development of AFE has been established. Although uterine tetany often occurs, it is thought to be a response to hypoxia and noradrenaline release rather than to be the cause of AFE.

One factor that has remained constant is the occurrence of AFE and its relationship to a tear in the fetal membranes either spontaneously or by artificial means. There was also a statistically significant bias in fetal gender in AFE, the male gender being predominant. No explanation was offered for this.

A biphasic response to AFE has become evident. There is an initial response of vasospasm in the pulmonary vasculature which increases the pulmonary artery pressure. This accounts for the development of right heart failure which is often fatal. Low cardiac output leads to increased ventilation/perfusion mismatch, hypoxia and hypotension. This initial response is transient and lasts for about 30 minutes. Women who survive the initial events may enter a second phase of haemodynamic compromise, primarily involving left ventricular failure and pulmonary odema with return of normal right heart function. The hypoxia associated with AFE could lead to

left ventricular dysfunction although the possibility of a direct myocardial depressant effect cannot be excluded.

Many authors have suggested that humoral factors mediated by prostaglandins and other arachidonic acid metabolites might contribute to the haemodynamic changes associated with AFE. Unstable products of the prostaglandin synthetase enzyme complex in the amniotic fluid might theoretically be converted to thromboxane, prostaglandin or prostacycline which are vasoactive substances. Endothelin-1which is a potent vasoconstrictor and bronchoconstrictor has also been implicated. These suggest that it is the chemical composition rather than the volume of amniotic fluid that is responsible for the haemodynamic effects. Patients who survive the initial event may develop a secondary coagulopathy and haemorrhage. These are believed to be due to the high levels of tissue factor and tissue factor inhibitor in the amniotic fluid than in the plasma.

There is no pathognomonic test for AFE. Only 50% of patients who are resuscitated have shown squamous cells other debris of fetal origin in the maternal pulmonary vasculature. Various diagnostic stains have been investigated. TKH-2 immunostaining and zinc coproporphyrin plasma levels have been investigated. Clinical experience is still limited with these modalities.

A number of reports described increased levels of serum tryptase. A number of cases were reported with normal tryptase levels and low complement. This suggests complement activation rather than mast cell degranulation as a mechanism in the manifestation of the anaphylactic response of AFE.

One must always remember that the differential diagnosis of AFE includes the following: septic shock, aspiration pneumonitis, acute myocardial infarction, pulmonary thromboembolism, venous air embolism, anaphylaxis, obstetric complications such as abruption placenta, eclampsia and uterine rupture as well as anesthetic complications such as total spinal anesthesia and systemic local anesthetic toxicity.

Treatment is supportive and directed towards the maintenance of oxygenation, cardiac output and blood pressure and correction of the coagulopathy. Delivery of the fetus by caesarean section must be initiated as soon as possible.

As these cases often end up in the medico-legal arena, doctors must ensure full documentation of the circumstances of collapse and resuscitation. In the event of death, consent for post-mortem should always be requested.

5.5 Recommendations

5.5.1 All care givers should attempt to obtain a definitive diagnosis of DVT in pregnancy by the use of ancillary investigations as the diagnosis carries a long-term implication for future pregnancies. There should be less concern about the radiation hazards to the fetus of some of the investigation modalities.

5.5.2 All at-risk patients in pregnancy and postpartum should be offered

thromboprophylaxis. A standard operation procedure and checklist should be developed and used by the O&G services. The percentage of compliance to these checklists should be monitored at the hospital level.

5.5.3 Awareness and the importance of thromboprophylaxis should be increased among the nursing personnel and junior medical officers so that treatment is commenced in all at-risk patients.

5.5.4 Efforts should be made to link the national obstetric registry to the CEMD system to enable Malaysia to develop its own amniotic fluid registry.

5.6 References

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CHAPTER 6

PUEPERAL SEPSIS

6.1 Introduction

Puerperal sepsis is becoming one of the leading causes of maternal morbidity and mortality. Many a time it is a very preventable cause. The occurence of pueperal sepsis is seen across the globe, both in the developed as well as the developing countries.

Most postpartum infections occur following discharge from hospital. Poor postnatal follow up and care results in the failure to diagnose many of these postnatal infections. Endometritis, wound infection, mastitis, urinary tract infection, and septic thrombophlebitis are some of the main causes of these puerperal infections. Among some of the predisposing factors causing these infections include home deliveries, low socioeconomic status, poor nutrition, primiparity, anemia, prolonged rupture of membranes, prolonged labor, multiple vaginal examinations in labor, ceasarean section, obstetrical maneuvers, retained products of conception and post partum haemorrhage.

Septicemia, endotoxic shock, peritonitis with or without pelvis abscess are some of the common maternal complications that we see. Failure to identify such complications coupled with delayed therapy and intervention (surgery) can often result in severe morbidity including maternal death.

These puerperal infections can occur as a result of nosocomial, exogenous, and endogenous transmissions. Nosocomial infections can be acquired in hospitals or other health facilities and may come from the hospital environment or from the patient's own flora. Exogenous infections come from external contamination, especially when deliveries take place under unhygienic conditions. Endogenous organisms, consisting of mixed flora colonizing the woman's own genital tract.

Early diagnosis, appropriate investigations and intervention, including antibiotic therapy and surgery, have played a major role in reducing the incidence of puerperal infections.

Puerperal sepsis is defined in ICD-10, as temperature rise above 38.0°C (100.4°F) maintained over 24 hours or recurring during the period from the end of the first to the end of the tenth day after the childbirth or abortion. However, WHO defines puerperal sepsis as infection of the genital tract occurring at any time between the onset of the rupture of membranes or labour and the 42nd day postpartum in which fever and one or more of the following are present:

1. Pelvic pain
2. Abnormal vaginal discharge
3. Abnormal odour of discharge
4. Delay in the rate of reduction of size of the uterus

In this chapter the analysis is based on the WHO definition.

Puerperal sepsis consists of a small number but a preventable cause of maternal deaths in Malaysia. Over the period of 2006 to 2008 there were a total of 9 maternal deaths attributed to puerperal sepsis. These 9 deaths were out of a total of 396 maternal deaths over the 3 year period, accounting for 2.72%. There is a slight increase in the number of cases over the 3 years 1.6% in 2006, to 2.2% in 2007 to 3.1% in 2008 (Table 6.1). Though maternal deaths from puerperal sepsis are small, it still remains as a very preventable cause of death.

Table 6.1: Cause of maternal deaths

STATES	2006		2007		2008	
	n	%	n	%	n	%
Postpartum Haemorrhage	24	18.9	23	16.9	26	19.5
Hypertensive Disorders in Pregnancy	22	17.4	25	18.4	14	10.5
Obstetric Embolism	18	14.2	24	17.7	40	30.0
Associated Medical Conditions	24	18.9	20	14.7	24	18.0
Obstetric Trauma	6	4.7	6	4.4	5	3.8
Antepartum Haemorrhage	5	3.9	2	1.5	2	1.5
Puerperal Sepsis	2	1.6	3	2.2	4	3.1
Abortion	3	2.3	6	4.4	3	2.3
Ectopic	9	7.1	7	5.1	3	2.2
Unspecified complications of pregnancy & puerperium	5	3.9	8	5.9	2	1.5
Associated with anaesthesia	0	0	1	0.7	1	0.8
Others	9	7.1	11	8.1	9	6.7
Total	**127**	**100.0**	**136**	**100.0**	**133**	**100.0**

6.2 Patient Profile

There were a total of 9 (2.3%), out of 396 maternal deaths over the years 2006-2008, attributed to puerperal sepsis (Table 6.2). Seven (77.8%), of these women were in the 20-34 yr age group. This is expected as it is the 'most reproductive age group". The maternal deaths was the same between the primigravidas and the multigravidas, 4 (44.4%), in each group)

The Malay community seems to be at highest risk of 4 out of 9 (44.4%) patients, this is most likely a population skew. There were 2 Chinese patients. As for the education level 5 (55.6%) out of 9 of them had at least a minimum of, upper secondary education. Housewives formed the bulk of the deceased of 4 out of 9 (44.4%).

Table 6.2: Profile of patients who died from puerperal sepsis

Patient's profile	2006 n=2	2007 n=3	2008 n=4
Age (years)			
<19	0	0	1
20 – 24	1	0	2
25 – 29	0	2	0
30 – 34	1	0	1
35 – 39	0	1	0
Ethnic group			
Malay	1	2	1
Chinese	1	1	0
Indians	0	0	0
Muruts	0	0	1
Others	0	0	2
Parity			
1	1	2	1
2 - 5	1	1	2
No information	0	0	1
Educational level			
No schooling	0	2	1
Primary School	1	1	1
Secondary School (till Form 5)	1	0	1
Secondary School (till Form 6)	0	0	0
Tertiary Education	0	0	0
Unknown	0	0	1
Occupation			
Housewives	1	1	2
Clerical	0	1	0
Sales & Services	1	0	1
Student	0	1	0
No information	0	0	1

6.3 Delivery characteristics

Five (55.6%) of the maternal deaths, had delivered at facilities outside a government hospital, these include 2 at home, 2 at private centres and 1 undetermined (Table 6.3). However the majority, 6 (66.7%), of the deaths occurred at government hospitals. 2 of the deaths happened at home. More than 55.6% of the mothers who died had been delivered by normal vaginal birth, 2 (22.2%) of them had a vaccum assisted delivery. It appears that the majority of these deaths occurred in patients who were delivered by non doctors. Three (33.3%) were delivered by nurses and 1 (11.1%) had an unattended delivery.

Table 6.3: Delivery characteristics of patients who died from puerperal sepsis

Patient's profile	2006 n=2	2007 n=3	2008 n=4
Place of delivery			
State hospital	0	0	2
Hospital with obstetrician	0	1	0
Hospital without obstetrician	1	0	0
Private hospital with obstetrician	0	2	0
Home	1	0	1
Others	0	0	1
Mode of delivery			
Vaginal delivery	0	0	3
Vacuum	2	2	0
Caesarean sections	0	1	0
No information	0	0	1
Accoucheur			
Obstetrician	0	0	1
Medical Officer > 6 months experience	0	1	0
Medical Officer < 6 months experience	0	1	0
Staff nurse	1	0	1
Midwife / Community Nurse	0	0	1
Traditional Birth Attendant	0	0	1
Unattended	1	0	0
No Information	0	0	1
Place of Death			
State Hospital	2	1	1
Hospital with obstetrician	0	1	1
Hospital without obstetrician	0	1	0
Home	0	0	2

6.4 Case Illustrations

Case 1

Remediable/ contributory factors:

- Failure to adhere to protocols
- Failure to appreciate severity
- Patient factors

This patient was a 29 years old, Malay university student, G3P2 at 39 weeks and 1 day. She had regular antenatal care (ANC) at a private hospital. She was morbidly obese (weight 103kg). She presented to the private hospital in labour and artificial rupture of membrane (ARM) revealed thick meconium stained liquor (TMSL). Emergency LSCS was performed and delivered a 4.1 kg baby was delivered with Apgar score of 9/10. Intraoperatively it was noted that the lower segment was rather vascular. She had received Unasyn as perioperative antibiotic and post operation,

her haemoglobin was 6.5gm%. She was transfused 3 units of whole blood. Her wound was normal and she was discharged on the 4 post operative day. On discharge she was advised to inform the nearest health clinic and for a TCA 5 days post discharge.

She presented to the same private hospital on the 10th day post partum with complaints of fever and abdominal pain. Examination revealed a conscious but ill looking patient who was mildly tachypnoeic. The lower abdomen was tender but the surgical wound had healed well with no signs of infection. Lochia was normal. An ultrasound showed a well contracted uterus. Patient was then transferred to a government facility following a request by the husband.

On arrival at the government hospital, she was noted to be conscious but pale, tachypnoeic, sweating, cold and clammy extremities. Her oxygen saturation was 94%, BP 100/60 mmHg, PR 140bpm and temp was 37.8^{o}C. The abdomen was distended and guarded with a healed LSCS scar. Speculum examination revealed an open os but with no any foul smelling discharge. Ultrasound showed a uterus 12 by 6 cm and significant intraperitoneal fluid.

Diagnosed as "Sepsis with Peritonitis"

She was immediately referred to the anaesthesia and surgical unit in view of further management and ICU care. In ICU, she was diagnosed to be in septicaemic shock and was started on fluids as well as inotropic support. Patient was stablised and an urgent CT scan showed multiple areas of loculated fluid collection with possible inflammation. Laprotomy was done and the intraoperative findings were thick intraperitoneal slough (including the greater and lesser sac), interloop abcess and about 200 mls intraperitoneal clots. Post operatively she was nursed in the ICU, however her condition detoriated further. She developed high grade temperature of 42^{o}C, metabolic acidosis, electrolyte imbalance and renal shutdown. Despite treatment she succumbed.

Cause of Death: "Severe septis shock secondary to infected intraperitoneal hematoma"

Case 2

Remediable/ contributory factors:

- Failure of communication
- Failure to diagnose
- Failure to adhere to protocols

A 35 yr old Malay housewife, in her first pregnancy, had regular ANC at the local clinic and the district hospital. She was diagnosed to have a uterine fibroid as well as gestational diabetes for which she was on diet control. She was delivered by outlets forceps for poor maternal effort. She was delivered by the O&G specialist and was discharged well, the following day. Patient however decided to room in with her baby as the baby was jaundiced.

Three days postnatally, at 4.00am, she complained of feeling dizzy and unwell. Her BP was 80/40 mmHg and PR was 100 bpm. Her glucose level was 9.1mmol/l and oxygen saturation was 99%. This was informed to the doctor on call. The doctor then ordered via phone, to start IV Hartman drip over 2 hours and to do a full blood count. An hour later the doctor was contacted again as the nurse was unable to set the line. However, the doctor was not able to attend as he was busy with another patient. The patient was reviewed by the doctor at 6.30 am. Her BP was 80/60 mmHg, PR was 100 bpm and the temperature 39.4C. Examination revealed a swollen and indurated perineum with a gaping episiotomy wound. The swelling had extended to the entire buttock and inner thigh. Her haemoglobin was 12.6 gm% and total white count increased. The case was then immediately discussed with the medical office at the tertiary hospital. It was then decided to transfer the patient after informing the specialist, but to stabilize patient prior to transfer. Patient's condition took a turn for the worse. Her BP started to drop, inotropic support was commenced, with antibiotic change. However patient continued to deteriorate and collapsed. Despite all efforts patient died.

Cause of death: "Septicaemic shock secondary to infected episiotomy wound"

6.5 Discussion

Puerperal sepsis still remains as one of the most preventable cause of maternal death. As we can appreciate from the 2 case illustrations, proper adherence to existing ministry of health protocols and a high degree os suspicion are extremely important. Early referrals without undue delays are necessary to ensure adequate care. Appropriate choice of antibiotics as well as re-emphasisng the importance of aseptic technique in the delivery process is crucial in order to prevent more such deaths.

Patients must be educated to detect early signs of infection and advised to seek early medical attention. Ensuring that the health personnel are aware of new mothers and providing them with the appropriate level of care.

6.6 Recommendations

- To refresh the knowledge of all health personnel involved in maternal health care, in the early detection of pueperal sepsis to ensure that early detection and early initiation of appropriate therapy is initiated.

- To simplify the referral process. This will facilitate the lines of communicaton to ensure a fast and safe transfer of patient to the appropriate place of care.

- To adhere to existing protocols and guidelines.

Questions to improve the healthcare providers appreciation of puerperal sepsis *(adopted from Education material for teachers of midwifery - Midwifery education modules - second edition, WHO 2008)*

Q1 What is puerperal sepsis?

A *An infection of the genital tract which occurs after the birth of the baby,usually after the first 24 hours.*

Q2 When the membranes rupture for more than 18 or more hours before the onset of labour, what condition may develop?

A *Chorioamnionitis*

Q3 Following the birth, where might puerperal sepsis be localized?

A *The perineum, vagina, cervix, or uterus.*

Q4 Name some life threatening conditions which may result from puerperal sepsis?

A *Septicaemia, septic shock, coagulopathy, peritonitis,pelvic abscess.*

Q5 Name some common signs of puerperal sepsis?

A *Fever, chills, lower abdominal pain, tender uterus purulent, foul-smelling lochia.*

Q6 What are the risk factors for puerperal sepsis which could be identified on history taking?

A *Prolonged rupture of membranes, prolonged labour, unskilled delivery attendant, unclean delivery equipment, insertion of harmful substances into the vagina (e.g. cow dung), operative delivery, excessive haemorrhage after birth, presence of sexually transmitted infection during pregnancy, presence of diabetes or anaemia, woman not immunized for tetanus.*

Q7 What are the risk factors for puerperal sepsis which could be identified by physical examination?

A *Evidence of anaemia (pallor of palms and conjunctiva), evidence of retained placental fragments, uterus soft and bulky with excessive lochia, unrepaired vaginal or cervical lacerations.*

Q8 What investigations may be required for the diagnosis of puerperal sepsis?

A *High vaginal swab, midstream specimen of urine, throat swab, wound swab, blood culture.*

Q9 Organisms that commonly cause puerperal sepsis?

A *Streptococci, staphylococci, E.coli, clostridium tetani, clostridium welchii, chlamydia and gonococci.*

Q10 What is the preferred route of administration for antibiotics in the case severe puerperal sepsis, and why?

A *The intravenous route, because the effect of the antibiotics is more rapid than when administered by other routes.*

6.7 References

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CHAPTER 7

DEATHS ASSOCIATED WITH DELIVERIES AT PRIVATE HEALTH FACILITIES

7.1 Introduction

Maternal death has remained one of the most daunting problems in any healthcare system. Pregnancy being a physiological process can still be complicated by various problems that may end in a maternal death. Maternal mortality in Malaysia has reduced dramatically because of the comprehensive provision of health care but it is still a far way to go before we reach the low numbers of the developed world. The number of maternal death in the private healthcare facility has been reduced substantially over the last ten year period. From the year 2006 to 2008 there were a total of 29 maternal deaths compared to 66 between the years 1997 to 2000. The total number of deliveries during this period was 1,398,239 giving a prevalence of maternal death in the private healthcare facilities to be 2.07 per 100,000 births.

7.2 Data analysis

7.2.1 Cause

The commonest cause of death in the private healthcare mirrored a similar trend in the government facility being post partum haemorrhage (34.5%), amniotic fluid (24.1%) and pulmonary embolism (13.8%) (Table 7.1).

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Table 7.1: Causes of death associated with deliveries at private health facilities

Causes	2006	2007	2008
Septicaemia – unspecified	0	0	1
Systemic lupus erythematosus	0	1	0
Pre eclampsia	0	1	0
Eclampsia	0	1	0
Rupture of uterus	0	0	1
Postpartum haemorrhage – Retained placenta	1	0	2
Postpartum haemorrhage – Uterine atony	3	2	2
Puerperal sepsis	0	2	0
Amniotic Fluid Embolism	2	2	4
Obstetric Pulmonary embolism	1	2	1
Total	**7**	**11**	**11**

7.2.2 Patient's profile

i. Age

The majority of the maternal death occurred between the age of 20-35 years (58.6%). However a significant number of death occurred in women older than >35years (37.9%) and 1 death during the adolescent period (3.5%) which is similar to the pattern in the previous years (Table 7.2).

Table 7.2: Number of maternal deaths at private health facilities by age group

Age (years)	2006	2007	2008
<19	1	0	0
20-24	1	0	1
25-29	0	4	5
30-34	2	3	1
35-39	1	3	2
40-44	2	1	1
>45	0	0	1
Total	**7**	**11**	**11**

ii. Ethnic group

There seem to be more maternal deaths among the Malays (58.6%) compared to the Chinese (17.2%). This is not unexpected because the Malays contribute to the major percentage of the total number of deliveries (Table7.3).

Table 7.3: Number of maternal deaths at private health facilities by ethnic group

Ethnic group	2006	2007	2008
Malay	6	7	4
Chinese	1	2	2
Indians	0	1	1
Others	0	1	4
Total	**7**	**11**	**11**

iii. Parity

There is no significant pattern in between maternal death in the private health facilities and parity as shown in Table 7.4. Similarly there is no relationship between the education level and maternal death as seen in Table 7.5.

Table 7.4: Number of maternal deaths at private health facilities by parity

Parity	2006	2007	2008
0	1	1	3
1	2	2	0
2-5	3	7	7
6 and above	1	1	1
Total	**7**	**11**	**11**

Table 7.5: Number of maternal deaths at private health facilities by educational level

Educational Level	2006	2007	2008
No schooling	0	1	1
Primary School	0	0	2
Secondary School (Up to Form 3)	1	0	2
Secondary School (Up to Form 5)	2	8	4
College	2	2	1
No information	2	0	1
Total	**7**	**11**	**11**

iv. Occupation

The majority of maternal deaths occurred among the housewives followed by those in the sales and services. However this information does not show any specific contributing factors towards the maternal death (Table 7.6).

Table 7.6: Number of maternal deaths at private health facilities by occupation

Occupation	2006	2007	2008
Housewives	1	4	7
Administrative	0	2	0
Clerical	0	3	1
Sales & Services	4	1	0
No Information	0	0	2
Unemployed	2	0	0
Student	0	1	0
Total	**7**	**11**	**11**

7.2.3 Delivery characteristics

i. Mode of delivery

The commonest mode of delivery is caesarean section (41.4%) followed by vaginal deliveries (34.5%) and instrumental deliveries (24.1%). The

high rate of caesarean section is a common trend seen in the private healthcare and this is a worrying trend as it has an impact in future pregnancies. It has been shown in the west where increasing caesarean section has resulted in an increase in placenta accreta which carries substantial maternal morbidity and mortality. Efforts should be targeted at reducing the rate of caesarean section in the private healthcare (Table 7.7).

Table 7.7: Maternal deaths by mode of delivery at private health facilities

Mode of delivery	2006	2007	2008
Vaginal Delivery	4	3	3
Vacuum	1	2	2
Forceps	2	0	0
Caesarean Sections	0	6	6
Total	**7**	**11**	**11**

ii. Accoucher

As shown in this table we still see maternity homes which are managed by non O&G specialist. There is 1 maternal death conducted by a staff nurse and 1 death by a medical officer with less than 6 months of O&G experience and 4 deaths by medical officers with more than 6 months experience. The issue of competency has to be addressed and facilities of these maternity services have to be looked into to ensure that they are compliant to the guidelines put forward by the ministry of health (Table 7.8).

Table 7.8: Maternal deaths by accoucheur at private health facilities

Accoucheur	2006	2007	2008
O&G Specialist	5	8	9
Medical Officer <6 months experience	0	1	0
Medical Officer >6 months experience	2	1	1
Staff nurse	0	0	1
No information	0	1	0
Total	**7**	**11**	**11**

iii. Place of death

15 (51.7%) of the maternal death associated with private healthcare facilities occurred in the government hospital where they were referred to. This is not unusual; however, it is not clear if those cases had been stabilized prior to transfer. This is an important issue because it will reflect on the standard of care and availability of facility in that private health facility in terms of providing emergency care. Patients that were

transferred in a moribund state will have a higher risk of mortality. In Table 7.9, 1 patient died during enroute and this patient may be transferred without being stabilized first. It is disheartening to see that 2 patients were sent to a hospital without an O&G specialist bearing in mind that these patients had some form of complications and needed a specialist care and should be transferred to a hospital with specialist to ensure that they get optimal care.

Table 7.9: Maternal deaths by place of death associated with private hospital deliveries

Place of Death	2006	2007	2008
State Hospital	0	3	5
Hospital With O&G Specialist	1	2	1
Hospital Without O&G Specialist	0	1	1
Private Hospital With Specialist	6	5	3
Enroute	0	0	1
Total	**7**	**11**	**11**

7.3. Discussion

The number of maternal death in the private healthcare facilities still remain small from the last 10 years but it has not shown any improvement. We should aim for a rate of less than 1 maternal death per 100,000 live births. The standard of care in private facilities should be monitored and the facilities of the hospital or maternity home must follow the standard guideline of the private healthcare act. The care of patients in the private health facilities are mainly provided by O&G specialist. Therefore the care should be better than average. The competency of these doctors should be monitored from time to time to encourage self and continuous learning. One of the key issue in in reducing the maternal death in this area is to have a better communication between the private and government healthcare providers especially when there is a complication in the patient under their care. Early and timely referral is important. Special retrieval team comprising of specialists from the government hospital should be readily available to ensure critical patient are transported in the optimal condition. This will have an impact on reducing the potential maternal death in the future. There was no information whether the patients transported to the government hospital are being accompanied by a medical personnel. The clinical practice guidelines (CPG) which is used by the hospitals in the government should also be practiced in the private hospitals such as the CPG for thromboprophylaxis as this could be a major cause of maternal death in future.

CHAPTER 8

HOME DELIVERIES

SUMMARY

There were 23 maternal deaths associated with home deliveries. This is reduction of 20 (50%) deaths compared to 43 deaths from 2001-2005. Analysis showed that Post Partum Hemorrhage accounted for 60% (13 cases) making it the major cause of death. 86% of deaths occurred amongst age 20-39 years. Most of the deaths occurred in housewives, low education, of other ethnic groups and were untagged or coded green. Out of this, 15 (65%) of babies who were delivered survived.

8.1 Introduction

The trend for maternal death associated with home deliveries in the year 2006-2008 showed a decline compared to last five years (Table 8.1).

Table 8.1. Number of maternal deaths from home deliveries

Year	2006	2007	2008
Number	10	6	7

8.2 Data analysis

i. Causes of death

Postpartum haemorrhage is still the leading cause of maternal deaths resulting in 13 death (60%).Other causes of death include chorioamnionitis, chronic rheumatic heart disease, cardiomyopathy, obstetric trauma, puerperal infection and obstetric embolism (Table 8.2).

Table 8.2: Causes of maternal deaths associated with home deliveries

Causes	2006	2007	2008
Chorioamnionitis	1	0	0
Chronic Rheumatic Heart Disease	0	1	0
Cardiomyopathy	0	0	1
Obstetric trauma	2	0	0
PPH with retained placenta	4	3	4
PPH with uterine atony	0	1	1
Puerperal infection	1	0	1
Obstetric embolism	0	1	0
Unspecified	1	0	0

ii. Patient's Profile

Almost 86% of the total deaths occurred between the ages of 20 - 39. From this group, 13 deaths occurred in women aged 30 and above (Table 8.3). Based on ethnicity, 'Others' account for higher deaths (9 cases), Malay account for 21% (5 cases) deaths followed by Chinese, Kadazandusun, Iban, Murut and Orang Asli Peninsular Malaysia. Majority of deaths occured among women in multipara (parity 6 and above) .Patients with higher educational levels appeared to have lower incidence of death. 15 (65%) of deaths were among the group that never attended school or were educated only at primary school level. About 74% of the deceased were housewives

Table 8.3: General analysis of maternal deaths associated with home deliveries,

Patient's profile	2006 n=10	2007 n=6	2008 n=7
Age (year)			
<19	1	1	0
20-24	2	0	2
25-29	3	0	1
30-34	3	2	1
35-39	1	3	2
40-44	0	0	1
Parity			
1	3	2	0
2-5	3	2	3
6 and above	4	2	4
Ethnic group			
Malay	2	2	1
chinese	1	0	0
kadazandusun	0	1	1
Iban	0	0	1
Murut	0	1	1
Orang Asli (Pen.)	1	0	2
Others	6	2	0
Educational Level			
Never attended school	3	1	2
Primary School	4	1	4
Secondary School (Up to form 3)	1	1	1
Secondary School (Up to form 5)	1	2	0
No information	1	1	0

iii. Delivery characteristics

13 (56.5%) cases that died were tagged green. All deliveries were performed by vaginal vertex delivery, (8 (35%) cases died unattended ,6 (26%) cases died enroute, 5 (22%) cases died at home, 12 (52%) cases died in hospitals, 3 babies died and 15 babies survived (Table 8.4).

