



Sri Lanka: Outcome of Maternal Death Surveillance and Response – 2018

Review of maternal deaths is recognized as an internationally accepted best practice for reducing maternal deaths. World Health Organization (WHO) in 2004 introduced a guide, *Beyond the numbers—Reviewing maternal deaths and complications to make pregnancy safer* to initiate maternal death reviews & response systems.

Sri Lanka started reviewing maternal deaths way back in 1981. The review process evolved over the years with the addition of quality dimensions. In 1985, the gazette regulation on mandatory notification of probable maternal deaths was issued. In 1995, structured review of deaths was started by Family Health Bureau (FHB). In 2000, a national maternal death database was established. In 2009, Ministry of Justice issued a circular to all coroners on compulsory post-mortems on maternal deaths. In 2010, the review process was revolutionized with the addition of several quality dimensions; mandatory post-mortems, case scenario development, central level expert reviews and strengthening the 'response' part. FHB coordinates the surveillance process island wide with the expertise contribution from professional Colleges of Obstetricians, Anaesthesiologists, Community Physicians, Administrators, Physicians, Cardiologists and Forensic Pathologists. The *British Journal of Obstetrics & Gynaecology (BJOG)* in 2014 acknowledged that Sri Lanka's MDSR system to be the best organized and structured.

Maternal Death

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

Maternal Mortality Ratio (MMR) is calculated as the number of maternal deaths per 100,000 live births. MMR is an overall quality index of a country's socio-economic development and healthcare. Sri Lanka reported an MMR of 1694 per 100,000 live births in the year 1947 and gradually reduced the same over the last few decades to achieve the best MMR in the South Asian Region.

It is important to note that both health and non-health interventions made a significant impact on maternal care service delivery and reducing maternal mortality. These include; socio-economic development, free education and related high literacy rate of population, improved transport

services, free health services, improved quality of obstetric care, control of communicable diseases and well organized primary health care (PHC) systems.

Maternal death Notification Criteria: All female deaths (15 – 49 years), irrespective of the cause, during the pregnancy period and until one year after termination of pregnancy.

When a probable maternal death is known, field and hospital health staff notify, conduct post-mortems, review the index death at field and hospital levels and send a detailed report to FHB. At FHB, the Maternal & Child Morbidity and Mortality Surveillance Unit maintains a database and comprehensive case scenarios are developed. These cases are then desk reviewed by an expert panel comprised of different specialties related to maternal care service provision. A national team of experts from related specialties visit each and every district in the following year to conduct National Maternal Mortality Reviews (NMMR) at district level with the participation of all concerned stakeholders. Each maternal death is reviewed based on 3 delays – (deficiencies in seeking healthcare, reaching and treating), and lessons learnt are translated into practice, programs and policies at district and national levels.

In the year 2018, the field health staff catered for 3,909,165 eligible families all over the country and registered 363,336 pregnant mothers. Antenatal care was provided to 95.6% of them and 99.9% of women delivered in a hospital.

For the year 2018, all NMMRs in 26 health regions were conducted and review of all deaths (100%) were completed by November 2019.

