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Maternal Mortality in Thailand during 1997-1998

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ABSTRACT

Background Maternal Mortality Ratio (MMR) in Thailand has been measured by reporting from vital registration and Safe Motherhood Project. In 1996 WHO/UNICEF[1] published the revised 1990 Estimates of Maternal Mortality for all countries included Thailand. The big difference between the estimates has led to the study of Maternal Mortality study by RAMOS in 1995 – 1996, by sampling 12 provinces from 12 regions in Thailand.[2] It was found that MMR from this study was higher than vital registration and Safe Motherhood Project [2,3] but much lower than the revised 1990 Estimates of Maternal Mortality. The Maternal Mortality Study in Thailand 1997 – 1998 covered every province in Thailand.

Objectives The objectives of this study were estimating MMR in Thailand during 1997-1998, identifying causes of maternal deaths during 1997-1998 and clarifying definition of maternal deaths.

Methodology Tool used in this study was developed to collect data from death certificate of reproductive aged women (age 15-49 years). The training were conducted for health personnel from all provinces to clarify definition and causes of maternal deaths. The process and flow of collecting and analyzing data were disseminated and planned for each province. The verbal autopsy was used to clarify the death of women in reproductive aged who died outside the health facilities [4].

Results There were 303 maternal deaths in 1997 identify from 26,143 women aged 15-49 years old deaths resulted in MMR of 36.50 per 100,000 live births (LBs). Consider by region MMR was highest in the South follow by the North, the Northeast and lowest in the Central (65.1, 43.0, 35.0 and 24.3 respectively) and the Proportion Maternal Deaths of Female of Reproductive Age (PMDF) of 1.16%. There were 313 maternal deaths in 1998 identify from 28,380 women aged 15-49 years old deaths resulted in MMR of 36.43 per 100,000 LBs. Consider by region MMR was highest in the South follow by the North, the Northeast and lowest in the Central (53.8, 47.7, 34.0, and 24.6 respectively) and PMDF of 1.10%. The major direct cause of maternal death in 1997 and 1998 was hemorrhage and the major indirect cause of maternal death in 1997 and 1998 was HIV/AIDS. The reported MMR from Safe Motherhood Project was increased from 17.6 per 100,000 LBs in 1998 to 23.96 per 100,000 LBs and 28.02 per 100,000 LBs in 1999 and 2000. The reported MMR from Vital Registration was increased from 7 per 100,000 LBs in 1998 to 12.3 per 100,000 LBs and 13.2 per 100,000 LBs in 1999 and 2000.

Conclusion This study was done in every provinces in Thailand. The National MMR was not difference between 1997 and 1998 but there was some difference in each region. The PMDF between 1995-1998 were slightly decreased. The impact of this study was the maternal deaths reported to routine statistic system namely death certificates and Safe Motherhood Project were increased the coverage rate of registration of maternal deaths and uniformed classification of causes of maternal deaths. This will lead to more accurate information in routine reporting system.

Key words: Maternal Mortality Ratio (MMR), the Reproductive Age Mortality Survey (RAMOS), the Proportion Maternal Deaths of Female of Reproductive Age (PMDF)

After the attempt of Bureau of Health Promotion, Department of Health, Ministry of Public Health, Thailand to present the most real situation of Maternal Mortality Ratio (MMR) in Thailand through RAMOS approach to identify MMR and causes of maternal death. The result of this study lead to idea to develop the simplify methodology to measure MMR and causes of maternal death that health personnel could operate at provincial level with limited time and small budget. Information of this study was gathered from the study done by Provincial Public Health Offices by using the manual. The manual was developed by the committee at national level under supervision of Department of Health.

Thus benefits of this study are not only realizing the real situation of MMR in Thailand but health personnel also could measure MMR in their provinces themselves. This study will help them to improve data collection effectively and improve the quality of services resulted in decline of MMR and increase the quality of Maternal and Child Health Care in their provinces.