Table 8.4 : Number of maternal deaths associated with home deliveries by delivery characteristics

Delivery characteristics	2006 n=10	2007 n=6	2008 n=7
Colour code			
white	0	0	2
Yellow	1	1	0
Green	5	5	3
Unknown	4	0	2
Mode of delivery			
Vaginal delivery	10	6	7
Accoucheur			
Staff nurse	1	1	1
Midwife/Community Nurse	1	0	0
Traditional Birth Attendant	3	0	2
Unattended	1	5	2
Others	4	0	2
Place of Deaths			
State hospital	3	2	0
Hospital with specialist	0	0	3
Hospital without specialist	3	0	1
Home	1	3	1
Enroute	3	1	2
Status of baby			
Died	1	1	1
Alive	5	5	5
Unknown	4	0	1

8.2 Case illustrations

Case 1 (Defaulter and Postdates)

22 years old malay housewife, G2 P1 was booked after 24weeks of POA. Her antenatal screening was normal. She had 8 antenatal visits which were uneventful. Due to post date for 17 days she was advised to go for admission and induction, however she defaulted treatment. She stayed about 1 kilometer from health clinic and 33 kilometers from the hospital. The community nurse on call was called when she went

into labour and a baby girl weight 3.23kg was delivered with good apgar score. Placenta was delivered completely and during the vaginal examination it was noted that patient had first degree vaginal tear and small laceration over the right labia minora. Blood loss was estimated 800mls. Patient was transferred to district hospital 2 hours later, after diagnosis of PPH was made. On arrival at the district hospital, patient was pale, drowsy and restless, B/P 100/70, pulse rate was 70 with weak pulse volume. Vaginal examination was performed and revealed uterine inversion and manual reduction was attempted, however patient continued to bleed and fluid resuscitation and oxcytocin infusion was given. Patient was only referred to state hospital after two hours and arrived there after one and the half hours. The reason for delay was because of heavy traffic and rain. On arrival at the general hospital, red alert was activated and patient was aggressively resuscitated before proceeding to the operation theatre for laporatomy. Finally hysterectomy was performed, however patient went into asystole and revived fifteen minutes after surgery. Her condition continued to deteriorate and eventually she succumbed in the afternoon of the following day.

This case illustrate failure to diagnose; failure to appreciate severity, failure to inform senior and failure to adhere to protocol which eventually led to delay in giving appropriate therapy such as adequate initial resuscitation and late transfer to tertiary care.

Case 2. (Suboptimal care and failure to communicate)

40 years old Kedayan housewife, G6P4+ 1 unsure of her LMP, was first seen at the antenatal clinic at 10 weeks. The examination was uneventful and her subsequent visit was normal. She stayed about 26 kilometers from health clinic and 67 kilometers from hospital. At 33 weeks of gestation she had slight per vaginal bleeding and tightening. She was sent to labour room of district hospital for examination and was quite comfortable, vital signs were stable. Ultrasound examination had showed the placenta to be on the upper segment. The uterus corresponded to 34 weeks, single fetus, and head 5/5 palpable with no contraction. CTG was satisfactory and her condition was noted and referred to the medical officer via phone and was sent home. There was no documentation to state whether vaginal examination was performed.

The following day the staff nurse received call from the husband to inform that the patient had delivered spontaneously to a stillborn at home. The nurse was sent to the house and on arrival she found that the patient was restless and weak. There was evidence of substantial bleeding per vagina with 3 sarongs soaked with blood. There was no obvious vaginal tear but there was oozing. Uterus was bulky and not contracted. The placenta and membrane was still attached to the baby and appeared complete. BP was 90/50mmHg and pulse rate was 90/min. IM syntocinon was given and request for ambulance was sent however there was no ambulance available. While waiting for ambulance, patient was transported to the health clinic .She remained restless and was resuscitated for an hour and eventually she succumb in health clinic while waiting for ambulance.

This case illustrate failure to diagnose, failure to appreciate severity, and failure to adhere to protocol and inadequate /inappropriate or delayed therapy..

Case 3 (Remoteness and inaccessibility)

37years old Orang Asli housewife, G11P10, unknown POA and had no history of antenatal visit. She stayed about 15 kilometers from health center and 35 kilometers from hospital. According to the report she had retained placenta following home delivery conducted by a neighbor. Patient' s husband had to go to the police station to get help for an ambulance which took about 20 minutes to reach the station. The paramedics had to climb a steep hill to reach the patients house. On reaching the house the patient was described as unresponsive. The journey from patient's house to hospital took about one hour and the patient was given oxygen while being transported. On arrival at the A&E pupils were fixed and dilated, and there was no spontaneous breathing and absent pulse rate. Vital signs were unrecordable, patient was pronounced dead fifteen minutes after arrival. Post mortem was carried out and cause of death was PPH.

More efforts should have been made by health staff to ensure that all pregnancies among indigenous group are properly and closely monitored. Plan should be made for early referral to hospital. Cooperation is needed to advocate family planning among the multi para mothers.

Case 4 (Concealed Pregnancy)

26 years old Malay, single, G1P0, factory worker. She stayed 15 kilometers from health center and 15 kilometers from hospital. Patient was found unconscious by her family with her newborn baby by her side. She was brought to hospital and declared dead. Post mortem was done which revealed severe pallor suggesting PPH and retained placenta which was anterior with no evidence of abruptio.

Case 5 (Poor Compliance to Advice)

34 years old Orang Asli, housewife G9P8, husband worked as rubber tapper. She stayed about 22 kilometers from health center and 50 kilometers from hospital. She was booked at 19 weeks and had frequent ante natal visit including 15 home visits by nurses. Patient had to be persuaded most of time to attend the antenatal sessions. All her deliveries were conducted by traditional birth attendance and her last pregnancy had been uneventful although there was history of retained placenta. Patient was admitted to district hospital at 36 weeks of gestation for anaemia in pregnancy. On admission the haemoglobin was 8.7g/dL and she was transfused one unit of packed cells and discharged the following day. The last visit by the nurse was at 37 week of gestation and patient was quite well. 8 days later patient delivered at home which was complicated by PPH and retained placenta. She was only attended by community nurse 2 hours after delivery and was subsequently transferred to hospital after 4 hours. Despite resuscitation patient was pronounced dead after 5 hours of delivery and the retained placenta was removed manually. Her haemoglobin was 5.9g/dL.

8.3 Conclusion

In spite of improved antenatal and intrapartum care, there are still considerable number of mothers who either refused or defaulted follows up. The number of

maternal deaths associated with home deliveries are still considerably high. Many deaths particularly among younger age group 20-39 (86%), 13 (56%) were tagged green and 6 cases (26%) were not tagged. The highest number of deaths was due to unattended (8 cases) deliveries and 2 cases were attended by Traditional Birth Attendants. Most of them stayed within 30-50 kilometers of nearest hospital and some within the range of 1 kilometer to health clinic. All these deaths were avoidable as they were not suitable for home deliveries.

8.4 Recommendations

- There should be concerted effort to trace the defaulters.
- To identify factors that contributes to patients or family refusal for hospital or Alternating Birth Center delivery and take the necessary measures.
- Vigilant monitoring and supervision by Public Health Nurse /Sister/Matron on the aspect of competencies and adherence to protocol and guidelines among junior nurses and community nurses should be emphasized.
- The importance of prompt consultation with senior staff should be emphasized on the junior staff.
- Requirements under existing legislation need to be strengthened and enforcement has to be more vigilant to ensure traditional birth attendants do not practice beyond their capabilities.
- Introduction of safe motherhood education to the secondary school students so that they may disseminate information and knowledge to peers and family members.

8.5 References

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CHAPTER 9

EARLY PREGNANCY DEATHS

9.1 Introduction

Early pregnancy deaths are maternal deaths occurring up to 24 weeks of gestation. This analysis is a review of early pregnancy deaths covering a 3 year period from 2006 to 2008. To appreciate the trend of maternal deaths directly attributed to complications arising in early pregnancy; this review has been expanded to cover a 10 year period from 1999 to 2008.

9.2 Summary

During the 3 year period 2006 to 2008, there were a total of 32 early pregnancy deaths reported to the CEMD committee. The increasing trend seen in deaths occurring up to 24 weeks of gestation in the last decade (1999 to 2008) has seen a decline in 2008 by 50%. While deaths resulting from molar pregnancies have remained at the occasional 1 case, there was a transient rise in deaths from ectopic pregnancies, with a decreasing trend in deaths due to complications of abortions.

Early pregnancy deaths account for 8.3% of direct maternal deaths in Malaysia over the last decade therefore remains one the main cause of maternal mortality. More than half of these deaths are due to ectopic pregnancies 19 (59.4%), complications of abortions 12 (37.5%) and molar pregnancy deaths made up the remaining 1 (3.1%) case. Most of these cases had remedial measures which were clearly identified.

This report documented the most deaths from ectopic pregnancies. Most of these cases presented as acute emergencies in which despite surgical intervention, they succumb. Other contributing factors frequently encountered in both ectopic pregnancies and complications of abortions are failure to diagnose, inadequate and/or inappropriate therapy and failure to seek and/or involve senior experienced doctors. Also noted in recent years is the factor of concealing pregnancy.

All 19 cases of ectopic pregnancy were diagnosed through surgical intervention prior to death or post mortem. Failure to diagnose is the single most significant contributing factor in these deaths.

As in the previous report, the majority of women dying from early pregnancy complications are of Malay ethnicity and coming from the lower socio-economic group as reflected by the education level and occupation. Of the 20 deaths due to ectopic pregnancy, 4 succumbed despite surgery being performed, with misdiagnosis, delay in seeking treatment and unaware that they were pregnant being the common contributory factors. Out of the 12 deaths due to complications of abortions, 7 cases

were due to sepsis, making it the major contributing factor. Haemorrhage, drug reaction, anaesthesia related complications and poor post procedure monitoring being the other contributing factors. The single case of death due to molar pregnancy was contributed by delay in treatment leading to haemorrhage.

9.3 Data analysis

9.3.1 Early pregnancy deaths

The trend of early pregnancy deaths over the period of 1999 to 2008 shows a gradual increase in number and percentage with an abnormal peak in 2004 contributed by a high number of deaths from abortions. However, 2008 has shown a significant drop (Table 9.1 and Fig. 9.1). This is due to a 50% drop in deaths of both ectopic pregnancies and complications of abortions.

Table 9.1: Number and percentage of early pregnancy deaths, 1999 to 2008

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Early pregnancy deaths	7	8	10	9	9	15	11	12	13	7
Direct maternal deaths	177	122	140	108	101	100	110	100	115	110
Percentage	3.9	6.6	7.1	8.3	8.9	15.0	10.0	12.0	11.3	6.3

Fig. 9.1: Trend of early pregnancy deaths, 1999 to 2008

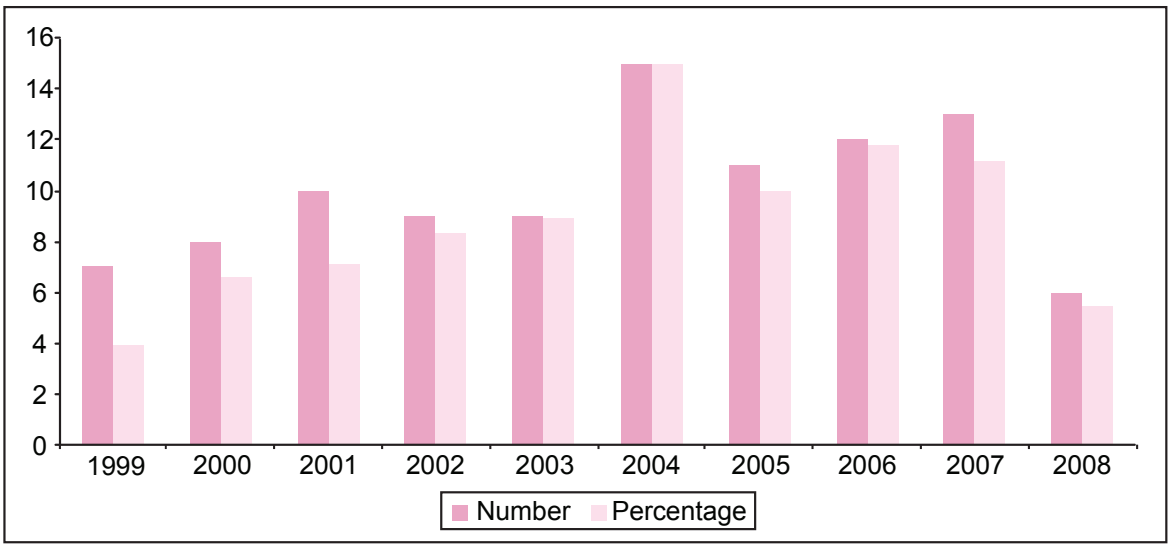
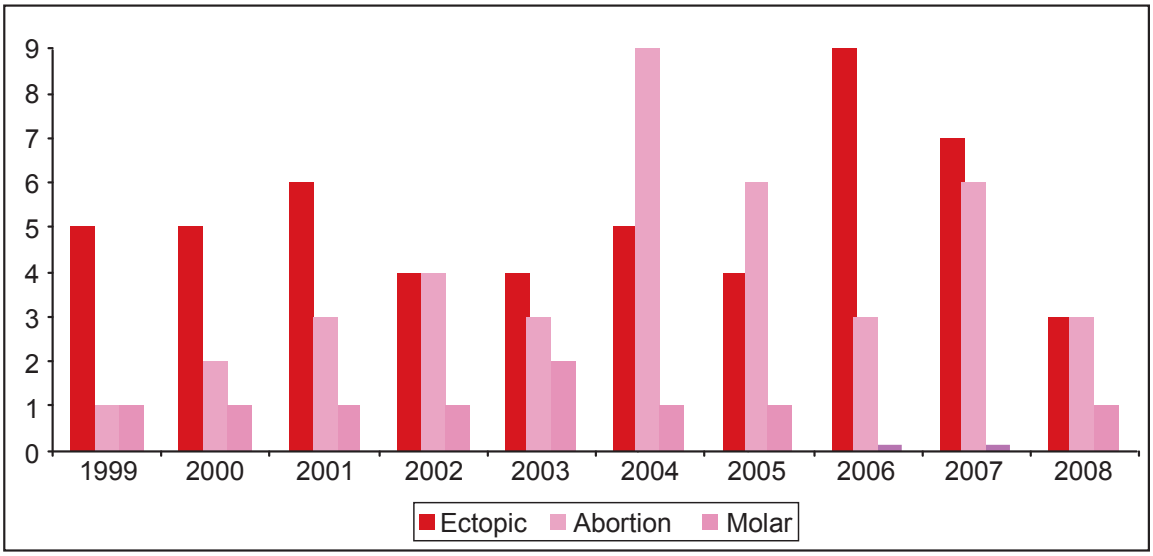


Fig. 9.2 shows that in the period of 1999 to 2008, early pregnancy deaths due to ectopic pregnancy has increased slightly with a relatively high number in 2006, complications of abortions did not show much changes and deaths due to molar pregnancy has remained low.

Fig. 9.2 Trend of causes of early pregnancy deaths, 1999 to 2008



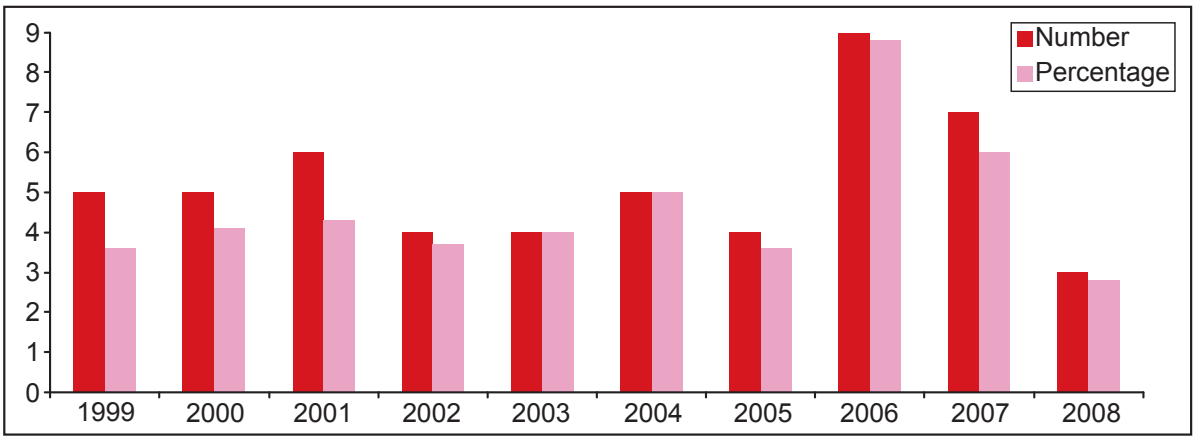
9.3.2 Deaths from ectopic pregnancy

The number and percentage of maternal deaths from ectopic pregnancies over the period 1999 to 2008 is shown in Table 9.2 and Fig. 9.3. The trend shows an increase towards the end of this period with an alarmingly high number in 2006. Ectopic pregnancies contributed an average of 4.3% of direct deaths throughout the 3 year period of 2006 to 2008, with 2006 having the highest percentage of 9% and 2008 being the lowest at 2.7%.

Table 9.2: Number and percentage of maternal deaths from ectopic pregnancies, 1999- 2008

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Ectopic pregnancies	5	5	6	4	4	5	4	9	7	3
Direct Maternal	137	122	140	108	101	100	110	100	115	110
Percentage	3.6	4.1	4.3	3.7	4.0	5.0	3.6	9.0	6.0	2.7

Fig. 9.3: Trend of maternal deaths due to ectopic pregnancies, 1999 to 2008



i. Patient's profile

Majority of maternal deaths due to ectopic pregnancies in the 3 year period of 1999 to 2008, was the 25 to 34 years age group and were either nulliparous or of low parity. There were also 2 cases of unknown parity. There was only 1 case involving parity 6 and above and therefore grandmultiparity is not a contributory factor. As in the years before, the majority of cases were of Malay ethnicity, followed by Indians and Chinese. There were only sporadic cases from other ethnicities. Majority of the cases received at least up to the level of secondary school education with 1 university graduate. There was no information for 4 of the other cases who died. Housewives and working women contributed in equal numbers to number of women who died from ectopic pregnancies. 3 cases had no information.

A third of the cases were unmarried women while 1 case had no information. Of the 4 cases of unmarried women who died from ectopic pregnancies, 3 concealed the fact that they were pregnant. Of the 7 women who died of ectopic pregnancies before reaching a health facility, 4 died at home and the other 3 died enroute. Of those who died in a state hospital and hospitals with specialists, 5 were initially managed elsewhere before being referred, often too late, only to succumb at the referral hospitals (Table 9.3).

The trend over the decade of 1999 to 2008 showed a slight increase in the average age of women who died from ectopic pregnancies. The other demographic profiles remained largely similar.

Table 9.3: Profile of patients who died from ectopic pregnancy, 1999- 2008

Patient's profile	1999 n=5	2000 n=4	2001 n=6	2002 n=4	2003 n=4	2004 n=5	2005 n=4	2006 n=9	2007 n=7	2008 n=3	Total n=52
Age											
<19	0	0	1	0	0	0	0	0	0	0	**1**
20 – 24	1	2	0	0	1	1	0	2	1	0	**8**
25 – 29	1	2	1	1	2	2	3	3	3	1	**19**
30 – 34	1	0	3	1	0	1	1	3	2	0	**12**
35 – 39	2	1	1	1	1	1	0	1	1	2	**11**
40 – 44	0	0	0	1	0	0	0	0	0	0	**1**
Parity											
0	2	2	4	1	2	2	1	3	3	0	**20**
1 – 5	2	3	2	3	2	3	3	5	3	2	**28**
6 and above	0	0	0	0	0	0	0	1	0	0	**1**
Unknown	1	0	0	0	0	0	0	0	1	1	**3**

Patient's profile	1999 n=5	2000 n=4	2001 n=6	2002 n=4	2003 n=4	2004 n=5	2005 n=4	2006 n=9	2007 n=7	2008 n=3	Total n=52
Ethnic group											
Malay	3	4	1	2	3	4	4	5	7	1	**33**
Chinese	0	1	0	0	0	1	0	1	0	0	**3**
Indian	1	0	3	2	0	0	0	2	0	1	**9**
Iban	1	0	1	0	0	0	0	0	0	0	**2**
Bidayuh	0	0	0	0	1	0	0	0	0	0	**1**
Other indigenous groups	0	0	1	0	0	0	0	1	0	1	**3**
Education											
No schooling	0	0	0	1	0	0	0	1	0	1	**3**
Primary	1	1	0	0	0	1	0	2	0	0	**6**
Secondary (Form 3)	2	0	1	1	0	0	0	1	0	0	**5**
Secondary (Form 5)	1	1	4	1	2	2	3	4	4	1	**23**
College/ University	0	1	0	1	2	1	1	0	1	0	**7**
No information	0	2	1	0	0	1	0	1	2	1	**8**
Occupation											
Housewife	3	2	2	2	1	2	0	4	2	1	**19**
Professional	0	1	0	0	1	1	0	1	0	0	**4**
Clerical	1	1	0	0	0	0	1	1	1	0	**5**
Sales & Service	1	0	3	1	1	1	3	2	3	1	**16**
Agriculture & prod.	0	0	0	1	0	0	0	0	0	0	**1**
Unemployed	0	0	0	0	1	0	0	0	0	0	**1**
No information	0	1	1	0	0	1	0	1	1	1	**6**
Marital Status											
Yes	NA	NA	5	4	3	5	4	7	5	2	**NA**
No			1	0	1	0	0	1	2	1	
Unknown			0	0	0	0	0	1	0	0	

Patient's profile	1999 n=5	2000 n=4	2001 n=6	2002 n=4	2003 n=4	2004 n=5	2005 n=4	2006 n=9	2007 n=7	2008 n=3	Total n=52
Place of death											
State hospital	2	3	3	1	2	2	3	0	4	1	**21**
Hospital with O&G	0	0	1	1	0	2	0	1	1	1	**7**
Hospital without O&G	1	2	1	0	1	1	1	2	1	0	**10**
Home	1	0	0	0	1	0	0	2	1	1	**6**
Enroute	1	0	1	2	0	0	0	3	0	0	**7**
Others	0	0	0	0	0	0	0	1	0	0	**1**

ii. Cause of death

In 5 women who died of ectopic pregnancies, diagnosis was confirmed by postmortem while 4 were by laparotomy. All the cases were ruptured tubal pregnancies except for 1 case each of ovarian and cornual pregnancy. Where documented, the average blood loss was more than 2 litres, with a range from 1.4 litres to 5 litres of hemoperitoneum.

9.3.3 Deaths from abortion

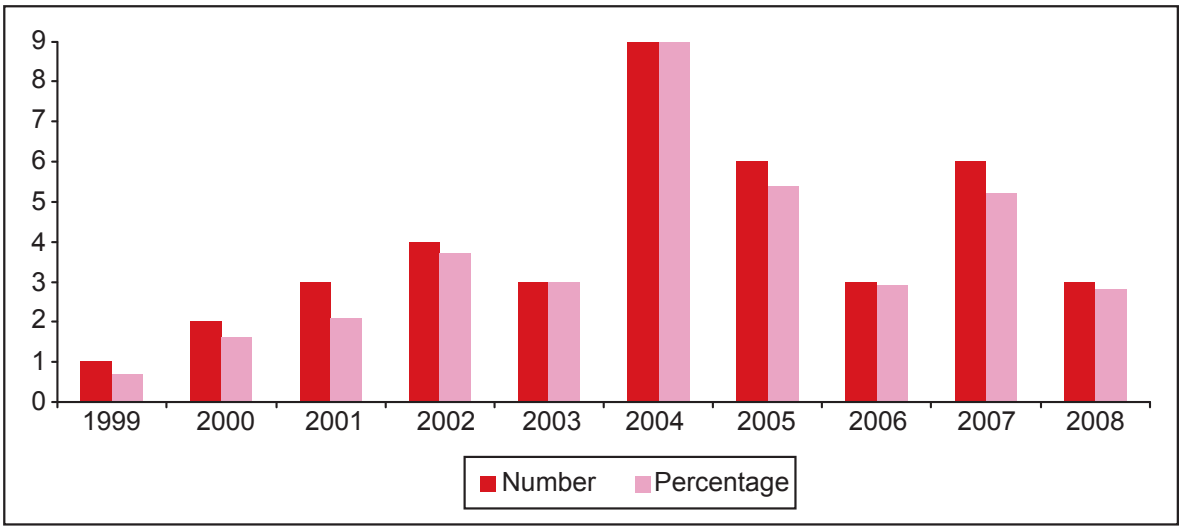
The average percentage of maternal deaths contributed by complications of abortions is 3.6% from 2006 to 2008, with 2007 showing 5.2% which is almost double that of the other 2 years (Table 9.4 and Fig. 9.4). This has contributed to the slightly higher percentage of early pregnancy deaths for that year.

The increasing trend of maternal deaths due to complications of abortions during the decade of 1999 to 2008 peaked in 2004 and has since been decreasing with the exception of 2007.

Table 9.4: Maternal deaths from complications of abortion, 1999 to 2008

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Deaths from abortions	1	2	3	4	3	9	6	3	6	3	40
Direct maternal deaths	137	122	140	108	101	100	110	100	102	115	114
Percentage	0.7	1.6	2.1	3.7	3.0	9.0	5.4	3.0	5.8	2.6	3.5

Fig. 9.4: Trend of maternal deaths due to complications of abortions, 1999 to 2008



i. Patient's profile

The majority of women who died from complications of abortions (66.6%) were above 25 years of age for the period 2006 to 2008, with 2 women younger than 25 and another 2 older than 40 years. Of these, there were 2 grandmultipara, while the rest were nulliparous or of low parity. Malay's had the highest number of deaths comprising 41.7%, followed by Indigenous groups with 25%. Although almost all the women were educated, only 1 woman had an education level of upper secondary while 4 women had no information on their education level. Six women (50%) who died were working, while 4 (33.3%) were housewives. No information regarding occupation was available from the other 2 women who died. Most of these women (75%) were married, while 2 women were not and 1 woman had no information on her marital status. Three women never reached a hospital alive. Two died enroute while another died in the clinic where the procedure was performed. The majority (75%) received some degree of specialist care before succumbing.

Over the decade of 1999 to 2008, the profile of women who succumbed to complications of abortions did not show much variation (Table 9.5).

Table 9.5: Profile of patient's who died from abortion, 1999 to 2008

Patient's profile	97' n=1	00' n=2	01' n=3	02' n=4	03' n=3	04' n=9	05' n=6	06' n=3	07' n=6	08' n=3	Total n=40
Age											
<19	0	0	0	0	1	0	1	0	0	0	**2**
20 – 24	1	0	0	0	0	1	0	1	0	1	**4**
25 – 29	0	1	0	0	0	2	1	0	3	0	**7**
30 – 34	0	1	0	2	2	1	3	1	1	2	**13**
35 – 39	0	0	1	2	0	5	1	0	1	0	**10**
40 – 44	0	0	1	0	0	0	0	1	1	0	**3**
45 and older	0	0	1	0	0	0	0	0	0	0	**1**
Parity											
0	1	1	0	1	0	2	1	1	0	0	**7**
1 – 5	0	1	1	3	3	6	4	1	5	3	**27**
6 and above	0	0	2	0	0	1	1	1	1	0	**6**
Ethnic Group											
Malay	1	1	1	2	2	4	4	3	2	0	**20**
Chinese	0	0	1	0	0	1	0	0	1	1	**4**
Indian	0	0	0	1	0	1	1	0	0	2	**5**
Iban	0	0	0	0	1	1	1	0	0	0	**3**
Other indigenous groups	0	1	1	1	0	2	0	0	3	0	**8**
Educational level											
No schooling	0	0	0	0	0	1	0	0	0	0	**1**
Primary	0	0	1	0	0	1	2	0	2	1	**7**
Secondary (Form 3)	1	0	1	2	1	3	1	3	2	0	**14**
Secondary (Form 5)	0	1	0	0	1	3	1	0	0	1	**7**
College / University	0	0	1	0	0	0	0	0	0	0	**1**
No information	0	1	0	2	1	1	2	1	2	1	**11**
Occupation											
Housewife	1	1	0	2	0	3	4	1	2	1	**15**
Professional	0	0	0	0	1	0	0	0	0	0	**1**
Clerical	0	1	0	0	0	1	0	0	0	0	**2**
Sales & Service	0	0	3	0	1	4	0	1	4	1	**20**
Agriculture & prod.	0	0	0	1	0	1	0	0	0	0	**2**
No information	0	0	0	1	1	0	2	1	0	1	**6**
Marital Status											
Yes	1	1	3	4	2	8	4	2	5	2	**32**
No	0	0	0	0	1	0	0	1	1	0	**3**
Unknown	0	1	0	0	0	1	2	0	0	1	**5**
Place of death											
State hospital	0	0	2	2	3	4	5	2	4	2	**24**
Hospital with O&G	1	2	0	1	0	3	1	0	1	0	**9**
Hospital without O&G	0	0	1	0	0	0	0	0	0	0	**1**
Home	0	0	0	0	0	1	0	0	0	0	**1**
Enroute	0	0	0	0	0	1	0	1	1	0	**3**
Others	0	0	0	1	0	0	0	0	0	1	**2**

ii. Cause of death

During the 3 year period from 2006 to 2008, seven women (58.3%) died due to sepsis, 2 died of haemorrhage (16.7%) and 3 died of drug reaction resulting in shock. The trend has not changed much in the decade of 1999 to 2008, with the main cause being sepsis (Table 9.6).