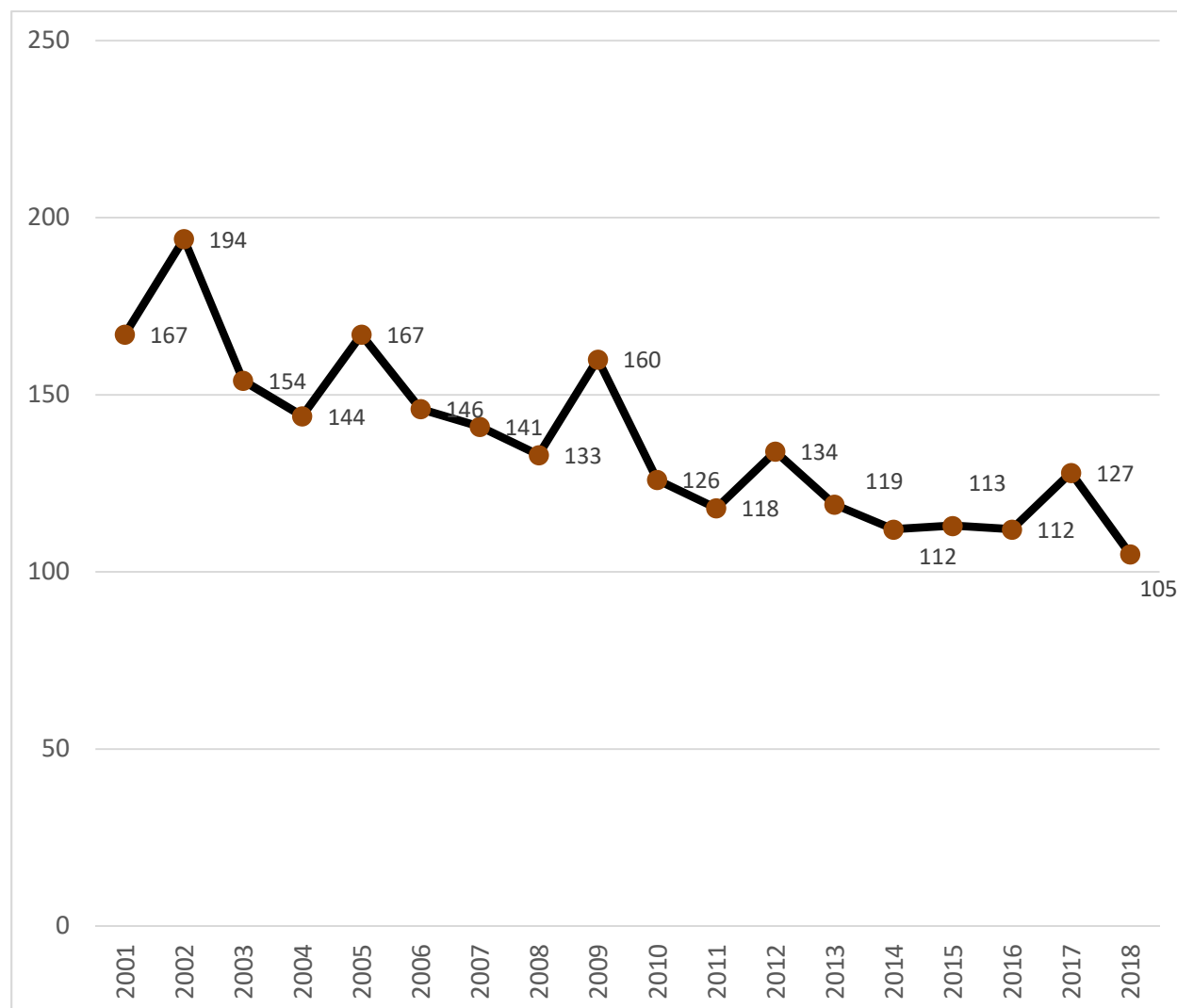
Preliminary review of all probable maternal deaths (n=196) reported during the year identified 105 deaths as maternal deaths giving a national maternal mortality ratio of 32 per 100,000 live births. Live births reported by the Registrar General's Department for the year 2018 was taken as the denominator (328,112) (**Figure 1**). It is notable that there was an increment of 2060 live births in the denominator (2017 - 326,052).

Figure 1: Calculation of MMR 2018



Figure 2 illustrates the number of reported and confirmed Maternal Deaths from 2001 – 2018. Though there is a gradual reduction in the number of maternal deaths over the years, the number has been almost stagnant during the period 2014 - 2016. A significant rise was noted in the year 2017 mainly due to higher number of Dengue Haemorrhagic Fever (n=21) contributing to the maternal death profile. It is noteworthy the substantial reduction of maternal deaths in the year 2018.

