
PUBLIC HEALTH RESEARCH

Trend of Stillbirths and Neonatal Deaths in University Kebangsaan Malaysia Medical Centre (UKMMC) From 2004-2010

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ABSTRACT

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Introduction	The aim of the Fourth Millennium Developmental Goal is to reduce mortality among children less than 5 years by two thirds between 1990 and 2015. Efforts are more focus on improving children's health. The aim of this study was to describe the trend of stillbirth and neonatal deaths in University Kebangsaan Malaysia Medical Centre from 2004 to 2010.
Methods	A retrospective cross-sectional study was conducted using hospital data on perinatal mortality and monthly census delivery statistics.
Results	There were 45,277 deliveries with 526 stillbirths and neonatal deaths. More than half of the stillborn cases were classified as normally formed macerated stillbirth and prematurity was common in neonatal deaths. The trend of SB and NND was found fluctuating in this study. However, by using proportionate test comparing rate, there was a transient significant decline of stillbirth but not neonatal deaths rates between 2004 and 2006. On the other hand, the neonatal deaths rate showed significant increment from 2006 to 2008. When both mortality rates were compared using proportionate test, from the start of the study, year 2004 with end of the study, year 2010, there was no significant decline noted.
Conclusions	Trends of stillbirth and neonatal death rates in University Kebangsaan Malaysia Medical Centre within 7 years study period did not show the expected outcome as in Millennium Developmental Goal of two thirds reduction.
Keywords	Stillbirth - Neonatal mortality – MDG.

INTRODUCTION

The fourth goal of the Millennium Development is to reduce mortality among children under 5 years old by two thirds between 1990 and 2015^{1,2}. Worldwide, child mortality between 1980 and 2000 was reduced by one third while the neonatal mortality rate was reduced by only a quarter^{1,2}. To achieve MDG 4 goals, the neonatal mortality must at least be halved^{2,3}. Neonatal mortality is divided into early and late neonatal death. Early neonatal deaths occur during the perinatal period and have similar obstetric origins as the stillbirth^{2,3}. Reasons for early neonatal deaths includes severe congenital malformation, premature delivery, antepartum or intrapartum obstetric complications (foetal malpresentation or obstructed labour) or because of harmful practices after birth that leads to infections¹⁻³. Besides, another common adverse outcomes of pregnancy is stillbirth^{3,4}. It accounts for over half of all perinatal deaths³. Perinatal period is measured as completed 22 weeks of gestation and ends seven days after birth^{3,4}. Stillbirth can occur before onset of labour (antepartum death) or during labour (intrapartum death)^{3,4}. Foetuses may die before onset of labour due to pregnancy complications or maternal diseases³. Distinguishing between these two types is important. Through appropriate intrapartum care, stillborn can be avoided. Intrapartum death also known as fresh stillbirth (FSB) refers to normal appearance of foetus after delivery⁴. Antepartum death also known as macerated stillbirth (MSB) refers to macerated looking skin of foetus and implies that death is more than 12 hours before delivery⁴.

Stillbirth and neonatal mortality data are important health status indicators. In Malaysia, the government and private hospitals data were analysed by the Division of Family Health Development and annual report are then produced. In addition, data related to SB and NND in specialist hospitals maybe published via their own hospital's annual report or discussed during departmental meeting. Suggestions for ongoing improvement are then advised to prevent another death in cases similar to the index case. Therefore, in an attempt to lower the stillbirth rate, screening and treatment strategies should be developed to best suited local scene⁵.

Vital and mortality statistics, community survey or hospital data gives an overall estimation of the problem. However, each has its own limitation and underreporting is common. In Peninsular Malaysia, the percentage of institutional deliveries increased from 75.6% in 1990 to 96.6% in 2004⁶. The antenatal coverage in 2008 was 94.4% as compared to 73.4% in year 2000⁶. The average number of antenatal visits by the pregnant mother to public and private health facilities increased from 8.4 in 2005 to 9.6 in 2008⁷. This was even higher than the minimum four antenatal

visits being recommended by World Health Organization^{6,7}. Institutional deliveries in Malaysia include care given by government and private sector which contributed 96.6% of all deliveries in 2004⁶. Universiti Kebangsaan Malaysia Medical Centre is an example of institutional delivery facility and was chosen for this study because it represents one of the specialist hospitals in Klang Valley area.

The aim of this study was to describe the trend of stillbirth and neonatal deaths in University Kebangsaan Malaysia Medical Centre from 2004 to 2010. Institutional data was used to assess trend of SB and ND and associated factors.