Table 9.6 Complications due to abortion, 1999 to 2008

Complications	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Sepsis	1	1	3	4	2	7	2	2	5	0	26
Haemorrhage	0	0	0	0	0	2	1	1	0	1	5
Genital tract trauma	0	0	0	0	1	0	1	0	0	0	2
Attempted abortion	0	0	0	0	0	0	2	0	0	0	2
Shock due to abortion	0	1	0	0	0	0	0	0	1	2	4

9.3.4 Deaths from molar pregnancy

There was only 1 death from molar pregnancy during the 3 year period from 2006 to 2008. She is a 26 year old, Para 3, Malay housewife who died in a hospital with specialist due to haemorrhage (Table 9.7). There is a decreasing trend in maternal deaths due to molar pregnancy seen in the decade 1999 to 2008.

Table 9.7 Number of maternal deaths due to molar pregnancy, 1999 to 2008

General analysis	1999 to 2000	2001 to 2005	2006 to 2008
Number of cases	2	6	1
Cause of death	1 – Bleeding 1 - Molar tissue embolism	3 - Uterine perforation 3 - Bleeding	Bleeding
Age	28 and 29	29 to 47	26
Parity	2 to 3	1 to 7	3
Ethnic group	1 – Malay 1 – Non Malay	3 – Malay 3 – Non Malay	Malay
Education level	2 - Form 3	NA	Form 3
Occupation	2 – Housewife	5 – Housewife 1 - working	Housewife
Marital status	2 - Yes	6 - Yes	Yes
Place of death	1 - Hospital without specialist 1 - Hospital with specialist	4 - Hospital with specialist 1 - Hospital without specialist 1 - enroute	Hospital with specialist

9.4 Case illustrations

Ectopic pregnancy

Case 1

A 22 year old primigravida Chinese factory worker apparently underwent a Dilatation & Curettage at a private practitioner's clinic. The procedure was unsuccessful as an ultrasound scan done 7 weeks later shows a viable fetus corresponding to 14 weeks period of gestation. She did not have any visits to any government or hospital clinic. She went for a second follow-up at the clinic 4 weeks later. Subsequently, she absconded from follow up.

She developed abdominal pain 5 days later. Her cousin came back and saw her collapsed at home and immediately brought her to hospital. Unfortunately, she died on the way to the hospital. Post-mortem revealed 1400 mls. of haemoperitoneum and a fetus in the abdominal cavity.

Failure to diagnose as well as the patient's non compliance was the main contributory factors in this maternal death.

Case 2

A 26 year old primigravida Malay housewife, complaining of vomiting and diarrhoea was admitted to the medical ward by a junior medical officer of Emergency Department with the diagnosis of acute gastroenteritis with dehydration and anemia for investigation. She was afebrile and her vital signs were stable at that time. She was seen by the house officer in the ward who noted that the patient suffered a miscarriage 1 month ago and was treated in a local private hospital. The patient was conscious but appeared pale and dehydrated. BP was 100/80mmHg and pulse rate of 105 bpm with good volume was noted. Her abdomen was soft with tenderness noted over the suprapubic region. There was no abdominal distension and per rectal and vaginal examinations revealed no evidence of bleeding. Her haemoglobin was 9.2gm % and a primary diagnosis of acute gastroenteritis with severe dehydration was made. The plan was to rehydrate the patient with 2 pints of Hartmans. About 3 hours later, it was noted that her BP was 60/30mmhg and pulse rate was 120bpm. The Senior Medical Officer was informed and blood investigations were taken. Arterial Blood Gas showed a pH of 7.17, HCO 3.4mmol/L, capillary blood sugar was 21.6 mmol/L and urine ketone was positive. Urine pregnancy test (UPT) was noted to be negative.

A diagnosis of diabetic ketoacidosis was made and treatment was administered accordingly with fluid and antibiotics. An hour and a half later, despite another 2 pints of normal saline challenge, patient's general condition did not improve. She remained hypotensive, tachycardic, appeared drowsy and pale with a GCS of 11/15. Her abdomen was distended, tense and tender. The house officer called up blood bank urgently for 4 pints of pack cell but was told that no blood sample was received from the Emergency Department. The patient was referred to the anaesthetist to be intubated. While preparing for intubation, the patient collapsed and despite CPR, she succumbed. Postmortem revealed a ruptured right ectopic pregnancy.

There were many factors contributing to the death of this patient. These include failure to diagnose, failure to inform senior colleagues, failure to appreciate severity, inappropriate with delayed therapy and delayed referral.

Case 3

A 23 year old single primigravida Malay salesperson was brought in dead to hospital by her colleague. She had complained of abdominal pain and constipation a few days earlier to her colleague who was staying with her. On the day of her demise, she was found unconscious by her colleague and was brought to the hospital. However, there was no sign of life on arrival at the hospital. Postmortem showed haemoperitoneum due to rupture left etopic pregnancy.

As the patient did not seek any medical care during her pregnancy, the ectopic pregnancy was not diagnosed, resulting in her death. The main contributing factor to this maternal death is concealment of pregnancy.

Case 4

A 35 year old G5 P4 Suluk housewife was brought to hospital by her husband with the complaint of severe abdominal pain associated with right hemi paresis for two days, prior to admission. Her POA was 4 weeks plus. Her BP on admission was 162/102 mm Hg and UPT was noted to be positive. Ultrasound examination revealed presence of free fluid in the peritoneal cavity and a diagnosis of ruptured ectopic pregnancy was made. Emergency laparotomy was immediately performed which noted a ruptured right ovarian pregnancy and right partial oophorectomy was done. The estimated blood loss was 2 litres. Postoperatively the patient was managed in ICU and a CT brain was done for the hemi paresis, showing multiple infarcts. She was managed with antibiotics and anti hypertensive. Her blood sugar was also noted to be high and was started on insulin. There was some aphasia which was resolving. She was ambulating by the 7th post operative day. Unexpectedly, on day 12 post operative, after returning from the toilet on the wheelchair, she collapsed. She was attended immediately and resuscitated but failed. The cause of death was put as Pulmonary Embolism.

This maternal death is unexpected as she was recovering quite well after surgery for the ectopic pregnancy. No apparent contributing factor could be found for this death.

Complications of abortions

Case 1

A40 year old G7 P7+1 Malay housewife, presented to hospital with vaginal bleeding at 20 weeks POA. She was booked at 14 weeks. She was treated as cervical incompetence and cervical cerclage was performed. On the 2nd post operative day, she was noted to have a spike of temperature and she complained of per vaginal bleeding. She was stable and her uterus was not irritable and non tender. Ultrasound examination revealed fetal demise and absence of liquor. She was planned for delivery, cerclage was removed and antibiotics were started. She was mildly anaemic with haemoglobin of 9.7 g%, her TWBC was elevated at 24,000, platelet count and coagulation profiles

on the day on induction were normal. She delivered a grossly normal baby weighing 428grams. Immediately after delivery she had profuse vaginal bleeding. She became hypotensive and was resuscitated with fluid and blood. Uterotonics were also given. Despite that she continued to bleed and an emergency laparotomy and hysterectomy was planned with the suspicion of uterine rupture or placenta accreta. However, she deteriorated and collapsed while preparing to go to the operation theatre. CPR was commenced and blood pressure obtained. She was then pushed to the operating theatre. There was no hemoperitoneum intraoperatively and the uterus was soft with abnormal vessels at the lower segment of the uterus. A subtotal hysterectomy was performed. Intra-op, she went into cardiac arrest for the second time. CPR was commenced and patient was revived. Estimated blood loss was 3 litres. However, soon after completion of the operation, she had 3rd episode of cardio respiratory arrest and succumbed. The cause of death being hypovolumic shock secondary to PPH contributed by septicaemia due to IUD.

The contributing factors identified in this death were failure to communicate with other specialists and failure to diagnose during the ante partum period and failure to appreciate severity and inadequate therapy in the postpartum period.

Case 2

A 20 year old single G2 P1 Malay factory worker presented to the emergency department with bilateral leg swelling associated with pain and weakness. She also complains of shortness of breath. The patient did not reveal that she had an induced miscarriage in a private maternity centre 2 weeks prior to onset of these complaints. She was treated in intensive care unit with combined care provided by the medical, anesthetists and surgical team in view of disseminated vascular thrombosis with septicaemia. Unfortunately, she succumbed due to extensive thrombosis. Post mortem revealed post partum uterus with evidence of recent evacuation. Blood culture showed streptococcus pyogenes. The cause of death was septic abortion.

The main contributory factor leading to this death is failure of the patient to reveal the history of induced abortion due to social reasons.

Case 3

A 41 year old G6 P3+2 Malay cook at 6 weeks POA, went to a private clinic with O&G specialist with complains of fever and vomiting. She was diagnosed to have a missed abortion via ultrasound and was planned for an evacuation. A cervagem (1mg) pessary was inserted and she was asked to come back to the clinic later. However, 2 hours later, she felt unwell, dizzy, complained of fecal incontinence and suddenly collapsed. She also had bleeding per vagina. She was brought to the private clinic and after an examination by the specialist in the car she was urged to be rushed to the hospital accompanied by his staff nurse. She was confirmed dead on arrival at the government hospital. Post-mortem examination did not demonstrate any evidence of the alleged missed abortion. The cause of death was given as medical abortion with adverse drug reaction.

The contributory factor identified in this maternal death is the failure to monitor the patient after insertion of cervagem. It is recommended that in hospital setting, cervagem needs close monitoring as patients may develop bleeding and contractions.

Case 4

A 25 year old G2P1 labourer, unbooked case, was bought to Accident & Emergency department for per vaginal bleeding and abdominal pain. She gave history of passing out blood clots and suspected products of conception one day before. On arrival, she was hypovolumic and tachycardic. Abdomen was tender and VE revealed blood. Ultrasound showed a bulky uterus with intrauterine hyper echoic mass/shadow and fluid at the POD.

Thrombocytopenia and coagulation derangement were noted. She was diagnosed to have septic miscarriage and in hypovolumic shock with suspected perforation of uterus/viscera. Her condition deteriorated further and she was intubated and stabilized in ICU. The O&G specialist reviewed her and planned for emergency laparotomy and D&C once her condition was stable. However, the patient collapsed soon after and was successfully revived. The O&G consultant reviewed her and decided on the same plan of management. The patient collapsed again and succumbed. Post-mortem revealed a lot of fluid in the lungs and abdominal cavity. The cervix was swollen and had evidence of lacerations caused by trauma. On opening the enlarged uterus, skeletal remains of a fetus was seen. The cause of death was septic miscarriage complicated by DIVC.

The contributing factor identified in this maternal death is patient related as there is a high suspicion of attempted termination of pregnancy resulting in sepsis and death.

Molar Pregnancy

Case 1:

A 26 years old G3P2 Malay housewife was admitted with complaints of abdominal distension for 1 month and abdominal pain on and off. She also had been vomiting on and off with headache and giddiness. She had two UPT done prior to admission but both were negative. She appeared pale; BP was high requiring antihypertensive therapy. Abdominal examination showed a 26-28 weeks size gravid uterus. Ultrasound showed multiple cystic areas within a fibroid. Diagnosis of uterine fibroid with degenerative changes and differential of molar pregnancy was made. UPT was done again twice during admission and both results were negative. Blood investigations showed high urea and serum creatinine which were explained by dehydration and possible pre- eclampsia. Her haemoglobin was low (8.9gm/l), urine albumin of 2+ with evidence of UTI, hence antibiotic was started. She developed hypertensive crisis and complained of giddiness and vomiting in the ward. On day 2 of admission, she had sudden excessive per vaginal bleeding with vesicles passed out. Estimated blood loss then was 1000ml. She was pale (Hb 7.8gm%) but remained hemodynamically stable. Oxytocin infusion was started.

Senior specialist on-call was consulted, in view of ongoing bleeding, emergency suction and curettage was arranged. However, procedure was delayed as OT was

busy. Packed cell transfusion was started in the ward while waiting to go to OT. Meanwhile the patient was still bleeding. Emergency suction and curettage was done 6 hours later by the medical officer, supervised by the O&G specialist. Intra operative blood loss was 2000ml. Following evacuation, patient suddenly deteriorated and collapsed and despite CPR, was pronounced dead. Post mortem was not done as family members refused. Cause of death was hypovolumic shock secondary to massive per vaginal loss following suction curettage

The contributing factors identified in this maternal death can be divided into ante partum and postpartum. The ante partum factors are failure to diagnose, failure to appreciate severity and inadequate and delay in treatment. While the intrapartum factors are, inappropriate delegation of duties and failure to appreciate severity.

11.5 Discussion and Recommendations

Early pregnancy deaths are still one of the main causes of maternal deaths in the decade from 1999 to 2008. The increasing trend over this period until 2007 has shown a significant decrease in 2008. Deaths from ectopic pregnancies have shown an increase but deaths from complications of abortions has remained relatively unchanged. Deaths from molar pregnancy remains low.

During the 3 year period from 2006 to 2008, most of the maternal deaths had identifiable contributory factors. Clinical factors contributed to the highest number with 11 deaths, followed by patient factor with 8 deaths and facility factor with 4 deaths. There were 5 cases that had a combination of these factors.

Due to the high number of deaths contributed by clinical factor, it is recommended that medical officers in both health centres and hospitals must have a high index of suspicion for ectopic pregnancy especially when a woman in the reproductive age group comes with the complain of abdominal pain.

As sepsis contributed to 58.3% of maternal deaths due to complications of abortion, the medical officers are recommended to develop the skill to manage septic abortions rapidly and adequately.

All medical staff in the Accident & Emergency department is recommended to take last menstrual period as an important part of history in order to avoid missing an ectopic pregnancy.

It is also recommended that in indicated cases, ultrasound scanning should be performed in order to avoid missing molar pregnancies and ectopic pregnancies. Health facilities without ultrasound machines or medical officers trained in ultrasound, should refer suspicious cases to the Early Pregnancy Assessment Unit in the hospitals.

9.6 References

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CHAPTER 10

ANAESTHESIA RELATED MATERNAL DEATHS

Summary

There were a total of 13 anaesthesia related deaths in the 12 year period from 1997 to 2008. Nine deaths occurred from 1997 – 2000 and two from 2001 to 2005 and another two from 2006-2008.Most of these deaths were related to a combination of pulmonary aspiration during anaesthesia as well as difficulties with the airway such as intubations. The advent of newer safe practices in anaesthesia and the availability of sophisticated equipment for monitoring, close supervision of medical officers and specialist participation for high risk patients are some of the factors that have contributed to a decrease in anaesthesia related maternal deaths.From the 13 deaths, some crucial learning points are highlighted.

10.1 Introduction

A maternal death is devastating to all involved; after all, only in the obstetric patient can mortality be 100%. Maternal mortality has remained approximately 27.3 maternal deaths per 100,000 live births. Anesthetic related causes for maternal mortality have fallen from 1.7% in 1997-2000 to 1.4% (2001-2005) and 0.3% in 2006-2008. Although the number of deaths globally from general anesthesia remained stable until 1990, the number of deaths associated with regional anesthesia declined markedly. This occurred despite the fact that regional anesthesia was being used more often for cesarean delivery in virtually every hospital.[1]

Some anaesthetic causes of maternal mortality are; (1) difficult airway (2) aspiration of gastric contents (3) local anaesthetic toxicity (4) high spinal or epidural block.

Although anesthesia-related mortality has been reduced in recent decades, such a reduction is insufficient because, as articulated by Macintosh in 1948, the ideal goal is that zero anesthesia-related deaths should occur.[2] Unfortunately, anesthesia still contributes to major and avoidable adverse effects and deaths, and is still not completely safe in ASA I or II status patients.[3-5]

On the other hand, mortality rates of zero have been observed during plexus block. Studies have shown that because there are no major respiratory and cardiovascular changes in plexus block mortality rates can be almost nil, and these low rates happened mainly after the introduction of newer local anesthetics with low myocardial toxicity.[6-7]

Predominance of cardiovascular events in anesthesia-related cardiac arrest and mortality may be related to the compulsory use of pulse oximetry and capnography and monitoring hardware that may be more effective in preventing respiratory and cardiovascular events. This is in accordance with the requirements of the “minimum monitoring standards” as endorsed by Ministry of Health Malaysia.

Major improvements in terms of perioperative morbidity and mortality seem possible with the availability of national guidelines, CPGs and protocols. In addition, the application of simple anesthesia management principles, such as the routine use of an equipment checklist with documentation of equipment check, direct availability of an anesthesiologist to lend a hand or troubleshoot when needed, the presence of skilled assistance, close supervision of medical officers, specialist participation for high risk patients and the use of new airway equipment and safer drugs reduce perioperative morbidity and mortality after surgery and anesthesia.[8]

A period of monitoring in a recovery or post-anesthesia care unit is now mandatory following all general, neuraxial, and regional anesthetics. For high-risk patients, continued monitoring in an intensive care unit may reduce anesthetic mortality. Inability to provide or failure to use these facilities may increase anesthesia-related mortality rates.

10.2 Case Illustrations

Case 1

34 year old Chinese lady, G1P0 was scheduled for LSCS at 38 weeks for big baby with preeclampsia. Preoperative assessment could only be done on the day of surgery as she had admitted herself late in the night prior to surgery. She was found to be anxious and requested for a general anaesthetics. Unfortunately she had a difficult intubation and went into acute pulmonary oedema and then had a cardiac arrests. She was promptly resuscitated and managed to be intubated by another anaesthetist. She was then stabilized in the ICU. The fetal heart was not heard after the incident and it was delivered by caesarean section. Following which she developed Acute Respiratory Syndrome (ARDS) and succumbed

Discussion

Problems:

Pre-operative:
1.Pregnancy
2. Pre-eclampsia
3. No pre-anaesthetic assessment

The pre-anaesthetic assessment is essential to ascertain whether patient was well optimised, to assess the airway and to discuss the preferred technique of anaesthesia. A regional anaesthetic technique would have been a better option in the presence of the above problems. The incidence of failed intubation in obstetric patients is 1:280 while the incidence of failed intubation in the general operating room is 1:2,230.[9] Therefore, there is a seven times more chance of dealing with a failed intubation while providing general anesthesia for labour and delivery. The presence of pre-eclampsia will result in pharyngolaryngeal oedema which can further cause difficulty during intubation.[10]

Intra-operative:
1. Failed intubation
2. Exaggerated response to laryngoscopy
3. Acute pulmonary oedema
4. Aspiration pneumonia

The possibility of difficult intubation should be minimized by meticulous pre-operative airway assessment, preparation and adherence to a difficult airway algorithm. Unfortunately, airway oedema may not become apparent until larygoscopy.[11] Transient but severe hypertension that accompanies tracheal intubation can sometimes precipitate the frightening complication of acute pulmonary oedema in pre-eclamptic patients. Many regimens have been proposed to attenuate the pressor response during laryngoscopy and intubation. Some suggested regimens would be the use incremental doses of labetolol or intravenous fentanyl.[12,13] During difficult intubation, aspiration of gastric contents can occur. H2 antagonists and oral sodium citrate immediately before induction of anaesthesia should be given to minimise morbidity. Correct method of providing cricoid pressure during induction is another essential step.

Post-operative:
1. ARDS

ARDS can be caused by any major swelling (inflammation) or injury to the lung. Some common causes include aspiration, inhaling chemicals and pneumonia. In this patient, the difficult intubation would have resulted in aspiration. Presence of acute pulmonary oedema and aspiration can lead to ARDS. Typically patients with ARDS need to be in an intensive care unit (ICU). The goal of treatment is to provide ventilatory support with high level of pressure or PEEP(positive end-expiratory pressure) and treat the underlying cause of ARDS. Other aspects of patient care should also be addressed.

Case 2

30 year old Indian lady, G2 P0+1 was seen at 34 weeks when she fell from the chair. She did not sustain serious injuries from the fall but her BP was noted to be 140/90. She was followed up for mild PIH and was admitted at term for induction in view of her PIH. Patient was induced with prostin and labour progressed well until late first stage when there was no descent of the fetal head and fetal distress. She was given a spinal anaesthesia, following which she developed hypotension and cardiac arrest. She was resuscitated and revived after 20 minutes. At this point in time, the fetal heart was absent. Surgery proceeded and a FSB baby was delivered. She was then transferred to the ICU for stabilization and cerebral resuscitation. Unfortunately she had poor neurological outcome following the cardiac arrest and therapy was withdrawn on the 12th post-operative day after discussion with the family.

10.3 Discussion

Problem: Cardiac arrest following spinal anaesthesia

Spinal anaesthesia is the preferred technique for patients coming for LSCS. However, hypotension following spinal anesthesia for caesarean delivery is common and can result from; (1)pre-existing dehydration or inadequate fluid therapy to compensate for any reduction in preload and after load during the administration of regional anaesthesia, (2) high spinal block.

Measures to prevent hypotension during anaesthesia include; (1) administration of fluids before spinal anaesthesia, (2) left uterine displacement and (3) administration of a prophylactic vasopressor.

Fluid loading is recommended to prevent hypotension. Timing of the fluid infusion, before (preload) or during (coload) induction of spinal anesthesia for caesarean delivery does not influence the incidence of maternal hypotension or neonatal outcome.[14] The administration of colloids has been repeatedly demonstrated to be superior in reducing the incidence of hypotension, which was also confirmed in a recent meta-analysis. Rapid administration of colloids increases maternal cardiac output and uteroplacental blood flow. Hydration with colloids may require administration of a smaller volume and improve the preservation of oncotic pressure.[15] Ephedrine has been advocated as the vasopressor of choice for treating maternal hypotension during regional anaesthesia. However, most studies that have compared ephedrine and phenylephrine have found more acidosis in the fetus when the mother was given ephedrine.The aggressive use of phenylephrine and other pure alpha vasoconstrictorsis advocated.[16] There is an inadequate appreciation of the interaction between sympathetic blockade during high spinal anesthesia and the mechanisms of cardiopulmonary resuscitation. Prompt augmentation of central venous filling through the use of a potent [alpha]-agonist and positional change might have improved organ perfusion, shortened the duration of cardiac arrest, and lessened the degree of neurologic damage.

A high spinal block may result from spinal anaesthesia. This can be attributed to patient factor such as obesity and short stature, wrong dosage of local anaesthetics or trendelenberg tilt immediately following administration of the spinal block. As devastating as this situation may appear, prompt intervention by the anaesthesiologist should prevent any significant or lasting sequelae. Treatment includes endotracheal intubation, positive pressure ventilation and maintenance of maternal circulation.

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CHAPTER 11

OTHER ASSOCIATED MEDICAL CONDITIONS

Summary

In 2006 to 2008, maternal death due to other associated medical conditions accounted for 4.8% of the total maternal deaths in Malaysia. The number of deaths are reducing compared to previous report. Septicaemia was still a leading cause of deaths during these three years period followed by connective tissue diseases. Other causes were endocrine and metabolic, nervous system disorder and respiratory diseases. Analysis of 19 deaths associated medical conditions is highlighted in this chapter.

11.1 Introduction

Maternal mortality is an invaluable indicator of standard health care of the nation. The relative frequency of the different cause varies somewhat between countries. Although it has largely attributed to improved care in the management of obstetric patient, it could also reflect the future challenge in management of medical disorder in modern obstetric practice.

Maternal death attributed to indirect cause account for 29% of total deaths globally. Identifying concomitant underlying medical problems prior to pregnancy, prompt diagnosis active treatment for existing health conditions should be undertaken in order to achieve successful pregnancy outcomes. Special emphasis should be placed on the trend of the diseases like cardiovascular, hypertensive, anaemia, collagen, diabetes and metabolic diseases that has constantly contributed to indirect maternal deaths in this country.

Associated medical condition is classified under indirect death from which the patient might have some chronic disease that became worse during pregnancy. The relative immune compromised conditions during pregnancy predispose the mother to the disease or its complication.

Therefore, the mother should be healthy before conception, continues with prenatal care, early diagnosis and treatment of any disease for prevention of complications. The ideal results are pregnancy at term without unnecessary intervention, the delivery of a healthy baby, and healthy postpartum period in a positive environment that supports the physical and emotional needs of the woman, infant and family.

There were 68 maternal deaths associated with medical conditions from 2006 to 2008. 49 were due heart disease which is discussed in detail in chapter 12 and the remaining 1919 deaths are discussed in this chapter.

11.2 Analysis

A total of 19 maternal deaths due to other associated medical conditions for a period 2006 to 2008 were reviewed. There were 9 deaths in 2006, 3 in 2007 and 7 in 2008 respectively (Table 11.1).

Death occurred mostly in the age group of 35 – 39 years old (6) and 25 – 29 years old (5). Other age groups were 20 – 24 years old (4) and 30 – 34 years old (4) respectively. On ethnic analysis, majority of patients were Malays, followed by Chinese and minority groups of Iban, Bajau, Orang asli and other pribumi. Most of the patients achieved secondary level of education but majority were housewives and some worked in Sales and Services sector.

Table 11.1: Demographic profile of maternal deaths from other associated medical conditions

Patient's profile	2006	2007	2008
Total number of patients	9	3	7
Age			
20-24	3	1	0
25-29	2	0	3
30-34	1	2	1
35-39	3	0	3
Ethnicity			
Malay	7	1	5
Chinese	0	2	0
Iban	0	0	1
Bajau	1	0	0
Other pribumi	0	0	1
Orang asli	1	0	0
Educational level			
Never attend school	1	0	1
Primary school	1	0	2
Secondary school (up to form 3)	1	0	2
Secondary school (up to form 5)	6	3	1
No information	0	0	1
Occupation			
Housewives	6	0	6
Clerical	0	1	0
Sales and services	3	2	0
No Information	0	0	1

Majority of the death were parity 1-5 (11), others were primigravida (5) and grandmultip (3) The death mainly occurred during antenatal period, followed by post partum. Only one death due to abortion and another mother died intrapartum. Most of them were tagged green when they were attending antenatal clinic. Caesarean section outnumber mode of delivery followed by vaginal delivery. One had vacuum suction delivery, one had abortion at 16/52 and 1 had twin delivery. Only 3 deliveries were attended by O&G specialist, 3 by medical officer and 2 by the staff nurse. Most deaths occurred in state hospitals despite only a few of them were delivered there.

Table 11.2: Obstetric profiles of maternal deaths from other associated medical conditions

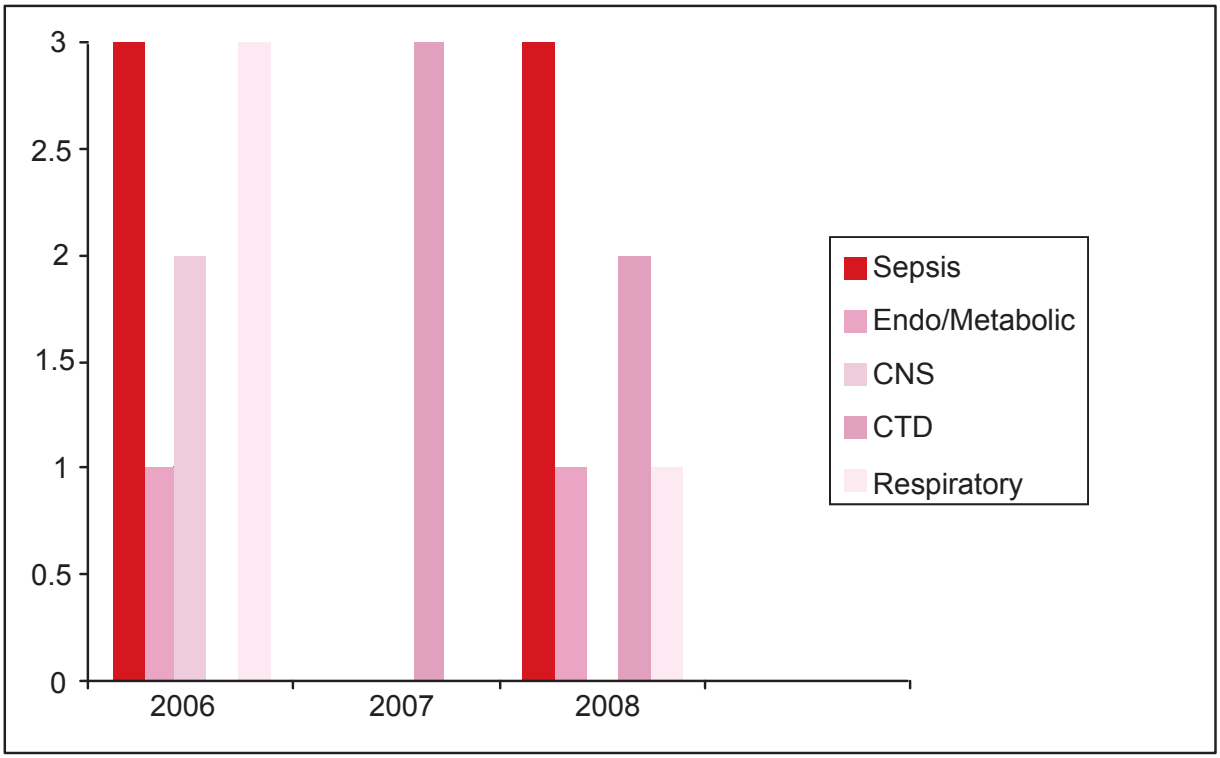
Patient's profile	2006	2007	2008
Parity			
0	2	1	2
1 to 5	6	0	5
6 and above	1	2	0
Stage of pregnancy			
Antenatal	5	0	3
Postpartum	3	3	2
Abortion	0	0	1
Intrapartum	1	0	0
Color coding			
Red	1	1	0
Green	5	2	1
White	2	0	1
No information	1	0	5
Mode of delivery			
Vaginal delivery	1	1	1
Vacuum	1	0	0
Abortive outcome	0	0	1
Twins	1	0	0
Caesarean	1	2	1
Accoucheur			
O&G specialist	1	2	0
Medical Officer>6 months experience	2	0	1
Staff nurse	0	1	1
No information	1	0	0
Place of delivery			
State Hospital	2	2	1
Hospital with O&G specialist	2	0	0
Hospital without O&G specialist	0	0	1
Private hospital without specialist	0	1	1
Place of death			
State Hospital	4	2	6
Hospital with O&G specialist	2	0	1
Hospital without O&G specialist	1	0	0
Private hospital with specialist	0	1	0
Enroute	2	0	0

Five main cause of death were identified as maternal deaths associated with Medical Conditions. Septicaemia was a leading cause, followed by connective tissue diseases. Other causes were endocrine and metabolic disorder, respiratory diseases and nervous system disorder. Analysis of sub groups, showed connective tissue disease was mainly due to systemic lupus erythematosus and respiratory deaths were due to acute pulmonary edema and bronchietasis. Diabetes and thyrotoxicosis contributed to deaths from endocrine and metabolic diseases. Maternal mortality from central nervous disorders was status epilepticus and non-traumatic intracranial bleeding (Tabel 11.3).