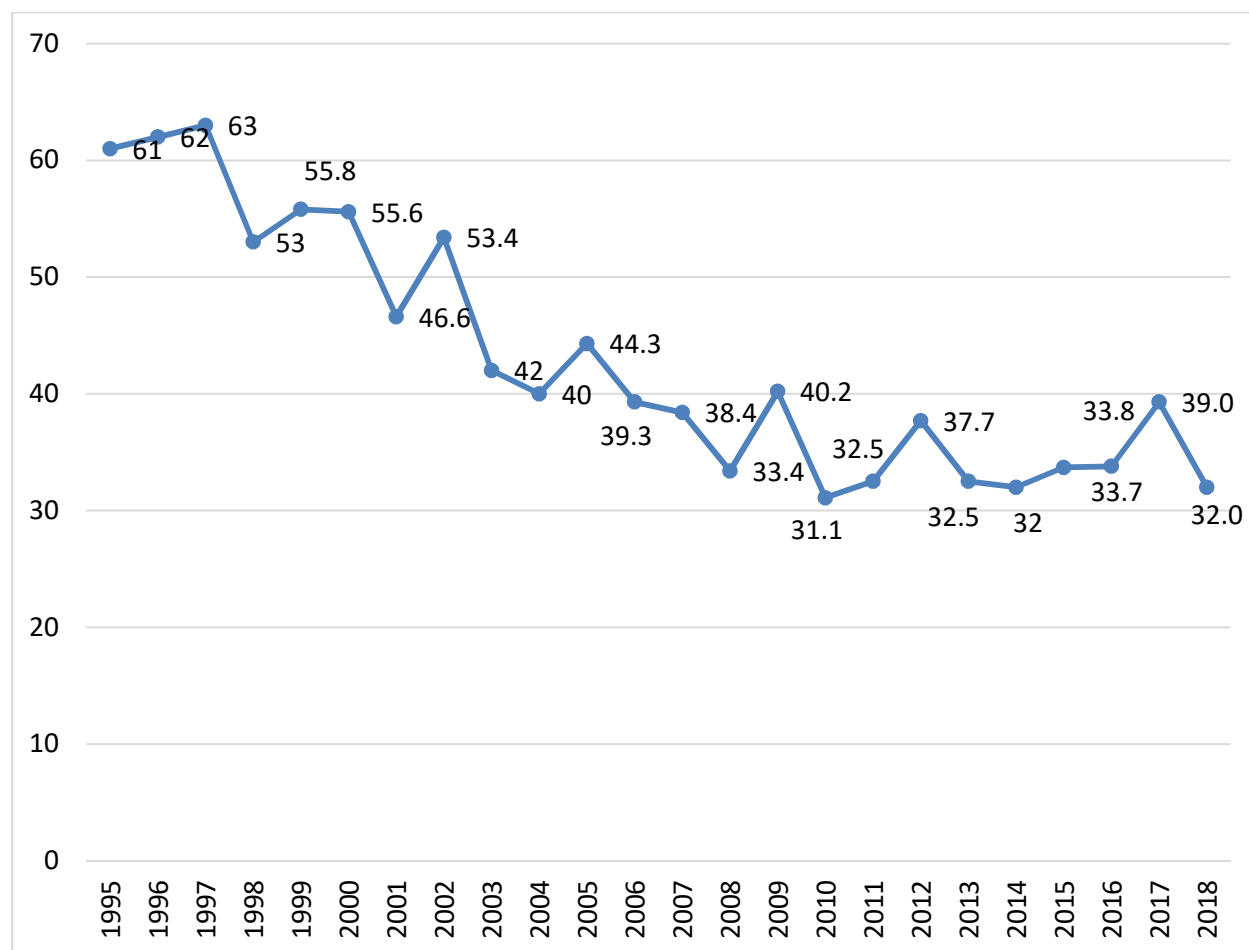
Figure 2: Number of Maternal Deaths (2001 – 2018)



Source: Maternal & Child Morbidity & Mortality Surveillance Unit - Family Health Bureau

Sri Lanka's MMR is well below the rate of other South Asian counter parts and is on par with high income countries. Figure 3 depicts the declining trend of MMR over the years from 1995 – 2018. However, similar to the number of maternal deaths, the MMR also has been stagnant since 2010.