Materials and Methods

As we know that RAMOS has been considered to be the "Gold Standard"[5] for estimating maternal mortality in the absence of completed vital registration and investigation the causes of all deaths of reproductive aged women anyhow there are time consuming and complex to undertake, especially on large scale. Regarding to the Maternal Mortality Study in Thailand during 1995-1996[6] and the Maternal Mortality Study in region 5[7] during 1996-1997, it was found that all maternal deaths have already registered in death certificate but in the different causes of death. Thus it is possible to use death certificate in routine reporting system as the primary source to study maternal deaths and death causes of women deaths aged 15-49 years were verified.

1. The committee comprised of experts in OBGYN, experts from Ministry of Interior who in charge of vital registration system and Ministry of Public Health who in charge of Safe Motherhood Project planning and evaluation have developed manual of survey and diagnosis maternal death. The manual will be used as the guideline for provincial heath office teams to conduct the maternal mortality study at the provincial level.

The manual was composed of definition of maternal death, definition of each causes of maternal death, methodology, flowchart of methodology, tools, process of data collection, data interpretation, data analysis, reporting and example of data collection forms, etc.

2. The orientation meeting will be arranged for Provincial Public Health Office composed of administrators, Chief of Health Promotion and Treatment, health promotion technician. For provincial hospitals composed of Provincial Public Health Office, administrators, chief of OBGYN ward and nurses. This meeting will be arranged 5 times in 4 regions including Bangkok. The propose of the meeting were to orientate the objectives of the study, to clarify the definition of maternal death, cause and definition of each causes of maternal deaths, how to interpret cause of maternal death and how to measure

maternal deaths and to introduce the methodology of this study.

3. Pre-format data entry, data analysis and standard tables were developed for SPSS package usage by researcher of Department of Health, Ministry of Public Health and pre format will be distributed to every province at the orientation meeting.

4. After the orientation meeting, each province had to set up the working groups for project management, data management and data interpretation.

5. Staffs of Ministry of Interior and Provincial Public Health Office selected death certificates of women aged 15-49 years and submitted them in order to train health personnel for primary reconsideration of causes of deaths. The death certificates were separated to 2 groups; non-maternal death group and unclear group. Data of unclear group was submitted to train the physician to clarify and confirm cause of deaths.

6. Data entry was done by using pre-format SPSS package that were developed by Department of Health, sent one copy to Bureau of Health Promotion, Department of Health, Ministry of Public Health for future analysis for the national level. Data received from Provincial Public Health Office was rechecked, confirmed all maternal death cases by researchers of Bureau of Health Promotion. In case of unclear diagnosis maternal death and/or cause of maternal death, maternal and child health board at the national level would be requested for consideration. Meanwhile at the Provincial Public Health Office level, data were also analyzed and written the report for their own provinces.

Results

Maternal Mortality Ratio in Thailand during 1997-1998

In 1997, there were 26,143 deaths of women aged 15-49 years, 830,090 live birtns(LBs) and 303 maternal deaths meanwhile there were 28,380 deaths of women aged 15-49 years, 859,196 LBs and 313 maternal deaths in 1998. For MMR, 95% confidence interval of MMR in 1997 and 1998 were calculated.

MMR in 1997 was 36.50 per 100,0000 LBs meanwhile 36.43 per 100,000 per LBs in 1998. At 95% confidence interval, MMR were 33.8 to 39.2 per 100,000 LBs in 1997 and 34.06 to 38.80 per 100,000 LBs in 1998. (See Table 1)

Table 1. National Maternal Mortality Ratio and the Confidence interval of MMR by year of death

	1997	1998
Number of live births	830,090	859,196
Number of female reproductive age deaths	26,143	28,380
Number of maternal deaths	303	313
MMR/100,000 LBs	36.50	36.43
Confidence interval of MMR	33.80-39.20	34.06-38.80

According to number of live births by region in 1997, there were 308,483 LBs in the central, 274,705 LBs in the Northeast, 130,214 LBs in the North and 116,688 LBs in the South and there were 8,528 reproductive aged women deaths in the Central, 8,109 in the Northeast, 7,539 in the North and 1,967 in the South.