Table 11.3: Causes of other medical conditions

Causes	2006	2007	2008
Septicemia	3	0	3
Endocrine and metabolic diseases	1	0	1
Nervous system disorder	2	0	0
Connective Tissue Disorder	0	3	2
Respiratory Conditions	3	0	0
TOTAL	**9**	**3**	**6**

Fig. 11.1: Causes of other medical conditions



Death due to septicaemia:

All deaths due to septicaemia had primary infection which originated either from urinary tract, lungs, gut or wound (episiotomy and caesarean section). However, only 2 cases were found to grow microorganisms from blood culture whilst the rest were culture negative. Two patients had concurrent anaemia, 1 patient had underlying heart disease and 1 patient had endocrinopaty. Patients who died with infected wound did not have any associated comorbidity. Two babies delivered by SVD and LSCS survived and the others were 2 fresh stillbirth and 2 died undelivered. Clinical remediable factors were identified in 4 out of 6 mortalities due to septicaemia (Table 11.4).

Table 11.4 : Profiles of maternal deaths from septticaemia:

Profile	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
Age	38	21	25	27	35	21
Race	Malay	Others	Iban	Malay	Malay	Bajau
Site of infections	Recurrent UTI	Episiotomy wound	Infected LSCS wound Pneumonia	Lobar pneumonia	Perforated appedicitis	Urosepsis
Underlying Co morbid	Anaemia Pulmonary hypertension	NIL	NIL	Mitral Stenosis with pulmonary hypertension	Thyroid storm	Anaemia
Organism	NIL	Group A hemolytic Strept	Wound C&S – Staph aureus Blood C&S - Proteus Klebsiela	NIL	NIL	NIL

Death due to Collagen Diseases:

Five maternal deaths from Systemic Lupus Erythematosus were reviewed. Their age ranged from 24-34 years old. The ethnic groups included 2 Malays, 2 Chinese and 1 Sungai. Proteinura and thrombocytopenia were present in all cases, while arthropathy, photosensitivity and cerebral lupus were present in only some case. Only 1 baby delivered by caesarean section survived despite catastrophic maternal complications. All patients had complications during their pregnancy and 2 had serious complications from intracranial bleeding. In 2 deaths, clinical remediable factors were identified (Table 11.5).

Table 11.5 : Profiles of maternal deaths from collagen diseases

Profile	Case 1	Case 2	Case 3	Case 4	Case 5
Age	31	24	35	32	28
Race	Chinese	Chinese	Sungai	Malay	Malay
Diagnosis	4 years	1 ½year	2 years	1 year	Present pregnancy
Proteinuria	Yes	Yes	Yes	Yes	Yes
Thrombocytopenia	Yes	Yes	Yes	Yes	Yes
Hypertension	No	No	Yes	No	Yes
Artropathy	No	No	No	Yes	No
Photosensitivity	No	No	No	Yes	No
Cerebral lupus	No	No	No	Yes	Yes
Complications	HELLP Syndrome	Pancreatitis Pyelonephritis Anaemia Pneumonia	Intracranial bleed	Pericardial effusion	Cerebral infarction and ICB

Death due to Respiratory diseases:

Three deaths from respiratory ailments were reported. They were due to pulmonary edema and in 2 deaths, clinical remediable factors were identified. Further analyses of the 3 cases of non-cardiogenic acute pulmonary edema are illustrated in Table 6. The age were between 28-39 years, and patient was in parity of 0-3. Two deaths had twin pregnancy at different period of gestation that was at first and third trimester. One case had post mortem which confirmed the pulmonary edema changes. No post mortem conducted in another 2 cases. In the 3rd case, there were catastrophic events that contributed to her death. In case 2, tocolytic treatment was given preterm labour. She also found to have anemia and poor weight gain during pregnancy.

Table 11.6: Profile of maternal deaths from respiratory disease

Profile	Case 1	Case 2	Case 3
Age	28	32	39
Gravida	G2P1	G4P3	G1P0
POG	11/52	13/52 – Twin pregnancy	36/52 - twin pregnancy
Post mortem	Acute pulmonary edema	NIL	NIL
Complications	Tonic-clonic seizure	Left lung collapsed and consolidation on right lung	Pulmonary embolism Intrabdominal bleeding and perforated jejunum

Death due to Endocrine and Metabolic diseases:

Death related to endocrine and metabolic diseases were contributed by diabetes mellitus and thyrotoxicosis. Diabetic death caused by diabetic ketoacidosis in patient who presented with abdominal pain at 19 weeks POG. She was initially thought to have abdominal pain due to stretching of abdominal muscle in pregnancy. Subsequent diagnosis was gastritis but an hour later noted to tachypnoeic and sweating with glucometer at 20.7 mmol/l .She was referred to referral hospital for further management but died enroute. In this case, clinical remediable factors were identified.

Second case was a thyrotoxic lady whom had been diagnosed 6 years prior to present pregnancy but defaulted treatment. She presented with fever and then noted to have persistent tachycardia. After 4 days in the ward she was restless and hallucinating. She was diagnosed to have thyroid storm and was treated accordingly. She developed ruptured left ectopic pregnancy and had laporatomy. Following this her she had uncontrolled arrhythmia and succumbed from her illness. In this case too, clinical remediable factors identified.

Death due to nervous system disorder:

Two deaths were reported due to nervous system disorder. One death was due to intracranial hemorrhage in a patient with underlying hypertension. The other patient had history of epilepsy since young and died of status epilepticus. Clinical remediable factor were identified in the latter case.

11.3 Discussion

Maternal deaths due to associated medical conditions are still significant. Although the trend is reducing the complexity of the disease is getting more difficult because of the multiple complications from the primary disease itself.

Septicaemia is a leading cause of death from medical conditions. Overall rate of bacteremia on the obstetrics and gynecology service of large teaching hospitals is approximately 7.5 per 1000 admissions; sepsis occurs in one to five of 20 bacteremic patients, while septic shock is rare. Septicaemia are among the leading causes of preventable maternal morbidity and mortality not only in developing countries but in developed countries as well. Many causes of infection including wound infection, mastitis, urinary tract infection, and septic thrombophlebitis are the chief cause of puerperal infections. The predisposing factors leading to the development of sepsis are unhygienic delivery practice, low socioeconomic status leading to poor nutrition, primigravida, anaemia, prolonged rupture of membranes, prolonged labor, multiple vaginal examinations in labour, caesarean section, obstetrical maneuvers and postpartum hemorrhage. Maternal complications include septicaemia, endotoxic shock, peritonitis or abscess formation leading to surgery and further compromising the patient's well being. The transmissions of infecting

organisms are typically categorised into nosocomial, exogenous, and endogenous. Nosocomial infections are acquired in hospitals or other health facilities and may come from the hospital environment or from the patient's own flora. Exogenous infections come from external contamination, especially when aseptic technique is not practiced adequately during delivery. Endogenous organisms, consisting of mixed flora colonising the woman's own genital tract, are also a source of infection in pregnancy related sepsis. Aseptic precautions, advances in investigative tools and the use of antibiotics have played a major role in reducing the incidence of puerperal infections. Since sepsis is a serious condition, proper handling of labour and delivery together with judicious use of antibiotics can play a major role in reducing the incidence of infections and its complications. Nevertheless the clinical picture of life-threatening sepsis often develops very rapidly and in many of the cases the outcome could not have been prevented. Severe systemic sepsis especially when accompanied by septic shock remains a challenge to all those involved in the care of critically ill obstetric patients. The onset of severe sepsis can be alarmingly rapid in pregnancy and once established it is difficult to treat.

Systemic Lupus Erythematosus (SLE) is a disease primarily targeting fertile women and reproductive age group. Good pregnancy outcomes can be expected in women with SLE when they are in remission. The disease on its own is not a contraindication of pregnancy and the fertility obviously not affected. However, it is recommended for better pregnancy management and outcome, patient should be in remission for at least six months prior to conception. The physiological changes in the course of pregnancy might have close resemblance to the symptoms of lupus, therefore pregnancy changes should be differentiated from symptoms caused by lupus. For mothers suffering from SLE, regular visits not only to their obstetricians but also to a physician or rheumatologist if available is advisable, to allow proper recognition of potential complications so early treatment can be instituted. Thorough assessment of the maternal disease is of high importance not only during but also prior to and following pregnancy. All SLE pregnancies should be considered high risk. The adverse outcome of pregnancy to fetus like spontaneous abortion, intrauterine growth restriction, increased risks of preterm delivery and perinatal fetal death is higher in pregnant women with SLE. The woman is more prone to develop pregnancy complications like eclampsia, thrombo-embolic events especially when there is concurrent antiphospholipid syndrome. Usage of anti thrombotics treatment increases the chance of survival with uneventful child birth in women suffering from antiphospholipid syndrome. Data has shown that SLE flair is common during pregnancy but postpartum flare is not exceptionally rare. However, reports have shown that there is improvement of the lupus disease during pregnancy.

The respiratory system undergoes a number of anatomic and physiologic changes during the course of a normal pregnancy. These physiologic changes in the pulmonary system during pregnancy, place the pregnant woman at risk for having pulmonary edema. Pulmonary edema is defined as the accumulation of fluid in the pulmonary interstitial spaces and alveoli, which prevents the adequate diffusion of both oxygen and carbon dioxide The presentation of acute pulmonary edema in a previously healthy woman who has recently delivered is an uncommon but fatal complications can occur. Several risk factors have been identified like pre eclampsia,

eclampsia, use of tocolytic therapy and development of pulmonary embolism from any cause. The development of pulmonary edema appears to be influenced by maternal age, parity, and pre-existing essential hypertension. Cardiogenic and non-cardiogenic pulmonary odema may have similar clinical signs and symptoms; however, treatments may differ greatly. Understanding the types of pulmonary odema enables health providers to improve care for this group of patients. The pathogenesis of pulmonary o dema associated with pre eclampsia and eclampsia is felt to be multifactorial. The incidence of pulmonary odema may be as high as 3% with pre eclampsia. Combination with the left ventricular dysfunction and increase in peripheral vascular resistance leads to pulmonary odema. During the postpartum period, excessive elevations in pulmonary vascular hydrostatic pressure compared with plasma oncotic pressure may produce pulmonary odema in some women. However, not all pre eclamptic patients with pulmonary odema demonstrate this phenomenon. Iatrogenic fluid overload is another possible preventable cause and serious attention has to be addressed in fluid management during for women in labour and post delivery.

Generally, diabetes form a common cause of endocrine disorder followed by thyroid disease Diabetes in pregnancy is associated with risks to the woman and to the developing fetus. Miscarriage, pre-eclampsia and preterm labour are more common in women with pre-existing diabetes. In addition, stillbirth, congenital malformations, macrosomia, birth injury, perinatal mortality and postnatal adaptation problems (such as hypoglycaemia) are more common in babies born to women with pre-existing diabetes. Pregnant women should be screened if they have any of the following risk factors, i.e BMI > 27 kg/m², previous macrosomic baby weighing 4 kg and above, previous gestational diabetes mellitus (GDM), first degree relative with diabetes, bad obstetric history, glycosuria at the first antenatal visit, current obstetric problems (essential hypertension, pregnancy induced hypertension, polyhydramnios, current use of steroid and also age above 25). Screening can done by using OGTT at least once at > 24weeks of gestation.

Graves disease is the most common form of hyperthyroidism as compared to thyroid storm. It is often precipitated by stressful events including pregnancy, trauma, any surgical procedures and also delivery. Infection is another common factor precipitating thyroid storm but women who receive limited or no prenatal care and have other medical or obstetric complications also has a higher risk of thyroid storm. Failure to control hyperthyroid state prior to pregnancy also contributes to thyroid crisis especially with co-existing medical conditions. Some of the normal changes of pregnancy can be confused with signs and symptoms of hyperthyroid. Hence, proper clinical assessment supported by blood investigation results would reveal the existence of the thyroid disease rather than physiological changes of pregnancy.

Intracranial haemorrhage (ICH) is a rare, yet potentially devastating event in pregnancy. ICH accounts for a substantial portion of pregnancy-related mortality. Advanced maternal age, hypertensive diseases, coagulopathy, and tobacco abuse are all independent risk factors for pregnancy-related ICH. Hypertension is a major risk factor for cerebral haemorrhage both in pregnancy and in the non-pregnant state and can be fatal when there is failure to control it. The risk of ICH associated

with pregnancy is greatest in the postpartum period. Urgent neurosurgical conditions generally outweigh obstetric considerations in management decisions.

Epileptic syndromes during pregnancy caused by several mechanisms, including syndromes such as metabolic derangement and cerebral venous sinus thrombosis, can induce seizures during pregnancy and postpartum period. Majority of women have had seizures even before pregnancy. Rarely, some woman may experience seizures only during pregnancy, which is termed gestational epilepsy. Such women would be seizure-free between pregnancies. Another subgroup (gestational onset epilepsy) may have their first seizure during pregnancy and thereafter may continue to get spontaneous recurrent seizures. Uncontrolled seizures, particularly generalized tonic-clonic episodes, are hazardous during pregnancy. Miscarriage, trauma related to falls, fetal hypoxia and acidosis are all possible sequelae of maternal seizures. Approximately 1-2% of epileptic mothers may experience status epilepticus during pregnancy. Status epilepticus carries a high mortality rate for mother and fetus. Women with epilepsy should have specialist care in pregnancy from a consultant obstetrician and a neurologist.

11.4 Conclusion

Patients with underlying or at risk of developing medical associated conditions should be identified at antenatal booking. Other medical and obstetrics problems should also be assessed as it may precipitate or aggravate the underlying diseases. All ailments should be treated and regularly monitored during antenatal period. Woman with medical disorders should have proper obstetric-medical combined clinic follow up. Anticipation of problems and providing appropriate treatment may help to prevent further complications. Referral to sub-specialist is mandatory if the condition becomes out of control. Multidisciplinary approach of management may be able to improve the patient outcome. Pre-conceptual counseling should be started before marriage. If the condition is serious enough, pregnancy should be deferred or avoidance of pregnancy should be advised strongly. Optimising treatment of underlying chronic medical illness is a must before patients embark into pregnancy.

11.5 Recommendations

- Early recognition of medical problems and anticipate complications
- Identify obstetric risks that may precipitate or aggravate medical complications and treat promptly
- To start antibiotics early in patients with septicaemia
- SLE patients to plan pregnancy in remission and observe closely for disease flair during pregnancy and postpartum
- Diabetes mellitus should be controlled before pregnancy and good glycaemic control must be emphasize during pregnancy
- Aggressive early treatment with involvement of senior doctors is mandatory

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CHAPTER 12

MATERNAL DEATHS DUE TO HEART DISEASE

Summary

A composite review of forty-nine maternal deaths due to heart diseases reported to the Confidential Enquiries Into Maternal Deaths (CEMD) Committee), Ministry of Health Malaysia from 2006-2008 were analysed. Chronic rheumatic valvular heart diseases was the commonest constituting about 45% of the cases (10% had valve replacement). Deaths due to congenital heart disease were seen in about 18%. Peripartum cardiomyopathy rarely reported in previous CEMD reports was seen in 3 patients. Serious complications encountered were heart failure, arrhythmias, thromboembolic events, problems with anticoagulation and infective endocarditis. Many of these deaths could have been prevented. Delay in diagnosis or missed diagnosis during the early antenatal period accounted for more than half of the cases. Maternal deaths would have been avoided if cardiovascular risk assessment in pregnant patients was performed in the preconception and early antenatal period. The cornerstone for reducing maternal mortality due to heart disease entails detailed history taking focusing on cardiorespiratory symptoms, mandatory auscultation of heart of all pregnant patients at every antenatal visit and a wider use of echocardiography to confirm and evaluate cardiac status. Greater involvement of cardiologists in co-managing pregnant patients with cardiac diseases is recommended. Preventive clinical interventions throughout the continuum of a woman's reproductive span are discussed.

12.1 Introduction

CEMD reports since 1997 have shown that maternal deaths due to heart diseases are the main non obstetric cause of maternal mortality in Malaysia.[1,2] This is also true in the UK although the spectrum of heart diseases seen is different.[3]

In the UK peripartum cardiomyopathy was the commonest cause of maternal deaths due to heart disease in 1997-1999 constituting 20% of the deaths.[3] Chronic rheumatic heart disease is infrequently seen except among the immigrant population. Other differences included a larger number of surgically corrected congenital heart disease among their maternal deaths due to heart diseases. Women with coronary artery disease (14%) and aortic dissection (14%) are also more common in the UK compared to that in Malaysia where acquired chronic rheumatic heart disease constituted about 45% of the deaths. Also complex congenital heart disease are increasingly seen among maternal deaths due to heart disease.

Pregnancy has been known to aggravate cardiac haemodynamics and could compromise functional capacity.[5] Furthermore the presentation of cardiac disease mimics the signs and symptoms of pregnancy making detection of cardiac lesions by doctors running antenatal clinics not easy.[6] The consequences for such an omission can be considerable and prove fatal.

For a favourable pregnancy outcome evaluation of the patient, in particular assessment of cardiovascular risk and counseling of the pregnant patient with heart disease as early as possible is mandatory.[7,8] Management of a patient with heart disease comprises combined team care involving cardiologist, obstetrician and anaesthetist especially during the peripartum period where risks of complications are highest.[3] Reduction of maternal mortality from heart diseases entails a dedicated multi prong approach whereby opportunities for intervention need to be addressed throughout the continuum of a women's reproductive span beginning from pre conception to the puerparium. In Malaysia social cultural factors play a substantial role as will be discussed subsequently whereby a relatively high number of these deaths occurred among the economically and educationally disadvantaged.

This review attempts to identify remediable factors to address shortfalls in management. Evidence based guidelines are available for management of some specific cardiac lesions but there is still lack of guidelines for the growing numbers of patients who have under gone correction for their congenital cardiac abnormalities and desire for a child. Advances in paediatric cardiology and cardiac surgery are resulting in a growing population of young women with congenital heart disease well enough to contemplate pregnancy. Although certain conditions are still associated with high maternal mortality, we need to be mindful that inappropriate advice against pregnancy for a minor lesion can also be devastating to quality of life.

12.2 Data analysis

The main cause of maternal cardiac deaths was due to rheumatic heart disease, mitral stenosis and to a lesser extent aortic stenosis resulting in 22 deaths (45%) (Table 12.1). It is well documented that stenotic lesions do poorly compared to regurgitant lesions. Congenital heart disease was the next commonest heart disease comprising Atrial Septal Defect (ASD), Ventricular Septal Defect (VSD) and Patent Ductus Arteriosus (PDA) (18%). Eisenmenger syndrome a complication with a grave prognosis was seen in five patients. Two patients with ASD, two patients with PDA and one patient with uncorrected Tetralogy of Fallot (TOF) were seen in this group of deaths (Table 12.2). Peri partum cardiomyopathy (PPCM) was diagnosed in three of the deaths. This entity with clear criteria for diagnosis is increasingly recognized.[3,4] PPCM were not reported in the 2001-2005 CEMD report. Two deaths were due to myocarditis probably of viral aetiology.

Table 12.1: Number of maternal deaths from cardiac lesions

Types	2006	2007	2008	Total
Acquired Heart Disease				
Mitral Valve	3	7	3	
Aortic Valve	0	1	0	
Mixed Mitral/Aortic Valve	1	2	2	22 (45%)
Unspecified	1	2	0	
Congenital Heart Disease				
VSD	0	1	0	
ASD	0	0	2	
PDA	1	1	1	9 (18%)
TOF	1	0	0	
Others (corrected TGA/TR)	0	0	2	
Infective Endocarditis	1	(1)	(1)	1 (2%)
Prosthetic Valve Replacement				
Mechanical	1	0	2	4 (8%)
Bioprosthetic	0	0	1	
Hypertrophic Obstructive Cardiomyopathy	0	1	0	1(2%)
Peripartum Cardiomyopathy	1	1	1	3 (6%)
Myocarditis	1	0	1	2 (4%)
Cardiac Failure	3	1	1	5 (10%)
Pulmonary Embolism	1	0	1	2 (4%)
Arrhythmias	(6)	0	(1)	
Total	**15**	**17**	**17**	**49**

( ) indicates in association with other cardiac lesions and not included in the total

Table 12.2: Details of common cardiac lesions seen in maternal deaths

Type of Lesion	2006	2007	2008	Total
Mitral				
Stenosis	1	4	2	7
Regurgitant	1	2	0	3
Stenosis/Regurgitant	2	0	2	4
Undetermined	1	0	1	2
Aortic				
Stenosis	0	0	0	0
Regurgitant	0	0	(1)	1
Stenosis/regurgitant	2	2	(1)	5
Mixed Mitral/ Aortic/ Tricuspid	0	0	(1)	(1)
Eisenmenger Syndrome				
Patent Ductus Arteriosus	1	1	0	2
Atrial Septal Defect	0	0	2	2
Ventricular Septal Defect	0	1	0	1

Type of Lesion	2006	2007	2008	Total
Tetralogy of Fallot (uncorrected)	1	0	0	1
Transposition of Great Vessels/ TR (corrected)	0	0	2	2

( ) indicates valve replacement performed

Eighteen patients were 0 -1 parity, nineteen were of parity 2-3. Twelve patients were parity 4 and above. Six patients were of parity 6-10, one patient was of parity 7 and another of parity 10 (Table 12.3). Termination of pregnancy and instituting effective contraceptive methods at the opportune time would have prevented these maternal deaths in the multi parity patients.[8,9] Out of these 49 patients, 30 delivered with only 17 live births. Nineteen patients succumbed undelivered. A favourable fetal outcome is seen in 17 (34%) patients. Only 14 (28%) patients were seen or had some sort of consultation with cardiologists. None of these high risk cardiac patients was delivered in a specialised cardiac centre or had the benefit of a cardiologist in attendance during the intra or peripartum period.

Table 12.3: Maternal deaths due to cardiac diseases

Clinical Factors	2006	2007	2008	Total
Gravida				
0-1	4	7	7	18
2-3	7	6	6	19
4-5	2	3	1	6
6-10	2	1	3	6
Delivered	11	10	9	30
Fetal Outcome				
Alive	7	4	6	17
Dead	2	5	2	9
Abortion	2	1	0	3
No information	0	0	1	1
Undelivered	4	7	8	19
Seen by or consultation with cardiologist at least once during pregnancy	3	5	6	14

Attempt was made to identify the stage of pregnancy when cardiac disease was first recognized (Table 12.4). Eleven patients were known to have cardiac disease pre conception. Only twelve patients had their cardiac disease detected in the first trimester. This group is an ideal target for meticulous cardiovascular risk assessment, detailed conjoint counseling with spouse as well and in the Malaysian context the relevant extended family members who on many instances exert powerful influence on the final decision whether to adhere to medical advice. This period is also the time when surgical interventions if required are the safest. [9] In 28 (56%) patients cardiac disease was detected in the second and third trimester.

Table 12.4: Stage of pregnancy when cardiac disease was detected

Stage of detection	*Pre conception*	1st Trimester	2nd Trimester	3rd Trimester	Post partum	Total
2006	*3*	3	9	1	2	15
2007	*2*	4	6	3	4	17
2008	*6*	5	8	1	3	17
Total	***11***	**12**	**23**	**5**	**9**	**49**

Pre conception not included in the overall total

Active involvement of a cardiologist in concert with obstetrician and anaesthetist is crucial in determining the definitive management strategy. In nine patients cardiac disease was detected in the post partum period when patients presented with complications and then cardiac disease was entertained (Table 12.5). This underscores the importance of auscultation of every pregnant patient's heart throughout the antenatal period till the puerparium. The cascade of cardiac complications experienced by pregnant patients with heart disease who are sub optimally managed need to be appreciated. Cardiac failure was the most common complications occurring in seventeen instances. Pulmonary hypertension (PHT) is another dreaded complication of heart disease seen in four patients.[10] Two primigravida with corrected Transposition of the Great Arteries had associated PHT. Both presented for first antenatal at 20 weeks and 21 weeks gestation, too late for any fruitful interventions to be undertaken. Unfortunately both had knowledge of their cardiac disease, defaulted follow up at specialized cardiac centre (Case Illustration 2). These patients presented for their first antenatal at 14-17 weeks gestation. One patient had the benefit of cardiologist follow up but died at 35 weeks gestation. The other two patients although presented at the beginning of the second trimester had their cardiac lesion missed. This was detected only at 24 weeks and 35 weeks gestation.

Arrhythmias were noted in seven instances. Pregnancy itself is a pro arrhythmogenic state and with underlying structural heart disease makes this complication more frequent. Atrial fibrillation is commonly seen in cardiac diseases and detection is important for prophylactic anticoagulation if not contraindicated. Five patients with atrial fibrillation were not anticoagulated exposing them to the risk of thromboembolic events. Infective endocarditis complicated three maternal deaths. All three had positive cultures of Streptococcus viridans sensitive to penicillin and gentamicin in two patients and the other showed Gram positive cocci.

One patient had cerebral infarct and two patients had intra cardiac thrombus. Pregnancy being a thrombophilic state due to increase clotting factors poses difficulty in achieving target anticoagulation. Close monitoring of INR is essential during pregnancy. There were problems in achieving target INR in four patients, one resulted in cerebral haemorrhage and three experienced thromboembolic events. Interestingly two patients were diagnosed with HELLP,

a condition known to be encountered more often among pregnant patients with heart disease.

Table 12.5: Maternal deaths associated with complications from cardiac diseases

Complication	2006	2007	2008	Total
Heart failure	8	5	4	17
Arrhythmias	4	1	2	7
Infective endocarditis	1	1	1	3
Pulmonary embolism	0	1	2	3
Anticogulation problems (under /over anticoagution)	3	1	1	5
Failure to institute	(1)	0	(4)	(5)
Pulmonary Hypertension	1	1	2	4
Thromboembolic				
Stroke	0	1	0	1
Intracardiac thrombus	1	0	1	2
HELLP	1	0	1	2

NB. More than one complication can occur in the same patient
( ) Anticoagulation indicated but failure to institute i.e atrial fibrillation

Table 12.6 showed maternal deaths due to heart disease occurred most commonly between the ages of 20 -30 years. Nineteen were in the 30-40 years age group. Two patients more than 40 years old died due to tight mitral stenosis. Both were grand multip of G7 and G10 (Case Illustration 1). These two deaths were preventable had they been tubal ligated before the current pregnancy. These maternal deaths occurred among the less educated and lower socio economic strata of society. Four were in the middle class. Health education pertaining to heart disease and pregnancy among this category of population needs to be approached from the patient view point rather than from the perspective of the health care provider. Cultural factors and their beliefs about health and disease should be considered when embarking on cardiovascular risk counseling. Malays constituted 29 deaths; four were Chinese and four Indians. Ten were from the rural and native tribes. Practice of birth control was seen in 22%. There isn't much choice for women with heart diseases as contraceptive pills and IUCD expose them to complications. The best is sterilization i.e. tubal ligation.