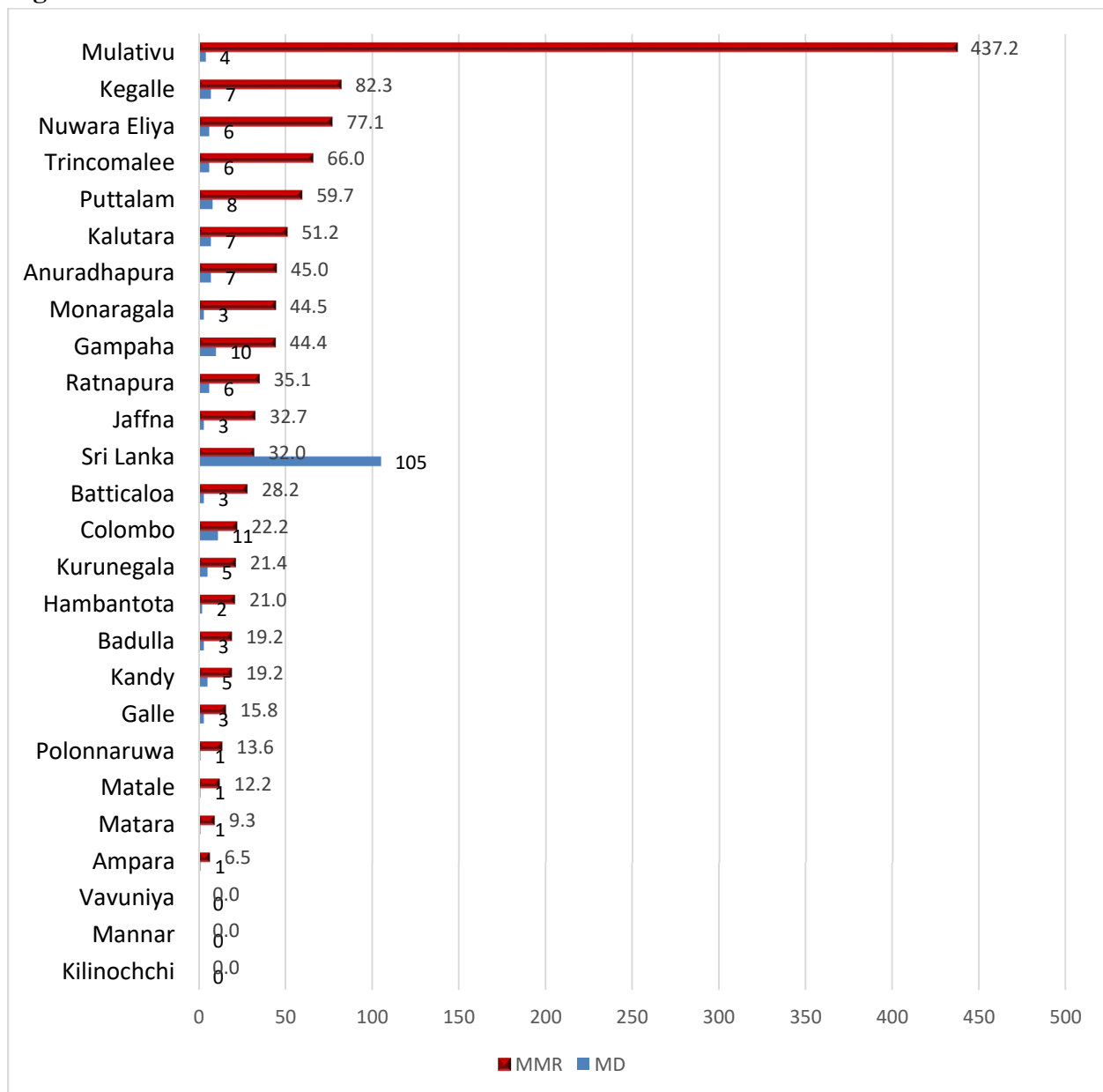
Figure 3: Maternal Mortality Ratio from 1995-2018