Meanwhile in 1998 there were 284,506 LBs in the Central, 293,498 LBs in Northeast, 136,201 LBs in the North and 144,991 LBs in the South and there were 8,838 reproductive aged women deaths in the Central, 8,773 in the Northeast, 8,372 in the North and 2,397 in the South. (See Table 2)

Table 2. Number of Live Births and women aged 15-49 years death by region and year of death

Region	1997		1998	
	Live Births	Woman aged 15-49 years death	Live Births	Woman aged 15-49 years death
Central	308,483	8,528	284,506	8,838
Northeast	274,705	8,109	293,498	8,773
North	130,214	7,539	136,201	8,372
South	116,688	1,967	144,991	2,397
Country	830,090	26,143	859,196	28,380

MMR in 1997 was the highest in the South followed by the North and the lowest in the Central (See Table 3)

Table 3. Regional Maternal Mortality in 1997

Region	No. of LBs	No. of female of reproductive age deaths	No. of maternal deaths	MMR: 100,000 LBs
Central	308,483	8,528	75	24.31
Northeast	274,705	8,109	96	34.95
North	130,214	7,539	56	43.01
South	116,688	1,967	76	65.13
Country	830,090	26,143	303	36.50

In 1998 MMR was the highest in the South followed by the North and the lowest in the Central (See Table 4)

Table 4. Regional Maternal Mortality in 1998

Region	No. of LBs	No. of female of reproductive age deaths	No. of maternal deaths	MMR: 100,000 LBs
Central	284,506	8,838	70	24.60
Northeast	293,498	8,773	100	34.07
North	136,201	8,372	65	47.72
South	144,991	2,397	78	53.80
Country	859,196	28,380	313	36.43

Causes of Maternal Deaths in 1997-1998

Regarding to causes of maternal death in 1997, indirect cause namely HIV/AIDS etc was major cause of maternal death followed by hemorrhage, other direct causes namely amniotic fluid embolism etc, hypertension disorders in pregnancy and eclampsia, sepsis, unsafe abortion, unknown cause and obstructed labor still cause of maternal death in 1997. (See Table 5)

Meanwhile regarding to causes of maternal death in 1998, indirect cause namely HIV/AIDS etc was major cause of maternal death followed by hemorrhage, sepsis, hypertension disorder of pregnancy and eclampsia, other directed causes namely amniotic fluid embolism etc, unsafe abortion, unknown cause and obstructed labor still cause of maternal death in 1998.(See Table 5)

Comparing cause of maternal death between 1997 and 1998, it was found that the indirect cause followed by hemorrhage was the leading cause of maternal death in 1997 and 1998. There were some changes to cause of maternal deaths per 100,000 LBs, some was decreased namely unsafe abortion (decreased from 3.13 per 100,000 LBs to 1.40 per 100,000 LBs), obstructed labor (decreased from 0.84 per 100,000 LBs to 0.47 per 100,000 LBs), other obstertric cause (decreased from 4.82 per 100,0000 LBs to 3.49 per 100,000 LBs), some was slightly increased namely hemorrhage (increased from 9.16 per 100,000 LBs to 9.89 per 100,000 LBs), some was increased namely sepsis (increased from 3.37 per 100,000 LBs to 5.47 per 100,000 LBs) (See Table 5)

Table 5. Causes of Maternal Deaths by years

Causes of Maternal Deaths	1997 (n=303)		1998 (n=313)	
	%	:100,000 LBs	%	:100,000 LBs
Hemorrhage	25.08	9.16	27.16	9.89
Sepsis	9.24	3.37	15.02	5.47
Hypertension disorders in pregnancy and eclampsia	10.89	3.98	10.56	3.84
Obstructed labor	2.31	0.84	1.28	0.47
Unsafe abortion	8.58	3.13	3.83	1.40
Other direct obstetric causes	13.20	4.82	9.58	3.49
Indirect causes	28.05	10.24	30.35	11.06
Unknown	2.64	0.96	2.24	0.81
Total	100.00	36.50	100.00	36.43
N		**303**		**313**