Table 12.6: Demographic profile of maternal deaths associated with heart disease

Demograhic profile	2006 n=15	2007 n=17	2008 n=17	Total N=49
Age (years)				
< 20	2	0	0	2
20 – 30	8	9	9	26
>30 – 35	3	6	3	12
>35 – 40	1	2	4	7
>40	1	0	1	2
Occupation				
Housewife	11	9	10	30
Sales and services	2	1	3	6
Factory worker	2	5	1	8
Farmer	0	0	1	1
Teacher	0	1	2	3
Clerk	0	1	0	1
Educational Level				
Never attended school	2	0	2	4
Primary School	3	5	5	13
Secondary School (Up to Form 3)	4	1	1	6
Secondary School (Up to Form 5)	4	9	4	17
College	0	0	1	1
Unknown	2	2	4	8
Ethnic Group				
Malay	8	11	10	29
Chinese	2	2	0	4
Indian	0	0	4	4
Orang Asli	2	1	0	3
Iban	1	1	0	1
Bajau	2	2	0	4
Bidayuh	0	0	1	1
Others	0	0	2	2
Family Planning				
Ever User	5	1	5	11
Never User	8	12	10	30
Unknown	2	4	2	8

12.3 Case Illustrations

Case 1

This patient is a 43 years old Orang Asli who was in her tenth pregnancy with 6 living children the youngest of 8 years suffering from cerebral palsy. She had one stillbirth previously. She refused birth control when advised after her last pregnancy but opted for traditional methods. This pregnancy was planned. She was booked at a health facility at 23 weeks POA and had been very regular with her antenatal visits each time seen by a medical officer and also an O&G specialist on two occasions. She had complaints of shortness of breath and palpitations which has limited her daily activities. Thyrotoxicosis was suspected and empirically treated with Propranolol and Propylthioracil at the first antenatal visit. Thyroid function tests were sent three weeks later.

At 31 weeks POA she presented to a low risk delivery centre in established labour. She delivered vaginally to a premature baby. A medical referral was made to the medical team for her fast atrial fibrillation. An ECHO examination showed features of a tight mitral stenosis, with pulmonary regurgitation and tricuspid regurgitation and a dilated left atrium indicative of pulmonary hypertension. She was warfarinised and an appointment was made to a specialized cardiac centre for follow up. On the 8th post partum day she was scheduled for bilateral tubal ligation. But not carried out as she developed fast AF in the operating theatre but an IUCD was inserted instead. The next day she developed sudden respiratory distress and was in metabolic acidosis. She was resuscitated but required ICU management. She died on the 13th post partum day.

Comments

Antenatal

Poor general antenatal evaluation was evident. This patient is a grandmultipara with bad obstetric history. A more effective form of birth control should have been strongly offered to her. Failure to perform full physical examination especially auscultation of heart at the baseline antenatal visit and failure to appreciate symptoms of cardiac failure at the antenatal visits were identified. Patient should have been assessed in a more holistic manner – other causes for atrial fibrillation were over looked. The propranolol would have worsened her cardiac failure. Presumptive treatment of thyrotoxicosis before biochemical confirmation is considered unsafe practice.

Intra partum

Inappropriately assigned patient to deliver in a low risk centre without full examination and risk stratification is not in compliance to good standard practice. Failure to auscultate the heart for murmurs, in retrospection, with the ECHO findings, murmurs would have been easily detected.

Post partum

Management for the complications of heart failure was not aggressively treated. Cardiac rhythm need to be adequately stabilized before any surgical procedure. Antibiotic prophylaxis was not instituted prior to scheduled procedure. The choice of IUCD was unwise as this increases the risk for infective endocarditis. In fact there was no urgency to put in the IUCD during the immediate post partum period in an unstable patient.

Case 2

This 25 year old primigravida with known history of congenital heart disease diagnosed at birth had been regularly followed up at a specialized cardiac centre for her cardiac condition till age 13 years after which she defaulted follow up. She was referred from a secondary level hospital where she was admitted for cardiac failure NYHA Class 111 with fast atrial fibrillation. She was managed in the coronary care unit at the tertiary level hospital. She was noted to be pregnant at 21 weeks POA. There was no prior antenatal assessment. A grade 2 systolic murmur was detected on examination of her heart. ECHO showed a congenitally corrected transposition of the great arteries, (TGA), severe tricuspid regurgitation (TR), dilated pulmonary artery, severe pulmonary hypertension and a ventricular septal defect (VSD), ejection fraction of 40%. She was aggressively treated for her cardiac failure. The obstetric team assessed the fetal viability. Discussions were made with the paediatric cardiology team and her pregnancy was deemed life threatening and it was impractical to under take any corrective surgery at the time. Termination of pregnancy proceeded with Gameprost pessary. Augmentation of labour with oxytocin was commenced when she was in active labour. She became more breathless delivering a fresh still birth weighing 675 gm. Manual removal of placenta was attempted for retained placenta under general anaesthesia. Fifteen minutes later she became hypotensive with no pulse. Transesophageal ECHO showed massive thrombus in all four chambers of the heart as well as the great vessels. Her cause of death was cardiac failure secondary to underlying TGA with pulmonary hypertension and severe TR.

Comments

Pre conception

This patient and parents should have been counselled by the paediatric cardiologist and cardiac surgeon who performed the surgery at birth about pregnancy issues. Sometimes repeated counselling sessions at every follow up visit need to be done as the child grows up.

Antenatal

The patient presented in the second trimester. In fact cardiovascular risk assessment should have been done at the first baseline antenatal visit in the early gestational period. This cardiac lesion carries a very high maternal and fetal cardiovascular risk. Complications are life threatening most of the time including massive thrombosis. There should be no doubt that the pregnancy should have been terminated. Termination of

pregnancy in the late second trimester in a patient with pulmonary hypertension and severe cardiac failure is often dismal. The doctor at the secondary hospital was not aware she was a pregnant patient with a heart problem. Here in lies the importance of mandatory history taking and routine auscultation of hearts in all pregnant patients.

Once severe complications develop whatever interventions done or no intervention the outcome remains the same. The learning point is early detection of cardiac disease in pregnancy is that comprehensive cardiovascular risk assessment are crucial in preventing maternal death.

Case 3

This 28 years primigravida, a case of Chronic rheumatic heart disease had mitral valve replacement and VSD repair performed in 2000. She defaulted taking warfarin two weeks prior to admission for fear of fetal toxicity. A review of her anticoagulation booklet showed that her control was not satisfactory INR 1.4-2.3. She was advised admission but refused. A month later her INR was 4.4. She presented with sudden onset of right hemiparesis while working. A suspicion of left middle cerebral artery stroke was made because of her metallic valves however, CT and MRI of brain were not done. The O&G specialist confirmed an intrauterine gestational sac with fetal heart about 7 weeks size. She was kept in the ward for anticoagulation adjustment. While in the ward for 3 weeks she had an episode of vomiting followed by sudden onset of seizure and was ventilated. Urgent CT scan showed a large fronto-parietal intracerebral and intraventricular haemorrhage with mid line shift. Neurological consultation was made and no intervention was pursued due to the grave prognosis. Cause of death was massive cerebral haemorrhage due to over warfarinisation.

Comments

Heparin use during the first trimester is safer. Poor monitoring of warfarin in patients with mitral valve replacement.

12.4 Discussion

It is well recognized that pregnancy poses an increasing burden to the heart. The blood volume can increase up to 20 – 100% from the pre pregnancy state. Cardiac haemodynamics will be compromised the extent depending on the type and severity of the cardiac lesions. [5,11]

In Malaysia acquired heart disease predominantly rheumatic heart disease constituted 45% of the maternal deaths due to heart disease and involvement of the mitral valve (16/22) is the most common abnormality. Rheumatic fever is still prevalent in parts of Malaysia especially in the under served regions of the country and in areas with poor housing conditions. Rheumatic heart disease will continue to be seen among young women in these communities. Mitral stenosis alone or in combination with other

valve involvement like aortic valve was diagnosed in the majority of these patients comprising 18/22 patients. Unfortunately this cardiac abnormality is known to carry a poor prognosis. Particularly in this lesion doctors should discuss the cardiovascular risk with the patient before she decides to become pregnant. Interventions such as percutanous mitral valvutomy or mitral valve repair is possible in selected patients.[8] All patients with valvular heart disease should have an echocardiography and close follow up after the beginning of the second trimester.[8] On several occasions the presence of cardiac disease was missed or detected very late even in the post partum period. When this occurs essential elements in the management and care for instance prophylactic antibiotics intra partum will not be prescribed resulting in risk of developing infective endocarditis. Three patients suffered this complication. Congenital heart diseases form the next important category of heart disease seen among these maternal deaths comprising 9 (19%). With advances in paediatric cardiac surgery it would be expected that more women with complex congenital heart diseases will live long enough to become pregnant.

According to a study carried out in Canada maternal and fetal risks could be predicted with quite good accuracy.[12] Application of this risk score would enable doctors to counsel patients with heart disease and design an appropriate management plan. This risk score which incorporates four maternal risk factors such as i) a prior cardiac event (stroke, TIA, arrhythmias) ii) cyanosis or poor functional class iii) left heart obstruction and iv) systolic ventricular dysfunction is easily applied in the day to day clinical antenatal practice . This should be adopted for routine maternal cardiovascular risk assessment in the antenatal clinic.

Patients with low and intermediate cardiovascular risk cardiac lesions also performed poorly. A significant number of patients classified with high risk as well as those who presented with Eisenmenger syndrome and pulmonary hypertension and uncorrected congenital heart disease continued with their pregnancy without management from a dedicated cardiac team until serious complications developed. [13]None of the patients was delivered in a cardiac centre.

Shortfalls in care identified included i) patients presenting late for antenatal care, ii) failure of doctors to detect cardiac lesions at the first baseline antenatal visit. On occasions even obvious cardiac lesions were missed iii) inexperience in anticipating complications iv) failure to involve cardiologists in combined care in a more formalized and expectant manner. Signs and symptoms of pregnancy are very similar to that of cardiac diseases. Breathlessness, leg swelling, tachycardia and systolic murmurs occur in both conditions.[6] Rheumatic heart disease can easily be missed. Thus clinicians working in developing countries where acute rheumatic fever is still prevalent should particularly think about this diagnosis.[7] There should be a low threshold for echocardiography in women with cardiorespiratory symptoms in the early antenatal and peripartum period.

Early antenatal assessment of pregnancy patients with cardiac lesions is the starting point in making a definitive care plan to ensure a favourable outcome. In fact, this is the crucial stage whereby maternal deaths due to heart disease can be avoided. [4,9,16] This is when counseling regarding termination of pregnancy and prospects of future pregnancy should be seriously discussed. Recurrence risks in offspring should be clearly addressed to minimize maternal and fetal morbidity and mortality.[15]Cardiac lesions were missed at the baseline antenatal visit in a significant proportion of the maternal deaths. Nine of the forty nine were detected during the postpartum. Doctors working in antenatal clinics need to routinely examine the heart in all pregnant patients at their first antenatal visit.[6] Clinical omission in this first step will trigger the whole cascade of complications that are so well described in any text book dealing with heart diseases in pregnancy. [5,11,14] Eleven patients who died were aware of their cardiac conditions pre conception yet became pregnant indicating failure of health education/counseling. It is to be appreciated that preconception counseling and even counseling by the medical practitioner who first made the diagnosis need to take responsibility for serious counseling regarding pregnancy risks. The issue of pregnancy even before the patient decides on conception should be raised by the medical practitioner who first diagnosed the cardiac lesion.

There was a lack of dedicated combined multidisciplinary specialist team providing care during the intra partum period even in patients with high risk cardiac lesions. Facilities for some form of invasive haemodynamic monitoring during this period would be helpful in guiding therapeutic interventions.[3] None of these patients were managed in a specialized cardiac centre during the intrapartum period.[16]

Data from previous CEMD report 2001-2005 showed similar spectrum of cardiac conditions. One difference of note is there are relatively more cases of maternal deaths in patients who had surgical interventions, five had valve replacement and corrected congenital cardiac diseases as alluded to earlier. Such patients carry special risks. At the present time not much has been written about the natural history of corrected congenital heart disease during pregnancy and the best way to manage these conditions.[4,9]

Advances in paediatric cardiology and cardiac surgery are resulting in a growing population of young women with congenital heart diseases well enough to contemplate pregnancy. Current recommendations are based on studies that have focused on a specific cardiac lesion, examined population before recent diagnostic and therapeutic advances. This poses a challenge for the future management for this category of patients.[8,14,16] Pregnancy is known to be a thrombophilic state and also has proarrhythmic potential. Complications related to these predisposing factors need to be anticipated and proactively managed.[5,11] Reported complications in the intra partum period like cardiac failure, arrhythmias, and problems associated with anticoagulation have been well described in heart patients during pregnancy.[14] Cardiac failure was identified on 17 instances, arrhythmias 7 and 6 developed thromboembolic events (Table 9). Pulmonary arterial hypertension carries a poor prognosis. This was seen in four patients.[3,10] Indication for termination of pregnancy if patients presented early may improve outcome. Several heart diseases necessitated the prophylactic use of anticoagulation. Apart from the

difficulty in maintaining a target INR such as bleeding and thrombosis, other pertinent issues to consider are fetal risks of death and embropathy of 30% and 4-10% respectively and maternal risks of death and thrombo embolism reported as 1.8% and 3.9% respectively when patients are on warfarin.[15] This information should be incorporated into the counseling sessions in the early antenatal period. The use of low molecular weight heparin is less established although increasingly favoured in some cases. Three maternal deaths due to peripartum cardiomyopathy were diagnosed over this three year period. When compared with the 2001-2005 CEMD report none was noted. This is attributed to the awareness of more definitive criteria for making this diagnosis.[3,5,11]This diagnosis may be increasingly recognised as reported in the UK.[3] One death was due to Hypertrophic Obstructive Cardiomyopathy (HOCM) diagnosed at post mortem. Women with HOCM are sometimes first diagnosed during pregnancy. These patients usually tolerate pregnancy well, although serious complications such as congestive cardiac failure, supraventricular tachycardia, ventricular tachycardia and syncope can occur as in this patient. Siblings need to be screened for this condition. There were no deaths due to coronary artery disease or aortic dissection reported. In elderly patients we need to be vigilant of this condition especially when sudden unexplained collapse occurs in the intra partum period or at labour. In patients above 40 years of age with risk factors for coronary artery disease a routine baseline ECG done would preempt such events.

Table 12.6 depicts the demographic profile of the maternal deaths. Most of the deaths occurred in those below 40 years of age. The occupation of the maternal deaths was from the lower socio economic strata of society with limited formal education. Malays constituted the majority. This corresponded to the racial composition in the country and also Malay women tend to have a higher parity. About 20 % (11/49) were from the native tribes and the aborigines a factor related to accessibility to specialized health care. Not to be dismissed is the extent played by socio cultural beliefs in hindering acceptance of medical advice among this community. Sixty per cent of these maternal deaths did not use any form of contraception methods (Table 5). Contraceptive pills are contraindicated due to the increased thromboembolic risk, IUCD run the risk of infection in CRHD. The best is sterilization. Ten patients (20%) delivered through caesarean section. Vaginal delivery is recommended, allowing caesarean section for selected indications.

12.5 Conclusion

Forty nine maternal deaths due to heart diseases from 2006 to 2008 reported to the CEMD were reviewed to look for remediable shortfalls. Many of the deaths were preventable. Chronic rheumatic heart disease in particular mitral and to a lesser extent aortic valve stenosis was the commonest cardiac lesions consistently seen over the past ten years. Congenital heart diseases were also noted in some of the maternal deaths. Aspects of sub optimal management identified included delay in detection and lack of cardiovascular risk assessment. Active involvement of cardiologists in the antenatal care and management of the patients was also lacking. Pre conception clinics as well as combined specialized cardiac teams need to be strengthened to

improve better care for high risk cardiac patients and those who encountered complications during the intra partum period. Future challenges especially related with current advances in paediatric cardiology and surgical techniques and how these will impact on adult patients who do survive these interventions and have a desire to be pregnant are awaited.

The best approach currently is for the cardiologist, obstetrician and anaesthetist working as a team to present the most realistic and comprehensive estimate of risk, both fetal and maternal to assist the patient in decision making. At the present management by an experienced team in a designated specialist cardiac centre for complex and complicated heart diseases is the way forward to achieve better outcomes.

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12.6 Recommendations

Issue	Strategy	Action
Known history of heart disease in the non pregnant state	Enhance pre conception counseling	Implement preconception clinics in all health care facilities providing antenatal services
Late detection of cardiac lesions	Enhance competency of doctors in cardiovascular examination of all antenatal patients	Mandatory examination of CVS of antenatal patients at every antenatal visit Ensure adequate systems in place for early detection of cardiac diseases. Echocardiography be made more easily available.
Inadequate / lack of cardiovascular risk assessment of pregnant patients with heart disease	Referral to cardiologist/ physician for evaluation	Strengthen Combined Cardiologist / Medical / Obstetrician clinics Serious counseling on maternal and fetal risks
Problem with achieving target INR	Understand current guidelines on anticoagulation in obstetric practice with special reference to heart diseases in pregnancy	Establish anticoagulation clinics in all hospitals where anticoagulation is a prescribed form of therapy. Closer monitoring of INR for patients on anticoagulation
Identification of high risk pregnant patients	Regular follow up with cardiologist and obstetrician	Establish Specialized Cardiac Clinics (ideally in Cardiac Centre) for pregnant patients with high risk cardiac lesions
Lack of specialized team to closely monitor and manage patients during the intra partum period	Pregnant patients with high cardiovascular to deliver in specialized Cardiac Centre where resident cardiologist in attendance	Develop SOP to facilitate transfer of patients to pecialised Cardiac Centre for delivery in a timely manner In women wishing to proceed to term, cardiac status must be optimized preoperatively and planned elective delivery is preferable. Vaginal delivery is preferred and carefully titrated regional anaesthesia is safe
Socio cultural barriers to acceptance of medical advice	Engage local community to work with health care personnel	Hospital to interface with health and local community leaders in education of health risks associated with heart diseases

CHAPTER 13

HIV/ AIDS ASSOCIATED DEATHS IN PREGNANCY

Summary

There were seven pregnancy related HIV deaths occurring from 2006 to 2008 which were serologically confirmed and reported to the CEMD. Four were Malays and the rest were Myanmar (one), Indonesian (one) and Bugis (one). The age group was between 22 to 32 years old. Two patients were known to be HIV positive prior to their current pregnancy, three patients were diagnosed during the antenatal period and the other two patients diagnosed during post-natal period. Two patients succumbed to pneumocystis carina, one to cerebral toxoplasmosis, one to disseminated herpes simplex infection, one to disseminated fungal infection, one to severe pneumonia and one to menigoencephalitis. The deaths may be preventable if the infections detected early and treated.

13.1 Introduction

AIDS emerged as a global epidemic; more than 33.2 million men and women are HIV positive. There are 6800 new cases and 5700 deaths every day. There is an increasing trend of women infected with HIV in Malaysia and majority of them are in the reproductive age groups. The risk of mother-to-child transmission of HIV is high.

In general pregnant womens are relatively immunosuppressed during pregnancy. With the underlying HIV infection, they are more prone to infections caused by opportunistic organisms such as tuberculosis, viruses and bacterias. They may be infected with more than one pathogen. Early diagnosis and early treatment can prevent transvertical infection to the fetus and prevent HIV associated infections to the mother. A total of 7 (4 were citizen and 3 were non-citizen with documents) out of the 667 maternal deaths due to HIV/AIDS associated infection for a period of three years (2006-2008), contributed to 0.01% of maternal deaths. Thought this number is small, almost in all of the cases, the deaths were avoidable.

13.2 Data analysis

From 2006 to 2008 seven HIV related maternal deaths were reported to the CEMD, Ministry of Health, Malaysia. Four of them were Malays and one each for Myanmar, Bugis and Indonesian. Two of the cases were primigravida while the parity in the others were three gravida two, one gravid three and one gravida four. The youngest patient was 22 years of age and the oldest was 32 years of age (Table 13.1). All the patients were from the lower socio economic strata of society with unfavourable social profile, which included factors such as multiple marriages, having spouses who had history of substance abuse or who died prematurely of infectious causes. Five of them died in the post-natal period, two died in the antenatal period and one aborted at 20 weeks POA.

Two patients were unbooked patients presented for antenatal care during the first time trimester of pregnancy, two in the second trimester, one in the third trimester and one with unknown period of amenorrhoea. One of the unbooked patient delivered at home to a baby's weight of 1.3kg attended by a neighbour. She was brought to hospital for labial tear repaired and subsequently discharged the following day. She was readmitted to hospital at day twenty two post-partum for severe pneumonia which was later found to have positive test for HIV. She died due to pneumocystis carina pneumonia infection. Two patient were tested negative (rapid test) during antenatal screening at a health clinics. One of these patient later presented with cough and was initially treated for pneumonia but later it was noted that her husband is an active IVDU. Subsequent serological test was positive for HIV and she then treated for pneumocystis carinii .Unfortunately she succumbed to this infection. One patient was admitted for suspected pulmonary tuberculosis and she succumbed to cerebral toxoplasmosis. One patient died due to disseminated herpes simplex infection. One patient died due to disseminated histoplasmosisis of which she was initially diagnosed as contact dermatitis with generalization two month prior to the death. The diagnosis of fungal infection was not suspected as the attending attending doctor did not notice the HIV result. Out of the four positive patients (diagnosed prior to pregnancy and during antenatal period) only two patient recieved antiretroviral treatment during antenatal and intrapartum period.

Table 13.1 : Profile of maternal deaths associated with HIV/AIDS

Age	Ethnic group	Parity	Occupation	1st ANC (Weeks)	Rapid Test	Other HIV Test & Rx.	Clinical Presentation and managements	Cause of Death and comments
22	Malay	G1P0	Store helper. Incomplete history. Risk factors not evaluated	8	-	Antenatal screening at 8 weeks of gestation positive & Rx with AZT	Initial presentation at 19/52 POA was dengue like illness. Only later diagnosed as disseminated herpes simplex involving brain & lung (was treated as bronchopneumonia initially).	Disseminated herpes simplex infection (case of late treatment)
23	Malay	G4P4	Housewife (2nd marriage). 1st husband HIV positive	12		Diagnosed as HIV infection in 2002 and become AIDS in 2006- Rx. With HAART	Presented with chronic cough at 23/52 POA and investigated for PTB. Patient defaulted. Presented again at 28/52 with drop in GCS. CT scan consistent with cerebral toxoplasmosis. Noncompliance to treatment	Cerebral toxoplasmosis (inadequate treatment due to poor compliance)
26	Malay	G1P0	Housewife (2nd marriage) 1st husband IVDU, died after divorce	Unbooked	-	Premarital screening for second marriage positive. Un-able to trace patient Therefore antiretro-virals was not given	Home delivery, admitted for labial tear and discharged. Presented at 22 days postpartum for fever, chest pain and productive cough. Initially treated as community aquired pneumonia. Later as PCP	PCP (case of late treatment)

Age	Ethnic group	Parity	Occupation	1st ANC (Weeks)	Rapid Test	Other HIV Test & Rx.	Clinical Presentation and managements	Cause of Death and comments
32	Malay	G3P2	Housewife	14	Initial booking rapid test @ health centre- negative at 14/52	Serology positive for current admission. Test done after review husband social history	Post partum presented with fever, cough and dyspnoea. Initially treated as pneumonia. Condition deteriorated, CXR reported as miliary TB, treated with antiTB. Case later seen by chest physician & Rx. as PCP	Miliary TB PCP (dual infection and late treatment of PCP)
24	Myanmar Non-Citizen	G2P1	Housewife	Unbooked Unknown gestation		Known HIV last delivery 2 yrs ago. Defaulted follow-up	Presented in a moribund stage due to meningitis and cerebral edema	HIV disease Underlying cause of meningoencephalitis uncertain
29	Bugis Non-Citizen	G2P1	Housewife	23	Done at health centre @ 23/52, negative	ELIZA done during current admission base on history of promiscous husband and an extensive oral candidiasis	Presented @ 27/52 for fever, cough, vomiting, blood stained diarrhoea. Dehydrated, toxic, bilateral lung crackles. Treated as infective diarhoea, PCP and bacterial pneumonia	Severe pneumonia unspecified
31	Indonesian Non-Citizen	G2P1	Housewife	25		Serology @ 25/52 in private hospital positive. Skin clinic doctor did not noti-ced the result.	Presented twice @ 29/52 and @ 32/52 for generalised papulovesicular rashes. Patient developed acute liver failure and DIVC. Baby born SVD. HIV result only known later.	Disseminated histoplasmosis. Delayed antifungal treatment

13.3 Discussion

There were seven maternal deaths associated with HIV/AIDS infections reported to CEMD. Three were non-citizens and four were citizens. The trends in HIV related maternal deaths seen to be static although the current status are an increasing trend of HIV infection among women as well as the overall increasing trend of HIV seen at national level. Seven deaths reported for a period of 2006 to 2008 compare to ten deaths reported from 2001 to 2005 (CEMD report 2001-2005). The pattern of causes of maternal death in mothers infected with HIV were the same. The cause of death was an opportunistic infections (PCP, fungal and cerebral toxoplasmosis), tuberculosis, severe viral infection and severe pneumonia.

In Malaysia there is an increase rate of HIV positive in the female population. Among the female HIV positive population the majority (>80%) are in the reproductive age group, a trend also seen globally.

In this review, the maternal deaths due to HIV, three of the seven patients were unware of their HIV status prior to their presentation to hospital. Two patients when tested using rapid test during their antenatal visits in the health centre showed a non reactive result but when the test was repeated during their acute presentation few weeks later a reactive result was obtained. The management and follow up of patients is to be effected. The test used need to be evaluated from time to time to ensure their sensitivity and predictive value. In such situation the opportunity for instituting antiretroviral theraphy and prophylaxsis for opportunistic infections is misssed with poor final outcome.

Two out of seven patients died from PCP, each of the remaining five had disseminated herpes simplex infection, disseminated histoplasmosis, cerebral toxoplasmosis, severe pneumonia and severe viral meningoencephalitis respectively. It has been reported that 53% persons who died from AIDS would have had PCP during the course of their disease. PCP is often associated with a poor prognosis. Vigilance in diagnosis of PCP among HIV infected individuals should be enhanced in our settings. Among our patient there was a low index of suspicious of PCP. In all the cases who died from PCP this diagnosis was entertained only after a trial of various antibiotics and antituberculosis .

Prompt treatment for PCP can be very rewarding. Although most studies in the treatment for PCP during pregnancy involved small numbers of patients, there is suggestion that sulfamethoxazole-trimethoprin (STX) treatment with or without steroids was associated with an increased survival rate. Many reasons have been attributed to the poor survival rates. It is known that cellular immunity wanes during pregnancy. PCP is known to run a more aggresive course in pregnancy compared to the general population.

PCP prophylaxsis which is known to be very effective with rates of prevention in the range of 90-95% were not prescribed to any of the patients who was on antiretroviral therapy or where the HIV status was positive. A high index of suspicion of PCP among HIV infected pregnant women needs to be alerted to all medical practitioners caring for antenatal patients.

There was one patient who died from cerebral toxoplasmosis. This is a less common but potentially fatal opportunistic infections described in pregnant women. Treatment is available for cerebral toxoplasmosis and response favourable if started early. There was one patient who died from disseminated herpes simplex infection which was initially diagnosed as dengue fever resulting in delayed treatment. This is again less common but potentially fatal. One patient died due to disseminated histoplasmosis. Again the diagnosis was not entertained early when she presented with an extensive skin infection two month prior to admission. Histoplasma infection is treatable if early treatment is initiated .

In the report of CEMD Malaysia 2001-2005, the socio-ecomic profile of HIV related maternal deaths was similar to those in 2006-2008. The clinical presentations and underling causes of death were similar. The frequency whereby rapid test for HIV was performed during the antenatal period was no different during the two review periods. An important message to be heeded is that knowledge of HIV status as early as possible during the antenatal period is a crucial factor in improving the prognosis of HIV infected pregnant women. Instituition of START (Short Term Antiretroviral Therapy) and providing PCP prophylaxsis when indicated to be used is peripartum so as to reduce maternal to child transmission of HIV.