METHODS

This was a retrospective cross sectional study using Rapid Reporting of Stillbirth and Neonatal Death form in UKMMC (PNM 1/97) from year 2004 until 2010. National usage of this form was started since 1998⁸. The format is simple, practical and can be used without autopsy findings because permission for autopsy is difficult to obtain in Malaysia due to cultural and religious beliefs^{9,10}. It is only a reporting system and not a confidential inquiry system^{8,10}. The classification used was based on a modified pathophysiological Wigglesworth classification^{8,9}.

UKMMC is located in Cheras, at the outskirts of Kuala Lumpur but within Klang Valley area. Klang valley area is the most populated in Malaysia. It is an institution providing specialist healthcare and also acted as referral centre for places across Malaysia as well as from neighbouring countries¹¹.

All stillbirths and neonatal deaths reported by UKMMC from 2004 until 2010 were included in the study. The data of total births by ethnicity, parity, gestational age, birth weight were collected from the monthly census data which was kept in the census files in Obstetrics and Gynaecology Department. Data were grouped as maternal related, and foetal related factor. Maternal related factors are ethnicity, citizenship, age, parity status, methods for gestational age estimate, antenatal clinic follow up and maternal medical illnesses. Foetal related factors includes place of delivery, who delivered the cases, plurality of pregnancy, birth weight and sex of the foetus. Exclusion criteria were incomplete forms which cannot be verified further. There were 526 forms collected and 2 (0.4%) forms were rejected because of incompleteness. Routinely, the form is filled by the attending doctor on the delivery day of the stillborn or on the day of death for the neonate.

In this study, stillbirth is defined as a birth of a dead foetus of at least 22 weeks of gestation or weighing at least 500grams¹². Early neonatal deaths were deaths of live born babies during the first seven completed days after birth, and late neonatal

deaths occurred after 7 completed days and before 28 completed days^{3,12}. Neonatal mortality includes early and late neonatal deaths, the rates are given per 1000 live births³. Stillbirth rates are reported as stillbirth beyond a certain gestational age (more than 22 week or 500g) divided by the number of total birth¹².

Age of a mother is based on the date of birth stated in the identity card. For those without identity card, the age is obtained through admission data. Ethnic group is divided to Malay, Chinese, Indian or Others (Murut, Bajau, Melanau, Bidayuh, Kadazan/Dusun, Iban, Orang Asli and noncitizens). Low birth weight is birth weight less than 2500g³. Birth weight is determined by duration of gestation and rate of foetal growth. Infants with birth weight less than 2500g can be either born prematurely (preterm birth) or born small for gestational age (SGA; a proxy for intra uterine growth restriction, IUGR)¹³. Preterm birth is delivery before 37 completed weeks of gestation³. Gestational age at delivery is calculated based on the first day of the last normal menstrual period till delivery occurs. Those with revised estimated delivery date were categorized under ultrasound based estimation.

Gestational age is expressed in completed days or completed weeks³.

Data was analysed using Statistical Package for Social Sciences (SPSS Inc. Chicago USA) version 19.0 for descriptive analyses. Proportionate tests were conducted to assess rate significance.

RESULTS

Total deliveries reported in UKMMC from year 2004 to 2010 were 45 277. There were 44,994 live births, 453 perinatal deaths and 241 neonatal deaths. Of the perinatal deaths, 283 (54%) were stillbirths. Out of the stillbirths, 168 (32.1%) were macerated stillbirths and 115 (21.9%) were fresh stillbirths. Of the neonatal deaths, 170 (32.3%) were early deaths and 71 (13.5%) were late neonatal deaths.

Table 1 shows maternal related factors of the cases. Majority of the patients were Malay (88.5 %), with Malaysian citizenship (89.7%), age more than 35 (79.7%), with multiparity (57.1%) with 92.7% had antenatal clinic follow-up and 45.9% had specialist clinic follow-up.

Table1 Characteristics of cases according to maternal related factors

	Cases n	SB		ND	
		N	%	n	%
Ethnicity					
Malay	336	170	67.5	166	76.1
Chinese	107	64	25.4	43	19.7
Indian	20	14	5.5	6	2.8
Others	7	4	1.6	3	1.4
Citizenship					
Yes	471	252	89.0	219	90.9
No	53	31	11.0	22	9.1
Maternal age					
< 35	403	206	76.9	197	82.8
≥35	103	62	23.1	41	17.2
Parity					
0	207	122	43.9	85	35.4
1-4	296	144	51.8	152	63.3
>5	15	12	4.3	3	1.3
ANC Follow up					
Yes	484	254	90.7	230	95.4
No	37	26	9.3	11	4.6
Place of ANC follow up					
Government Health Clinic	72	41	14.6	31	11.8
Hospital with specialist	349	180	64.3	169	64.5
Hospital without	6	3	1.1	3	1.2