Causes of Maternal Deaths by region

Comparing the causes of maternal death in each region with the country, in 1997 the causes of maternal death were statistically difference among regions. The two leading cause of maternal death in the North, the Northeast and the Central were indirect cause namely malaria, HIV/AIDS followed by hemorrhage conversely the two leading causes of maternal death in the South was hemorrhage followed by indirect cause namely HIV/AIDS, malaria etc. (See Table 6-7)

Table 6. Percentage Distribution of Causes of Maternal Deaths in 1997 by region

Causes of Maternal Deaths	Central	Northeast	North	South	Country
Hemorrhage	18.67	27.08	23.21	30.26	25.08
Sepsis	10.67	7.29	7.14	11.84	9.24
Hypertension disorder of Pregnancy and eclampsia	10.67	11.46	8.93	11.84	10.89
Obstructed labor	1.33	1.04	5.36	2.63	2.31
Unsafe abortion	6.67	11.46	3.57	10.53	8.58
Other direct obstetric causes	16.00	8.33	17.86	13.16	13.20
Indirect causes	29.33	31.25	32.14	19.74	28.05
Unknown	6.67	2.08	1.79	0.00	2.64
Total	100.00	100.00	100.00	100.00	100.00
N	75	96	56	76	303
X^2 = 23.00	**df = 21**			**p > 0.05**	

Table 7. Causes of Maternal Deaths: 100,000 LBs in 1997 by region

Causes of Maternal Deaths	Central	Northeast	North	South	Country
Hemorrhage	4.54	9.46	9.98	19.71	9.16
Sepsis	2.59	2.55	3.07	7.71	3.37
Hypertension disorder of Pregnancy and eclampsia	2.59	4.00	3.84	7.71	3.98
Obstructed labor	0.32	0.36	2.30	1.71	0.84
Unsafe abortion	1.62	4.00	1.54	6.86	3.13
Other direct obstetric causes	3.89	2.91	7.68	8.57	4.82
Indirect causes	7.13	10.92	13.82	12.85	10.24
Unknown	1.62	0.73	0.77	0.00	0.96
Total	24.31	34.95	43.01	65.13	36.50
N	75	96	56	76	303

Comparing the causes of maternal death in each region with the country, in 1998 it was found that the causes of maternal death were statistically difference among regions. The causes of maternal death in the Central were indirect cause followed by sepsis and hemorrhage. Meanwhile the cause of maternal death on the Northeast was indirect cause, hemorrhage followed by sepsis, hypertension disorder in pregnancy and eclampsia and other direct obstetric cause. The cause of maternal death in the North was indirect cause and hemorrhage followed by sepsis. The cause of maternal death in the South was indirect cause followed by hemorrhage and hypertension disorders in pregnancy and eclampsia and sepsis. (See Table 8-9)

Table 8. Percentage Distribution of Causes of Maternal Deaths in 1998 by region

Causes of Maternal Deaths	Central	Northeast	North	South	Country
Hemorrhage	18.57	30.00	33.85	25.64	27.16
Sepsis	22.86	11.00	15.38	12.82	15.02
Hypertension disorder of Pregnancy and eclampsia	12.86	11.00	1.54	15.38	10.56
Obstructed labor	1.43	1.00	0.00	2.56	1.28
Unsafe abortion	2.86	3.00	4.62	5.13	3.83
Other direct obstetric causes	8.57	11.00	9.23	8.97	9.58
Indirect causes	28.57	30.00	33.85	29.49	30.35
Unknown	4.29	3.00	1.54	0.00	2.24
Total	100.00	100.00	100.00	100.00	100.00
N	70	100	65	78	313
X^2 = 215	**df = 21**			**p > 0.05**	

Table 9. Causes of Maternal Deaths: 100,000 LBs in 1998 by region

Causes of Maternal Deaths	Central	Northeast	North	South	Country
Hemorrhage	4.57	10.22	16.15	13.79	9.89
Sepsis	5.62	3.75	7.34	6.90	5.47
Hypertension disorder of Pregnancy and eclampsia	3.16	3.75	0.73	8.28	3.84
Obstructed labor	0.35	0.34	0.00	1.38	0.47
Unsafe abortion	0.70	1.02	2.20	2.76	1.40
Other direct obstetric causes	2.11	3.75	4.41	4.83	3.49
Indirect causes	7.03	10.22	16.15	15.86	11.06
Unknown	1.05	1.02	0.73	0.00	0.81
Total	24.60	34.07	47.72	53.80	36.43
N	70	100	65	78	313