Source: Maternal & Child Morbidity & Mortality Surveillance Unit - Family Health Bureau

The analysis of district level number of deaths and MMR based on live births reported for each district by Registrar General's Department shows a wide variation (figure 4). Eleven districts have their district MMR above the national value. The highest MMR was reported from Mulativu district (437.2 per 100,000 live births). Other leading districts are Kegalle, NUwara Eliya, Trincomalee and Puttlam. The highest number of maternal deaths was reported from Colombo and Gampaha districts.

Figure 4: District level number of maternal deaths and MMR in 2018



Maternal deaths have occurred in 42 government hospitals (figure 5 & 6). Hospital level MMR was above the national level in 21 of the hospitals. The highest MMR was reported from District General Hospital Mulativu followed by District General Hospital Trincomalee. The lowest was reported from Teaching hospital Mahamodara (9.4 per 100,000 live births).

Figure 5 : Hospital level number of maternal deaths and MMR
(Hospitals above national MMR)

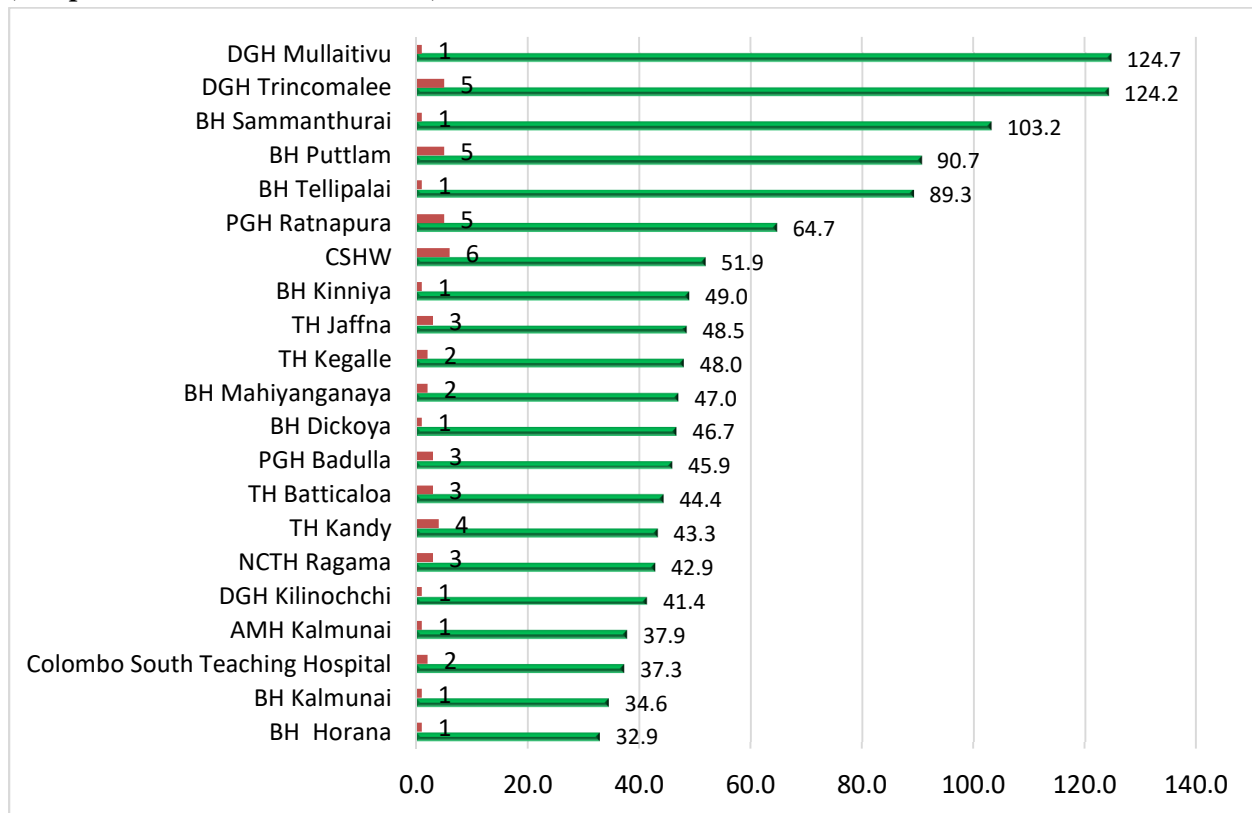
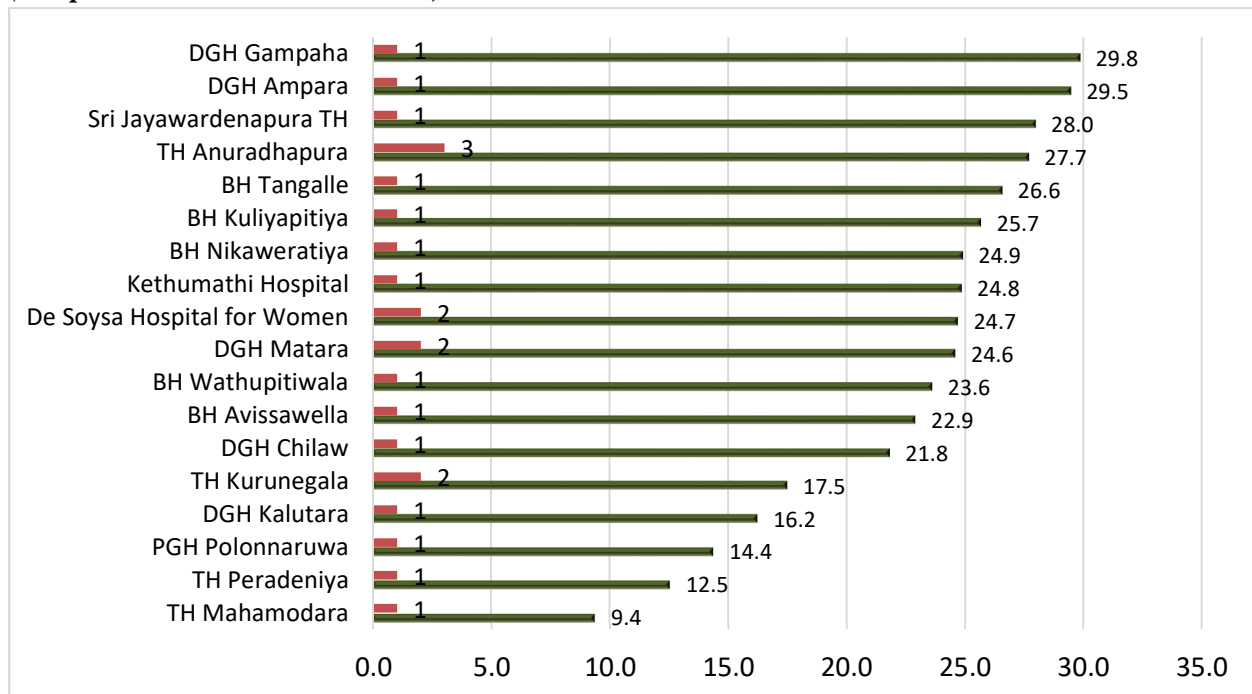
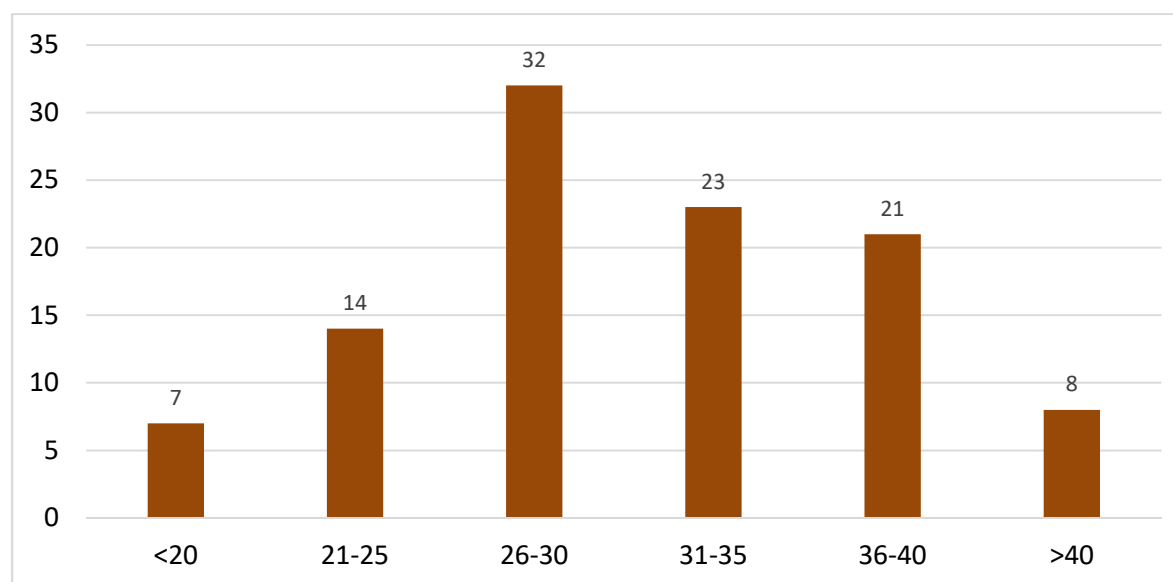