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specialist Private clinic/hospital	115	56	20	59	22.5
Gestational age estimated Last menstrual period	388	210	74.5	178	73.9
Ultrasound	109	53	18.8	56	23.2
Neonatal assessment	3	2	0.7	1	0.4
Unknown	23	17	6.0	6	2.5
Maternal medical illness					
Hypertension	68	45	13.0	23	9.6
Diabetes	33	21	6.1	12	5.0
Vaginal bleeding	25	16	4.6	9	3.8
Anemia	17	12	3.5	5	2.1
Prolonged rupture of membrane	37	16	4.6	21	8.8
Preterm labour	369	210	60.9	159	66.5
Other illness	35	25	7.3	10	4.2

Abbreviations: n, total cases (of SB and ND)

For those with other illness, there were four cases of thyrotoxicosis, three cases of Systemic Lupus Erythematosus (SLE) and three cases of Thalassemia trait.

Table 2 shows the foetal related factors. One third of the cases was below 27 week of

gestation (30.2%) and delivered at specialist hospital (93.5%). Majority were delivered by doctors (90.5%), singleton (90.0%), weighing less than 2500 gram (81.3%) and of male gender (56.6%).

Table 2 Characteristics of cases according to foetal related factors.

	Cases	SB		ND	
	n	n	%	n	%
Gestational age					
< 27 W	147	77	30.0	70	30.4
28- 32 W	120	69	27.0	51	22.2
33 – 36 W	110	64	25.0	46	20.0
> 37 W	109	46	18.0	63	27.4
Place of delivery					
Home	9	2	0.7	7	2.9
Hospital with specialist	487	265	94.0	222	93.3
Private clinic/hospital	24	15	5.3	9	3.8
Delivery by					
Doctors	475	248	87.6	227	94.2
Not doctors	49	35	12.4	14	5.8
Number of foetus					
Singleton	471	254	90.7	217	90.0
Non singleton	50	26	9.3	24	10.0
Birth weight					
Less than 2500g	416	229	83.9	187	78.2
More than 2500g	96	44	16.1	52	21.8

Sex of baby					
Male	268	154	54.4	114	54.0
Female	209	120	42.4	89	42.2
Undetermined/unknown	17	9	3.2	8	3.8

Abbreviations: n, total cases

Table 3 showed normally formed macerated stillbirths (NFMSB) accounted for 53.2% of deaths in stillbirth cases. In early and late neonatal death, prematurity was the common cause of death. Prematurity comprised 50.3% of the early neonatal deaths and 53.5% in late neonatal deaths. The mean birth weight in stillbirths was 1439.6 ± 955 grams, whereas in the neonatal deaths, the mean was 1699 ± 945grams.

Figure 1 showed trend of SB and ND rates from 2004-2010. The stillbirth rate declined from

8.1 per 1000 total births in 2004 to 6.2 in 2010. The neonatal mortality rate has increased from 5.1 per 1000 live births in 2004 to 5.8 in 2010. There is a transient decline in 2006 for both components of mortality rates with significant decline seen in SB rates but not ND. The significant transient increment of ND was noted from 3.3 in 2006 to 7.7 in 2008. Using proportionate test, there was no significant changes from year 2004 compared to year 2010 for both mortality rates.