The Proportion Maternal Deaths of Female of Reproductive Age (PMDF)

In 1997 there were 26,143 reproductive aged women deaths, which were 303 maternal deaths in Thailand and PMDF was 1.16%. The 95% confidence interval was 0.37% and 1.95%. Meanwhile in 1998 there were 28,380 reproductive aged women deaths, which were 313 maternal deaths in Thailand and PMDF was 1.10%. The 95% confidence interval was 0.39% and 1.81%. (See Table 10)

Table 10. The National Proportion Maternal Deaths of Female of Reproductive Age (PMDF) by year

	1997	1998
Number of female of reproductive age deaths	26,143	28,380
Number of maternal deaths	303	313
Proportion maternal deaths of female of Reproductive age (PMDF) (%)	1.16	1.10
Confidence interval of PMDF	0.37-1.95	0.39-1.81

Comparing PMDF during 1995-1998, it was found that PMDF was deceased: PMDF in 1995 was 1.34% meanwhile PMDF was 1.24% in 1996, 1.16% in 1997 and 1.10% in 1998. (See Table 11)

Table 11. The National Proportion Maternal Death of Female of Reproductive Age (PMDF) in 1996-1998

	1995*	1996*	1997**	1998**
Number of female of reproductive age deaths	3,440	3,799	26,143	28,380
Number of maternal deaths	46	47	303	313
Proportion maternal deaths of female of Reproductive age (PMDF) (%)	1.34	1.24	1.16	1.10
Confidence interval of PMDF	0.90-2.30	0.80-2.20	0.37-1.95	0.39-1.81

***** *Maternal Morality in Thailand 1995-1996, Department of Health, Ministry of Public Health, Thailand*

****** *Maternal Morality in Thailand 1997-1998, Department of Health, Ministry of Public Health, Thailand*

Considering PMDF by region, it was found that in 1997 PMDF in the North was the lowest but the South was the highest meanwhile PMDF in the South was 5 times higher than the Central and 3.3 times higher than the average of the country. (See Table 12)

Table 12. The Proportion Maternal Deaths of Female of Reproductive Age (PMDF) in 1997 by region

	Central	Northeast	North	South	Country
Number of female of reproductive age deaths	8,528	8,109	7,539	1,967	26,143
Number of maternal deaths	75	96	56	76	303
Proportion maternal deaths of female of Reproductive age (PMDF) (%)	0.88	1.18	0.74	3.86	1.16

In 1998 PMDF in the North was still the lowest but a slightly higher than in 1997 meanwhile the South was still the highest but decreased from 1997. PMDF in every region were decreased except the North, which was increased a little bit. (See Table 13)

Table 13. The Proportion Maternal Deaths of Female of Reproductive Age (PMDF) in 1998 by region

	Central	Northeast	North	South	Country
Number of female of reproductive age deaths	8,838	8,773	8,372	2,397	28,380
Number of maternal deaths	70	100	65	78	313
Proportion maternal deaths of female of Reproductive age (PMDF) (%)	0.79	1.14	0.78	3.25	1.10

Clarify definition of maternal death and causes of maternal deaths

The 2 major sources of maternal deaths information in Thailand are Bureau of Policy and Planning, Ministry of Public Health[2,3] that responsible to calculate MMR from death certificate and Bureau of Health Promotion, Department of Health, Ministry of Public Health responsible to calculate MMR from report of Safe Motherhood Project.[8] It was also found that MMR from both sources lower than survey data due to the misclassification of causes of deaths among reproductive aged women and unclear in definition of maternal deaths among health personnel who report cause of death in death certificate including to health personnel in other unit outside OBGYN clinics in hospitals.