13.4 Conclusion

HIV related deaths are preventable as prevention of opportunistic infections will prevent deaths. Furthermore, there are available effective therapies if infections are detected early and treated. There are medicines for controlling HIV infection and for curing pneumonia, tuberculosis, cerebral toxoplasmosis and herpes infection. HIV situation in Malaysia does not seem to be on the decline, it is anticipated that more HIV infected pregnant women will be encountered in our antenatal facilities.

13.5 Recommendations

Issue	Recommendation
Early detection of HIV status	A proper social history should be undertaken. High index of suspicion mothers with a history of multiple marriages and ex-wife of high risk behaviour husbands.
Reliable HIV screening test	HIV screening tests must be reliable and validated from time to time for its sensitivity. If rapid test was non- reactive other method of tests should be performed for patients with a strong clinical suspicion.
Expansion of screening population at risk	HIV tests should be performed on a routine basis in patients with signs to indicated HIV associated conditions other than usual opportunistic infections such as abortions, poor weight gain, severe pneumonia and septicaemia .
Guideline on Management of HIV in Pregnancy	To ensure the implementation of the existing guideline

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CHAPTER 14

IMMIGRANT MOTHERS

Summary

Immigrant deaths contribute to between 25 to 30 per cent of all maternal deaths in Malaysia. As the number of deaths among citizens continues to decline, the percentage of these immigrant deaths increase every year. Majority of these deaths (75%) occur in Sabah and these mothers who die are from the Philippines and Indonesia. Most of them are housewives who follow their husbands illegally to this country. They have little or no education and many are delivered at home by untrained birth attendants. They usually have a few or no antenatal care and present late to the hospital when complications occur. When these mothers present they are usually very ill and use up much of the health resources and yet have poor outcomes.

14.1 Introduction

The issue of the immigrant population continues to plague the nation. Our continued reliance on immigrant workers especially for the plantation, manufacturing, construction and service industries is obvious and while attempt have been made to address the problem, it still continues on unabated. Making the employer responsible for the health care of their immigrant employees through insurance schemes have reduced some of the issues arising from health problems associated with these immigrant workers however this still does not address health issues associated with those who are illegally employed or who are unemployed.

This constant problem with influx of illegal immigrants continues and their numbers are unknown. Their health problems continue to present challenges to our health care system and our health finances. They have little or no preventive care and usually present late and in a very ill condition. When they do come to our health facilities, they use up a lot of our health resources.

Health problems with illegal immigrants are probably the most challenging in Sabah, due to its close proximity with the Philippines and Indonesia and with a very long coastline and border, there is much difficulty in controlling their influx into the state. In addition, the immigrant workers who come to this state will usually bring their families with them, unlike those workers in the Peninsular. Thus in Sabah, pregnancies and deliveries among the immigrant population has become a big issue. Majority of these immigrant workers are from Indonesia, Philippines, Myanmar, Bangladesh, India, Pakistan and China.

While maternal deaths among immigrant mothers are captured by our confidential enquiry system, the actual number of deliveries from this cohort is unknown. These deliveries may not be registered with the National Registration Department and are

thus not fully captured by the National Census. However in some states, statistics of births from immigrant mothers are captured. In Sabah, the state health department aggressively collects data on immigrant deliveries from deliveries at home, at government facilities as well as in private facilities. With this data available, calculation of MMR for the state is possible and will give a much greater reflection of the problem.

While deaths from immigrant mothers who have no legal documents are not taken into account when calculating the National MMR, the National CEMD committee continues to investigate their deaths as well as to make recommendations that will hopefully have some impact on reduction of maternal deaths.

14.2 Analysis

The number of deaths among immigrant mothers over the years reported are true numbers. As the denominator for the number of immigrant deliveries are not known, the Maternal Mortality Ratios cannot be calculated. While there has been a gradual decline in the number of maternal deaths among citizens, the number of deaths among immigrant mothers has remained relatively constant. Generally there are 30 to 40 deaths a year and they contribute to about 10% to 15% of all our maternal deaths (Table 14.1).

Table 14.1: Number of immigrant maternal deaths by citizenship status, 1995 - 2008

Year	95	96	97	98	99	00	01	02	03	04	05	06	07	08
Numbers of maternal deaths in non citizens - without documents	39	40	33	49	46	32	50	24	36	42	45	35	28	39
Number of maternal deaths - citizens and non citizens with documents	212	180	158	182	168	146	170	131	122	123	125	128	138	130

Majority of the problem lies with immigrants without valid document in the state of Sabah. This trend has been persistent over the past 2 decades. Deaths of these mothers in Sabah account for up to 75% of all immigrant maternal deaths. This is not unexpected looking at the large number of immigrants in the State.

Detailed delivery census of the immigrant population is available from the Sabah State Health Department and using available data, the MMR for this cohort of Mothers will be discussed at the end of this chapter (Table 14.2)

Table 14.2 : Maternal deaths by states among immigrants

States	97	98	99	00	01	02	03	04	05	06	07	08
Perlis	0	0	0	0	0	0	0	0	0	1	0	0
Kedah	0	0	2	1	1	0	1	1	1	0	0	0
P. Pinang	0	0	0	0	0	0	1	2	0	1	1	0
Perak	0	1	0	0	0	0	1	1	0	1	1	1
Selangor	4	2	3	2	0	0	1	4	9	6	0	1
F.T KL	0	2	0	0	0	1	1	1	1	0	0	1
Melaka	0	1	1	0	0	0	0	0	1	0	0	0
N. Sembilan	0	0	0	0	1	0	0	0	0	1	0	1
Johor	0	1	3	3	4	1	1	2	0	0	1	4
Pahang	1	0	2	1	1	0	1	1	1	1	0	0
Terengganu	0	0	0	0	0	1	0	0	0	0	0	0
Kelantan	2	1	1	1	2	1	0	1	0	1	0	0
Sabah	26	38	33	23	41	20	28	28	30	22	23	31
Sarawak	0	3	1	1	0	0	1	1	2	1	1	0
Total	33	49	46	32	50	24	36	42	45	35	28	39

i. Cause of death

Table 14.3: Cause of maternal deaths in immigrants

Causes	2006	2007	2008
PPH	8	7	9
Obstetric trauma	2	1	4
Puerperal sepsis	1	1	1
Hypertensive Disorders in Pregnancy	3	8	8
Others	21	11	17
Total	**35**	**28**	**39**

As with the previous years, the main cause of death among immigrant mothers is from postpartum Hemorrhage (PPH). PPH together with obstetric trauma accounts for about 30% of all the deaths. While deaths from PPH and obstetric trauma have decreased significantly among the citizens, this trend however, is not seen with the immigrant mothers. The higher rates of PPH are strongly associated with the higher home delivery rates and delivery by untrained birth attendants. The other causes are from Hypertensive Disorders in Pregnancy. Many of these mothers present late with eclampsia and usually by the time they present, there is already significant morbidity requiring intensive care.

ii. Patient Profile

The following describes the patient characteristics of maternal deaths in immigrants. Since the denominator of the group is not known it is difficult to analyze further to determine if any specific profile contributes to higher risks for the mother.

a. Age

Majority of the mothers who died were from the age group of 25 to 35 years. This is consistent with the group that has the highest child bearing rates (Table 14.4).

It is interesting to note that there were 12 maternal deaths among mothers who are age 19 years and below. Looking at data from maternal deaths from citizens, there were only 13 deaths among mothers age 19 years and below despite a larger population base. This may suggest a higher teenage pregnancy rate among the immigrants with corresponding higher rates of death.

Table 14.4: Maternal deaths in immigrants by age group

Age (years)	2006		2007		2008	
	n	%	n	%	n	%
<19	4	11.4	2	7.1	6	15.4
20-24	4	11.4	3	10.7	9	23.1
25-29	7	20.0	6	21.4	13	33.3
30-34	10	28.6	10	35.7	3	7.7
35-39	5	14.3	5	17.9	6	15.4
40-44	5	14.3	2	7.1	1	2.6
>45	0	0	0	0	1	2.6
Total	**35**	**100.0**	**28**	**100.0**	**39**	**100.0**

b. Parity

Majority of mothers who die are between parity 1 – 5. Approximately a quarter of all mothers who die are grandmultipara (Table 14.5). No conclusion can be drawn as the number and parity of immigrant births are not known..

Table 14.5: Maternal deaths in immigrants by parity

Parity	2006		2007		2008	
	n	%	n	%	n	%
0	3	8.6	2	7.1	9	23.1
1-5	25	71.4	14	50.0	23	59.0
6 and above	7	20.0	11	39.3	5	12.8
Total	**35**	**100**	**28**	**100**	**39**	**100**

c. Education level

As many of these mothers are illegals, it is not unexpected that they have little or no formal education (Table 14.6).

Table 14.6: Maternal deaths in immigrants by educational level

Educational Level	2006	2007	2008
Never attended school	14	15	16
Primary School	9	5	10
Secondary School (Up to Form 3)	4	2	4
Secondary School (Up to Form 5)	3	4	1
No information	5	2	8
Total	**35**	**28**	**39**

d. Occupation

Majority of these immigrant mothers who died are housewives (Table 14.7).. They are women who have come with their children to accompany their husbands who are working in this country. This confirms the fact that many of them are not covered by employers insurance and may be in the country illegally.

Table 14.7: Maternal deaths in immigrants by occupational group

Occupation	2006	2007	2008
Housewives	27	25	30
Clerical	1	0	0
Sales & Services	3	2	5
No Information	4	1	4
Total	**35**	**28**	**39**

e. Stage of Pregnancy

Majority of mothers (54%) died in the postpartum period (Table 14.8). It is interesting to note however that the numbers of mothers who die in the antenatal period (29%) seems slightly higher than what is seen among our local mothers (between 15% to 20%). This may be due to the absence of antenatal care as majority of these mothers are unbooked. It is also interesting to note that 8 mothers died following a miscarriage. Majority of these post abortal deaths were associated with sepsis or other infections. As histories were incomplete, we could not ascertain if any of these deaths were following a termination of pregnancy.

Table 14.8: Maternal deaths in immigrants in stage of pregnancy

Stage of pregnancy	2006	2007	2008
Antenatal	9	10	10
Intrapartum	2	3	5
Postpartum	16	15	24
Abortion	8	0	0
TOTAL	**35**	**28**	**39**

f. Place and mode of delivery

There is an unusually high number of home deliveries among these mothers who died (Table 14.9). They account for about 44% of the mothers who die in the postpartum period. This is not unexpected as the trend among immigrant mothers favoring a home delivery has been the same from year to year.

Table 14.9: Maternal deaths in immigrants by place of delivery

Place of Delivery	2006	2007	2008
State Hospital	1	4	2
Hospital With O&G Specialist	4	3	5
Hospital Without O&G Specialist	0	1	3
Private Hospital With Specialist	3	0	1
Other Hospitals	0	1	2
Home	9	7	11
Enroute	1	0	1
Other	0	0	1
No Information	0	0	1
Total	**18**	**16**	**27**

Most of these mothers had a vaginal birth, some attempted a vaginal birth at home but due to prolonged labour or an obstructed labour they subsequently had an assisted delivery or a caesarean section (Table 14.10). Frequently in such cases the perinatal outcome was poor and the mother was already very ill when the assisted delivery or caesarean section was done.

Table 14.10: Maternal deaths in immigrants by mode ofdelivery

Mode of Delivery	2006	2007	2008
Vaginal Delivery	14	9	23
Forceps	1	0	2
Breech	0	1	0
Twins	0	3	0
Caeserean	2	3	1
Abortive outcome	8	0	0
No imformation	0	0	1
Total	**25**	**16**	**27**

g. Accouccheur

Many of the mothers were delivered by untrained birth attendants and this probably accounts for the large number of cases of obstetric trauma (Table 14.11), There is a real need address this situation if we hope to reduce the number of deaths among these mothers. The preference for traditional birth attendants could be from several factors which include familiarity of these birth attendants to cultures and customs of the immigrant mothers, fear of going to hospital because of immigration issues and also because of the higher costs levied on these immigrant mothers at government facilities.

Table 14.11: Maternal deaths in immigrants by Accoucheur

Accoucheur	2006	2007	2008
O&G Specialist	3	2	2
Medical Officer <6 months experience	0	0	2
Medical Officer >6 months experience	1	5	3
Medical officer with no O&G experience	0	1	2
Staff Nurse	3	0	0
Midwives/ Community Nurse	0	1	3
Traditional Birth Attendant	4	4	7
Unattended	4	0	1
Others	2	3	6
No Information	0	0	1
Total	**17**	**16**	**27**

h. Place of Death

Majority of the mothers who died, died in a government hospital setting suggesting that many of those who delivered at home or at private facilities managed to be referred to a government hospital before they died (Table 14.12).

Table 14.12: Maternal deaths in immigrants by place of death

Place of Death	2006	2007	2008
State Hospital	8	9	7
Hospital With O&G Specialist	11	8	17
Hospital Without O&G Specialist	3	5	5
Private hospital with specialist	2	0	0
Home	7	4	5
Enroute	4	2	2
Others	0	0	3
Total	**35**	**28**	**39**

14.3 Case illustrations

Case 1

A 19 years old Indonesian, primigravida complaint of headache for a few days and then fitted at home. She was brought in to the nearest community clinic and fitted again there. Her BP was 180/100mmHg and IV valium was given by the community health nurse upon instructions given by medical officer via phone.

Patient was transferred to the nearest health centre about half an hour later. BP on arrival was 210/130mmHg, Pulse rate was 110bpm and she was febrile 38.5C. Magnesium sulphate loading dose given intramuscularly and oral adalat given via R/ tube. Patient remained restless and the BP remained high 180/120 mmHg throughout the journey to district hospital arriving at 1250hrs. She arrived at the labour room in the district hospital in a collapsed state and succumbed to death about an hour later.

Case 2

This mother was a 25 year old Ubian lady. She had a spontaneous vaginal delivery at home attended by traditional birth attendant. She had retained placenta and was brought to the hospital with hypovolemic shock with unrecordable BP and pulse. She was intubated and CPR given. Her BP unrecorded 15 minutes later 84/40mmHg and pulse 84bpm. The placenta was removed and the uterus was atonic. Oxytocin and haemabate was given The haemoglobin was 2.2gm%. Two units of whole blood and DIVC products were transfused. Exploratomy laparatomy with hysterectomy and bilateral internal artery ligation was done and total blood loss during the operation was 3500ml. Abdominal pack was left in situ to control the bleeding and she was nursed in the ICU postoperatively. The pack removal was done on the 3rd postoperative day. Her condition however didn't improve and she succumbed to death due to multiorgan failure.

MATERNAL DEATHS IN IMMIGRANTS IN SABAH

Constant influx of immigrant workers from neighboring countries remains a challenge to our healthcare system. The exact number of immigrant population in this country, including the obstetrics statistics of immigrant mothers, is unclear. Nevertheless, Sabah State Health Department has continued to maintain the statistics of immigrant deliveries, which allowed analysis into immigrant maternal death to a certain extent.

For the years 2006-2008, immigrant mothers made up about a quarter of total deliveries in Sabah, which showed a 3% drop as compared to 28% for the preceding 5 years (2001-2005) (Malaysian MOH, 2008. CEMD Report for 2001-2005). However, they contributed close to 70% of maternal deaths for the years 2006-2008, which was a 3% rise compared to preceding 5 years, i.e. 67% for 2001-2005. This could reflect the worsening of immigrant obstetrics health or an improvement among the citizen obstetrics health outcome. Even though the immigrant maternal deaths were not included in the calculation of national maternal mortality ratio, the immensity of this issue cannot be taken lightly (Table 14.13).

Table 14.13: Maternal deaths in immigrants

Sabah	2006	2007	2008	Total	2001-2005
Total live births	50,387	51,113	54,104	155,604	269,884
Live births (citizen)	37,275 (74.0%)	38,419 (75.2%)	40,287 (74.5%)	115,981	194,426 (72%)
Maternal deaths (citizen)	8	12	13	33	72 (32.9%)
MMR (citizen)	**21.5**	**31.2**	**32.3**	**28.4**	**37.0**
Live births (non citizen)	13,112 (26.0%)	12,694 (24.8%)	13,817 (25.5%)	39,623	75,458 (28%)
Maternal deaths (non citizen)	22	24	27	73 (68.9%)	147 (67.1)
MMR (non citizen)	**167.8**	**189.1**	**195.4**	**184.2**	**194.8**

Immigrant mother had 6 times higher risk of dying from complications of pregnancy/ childbirth as compared to citizens in Sabah. Consequently, immigrant mothers continued to use up a huge proportion of our healthcare resources, in particular the emergency services and intensive care. This invariably put a strain on our healthcare system.

The immigrant maternal deaths in Sabah for the years 2006-2008 continued to show increasing trend, i.e. 22, 24 and 27 respectively, totaling 73 for that 3 years. This constituted close to seventy percent of maternal deaths (68.9%) for the state of Sabah. In terms of MMR, the immigrant figures were 167.78, 189.06 and 195.41 respectively for that 3-year period. This gave rise to immigrant / non citizen MMR of 184.23, as compared

to citizen MMR of 28.45. Though this high ratio may be closer to the MMR of certain region in their countries of origin (Indonesia 420, Philippines 230 respectively for the year 2005) (WHO, 2007), this still meant that the immigrant mothers had higher risk of dying because of being pregnant when compared to citizen in Sabah.

However, to enable a more practical analysis, the data collection should further differentiate the immigrants mother with legal paper from those without, as the former is presumed to be more willing and forth coming in receiving healthcare, whereas the latter is unlikely to access healthcare service unless in dire situation or moribund state due to their illegal entry into the country.

The higher MMR among immigrant mothers are thought to be multifactorial, including lower socioeconomic status, in-accessible to or unwilling to access healthcare, delivery by un-trained personnel including home delivery, fear of repatriation by the authority, ignorance and low awareness. They therefore appeared to be marginalized from the mainstream society.

It is also a fact that the paperless immigrant mothers are more inclined to seek medical attention including antenatal care, from private health sector especially the general practitioners. It is therefore important that the private sector doctors / general practitioners keep abreast of current obstetrics management to enable early recognition of antenatal complications. A constant and effective communication channel between them and the main obstetric service provider in the government hospital is essential to facilitate communication and allow timely referral when the need arises. Similarly, provision of guidelines to include private health sector could be a positive step towards establishing good working relationship between the 2 divides as well as a form of continuous medical education (CME). One such example is the Sabah Obstetrics Shared Care Guidelines (SOSCG) which serves as a link between the primary care in the clinics and tertiary care in the hospital.

Unfortunately, due to lack of statistics on immigrant population in other states of Malaysia, there could not be any meaningful comparison nor analysis. Certainly, Sabah immigrant maternal deaths do not reflect the situation in the other states. It would be most informative to have similar data from other states, especially in those states with substantial immigrant maternal deaths such as Selangor and Johor, so that further analysis could be carried out to study the various contributing factors, different patterns if any, as well as to compare the immigrant mothers obstetrics statistics in these states.

14.4 Discussion

The maternal mortality ratio of immigrant mothers remain extremely high and is between 5 to 6 times higher than that of local mothers. Many of these mothers are in the country illegally and do not seek antenatal care. They frequently use the services of untrained birth attendants at delivery and complications in pregnancy, during delivery and in the post partum period are not detected until they cause significant morbidity to the mother.

They usually then present late and in very ill condition. Because of this they continue to use up a lot of health resources such as ICU care, blood products, drugs as well as operative

facilities. The high number of illegals in Sabah especially needs to be addressed, The following are some of the recommendations that should be considered.

14.5 Recommendations

14.5.1 Data collection

- Better data collection and analysis such as to include immigrant with/ without legal paper;
- Data collection on immigrant mothers to be extended to entire Malaysia to facilitate comparison between states.

14.5.2 Cooperation between public /private health sectors, and between primary / tertiary care

- Close working relationship, good communication channel
- Provision of relevant local guidelines to include private health sector.

14.5.3 Measures to encourage immigrant mother to seek antenatal care

- Reduction / waiver of fees at antenatal visit, especially for those high risk pregnancy which require frequent follow up at hospital.

CHAPTER 15

MATERNAL DEATHS IN INDIGENOUS PEOPLE

15.1 Introduction

Malaysia is a multi racial society that comprises many ethnic groups. In 2008, the population distribution (citizens) by ethnic group showed Malays constitute 54.3% of the population, Chinese 25%, Other Bumiputera (Indigenous) 11.9%, Indian 7.5% and Others 1.3%.

In Peninsular Malaysia, the Other Bumiputera are known as Orang Asli. Population census for the year 2004 by the Department of Orang Asli Affairs (JHEOA), showed that there were 149,723 Orang Asli, representing 0.6 per cent of the national population. They are classified into 3 main sub-ethnics of Proto-Malay, Senoi and Negrito.

In Sabah, there are about 32 ethnics of Other Bumiputera and mainly are the Kadazandusun, Bajau, Murut and the rest are addressed as Other Sabahan Bumiputera. While in Sarawak, there are about 26 distinct ethnic communities and most common are the Iban, Bidayuh, Melanau and the others are grouped as Other Bumiputera of Sarawak.

In this chapter Other Bumiputera will be referred as the Orang Asli and the Bumiputera of Sabah and Sarawak (S/S). Other Bumiputera recorded the second highest percentage of deaths (after Malay) at 15.2%.

15.1 Analysis

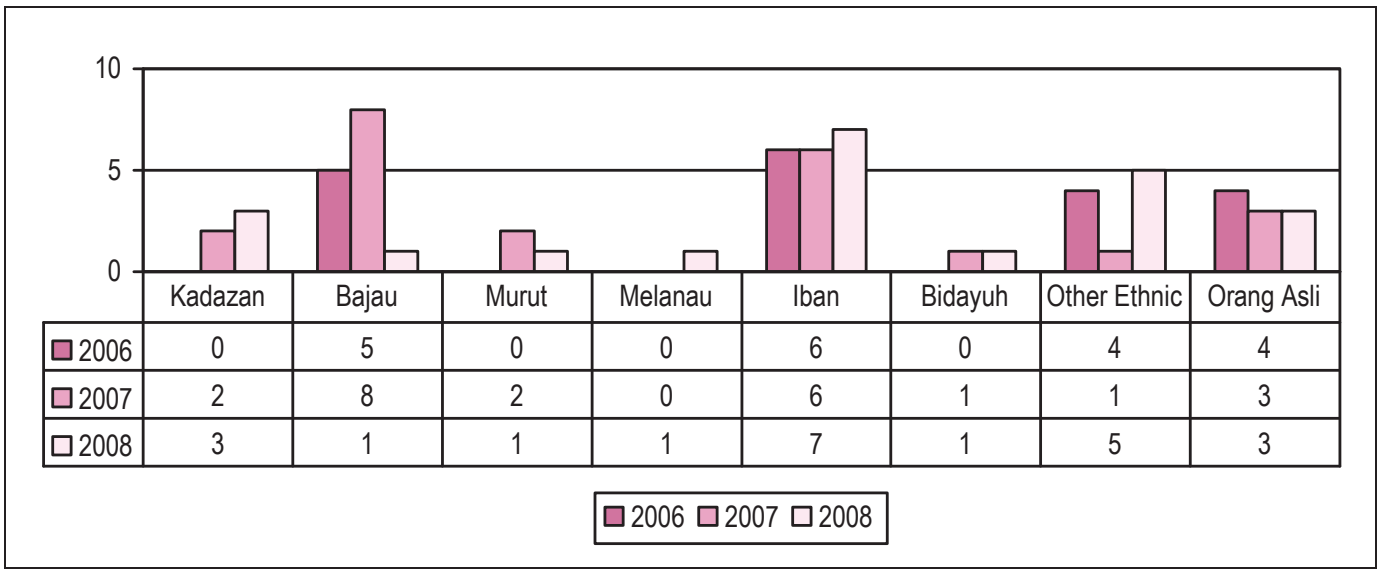
15.5.1 Trend, classification and causes of maternal deaths

In 2006, there were 19 (15%) maternal deaths reported among the Other Bumiputera which increased to 23 (16.9%) in 2007 and reduced to 22 (16.5%) in 2008. Over the three years, the trend according to specific ethnicity showed that maternal deaths was high among Iban with 6 deaths in 2006 and in 2007, and increased to 7 in 2008, while Bajau showed an outstanding increase from 5 deaths in 2006 to 8 in 2007, however reduced to 1 death in 2008. While maternal deaths in Orang Asli were 4 in 2006 and reduced to 3 deaths in 2007 and 2008 (Table 15.1) and (Fig.15.1).

Table 15.1: Maternal deaths by ethnic group

Ethnic group	2006		2007		2008	
	n	%	n	%	n	%
Malay	68	53.1	78	57.4	73	54.8
Chinese	14	11.7	11	8.1	10	7.5
Indians	13	10.2	7	5.2	10	7.5
Kadazandusun	0	0	2	1.4	3	2.3
Bajau	5	3.9	8	5.9	1	0.8
Murut	0	0	2	1.5	1	0.8
Melanau	0	0	0	0	1	0.8
Iban	6	4.7	6	4.4	7	5.2
Bidayau	0	0	1	0.7	1	0.8
Orang asli P. Msia	4	3.1	3	2.2	3	2.3
Other ethnic groups Sabah/ Sarawak	4	3.1	1	0.7	5	3.7
Others	13	10.2	17	12.5	18	13.5
Total	**127**	**100.0**	**136**	**100.0**	**133**	**100.0**

Fig. 15.1: Number of maternal deaths in the Other Bumiputera



In this report, we are able to analyse ethnic-specific maternal mortality ratio for 2006 and 2007. It is noted that the risk of mortality was highest among the Bajau (101.84 per 100,000 live births) followed by the Murut (100.4 per 100,000 live births) and Orang Asli (85.21 per 100,000). While the risk of maternal mortality among the Bidayuh and Kadazandusun are similar to the general population (Table 15.2)

Table 15.2: Ethnic specific MMR

Ethnic group	2006			2007			2008		
	n	LB	MMR	n	LB	MMR	n	LB	MMR
Kadazandusun	0	9,801	0	2	9,964	20.1	3	10,815	27.7
Bajau	5	7,168	69.7	8	7,855	101.8	1	8,356	11.9
Murut	0	1,928	0	2	1,992	100.4	1	2,082	48.0
Melanau	0	2,694	0	0	2,724	0	1	2,828	35.3
Iban	6	12,486	48.0	6	11,949	50.2	7	12,397	56.4
Bidayau	0	3,369	0	1	3,349	29.9	1	3,405	29.3
Orang asli Pen. Malaysia	4	4,694	85.2	3	4,643	64.6	3		

Classification and cause

From 2006 to 2008, the majority of maternal deaths (79.2%) were mainly due to direct causes (Table 15.3). The direct causes identified in the Bumiputera of Sabah and Sarawak were hypertensive disorders in pregnancy, PPH, obstetric embolism and heart diseases in pregnancy, whereas PPH and heart diseases in pregnancy were common causes in the Orang Asli (Table 15.4).

Table 15.3: Classification of maternal deaths in Other Bumiputera

Classification	2006		2007		2008		TOTAL	
	Other Bumi S/S n = 15	Orang Asli n = 4	Other Bumi S/S n = 20	Orang Asli n = 3	Other Bumi S/S n = 19	Orang Asli n = 3	Other Bumi S/S n = 54	Orang Asli n = 10
Direct	11	2	17	2	15	3	**43**	**7**
Indirect	4	2	3	1	4	-	**11**	**3**
Total	**15**	**4**	**20**	**3**	**19**	**3**	**54**	**10**

Table 15.4 Cause of maternal deaths in Other Bumiputera

Causes	2006		2007		2008		TOTAL	
	Other Bumi S/S (15)	Orang Asli (4)	Other Bumi S/S (20)	Orang Asli (3)	Other Bumi S/S (19)	Orang Asli (3)	Other Bumi S/S (54)	Orang Asli (10)
Postpartum haemorrhage	1	2	4	1	4	3	**9**	**6**
Hypertensive disorders in pregnancy	4	0	7	0	3	0	**14**	**0**
Obstetric embolism	1	0	3	1	4	0	**8**	**1**
Heart disease in pregnancy	3	2	3	1	1	0	**7**	**3**
Obstetric trauma	1	0	0	0	0	0	**1**	**0**
Pueperal sepsis	0	0	0	0	1	0	**1**	**0**
Placenta praevia	1	0	0	0	0	0	**1**	**0**
Septicaemia	1	0	0	0	1	0	**2**	**0**
Abortion/ Ectopic/ Molar	1	0	3	0	1	0	**5**	**0**

Causes	2006		2007		2008		TOTAL	
	Other Bumi S/S (15)	Orang Asli (4)	Other Bumi S/S (20)	Orang Asli (3)	Other Bumi S/S (19)	Orang Asli (3)	Other Bumi S/S (54)	Orang Asli (10)
Chorioamnionitis	1	0	0	0	0	0	**1**	**0**
SLE	0	0	0	0	1	0	**1**	**0**
Unspecified	1	0	0	0	3	0	**4**	**0**
TOTAL	**15**	**4**	**20**	**3**	**19**	**3**	**54**	**10**

15.2.2 Patient's profile

Majority of these mothers were in the low risk age group of 20-34 (57.8%) and followed with the above 35 age groups (35.9%). They were also in the low risk parity of (1-5)(68.7%) and more than 80% were housewives (Table 15.4). Most of the Bumiputera in Sabah and Sarawak (81%) had formal education, in contrary to 60% of Orang Asli who had no formal education. 35% of the Bumiputera Sabah and Sarawak (S&S) and 90% of the Orang Asli lived more than 20km from the nearest hospital. 55% of the Bumiputera Sabah and Sarawak and 70% of Orang Asli never practiced any form of family planning.