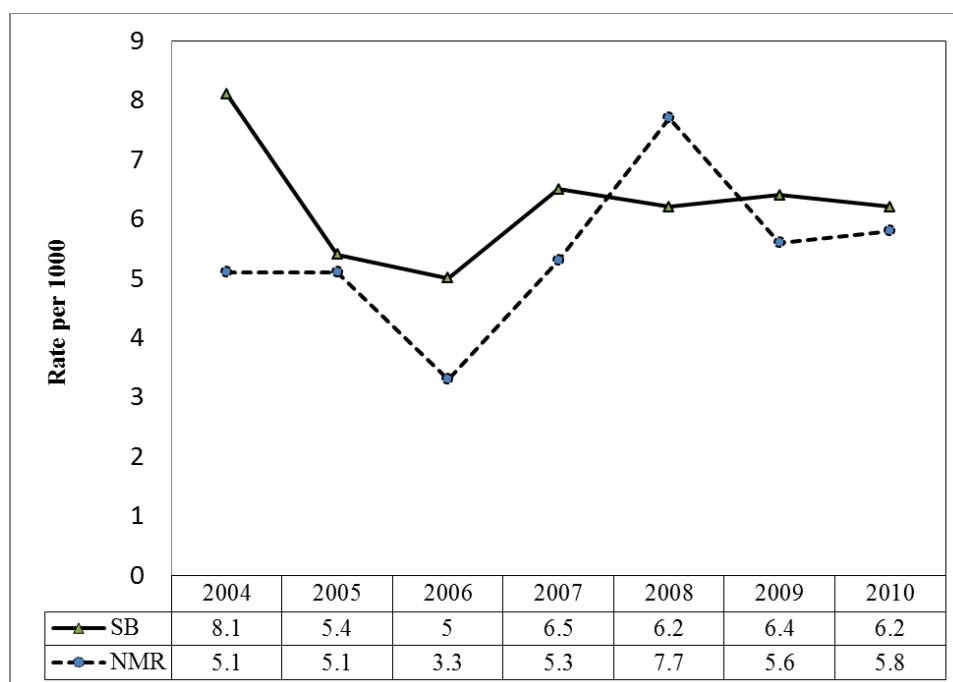
Table 3 Distribution of causes of death according to Wigglesworth Classification of Death

Cause of death according to WPC	Stillbirth		Early neonatal deaths		Late neonatal deaths	
	n	%	n	%	n	%
LCM	45	16.2	59	35.0	19	26.7
NFMSB	148	53.2	-	-	-	-
Birth asphyxia	84	30.2	17	10.0	5	7.04
Prematurity	-	-	85	50.3	38	53.5
Infection	-	-	4	2.37	9	12.7
Others	-	-	1	0.6	-	-
Unknown	1	0.36	3	1.78	-	-
Total	278	100	169	100	71	100

WPC = Wigglesworth Pathophysiological Classification

LCM = Lethal Congenital Malformation

NFMSB = Normally Formed Macerated Still Birth



Abbreviations: SB, stillbirth; NMR, neonatal mortality rate

Figure 1 Stillbirth and neonatal mortality rates, 2004- 2010 in UKMMC

DISCUSSION

This study shows that stillbirths were the commonest cause for perinatal deaths in UKMMC. This is consistent with most studies done in analyzing perinatal deaths^{12,14,15}. The stillbirths and neonatal mortality rates in this study were higher compared to the figures reported in Annual Report of Stillbirth and Neonatal Deaths in Malaysia 2003-2006 or from Department of Statistics, Malaysia 1998-2006⁷. This discrepancy could be due to deaths from complicated cases managed in such tertiary referral center. In addition, different definition of death was used. For example, the Department of Statistics used 28 week gestational age as the definition of death¹². Another reason is the differences in method of how notification form was analyzed in Ministry of Health compared to specialist hospitals. In public hospitals, the notifications will eventually be submitted to the national level whereby the findings will be tabulated based on the patient's residential address categorized by states. This is because the patient may receive antenatal care from one state in Malaysia but delivered eventually at another state. This differs to this study as data collected were based on place of death i.e. UKMMC. Nevertheless, the overall trend of SB rates was not declining significantly.

Since there was a significant transient decline in SB rate in 2004-2006, some intervention could have been taken place prior to the study. Underreporting is unlikely since notification was done by the respective ward where death has taken place and it has been counter check with monthly census.

There was non-significant transient declined of neonatal mortality from 5.1 in 2004 to 3.3 in 2006. In UKMMC, the neonatal resuscitation program (NRP) was implemented in 1998. The outcome of the program was reviewed from 1996 to 2004 and concluded that NRP was associated with improvement of neonatal mortality rates¹⁶. However, the Malaysian NRP success has yet to be reviewed since the last study which was done in 2004. Given the circumstances of transient significant increment of ND rate from 3.3 in 2006 to 7.7 in 2008, other factors besides the NRP could also be at fault and further study is warranted. Factors such as staffing, facilities, intrapartum interventions, paediatric factors and parental data have been found to have significant associations¹⁷. However, no published data available related to any intervention done in UKMMC to explain this increment.