During 1995-1996 the study of definition clarification on maternal death in maternal mortality in Thailand was conducted and distributed to 8 provinces in 1997. During 1996-1997 the study of definition clarification on maternal death in maternal mortality was conducted in region 5 in 5 provinces of the Northeast. In 1998, the report of maternal deaths in safe motherhood project was a little increased. Anyhow after the maternal mortality in Thailand 1997-1998 project was orientated in 1999, MMR in both sources was sharply increased. (See Figure 1)

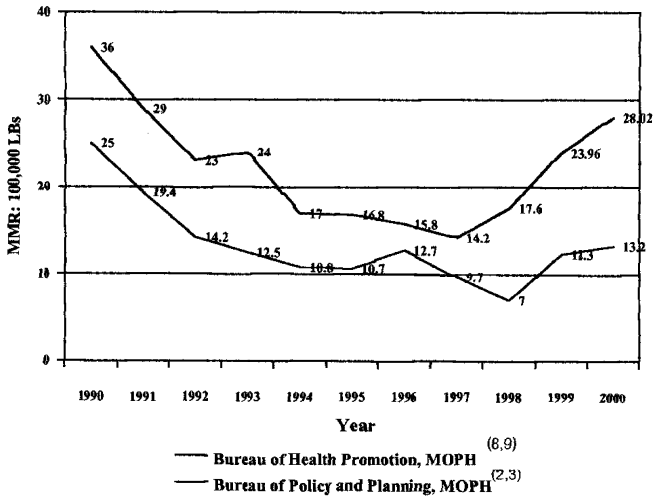

Fig. 1. Maternal Mortality Ratio by Routine Reporting Sources in Thailand.

Discussion

Considering to this study MMR in 1997 was 36.50 per 100,000 LBs and 36.43 in 1998 that compared to the previous study there was 44.3 per 100,000 LBs in 1995 and 43.9 in 1996.

MMR during 1997-1998 was the highest in the south and the lowest in the central. Meanwhile it was much decreased from 1997 to 1998 but slightly increased in the north.

The major cause of maternal death in Thailand in 1997 and 1998 was indirect cause with the percentage distribution was similar followed by hemorrhage. The cause of maternal deaths per 100,000 LBs between 1997 and 1998 was not much different.

According to the major cause of maternal deaths by region, it found that in 1997 the leading cause of maternal death in every region except the south was indirect cause. The leading cause of maternal deaths in the south was hemorrhage. In 1998 the leading cause of maternal deaths in the northeast and the north was indirect cause and hemorrhage but the south and the central was indirect cause meanwhile the south and the central was indirect cause.

The cause of maternal deaths between the previous study compares with this study shown that the hemorrhage was the major cause of the maternal death in 1996 followed by indirect cause conversely the indirect cause was the major cause of maternal death in 1997 and 1998 followed by hemorrhage. Regarding to the cause of maternal death per 100,000 LBs in 1997 and 1998, it was found that hemorrhage, Sepsis, unsafe abortion, unknown cause and other direct obstetric cause was decreased but hypertension disorder of Pregnancy and Eclampsia and indirect cause were increased.

Comparison the cause of maternal death between 1997 and 1998 by region shown that hemorrhage was decreased in every region except the northeast, Sepsis were also decreased in the central, the northeast and the north. PMDF in Thailand during 1995-1998 were slightly decreased. The trend of decline was steady even using sampling data or census data.

MMR in Thailand through routine statistic from Safe Motherhood Project of Bureau of Health Promotion and death certificate of Bureau of Policy and Planning were increased after clarification of maternal death definition. The information from Safe Motherhood Project was increased before, due to the data from this project was kept at hospitals and reported to Department of Health periodically thus this information was reconsidered for correction by physician and resent to Department of Health. Meanwhile, the retrospective information from death certificate can not be corrected thus only prospective data is corrected. However, the number of maternal deaths in Thailand hopefully should be close to the actual one for the nearly future. For maternal mortality study, periodic should be done to confirm information every 5 years and during this interval PMDF can be used to estimate the maternal death and MMR in Thailand.

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