Table 15.4 Maternal profile in the Other Bumiputera

Patients profile	2006		2007		2008		TOTAL	
	Other Bumi S/S n = 15	Orang Asli n = 4	Other Bumi S/S n = 20	Orang Asli n = 5	Other Bumi S/S n = 19	Orang Asli n = 3	Other Bumi S/S n = 54	Orang Asli n = 10
Age (years)								
<19	2	0	1	0	1	0	**4**	**0**
20-34	10	2	10	2	11	2	**31**	**6**
>35	3	2	9	1	7	1	**19**	**4**
Marital status								
Married	15	4	17	3	19	3	**51**	**10**
Unmarried	0	0	2	0	0	0	**2**	**0**
Unknown	0	0	1	0	0	0	**1**	**0**
Parity								
0	1	0	3	0	1	0	**5**	**0**
1-5	12	1	15	1	14	1	**41**	**3**
6 and above	2	3	2	2	2	2	**6**	**7**
Unknown	0	0	0	0	2	0	**2**	**0**
Level of education								
No formal education	2	4	5	0	3	2	**10**	**6**
Primary School	6	0	5	2	5	1	**16**	**3**
Lower Secondary	4	0	2	1	2	0	**8**	**1**
Upper Secondary	3	0	5	0	7	0	**15**	**0**
No information	0	0	3	0	2	0	**5**	**0**

Patients profile	2006		2007		2008		TOTAL	
	Other Bumi S/S n = 15	Orang Asli n = 4	Other Bumi S/S n = 20	Orang Asli n = 5	Other Bumi S/S n = 19	Orang Asli n = 3	Other Bumi S/S n = 54	Orang Asli n = 10
Occupation								
Housewives	12	4	14	3	17	3	**43**	**10**
Agriculture & Production	0	0	1	0	0	0	**1**	**0**
Sales & Service	2	0	0	0	2	0	**4**	**0**
Clerical	0	0	1	0	0	0	**1**	**0**
Administrative	0	0	1	0	0	0	**1**	**0**
Unemployed	1	0	1	0	0	0	**2**	**0**
No Information	0	0	2	0	0	0	**2**	**0**
Distance from nearest hospital								
0-10	0	0	8	0	5	0	**13**	**0**
11-20	1	0	1	1	4	0	**6**	**1**
>20	7	4	6	2	6	3	**19**	**9**
Unknown	7	0	5	0	4	0	**16**	**0**
Family Planning Practices								
Ever user	4	0	5	1	4	2	**13**	**3**
None user	8	4	9	2	13	1	**30**	**7**
Unknown	3	0	6	0	2	0	**11**	**0**

15.2.3 Delivery characteristics

34% of these cases were identified as high risk pregnancies and were tagged yellow and red, while 29% had no information regarding their risk status. Most of the deaths 43 (67%) occurred in the postnatal period (Table 15.5). 32 (50%) of the deliveries were conducted in the hospitals while 11 (17%) cases were delivered at home or en route. Most of the cases were delivered vaginally 32 (50%) followed by caesarean 10 (15%). 19 (29.7%) of the deliveries that occurred in the Other Bumiputera were unsafe deliveries i.e. conducted by Traditional birth attendants, others, unknown person or unattended. 15 (23.4%) of the deaths occurred outside hospital facilities.

Table 15.5: Maternal deaths by delivery characteristics in the Other Bumiputera

Delivery Characteristics	2006		2007		2008		TOTAL	
	Other Bumi (S/S) n = 15	Orang Asli n = 4	Other Bumi (S/S) n = 20	Orang Asli n = 3	Other Bumi (S/S) n = 19	Orang Asli n = 3	Other Bumi (S/S) n = 54	Orang Asli n = 10
Color Coding								
Red	1	2	1	0	1	1	**3**	**3**
Yellow	7	0	6	0	3	0	**16**	0
Green	3	1	7	2	6	1	**16**	**4**
White	1	0	0	0	2	0	**3**	0
No information	3	1	6	1	7	1	**16**	**3**
Stage of pregnancy								
Antenatal	0	0	5	0	5	0	**10**	**0**
Intrapartum	4	0	2	0	2	2	**8**	**2**
Postpartum	11	4	12	3	12	1	**35**	**8**
Abortion	0	0	0	0	0	0	**1**	**0**
Place of Delivery								
State hospital	3	1	6	1	1	0	**10**	**2**
Hospital with O&G	5	0	2	0	3	2	**10**	**2**
Hospital without O&G	2	0	0	1	3	1	**5**	**2**
Other hospital	0	0	0	0	1	0	**1**	**0**
Home	2	1	1	1	3	0	**6**	**2**
Enroute	0	1	1	0	1	0	**2**	**1**
Others	1	0	1	0	1	0	**3**	
No Information	2	1	1	0	1	0	**3**	**1**
Mode of Delivery								
Vaginal	6	3	7	2	11	3	**24**	**8**
Forceps	2	0	0	0	0	0	**2**	**0**
Vacuum	2	0	0	0	0	0	**2**	**0**
Breech	0	0	0	1	0	0	**0**	**1**
Caesarean	4	0	4	0	2	0	**10**	**0**
Twins	0	1	0	0	0	0	**0**	**1**
Abortion	0	1	1	0	0	0	**1**	**0**
No Information	0	1	1	0	1	0	**2**	**0**
Accoucheur								
Obstetrician	4	1	0	1	1	0	**5**	**2**
MO <6 months experi.	1	1	2	0	0	0	**2**	**0**
MO >6 months experi.	4	1	3	0	2	0	**9**	**0**
Staff nurse	2	1	3	0	2	1	**7**	**1**
Midwife	1	1	1	1	2	0	**3**	**1**
TBA	1	1	0	0	1	1	**2**	**1**
Unattended	0	0	1	1	2	1	**3**	**2**
Others	2	2	1	0	3	0	**6**	**2**
Unknown	1	0	1	0	1	0	**3**	**0**
Place of death								
State hospital	5	2	9	2	5	0	**19**	**4**
Hospital with O&G	5	1	4	0	7	0	**16**	**1**

Delivery Characteristics	2006		2007		2008		TOTAL	
	Other Bumi (S/S) n = 15	Orang Asli n = 4	Other Bumi (S/S) n = 20	Orang Asli n = 3	Other Bumi (S/S) n = 19	Orang Asli n = 3	Other Bumi (S/S) n = 54	Orang Asli n = 10
Hospital without O&G	1	1	4	0	3	0	**8**	**1**
Home	0	0	1	1	1	1	**2**	**2**
Enroute	4	0	2	0	2	2	**8**	**2**
Others	0	0	0	0	1	0	**1**	**0**

15.3 Conclusion

Maternal mortality among the Other Bumiputera showed a fluctuating trend over the 3 year period. However special attention should be given to the Iban where the trend of maternal deaths appears to be increasing. Emphasis should be given on family planning practices not only to the mother also to her spouse. Geographical barriers and difficulties in building static health clinics in low populated ethnic minority groups are some problems encountered by the Other Bumiputera. Establishing temporary home, early admission into healthcare facility and availability of transport to send patients to the nearest hospital for deliveries are some solutions to reduce maternal mortality in the Other Bumiputera groups.

15.4 References

i. Vital Statistics Malaysia Special Edition (2001-2006).Department of Statistics Malaysia.

ii. Report on the Confidential Enquiries into Maternal Deaths in Malaysia, 2001-2005.Ministry of Health Malaysia.

CHAPTER 16

DEATHS IN PREGNANCY RELATED TO INJURIES

Summary

There were 8 deaths in pregnancy, related to injuries which include suicide, burns, poisoning, electrocution and drowning for the period of 2006 – 2008. These contributed to 2.9% of fortuitous death of the same period. As compared to the previous report on the Confidential Enquiries into Maternal Deaths in Malaysia of 2001 to 2005 where majority of the cases were related to suicide (17 out of 20 cases), only 50% were related to suicide (4 out of 8 cases). This may due to better recognition of women at risk of psychiatric illness, depression and postpartum psychosis as recommended in previous report.

16.1 Introduction

The CEMD committee has scrutinized this group separately since CEMD Report of 1997 to 2000. Literature reveals that 1%- 2.4% of women admitted for suicide was pregnant.

16.2 Analysis

There were a total of 670 pregnancy related deaths for 2006-2008, in which 274 (40.9%) were fortuitous deaths. Deaths from injuries only contributed to 2.9% of fortuitous deaths. As compared to the previous CEMD report (200-2005), where majority of case had committed suicide, in this report there is a wider range of cause of deaths due to injuries.

4 women had committed suicide by poisoning, burn and hanging. Only one women had a definitive history of psychiatric illness i.e. schizophrenia while any pre-existing illness of the other women is unknown. The risk of becoming depressed during pregnancy of postpartum period is higher than at any other point in a woman's life.

The profile of pregnancy related deaths from injuries are analyzed from Table 16.1-Table 16.6.

Table 16.1: Number of deaths in pregnancy related to injuries

Year	2006	2007	2008
Number of cases	1	5	2

Table 16.2: Deaths in pregnancy from type of injuries

Causes	2006	2007	2008
Suicide - unspecifed	1	0	0
Hanging	0	0	1
Burns – unspecified degree	0	1	1
Poisoning	0	1	0
Electrocution	0	1	0
Assault (homicide)	0	1	0
Drowning	0	1	0
Total	**1**	**5**	**2**

Table 16.3: Demographic profile of deaths in pregnancy related to injuries

Demography	2006 n=1	2007 n=5	2008 n=2
Ethnic group			
Malay	1	4	1
Indian	0	1	0
Other	0	0	1
Age			
<19	0	1	0
20 – 24	0	2	0
25 – 29	1	0	2
30 – 34	0	1	0
35 - 39	0	1	0
Parity			
0	0	1	1
1 – 5	1	3	1
6 and above	0	1	0
Education level			
Never attended school	0	0	1
Primary School	0	4	0
Secondary (Till Form 5)	1	1	0
Tertiary Education	0	0	1
Marital Status			
Yes	1	4	2
No	0	1	0
Occupation			
Housewife	1	3	1
Clerical	0	0	1
Sales & Services	0	1	0
Unemployed	0	1	0

Table 16.4: Obstetric profile of deaths in pregnancy related to injuries

Obstetric profile	2006	2007	2008
Period of death			
Antepartum	1	3	1
Postpartum	0	2	1
Total	*1*	*5*	*2*
Mode of Delivery			
Vaginal Delivery	0	0	1
CaesareanSection	0	1	0
Unknown	0	1	0
Total	*0*	*2*	*1*
Place of Death			
State Hospital	0	3	1
Hospital with O & G	1	0	0
Other Hospital	0	0	1
Home	0	2	0
Total	*1*	*5*	*2*

10.3 Discussion

There was one single, unmarried woman in this series and she had committed suicide by ingesting endosulfan. Hence, social and psychological support including counseling for single mother during pregnancy is important to prevent such death.

There were 3 other unfortunate deaths in this series; one woman was a 23 years old primigravida at 32 weeks of gestation who was found murdered along with her husband in their rented house. Another case was a 35 years old Gravida 5 Para 4 who died from electrocution at home at around 18 weeks of gestation. The third case was a 22 years old Gravida 2, known epilepsy on carbamazepine with drug level within therapeutic range. At 39 weeks of gestation, she had fit and drowned while on a picnic at seaside. She delivered a macerated stillbirth on the following day and subsequently succumbed from sepsis after 9 days of stay in ICU.

10.4 Conclusion and Recommendations

There was a reduction of deaths due to suicide in this report; however doctors and midwives should continue to be vigilant to identify women at risk of psychiatric disease/ depressive illness which develop during pregnancy and postnatal period. Topics in psychiatrics illness and care should be included routinely in seminars/ courses for obstetrics care providers.

10.5 References

1. Suicide Warning Signs: Suicide Signs and Symptoms, Hearthstone Communications Ltd. 2008
2. Report on the Confidential Enquiries into Maternal Deaths in Malaysia, 1997 - 2000
3. Report on the Confidential Enquiries into Maternal Deaths in Malaysia, 2001 - 2005

CHAPTER 17

DEATHS IN PREGNANCY ASSOCIATED WITH MOTOR VEHICLE ACCIDENTS

Summary

Motor vehicle accidents (MVA) contributed to a considerable proportion of the total number of fortuitous maternal death during the period 2006 till 2008. MVA contributed to 12 deaths in 2006 (14.1%), 17deaths in 2007 (18.1%) and 12 deaths in 2008 (12.6%)(Table 17.1).

Table 17.1: Number of maternal deaths from transport accidents

Years	2006	2007	2008	Total
Number of accidents	12	17	12	41
Number of fortuitous death	85	94	95	274
Percentage	14.1	18.1	12.6	15.0

17.1 Analysis

i. Type of transport

The majority of death involved motorcycle riders (46.3%) and passengers in cars (31.7%) as shown in Table 17.2.

Table 17.2: Maternal deaths by Types of Transport Accidents

Causes	2006	2007	2008
Pedestrian injured in collision	4	0	0
Motorcycle rider injured in collision	5	9	5
Car occupant injured in collision	3	6	4
Driver injured in collision between two vehicles	0	0	1
Motor vehicle accident, unspecified	0	0	1
Unspecified transport injury	0	2	0
Accident causing drowning	0	0	1
Total	**12**	**17**	**12**

17.2 Patient's profile

Most of the MVA pregnancy related deaths occurred in the age group of 20-34 years old. These comprised 82.9% of the total MVA related deaths in the period 2006 till 2008. (Table 17.3). The highest number of deaths occurred in Malays (this was representative of the population distribution). Majority of the deaths occurred in the 1-5 parity group. Based on the patient's occupation, housewives (43.9%) and

those involved in sales and services (36.6%) were the largest groups contributing to MVA related deaths in pregnancy.

Table 17.3: Demographic profile of deaths in pregnancy associated with motor vehicle accident

Patient profile	2006	2007	2008
Total number of death	**12**	**17**	**12**
Age			
<19	0	2	1
20-24	2	4	2
25-29	5	6	5
30-34	3	4	3
35-39	1	1	1
>40	1	0	0
Ethnic Group			
Malay	7	13	11
Chinese	1	1	0
Indians	2	1	0
Bidayuh	1	0	0
Other pribumis	0	1	0
Others	1	1	1
Parity			
0	3	4	2
1-5	7	12	10
6 and above	2	1	0
Occupation			
Housewives	5	8	5
Clerical	1	1	0
Sales & Services	5	5	5
Unemployed	1	1	0
No Information	0	2	2

Obstetric profile

Majority of the deaths (32) related to MVA occurred during antepartum period and 7 during the post partum period (Table 17.4).

Place of death

58.5% of the deaths related to MVA occurred in the state hospitals or hospitals with specialists. This is probably related to the seriousness of injuries suffered by the patients who warranted intensive specialist care available only in secondary and tertiary hospitals.

Table 17.4: Pregnancy related deaths associated with motor vehicle accidents by period and place of death

Patient profile	2006	2007	2008
Total number of death	**12**	**17**	**12**
Period of death			
Antepartum	10	13	9
Postpartum	1	3	3
Post abortion	1	0	0
No information	0	1	0
Place of Death			
State Hospital	5	6	5
Hospital With O&G Specialist	3	3	2
Hospital Without O&G Specialist	0	0	2
Enroute	1	0	2
Home	1	0	0
At the scene	2	8	1

17.3 Case illustrations

Case 1 (Multiple intraabdominal and thoracic injuries)

14 year old primigravida (unbooked case and unmarried), passenger in a car was brought to the Accident & Emergency department of a district hospital without specialist after being involved in a MVA. She was hypotensive and tachycardic and was suspected to suffer from intraabdominal bleeding. She was resuscitated with IV fluids and referred to surgical medical officer. Diagnostic peritoneal lavage was planned but abandoned when patient mentioned that she may be pregnant. Urgent ultrasound abdomen/pelvis confirmed fluid in Morrison's pouch, perisplenic and both paracolic gutters. There was a single intrauterine pregnancy with no fetal heart detected confirming intrauterine death. Splenic and right renal injuries were suspected. After resuscitation, urgent laparotomy was arranged but patient arrested upon arrival in operation theatre.

Postmortem performed revealed intraperitoneal bleeding of 2.6l with multiple lacerations of right lobe of liver and right renal contusion. There was also right

haemothorax of 150mls and left haemothorax of 500mls. Spleen, uterus and bowel were normal. There was no remediable medical factor in this case.

Case 2 (Road safety should be stressed)

24 year old G5 P2+2 Malay housewife was riding a motorcycle with two of her children when they were involved in an accident with a lorry. Patient died on spot. Postmortem showed multiple fractures.

Road safety should be emphasized during antenatal classes at health clinics.

Case 3 (Severe head trauma with fracture of cervical vertebrae)

33 year old G3P2 Malay housewife, a known history of thyrotoxicosis was on treatment from the surgical outpatient clinic. At 28 weeks POA, ultrasound scan showed placenta previa type III posterior but patient refused admission. At 31 weeks POA, she was involved in an accident while on the way to town after having blood investigations done at the health clinic,. Patient was a riding pillion on a motorcycle driven by her younger sister when they collided with a lorry. Patient was thrown off the motorcycle and dragged for about 7 metres. She died on the spot.

Postmortem performed concluded cause of death as severe head trauma with cervical vertebrae fracture.

Case 4. (Delay in securing airways)

32 year old G8P7 Malay salesperson at 33 weeks POA, met with a motor vehicle accident while on her way for antenatal follow up near the health clinic. She was pillion rider and was transferred directly to the district hospital. In the Accident & Emergency department, she was initially stable. However, she developed respiratory distress while on way to radiology department for Xray. Unfortunately, medical personnel had difficulty intubating her. After intubation, right pupil was noted to be dilated and she was referred to state hospital for further management.

At the hospital, cerebral CT scan of brain showed patient had extradural haemorrhage, subarachnoid haemorrhage, cerebral oedema with the presence of midline shift. She also had compound fractures of right femur and closed fractures of multiple long bones. She was resuscitated and then sent to operation theatre for emergency craniotomy and evacuation of clot. Emergency LSCS, wound debridement and external fixation of long bones were also performed.

Postoperatively, she was transferred to the ICU. Her condition was complicated by development of disseminated intravascular coagulation and central diabetes insipitus. Despite aggressive treatment, she succumbed. Delay in the initial failure to intubate patient was a cause of concern. In service MO training for basic airway protection and intubation should be emphasized.

Case 5 (Multiple injuries with resulting complications)

19 year old unmarried primigravida (unbooked). She was a pillion rider on a motorcycle and was involved in a motor vehicle accident where she was thrown 20 feet down the flyover. She was brought to the Accident & Emergency, General Hospital with a

Glasgow coma scale 12/15. She sustained left temporal bleed, right temporo occipital bleed, fractures of medial and lateral walls of maxillary sinus, left sphenoid bone and closed fracture of distal right radius. She also suffered bilateral pneumothorax and suspected cardiac contusion (Echocardiogram showed minimal pericardial effusion). Bedside ultrasound showed a viable fetus, parameters corresponding with 22-23weeks POA with no retroplacental clots.

She was managed in the intensive care unit by multidisciplinary teams consisting of medical, surgical, nephrology, anaesthetic and obstetric teams. Two days after admission, she had a spontaneous miscarriage. Her stay in intensive care unit was complicated by acute respiratory distress syndrome, acute renal failure, metabolic acidosis and ventilated associated acinetobacter pneumonia with resulting hemodynamic instability and dependant on inotropic support. She died after 17days of hospitalization. According to post mortem report, the cause of death was multiple injuries due to motor vehicle accident. There were no shortfalls in management.

Case 6 (Riding illegally without a helmet)

15 year old unmarried, unbooked, primigravida who had ran away from home. She was a pillion rider without helmet on a motorcycle which skidded when attempting to avoid the police. She was brought to hospital with specialists where the patient was intubated and resuscitated. Physical examination revealed right temporal swelling and bleeding from mouth. Abdomen was mildly distended but soft. CT scan brain showed right hemispheric parietotemporal subdural haemorrhage, cerebral oedema with midline shift and interhemispheric haemorrhage. Abdominal ultrasound revealed free abdominal fluid but no obvious injury and patient was 15weeks pregnant.

She was referred to another hospital with neurosurgical service. On arrival, neurosurgical team noted that her brain stem reflexes were absent. Glasgow coma scale was 3/15 and based on this, it was decided that patient was for conservative care in view of poor overall prognosis. She died on same day.

17.4 Discussion

Motor vehicle accident contributed to a significant (15.0%) percentage of total fortuitous maternal deaths in the period 2006-08. The highest number (19 of 41cases) was contributed by motorcycle riders involved in collision. Over 80% of fatalities involved those aged 20-34 years and over 40% involved housewives. Majority (58.5%) was managed in state hospitals and hospitals with specialists before patient succumbed. Majority of patients sustained injuries to multiple vital organs involving cranial, abdominal and thoracic injuries. Due to the severe injuries sustained and death within short time of hospitalisation, remedial clinical factors were not found in majority of cases.

17.5 Recommendations

As mentioned earlier, remedial clinical factors were not found in majority of the cases of maternal deaths associated with motor vehicle accident. However, in anticipation

of seriousness nature of injuries sustained by pregnant women during accident, the following are recommendations to improve health care:

17.5.1. Road safety should be included as part of antenatal education for pregnant women. Use of helmets in motorcycle riders and seat belts in car occupants and obeying traffic laws should be stressed to reduce severity of injuries sustained during accidents and decrease rate of accidents.

17.5.2. Training of accident & emergency medical personnel in airway protection, intubation and basic resuscitation techniques as majority of the fatalities presented are critical and haemodynamically unstable.

CHAPTER 18

POSTMORTEM EXAMINATION IN MATERNAL DEATHS

Summary

The benefits of postmortem examination in maternal deaths cannot be over emphasized. This is evident from the number of complete postmortem examinations being carried out. Though the number of postmortems have improved it is still very low. Postmortem examination in maternal deaths must be conducted by trained pathologists so that appropriate specimens can be collected and proper findings can be recorded.

18.1 Introduction

Maternal mortality is an internationally accepted index by which we measure maternal health. A confidential system of enquiry into maternal mortality was introduced in Malaysia in 1991 based on that used in England and Wales. For cultural and religious reasons, postmortem examinations in maternal deaths are usually not performed in Malaysia.

18.2 Discussion

Autopsies are either performed for legal or medical purposes. A forensic autopsy is carried out when the cause of death may be a criminal matter, while a clinical or academic autopsy is performed to find the medical cause of death and is used in cases of unknown, uncertain death, or for research purposes.

Clinical autopsies serve two major purposes. They are performed to gain more insight into pathological processes and determine what factors contributed to a patient's death. Autopsies can yield insight into how deaths can be prevented in the future. The clinical autopsies can only be carried out with the consent of the family of the deceased person as opposed to a medico-legal autopsy instructed by a Coroner to which the family cannot object.

An autopsy is frequently performed in cases of sudden death, where a doctor is not able to write a cause of death in the death certificate, or when death is believed to be due to an unnatural cause. These examinations are performed under a legal authority and do not require the consent of relatives of the deceased. **There is a real need for routine postmortem examinations in cases of maternal deaths but various legal, social and religious factors stand in the way.** Autopsy is an important investigation despite new diagnostic techniques. The complete autopsy is the preferred standard for the investigation of maternal deaths and if possible all maternal deaths should have a post-mortem examination.

A meticulous attitude and patience are the keys to a comprehensive examination. Serious consideration should be given to referring the examination to an experienced pathologist who in turn will have consultations with other relevant specialists before performing the autopsy. This will pave the way for a complete examination. All health care workers involved in the management should be encouraged to attend the postmortem examination where possible. It is essential that the preliminary background investigation is carried out before the autopsy. Usually no special techniques are required to elucidate the cause of death but they should be kept in mind if the need arises in the course of the postmortem. However, if due to unforeseen circumstances consent for a postmortem is not available then a limited postmortem should be attempted. This may be done by way of a lumbar puncture, lung biopsy, swabs from the vagina, urine for culture etc. All this depend on the circumstances and type of cases. Responsibility for obtaining permission for an autopsy should lie with the consultant in charge of the case. The task may be delegated to junior medical staff in individual cases. Specially trained bereavement officers could approach relatives for consent at the request of the consultant in charge. The most common cause of direct maternal deaths in Malaysia are haemorrhage, obstetric embolism, pregnancy related hypertension and obstetric trauma.

External postmortem examination should be thorough and include ruling out evidence of deep vein thrombosis.

Internal postmortem examination should include ruling out pneumothorax for that maybe the only finding. Air embolism usually occurs during labour or surgical intervention in delivery of the baby or products of conception after miscarriage. The heart should be examined for myocarditis, conduction abnormalities and cardiomyopathy. The lungs should be examined for aspiration, pneumonia, amniotic fluid embolism, diffuse alveolar damage, tumors etc. The liver is often the best organ to identify the microscopic changes associated with pre-eclampsia, acute fatty liver of pregnancy and the kidneys for diffuse intravascular coagulation. Brain tissue should be examined in cases of eclampsia, epilepsy and hyperemesis and placental tissue in cases of placenta previa/ accreta. All abnormal macroscopic abnormalities should be fully characterized histologically.

18.3 Analysis of postmortem deaths

In 2008, the number of postmortem performed was 26 as compared to 9 in 2001 (Table 18.1).

Direct maternal deaths

In 2006 the number of direct maternal deaths was 100 out of 212 total deaths (47%) of which only 7 of the direct deaths had postmortem examination. Six of these cases had a full postmortem done with a final diagnosis of amniotic fluid embolism, atonic uterus with PPH, ruptured fallopian tube, septiaemia with pelvic abscess and pulmonary embolism. Only one postmortem had no specimens taken for examination.

In 2007 the number of direct maternal deaths was 115 out of 230 total deaths (50.0%). Nine of the direct deaths had full postmortem examinations with a final diagnosis of ruptured uterus secondary to placenta percreta, pulmonary embolism, ruptured ectopic, hypertrophic obstructive cardiomyopathy, cardiomyopathy, amniotic fluid embolism, septicaemia with DIVC, and upper gastrointestinal bleed with lobar pneumonia.

In 2008 the number of direct maternal deaths was 110 out of 228 total deaths (48.2%). Only 11 of the direct deaths had postmortem examination. Nine of these had a full postmortem with a final diagnosis of amniotic fluid embolism, septicaemia with pelvic abscess, pulmonary embolism and ruptured ectopic pregnancy. One of the postmortem was partially done and another had only an external examination. One of the postmortem done by a medical officer could not come to a conclusion.

Overall the number of postmortem examinations in direct maternal deaths is still very low but the quality has improved where more complete postmortems were carried out. The information obtained from partial postmortems will be inadequate for a proper interpretation and diagnosis. **Postmortems must be conducted by trained and experienced pathologists.**

Indirect maternal deaths

The overall incidence of postmortem examination for indirect deaths is still very low, compared to direct deaths. From 2006 to 2008 there were a total of 71 indirect death of which only one of the case had a postmortem done. The quality of postmortems is still much to be desired. Complete postmortem findings with the appropriate histological and toxicology report must be made available to conclude the cause of death.

Table 18.1: Number of postmortems in conducted in pregnancy related deaths

Classification	2001			2006			2007			2008		
	n	%	No. of PM	n	%	No. of PM	n	%	No. of PM	n	%	No. of PM
Direct	172	54.4	6	100	47.2	7	115	50.0	9	110	48.2	11
Indirect	32	10.1	0	27	12.7	0	21	9.1	0	23	10.1	1
Fortuitous	112	35.4	3	85	40.1	9	94	40.9	10	95	41.7	14
Grand total	**316**	**100**	**9**	**212**	**100.0**	**16**	**230**	**100.0**	**19**	**228**	**100.0**	**26**

18.3 Conclusion

The need for a detailed and quality postmortem examination is much to be desired. Attempts in getting consent from the next of kin should be pursued. **Once consent is obtained, the postmortem examination should be conducted by a trained and experienced pathologist.** Training of adequate specialists in this field is essential if we want a high standard of autopsies to improve the health care delivery system in the future.