In developing countries, infection is estimated to contribute to 25-50% of the stillbirths^{4,5}. This is in contrast to this study result. As mentioned previously, NFMSB are the predominant classification (53.2%) of deaths among stillbirth. This result is similar as produced by the Report of Stillbirths and Neonatal Deaths by Ministry of Health Malaysia. Infection as the classification of death was none in the analysis of stillbirth category as opposed to 15.1% as the cause of death in live births. This is because the aim of the

Wigglesworth's classification was to divide cases into groups with clear implications for clinical management. Cases may present in a vague manner. Classifications are then based on combination of clinical data and pathological findings¹⁸. This figure could be underestimated due to pathophysiological approach in reporting deaths in contrast to autopsy or post-mortem. In addition, investigations on infection were conducted after loss had occurred. Infection that presented earlier would be resolved by the time investigations were done. In other classification, for example Neonatal and Intrauterine Death Classification according to Etiology (NICE), it aimed to identify underlying biological causes of death and not areas of healthcare provision like Wigglesworth's. For example by using NICE, placenta abruption is identified as cause of death and not intrauterine death, asphyxia or immaturity which was the result of the abruption and lead to death¹⁸. Therefore different classifications used will produce different causes of death for the same set of data.

This study findings about classification of neonatal deaths also concurred with the Annual Report 2008 of Ministry of Health, Malaysia. Prematurity, lethal congenital malformations and asphyxia conditions were the main causes of neonatal deaths in Malaysia¹². To reduce such causes, the strategy identified was to strengthen the pre-pregnancy and antenatal care¹². For example in Singapore, prenatal screening of genetic disorders like Haemophilia has reduced the average case of β -Thalassaemia major of 15 to 20 cases a year to that of one case per year¹⁹. In Malaysia, history of rubella vaccination during school years has improved rubella sero-positivity among antenatal mothers²⁰.

Women who lacked antenatal care are at risk for stillbirths⁴. Antenatal care is one of the pillars for Safe Motherhood Initiatives²¹. By attending antenatal clinic women are exposed to health education and were taught the essential warning signs and symptoms during pregnancy which can result in saving her life and pregnancy. Ministry of Health Malaysia had produced series of Perinatal Care Manual since 2002 which can be referred as guidance for health care workers. The Manual consists of five sections: pre-pregnancy care, antenatal care, intrapartum care, postpartum care and neonatal care^{7,22,25}. However in this result, more than 90% of the cases had antenatal clinic follow up but there is difficult to ascertain the quantity or earliest booking period of the cases as this was not captured by the format.

Inadequate antenatal care is one of the common risk factors for stillbirths in developing countries^{4,5}. In Malaysia, screening strategies include foetal kick charts (Cardiff 'count to ten') which is the indirect tool to monitor foetal wellbeing^{26,28} and most health clinics are equipped with ultra sound for foetal growth assessment. However, in our data most stillborn occurred prior to 27 week and the foetal kick chart is

only given from 28 weeks gestation onwards. Perhaps other screening strategies can be employed earlier in second trimester rather than at the end of trimester. Perinatal Care Manual mentioned that antenatal booking should start as early as 12 weeks gestation²⁶. Ultrasound is used during booking visit depending on the facilities at the clinics. Symphysio-fundal height (SFH) tape measurement is performed routinely from 22 weeks of gestation. If there is a discrepancy between the SFH and gestational age, patient will also be referred for ultrasound²⁴. Antenatal coverage in Malaysia in 2008 was 94.4% with increase in average number of antenatal visits as well⁷. Malaysian's antenatal coverage has been extensive as also evidenced by increasing number of health clinics and hospitals by the Malaysian Plans⁷. The health clinic has its own specialist known as the Family Medicine Specialist (FMS). The FMS is responsible for receiving and handling cases referred to him or her and will ensure the cases seen are in accordance with clinical practice guidelines established by the Ministry of Health Malaysia. The FMS can refer complicated cases to tertiary hospitals. Therefore infrastructure, manpower and equipment seem to be adequate. Perhaps, public need to be educated on importance of early antenatal booking, especially those with high risk factors for adverse outcomes in pregnancy.

Further analysis of the trend by gestational age per year showed that stillbirth rates were highest among those with gestational age less than 27 week and of low birth weight (i.e. less than 2500 grams). The mean birth weight for stillbirth cases was 1439.6 grams. This strongly puts across the message that stillbirth is a result of low birth weight because of early gestation of delivery. Risk factor for low birth weight babies are poor maternal nutritional status²⁷⁻²⁹, advanced maternal age⁴, low economic status²⁷⁻²⁹, Indian race²⁷, unbooked²⁸ and pre eclampsia^{4,28,29}. In this study it is impossible to measure the maternal nutritional status as the parameter was not considered in the format. The mean maternal age for stillbirths (30 years old \pm 5.8) and neonatal deaths (30 years old \pm 4.8) did not differ much and the possible explanation is that the majority of the population that utilize the health care facilities is from the age of 35 years and less which made up 80% of the total cases.

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