When postmortems are carried out by medical officers, they should consult the forensic pathologists or the general pathologist as to what specimens to take during the procedure. Photographs should be taken during the postmortem examination and these could be emailed to the consultant if the need arises for proper assessment and diagnosis.

18.4 References

1. Postmortem Technique Handbook- Second Edition- Sheaff Hopster
2. Guidelines for Postmortem Examinations and Reports RCPathologist

CHAPTER 19

VERBAL AUTOPSY

Summary

Verbal Autopsy (VA) is a way of obtaining cause of death by interviewing lay respondents on the signs and symptoms experienced by the deceased before death. It is used in developing countries where vital registration systems are weak or when the proportion of a population under medical care is low. Though there are limitations, VA can be used to measure cause-specific mortality in population and to investigate the cause of death.

19.1 Introduction

Verbal Autopsy (VA) is an approach used to obtain the cause of death by interviewing relatives or care-takers on the signs and symptoms experienced by the deceased before death using standard questionnaires and algorithm. It is useful where vital registration systems are weak or when the proportion of a population under medical care is low.

19.2 Process

The process of VA involves:

1. Data collection by interviewing bereaved relatives or others who were with the deceased during the events leading to death
2. Assigning cause of death using either individual or multiple physician reviews, expert algorithms or data driven algorithms
3. Coding and tabulation of causes, ideally using International Classification of Deaths (ICD)

19.3 Uses

VA is often used as part of community-based maternal death reviews or Confidential Enquiries into Maternal Deaths. It is coupled with questions to ascertain both the medical and non-medical factors that precipitated a maternal death via in-depth interviews and questionnaires (including open ended verbatim accounts, symptom checklist or checklist with filter questions).

VA can be done on a one-off basis or routinely as part of Sample Vital Registration with Verbal Autopsy (SAVVY), Demographic Surveillance System (DSS), or Active Surveillance of Pregnancy-Related deaths. VA has been used in India, China and Tanzania to measure cause specific mortality in populations and to investigate cause of death in specific age, sex, or groups such as women of reproductive age, maternal, neonatal, infant, child or injury related deaths. They have also been used to investigate epidemics and to assess the effectiveness of disease specific interventions.

19.4 Underlying assumptions of the verbal autopsy method

It is assumed that each cause of death investigated has a set of observable features that can be recalled during a verbal autopsy interview and that the features of one cause of death can be distinguished from those of any other cause of death. The underlying mix of causes of death in the population affects the accuracy of the verbal autopsy.

In addition, cultural aspects influence the accuracy of verbal autopsy. The willingness to accept a VA interview, the ability of the respondent to describe the final illness, and the way in which diseases are understood and described in the community will vary from culture to culture

19.5 Identification of death

The identification of death is varied and sometimes multiple sources are used. This includes:

1 Existing records – civil registration, facility records
2 Survey/census of household
3 Key Informants

19.6 Ascertainment of maternal/ pregnancy related status

This is done by asking pregnancy-related questions followed by questions to ascertain sub-causes of maternal death. (See Appendix 3)

For example relatives of women who died postpartum can be asked:
"Was she bleeding from the vagina?"/ "Was the bleeding heavy?"/ "Did the bleeding start before the birth of the child?"

Responses to these questions would then be used to determine if the woman died of post partum haemorrhage.

19.7 Advantages

1. It can be the only way of ascertaining the cause of death when deliveries and deaths take place outside of health facilities
2. When coupled with other questions it can provide important information on social and community factors associated with a maternal death and identify barriers to accessing obstetric care

19.8 Limitations

1. It is assumed that most causes of death have distinct symptom complexes (and that these can be recognized, remembered and reported by lay respondents), and that it is possible to classify causes into meaningful categories

2. The causes of death have limited reliability when reported by lay-persons and can be subjective
3. The causes of death may be subject to under or over-reporting
4. The data collection is subject to the quality of training provided to field workers and interviewers as well as the quality of the VA questionnaire

19.9 References

1. WHO(2007) Verbal autopsy standard: ascertaining and attributing cause of deaths. Geneva: world Health Organization
2. Campbell O, Ronsmans C. Verbal autopsies for maternal deaths: report of a WHO workshop, London, 10-13 Jan 1994. Geneva, WHO 1995

A. SUGGESTIONS FOR QUESTIONS TO BE ASKED IN ORDER TO ARRIVE AT CAUSES OF MATERNAL DEATH

1. OBSTETRIC/ MEDICAL CAUSES OF DEATH

1.1 Early pregnancy death

- During her final illness, was she bleeding from the vagina?
- Did she have a high fever during her final illness?
- Did she have a foul-smelling discharge during her last illness?
- Did she complain of severe pain in her abdomen?

1.2 Eclampsia

- Did she have any fits before she died?
- Did she have swelling of the legs during her pregnancy?
- Did she have swelling of the face during her pregnancy?
- Did she complain of blurred vision during her pregnancy?
- Did she have her blood pressure taken during her pregnancy?
  If yes, do you know whether her blood pressure was high or low?

1.3 Haemorrhage

- During her final illness, was she bleeding from the vagina?

If yes, go on to the following questions:

- Did it wet her clothes, the bed or the floor? (N.B. to arrive at severity, use local terminology)
- Did the bleeding start before the birth of the child?

If the bleeding started before the birth of the child:

- Was she in pain while bleeding?
  If not, did she have other episodes of bleeding during this pregnancy? If there was pain, did the pain start before the labour pains?

If the pain started before the labour:

- Did she have a cesarean section in the previous pregnancy?
- Were any instruments used to help the delivery?
- Did she die before the baby was born?
- Do you know whether she ever had her blood pressure taken? If yes, was it high or low?

If the bleeding occurred during labour pains:

- Did she have a vaginal examination during her illness
  If yes, did it increase the bleeding?
- How long was she in labour for? (hours)
- Were any drugs used just before or during the labour?

If the bleeding started after the birth of the child:

- How long after the birth of the child was the placenta delivered
- Were any instruments used to help the delivery?

1.4 Sepsis

- Did she die before or after the birth of the child?
  If after the birth, go on to the following questions:
- Did she have a high fever during her final illness?
- Has she been ill with any other illness during this pregnancy (use local epidemiology/ local terminology)
- Did she have a foul-smelling discharge during her last illness?
- How long did the labour last? (hours)
- Were any instruments used to help the delivery?
- How long after the birth of the child was the placenta delivered (use local terminology)

1.5 Jaundice

- Was she yellow at the time of death?
  If yes, go on to the following questions:
  - How long/how many days was she yellow for?
  - Did she eat or swallow any poisonous substance?
  - Did she have any fits before death?
  - Had she ever suffered from any disease of the blood? (local epidemiology/local terminology)
  - Did she have a high fever during her (final) illness?

If death occurred after the time of delivery:

- Was she jaundiced at the time of delivery/abortion?
- If not, how many days after delivery/abortion did she develop jaundice?

Questions to help support different diagnoses:

- Did she suffer from bleeding during her final illness?
- Did she attend a health facility during this illness?
- What did they tell her about her illness?
- Did she have any tests?

If she did have tests:

- Do you know the results of these tests?
- Has there been anyone else in the neighbourhood or family who has been yelow within the last few months?

If death occurred after delivery:

- How long was she in labour for?
- Did she have a foul-smelling discharge during her last illness?

1.6 ANAEMIA

- Was she short of breath at the time of death?
- Was she short of breath when she carried out regular household activities?
- Was she pale?

Exclude other causes:

- During her final illness, was she bleeding from the vagina?
- Did it wet her clothes, the bed or the floor?
- Did she lose weight during her pregnancy?
- Did she have diarrhoea during her pregnancy?
  If yes, how long did the diarrhoea last for?

2. CONTRIBUTING FACTORS OF DEATH

The following set of questions should be addressed to the families of women who died. They should if possible be supplemented with questions to providers.

The broad groups of questions have to do with (the three) delays in receiving treatment, resources at the last level of the health services that was reached, and personnel at the last level reached.

2.1 DELAY

2.1.1 Delay in seeking care

The following questions should be asked for those who never sought care:

- Was the problem recognized?
- Who recognized it?
- Was the severity recognized?
- Was it decided to seek care? Who decided it?
- Was it decided not to seek care? Why not?
- Did you know where to go?
- Did you know how to get there?
- Why didn't you go?

The following questions should be asked for those who did seek care:

- When did labour begin (when did she know she was in labour?)
- When was a problem recognized?
- How was a decision reached to seek care?
- Who made the decision?

How was delivery accomplished?

Mode	Yes/ No	Where?	When?	Who?
Normal vaginal				
Breech extraction				
Vacuum				
Forceps				
Cesarean section				
Traditional				

Who attended the delivery?

Attendant(s)	Yes/ No	Where?	When?
Self/none			
Relative			
TBA			
Nurse or midwife			
General doctor			
Gynaecologist, obstetrician			
Other, e.g. healer, herbalist, spiritualist, homeopath, ayurvedic			

2.1.2 Delay in arriving at appropriate level of care

For EACH level of referral or contact, ask the following questions:
- How did she get there?
- What time did she arrive?
- Who did she see? List all.
- When did she see this person?
- What treatment was given? List all.
- When was it given?
- Why did she leave this level of care?
- When did she leave?
- Did this place provide transport to the next place?
- Why not?
- Where did she go next?
- Is there anything else you would like to say about this?

Supplementary questions on delay in arriving at appropriate care (transport):

Describe for EACH move how the deceased was moved. Describe means of transport (e.g. on foot, by truck, boat), how long it took to find it, and how long was spent in transit.
First move _____
Second move _____etc.

2.1.3 Delay in receiving care at the institution

- What time did she arrive at the last institution she attended?
- Describe her condition when she arrived here (e.g. unconscious, very pale, sweating, cold)
- What time did she receive treatment? List for as many treatments as possible.
- What time did she die?

2.2 RESOURCES

This applies only to the last level of care reached. Do you think there were delays in providing treatment at this level? Describe in detail, e.g. waiting for drugs, waiting for blood, waiting for health/ hospital staff (nurse, doctor, anaesthetist, etc.)

2.3 PERSONNEL

- At this last place where she was treated, do you feel that she had to wait to see the person she needed to see? Specify.
- Were you EVER told to go somewhere else because medical staff were not able or were not allowed to do a procedure? Specify.
- List all the health personnel seen (with their qualifications), where they were seen and whether they had been referred or not.

B. SUGGESTIONS FOR A QUESTIONNAIRE TO ARRIVE AT CAUSES OF MATERNAL DEATH

1. WOMAN'S BACKGROUND CHARACTERISTICS

- maternal age
- marital status
- education
- employment
- place of residence

2. PAST MEDICAL HISTORY

- Do you know of any medical problem (name) she had before she became pregnant?
  If yes, What was the problem?
- Was she ever hospitalized? ***If yes,*** for what reason?
- Did she ever have surgery? ***If yes,*** for what reason?

3. REPRODUCTIVE HISTORY

- How many live births has she had?
- How many were alive at the time of her death?
- How many had died before her death?
- Has she ever had a pregnancy which ended before term?
  If yes, how many?
- Has she ever had a pregnancy which ended as a stillbirth?
  If yes, how many?
- Did she have a cesarean section in the previous pregnancy?

4. INDEX PREGNANCY

- Could you tell us what happened before (name) died and what you think the cause of death was? (verbatim)
- When did she die? (day/month/year)
- Where did she die? (home, in transit, health centre, hospital, other)
- When during her pregnancy, did she die?
  - before labour started (record month of pregnancy)
  - during labour, delivery or 12 hours post-delivery (record month of pregnancy)
  - after delivery (record days and/or weeks after delivery)

IF THE WOMAN DIED PRIOR TO ONSET OF LABOUR, GO TO MODULE 1
IF THE WOMAN DIED AFTER THE LABOUR STARTED, GO TO MODULE 2

MODULE 1: DEATHS PRIOR TO ONSET OF LABOUR

1. Did she ever go for an antenatal care visit during her pregnancy?
   - If yes, do you have an antenatal care card?
   - If yes, where did she go for antenatal care?
   - If yes, whom did she see for antenatal care?
   - If yes, how many times did she go for antenatal care?
   - If yes, did she first attend antenatal care because she had a problem with the

pregnancy or just to check everything was fine? (If problem, what was the problem?)

2. Did she have any **fits** before she died?
3. Did she have swelling of the legs during her pregnancy?
4. Did she have swelling of the face during her pregnancy?
5. Did she complain of blurred vision during her pregnancy?
6. Did she have her blood pressure taken during her pregnancy?
   - If yes, do you know whether the blood pressure was normal/high?
7. During her final illness, was she **bleeding** from the vagina?
   - If yes, did it wet her clothes, the bed or the floor?
   - Was she in pain while bleeding?
8. Did she have other episodes of bleeding during this pregnancy? If yes, were they painful?
9. Did she have a vaginal exam during her illness?
   - If yes, did it increase the bleeding?
10. Did she have a **high fever** during her final illness?
11. Has she been ill with any other illness during this pregnancy (local epidemiology/local terminology)?
12. Was she **yellow** at the time of death?
    - How long/how many days was she yellow for?
13. Did she eat or swallow any poisonous circumstances?
14. Had she ever suffered from any disease of the blood?
15. Was she **short of breath** at the time of death?
    - Was she short of breath when she carried out regular household activities?
    - Was she pale?
16. Did she lose weight during her pregnancy?
17. Did she have diarrhoea during her pregnancy?
    - How long did the diarrhoea last for?

GO TO MODULE 3

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MODULE 2: DEATHS DURING LABOUR, DELIVERY OR AFTER DELIVERY

1. Was the baby she was carrying delivered before her death?
   - If yes, was the baby born alive?
   - If the baby was born alive, is it still alive today?
   - If the baby is now dead, how old was the baby when it died?
2. Did she ever go for an **antenatal care** visit during her pregnancy? If yes, do you have an antenatal care card? If yes, where did she go for antenatal care? If yes, whom did she see for antenatal care? If yes, how many times did she go for antenatal care?
   - If yes, did she first attend antenatal care because she had a problem with the pregnancy or just to check everything was fine? (If problem, what was the problem?)

3. Where did the **delivery** take place? (home, health centre, clinic, hospital, other)
4. Who attended the delivery? (none, relative, TBA, nurse or midwife, general practitioner, gynaecologist/obstetrician, other)
5. Did they need instruments (forceps or vacuum) to help the baby out, was a Cesarean section performed, or
   - Did the baby arrive by itself?
6. What part of the baby came out first?
7. Did she have any **fits** before she died?
   - If yes, did the fits stop after the baby was born? Did she have swelling of the legs during her pregnancy? Did she have swelling of the face during her pregnancy? Did she complain of blurred vision during her pregnancy? Did she have her blood pressure taken during her pregnancy? If yes, do you know whether the blood pressure was normal/high?
8. During her final illness, was she **bleeding** from the vagina?
   - If yes, did it wet her clothes, the bed or the floor?
   - Did the bleeding start before the birth of the child?
   - If yes, was she in pain while bleeding?
   - If she was in pain, did the pain start before the labour pains?
   - Did she have other episodes of bleeding during this pregnancy?
9. Did she have a vaginal exam during her illness
   - If yes, did it increase the bleeding?
10. Was the placenta delivered?
    - How long after the birth of the child was the placenta delivered? (hours)
11. Were any instruments used to help the delivery?
12. How long was she in **labour** for? (hours)
13. Were any drugs used just before or during the labour?
14. Did she have a **high fever** during her final illness?
15. Has she been ill with any other illness during this pregnancy (local epidemiology/local terminology)?
16. Did she have a foul-smelling discharge during her last illness?
17. Was she **yellow** at the time of death?
    - How long/how many days was she yellow for?
    - Did she eat or swallow any poisonous circumstances?
    - Had she ever suffered from any disease of the blood? (local epidemiology/ local terminology)
20. Was she yellow at the time of delivery?
    - If not, how many days after delivery did she develop jaundice?
21. Was she **short of breath** at the time of death?
    - Was she short of breath when she carried out regular household activities?
    - Was she pale?
22. Did she loose weight during her pregnancy?
23. Did she have diarrhoea during her pregnancy?
    - How long did the diarrhoea last for?

GO TO MODULE 3
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MODULE 3

For **EACH of the illnesses** (e.g.bleeding, fits) **listed in A above**, ask the following questions:

1. Did she seek care for the (illness)?
   - If yes, where did she seek care? (Probe separately for each of following: own home, someone else's home, health centre, clinic, hospital, other.)
   - If yes, who provided the care? (Probe separately for each of following: TBA, nurse or midwife, general practitioner, gynaecologist/obstetrician, other.)

For **EACH of the sources of care sought**, ask the following questions:

1. How did she get to (name the health facility)?
2. How long after the (illness) occurred did she get to the (name the health facility)?
3. Was a treatment given?
   - If yes, how many hours after arrival was the first treatment given?
   - What treatment was given? (Allow for more than one answer.)

(Adopted from Verbal Autopsies for Maternal Deaths, Report of a WHO workshop, London, 10-13 January 1994)

CHAPTER 20

IMPACT OF CEMD

Summary

The Confidential Enquiries into Maternal Deaths in Malaysia is an in-depth review of all pregnancy related deaths focusing on the cause and identifying factors that led to the death. The findings from this enquiry are important tools in the formulation of strategies aimed at improving maternal health services. This system enables health care providers to learn lessons from the remediable factors to prevent future deaths.

Introduction

The Confidential Enquiries into Maternal Deaths (CEMD) was established in 1991 and is one of the most impressive and sustained examples of audit for obstetric care. Although, some form of investigation into maternal deaths was already in existence since the 1970s, it was not confidential or comprehensive. The current CEMD was adapted from the enquiry system conducted in England and Wales. Malaysia is one of the first few countries to institutionalise maternal audit into it's health system.

This enquiry is an audit, which is independent, multidisciplinary, non-punitive and confidential. The purpose of reviewing the cases are to identify remediable factors contributing to the death. Recommendations are made for improvements in clinical care service provision as well as upgrading of facilities. The data from these deaths are analysed and published at regular intervals. The fundamental purpose of establishing an enquiry system is to improve obstetric service delivery.

Malaysian context

The enquiry reviews all deaths of pregnant women and those who have died within 42 days of delivery, irrelevant of the cause. The deaths are informed within 48 hours to the national secretariat of the CEMD, based in the Ministry of Health. The pregnancy related deaths are reviewed at the individual hospitals where the death occurred as well as the district and state levels before the reports are submitted to the national level. The review of each death is through using the 'road to death' approach, and it is documented in a standard format. At the national level, the format is anonymised before the case is discussed to ensure that the findings are for the purposes of improvement of practice and not for punitive actions.

The National Committee on CEMD is responsible to review all pregnancy related deaths, identify remediable clinical, remediable non-clinical and patient factors, classify the death and assign an ICD code. The lessons learnt from these reviews are used to formulate recommendations to prevent similar deaths, thus saving the lives of mothers in future. A specific budget is allocated for strengthening the CEMD at national level.

Benefits

Findings from the CEMD are used to justify increase in budget allocation and in

disseminating the information so that various activities to improve maternal health will be supported. The recommendations from the enquiries are essential and result in action plans which are incorporated into appropriate strategies and programmes suitable to each population group. The CEMD report is a tool that can change practice and improve patient care.

Data collection has vastly improved and due to the anonymous nature of the enquiry, more and accurate data on maternal mortality is made available to the CEMD than the vital registration system. Initially, the maternal mortality ratio (MMR) identified by the Birth and Registration system was lower than that captured by the CEMD. Both these systems are now matched to look for discrepancies and the final data is submitted to the Department of Statistics (DOS). The improvement in the reporting system and reclassification of the deaths caused an initial increase in the MMR. However, the MMR reported by CEMD and DOS are now comparable.

The major causes of maternal deaths are obstetric embolism, medical disorders, postpartum haemorrhage (PPH) and hypertensive disorders in pregnancy. The interventions from the CEMD paid attention to essential obstetric care and management of obstetric emergencies. Additional funds were allocated for training of health care providers in obstetric emergencies both in the hospital and health sector. Since 1991, training manuals, protocols and guidelines have been developed to improve competency in knowledge and skills of health staff. The training manuals produced include 'Management of Postpartum Haemorrhage', 'Management of Hypertensive Disorders in Pregnancy' and 'Management of Heart diseases in Pregnancy'. Protocols on the management uterine inversion with a training video, induction of labour, augmentation of labour and management of anaemia were developed and circulated to the states. Guidelines for transport of the critically ill patient, prophylaxis for acid aspiration in caesarean section and criteria for screening for malaria in endemic areas were also distributed to health facilities. In 2005, a handbook on 'Lessons from the Malaysian CEMD' was developed for medical officers.

The health nurses are trained to use magnesium sulphate in the management of convulsions in Hypertensive Disorders in Pregnancy. Community health nurses have been trained to set intravenous infusions. This was because it was found there were a number of cases in which community nurses were the first health care provider on the scene. The training modules for setting up of intravenous lines was incorporated into the basic training programme of community nurses.

Health staffs were trained to use WHO partogram for monitoring of patients in labour. The partogram was implemented for use in home deliveries; as it provides early warning to prevent prolonged labour, thus preventing life-threatening obstructed labour.

Interventions to improve existing referral and feedback systems between health and hospital sectors resulted in the revision of the existing antenatal card. The space to write the management and further action was found to be inadequate and a Home Based Maternal Health Card was developed for antenatal mothers. Due to an increase in maternal deaths from embolism, assessment for Deep Vein Thrombosis was included in the postnatal check list.

Alternative Birthing Centres (ABC) was constructed to facilitate deliveries by trained health

personnel for pregnant women with no identified risk as well as for those who stay in the interior and remote areas. Urban ABCs were built to decongest the high risk labour wards in some major hospitals. High Dependency Wards were set up in hospitals with specialists to decrease patient load in the intensive care unit. The obstetric 'Red Alert' system used for communication to facilitate a fast, efficient and coordinated team management of selected obstetric emergencies was implemented in hospitals.

Indirect deaths resulting from medical disorders are increasing, and this highlights the need for significance of multidisciplinary care. The importance of Combined clinics by the obstetrician and physician was re-emphasised and established in hospitals with specialists. Improvements were made to the existing flying squad and in some, hospital retrieval teams were established.

Findings from the CEMD provided justification to equip health centres with glucometers, haemocues, haemoglobinometers, daptones and ultrasound scan machines. Telephones or mobile phones for remote areas were also made available at health centres. Budget was allocated to purchase and upgrade ambulances to facilitate fast retrieval of obstetric cases.

Various conferences on maternal mortality are held periodically to disseminate information on the trends, causes and recommendations. These include the national conference on maternal and perinatal mortality in Kota Bharu in 1995, a conference 'to further strengthen the commitment of health care providers (private and public) in reducing maternal mortality' in Kuala Lumpur in 2001 and two conferences 'To achieve the Millennium Development Goals' were held in Penang in 2007 and in Kota Kinabalu in 2008. In addition, numerous case illustrations based on actual maternal deaths are printed to create awareness among health personnel. Relevant information and findings from the CEMD are also circulated to health facilities through CEMD Newsletter.

The findings from CEMD have improved policies on maternal health which has reduced maternal mortality. Other factors that have also helped to have an impact on maternal health are improved general socio-economic conditions, health status and access to appropriate general and specialised health care.

Challenges and constraints

Developing a nationwide enquiry system is not without constraints. Frequent turnover of health personnel can result in incomplete and inconsistent reporting of cases. Good documentation with legible clinical notes are important aspects of the investigation as it records the events leading to the death. Regular training of staff in filling the maternal death investigation format is essential.

The maternal death review committee at every level must meet regularly to identify remediable factors that led to the death. The state coordinators need to send the reports within the stipulated period to ensure timely printing of the CEMD reports. In some cases, there is difficulty in obtaining consent for postmortem to ascertain the cause of death.

There must be good communication between the hospital, health and private sectors in reporting and investigating maternal deaths. Lack of communication can result in, incomplete and delayed submission of reports. Dedicated committees on maternal deaths must be established at all levels especially the national level. Training of staff at all levels are

requirements for the successful implementation of the enquiry system. Despite general improvements, life threatening complications can occur, sometimes unpredictably.

The challenge for the next few years will be to implement more specific recommendations that will assist health care providers to improve maternal health services thus reducing maternal mortality.

The Way Forward

The audit sets out to raise the quality of health care. Reviewing maternal deaths is one method that may make pregnancy safer. Confidentiality and a no-blame policy are important to ensure good reporting and documentation of records. The reports have a tendency to produce the same recommendations over a period of time. However as some clinical practices are hard to change, this is inevitable. The publication of each report provides incentives for improvements of care. The CEMD can stimulate change in both hospital and health practices. It helps to identify areas for the health departments to focus their resources. These enquiries have been used as a quality improvement tool in health facilities.

Conclusion

Maternal death audits should be part of the routine supervision and monitoring of maternal health outcomes. There is no simple and straight forward intervention which by itself will bring down maternal mortality. However, developing a confidential enquiry system can produce timely and accurate maternal mortality data on which interventions can be founded on evidence based recommendations. The implementation of recommendations to further reduce maternal mortality are crucial to achieve the Millennium Development Goal 5 by 2015.

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ABBREVIATIONS

ABC	Alternative Birthing Centre
A&E	Accident & Emergency
AIDS	Acquired immunodeficiency syndrome
ANC	Antenatal care
APH	Antepartum haemorrhage
BBA	Birth before arrival
BTL	Bilateral tubal ligation
BP	Blood pressure
CEMD	Confidential Enquiries into Maternal Deaths
CPR	Cardiopulmonary resuscitation
C&S	Culture & sensitivity
CTG	Cardiotocography
CXR	Chest x-ray
D&C	Dilatation and Curretage
DIVC	Disseminated Intravascular Coagulation
DVT	Deep vein thrombosis
ERPOC	Evacuation of retained product of conception
Hb	Haemoglobin
ECG	Electrocardiograph
EDD	Expected date of delivery
G	Gravida
GCS	Glasgow coma scale
GDM	Gestational Diabetes Mellitus
GTT	Glucose tolerance test
HDP	Hypertensive disorder in pregnancy
HELLP	Haemolysis, Elevated Liver enzymes, Low platelets
HIV	Human immunodeficiency virus
ICU	Intensive care unit
ICD	International Classification of diseases & disability
IM	Intramuscular
IV	Intravenous
IUD	Intrauterine death
LB	Live birth
LSCS	Lower segment caesarean section
MDG	Millennium Development Goals
MMR	Maternal mortality ratio
MO	Medical officer
MRP	Manual removal of placenta
OCP	Oral contraceptives
O&G	Obstetrician & Gynaecologist
OT	Operation theatre
P	Para
PCP	Pneumocystis carinii pneumonia
POA	Period of amenorrhea
POD	Post operative day

PPH	Postpartum haemorrhage
PT	Prothrombin time
PTT	Partial thromboplastin time
SLE	Systemic lupus erythematosus
SVD	Spontaneous vaginal delivery
TBA	Traditional birth attendant
TWBC	Total white blood count
UTI	Urinary tract infection
VTE	Venous thromboembolism

hrly	hourly
mins	minutes
ml	millilitre

DEFINITIONS

Pregnancy related death

The death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the cause of death.

Maternal death

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

Direct Maternal Death

These are deaths resulting from obstetric complications of the pregnant state (pregnancy, labour and puerperium) from interventions, omissions, incorrect treatment or from a chain of events resulting from any of the above.

Indirect Death

These deaths are defined as those resulting from previous existing disease or disease that developed during pregnancy and which was not due to direct obstetric causes but which was aggravated by the physiologic effects of pregnancy.

Fortuitous Death

These are deaths from other causes, which happen to occur in pregnancy or the puerperium.

Substandard Care

Substandard care means that care the patient received or care that was made available to her fell below standard that should have been offered to her.

However there has been concern that this term may not describe the true nature of the issues underlying a particular death. Thus from the 1994 report the term Substandard Care has been dropped and the terms **Remediable Clinical factors** and **contributory factors** have been adopted.

Remediable Clinical Factors

These are specific interventions or alternative approaches to management appropriate in the year of occurrence that would have reduced the likelihood of death of the mother.

Contributory Factors

These are non-clinical factors which are likely to have significantly contributed to the mortality contributory factors are subclassified into **Personnel and Facility factors and patient factors.**

Personnel or Facility Factors

These are factors related to inadequacies in the number, types or availability of personnel or facilities.

Patient Factors

These are factors attributable to the attitude of women and/or their relatives, which prevented appropriate care being received by the patient.

All these factors have been further classified as antepartum, intrapartum and postpartum. The place of occurrence i.e. whether they occurred in the community health facility, district hospital, general hospital or private health facility has also been studied.

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