Figure 6 : Hospital level number of maternal deaths and MMR
(Hospitals below national MMR)



Age pattern of the women died indicate that majority were between 26 to 30 years old (figure 7). A fair number (n=7, 7%) of teenage maternal deaths and over the age 35 years deaths (n=31, 28%) were also noted.

Figure 7: Age profile of the women died



A majority of the women died were Sinhalese (n=60; 57%). Almost equal proportion of Muslim (n=22; 21%) and Tamil (n=23, 22%) women have died in 2018. These proportions are not in line with the population composition of three ethnicities based on 2012 census (Sinhalese 74.9%, Tamil 15.3%, Muslim 9.3%).

Nearly two thirds of the women were residing in rural areas (n=68; 65%) while others were from urban (n=33, 33%) and estate sectors (n=04, 4%). A greater majority (n=97; 92%) had been married. The rest of the women were either unmarried (n=7; 7%) or widowed (n=1; 1%). A large proportion (n=99, 93%) had either secondary or higher level of education. More than three quarters (n=80; 76%) had not been employed at the time of death. The parity level of the maternal deaths shows that one third of women were primies (n=38, 36%). A proportion of 41% of women were in their third pregnancy or over. Of the 105 maternal deaths, 18% (n=19) had unmet need for family planning and one was a medical contraindicated pregnancy.

Distribution of the body mass index (BMI) among the women is indicated in table 1. Quarter of the women (26%) were either overweight or obese while 8% were underweight.

Table 1 : Body mass index of the women died

BMI category	N	%
< 18	08	7.6
18 - 25	37	35.2
25 - 30	21	20.0
> 30	06	5.7
No data	33	31.4
Total	105	100.0

A greater majority (n=87; 83%) had received ante natal care and 85% had their booking visit before 12 weeks of gestation.

Conducting post-mortems:

A post-mortem was conducted in 96% of the cases. In majority of the cases, the post-mortem was conducted by a specialist JMO. The coverage achieved in conducting post-mortems on index cases over the years demonstrates the quality of the cause of death determination (Figure 8). However, the final determination of the cause of death was worked out through a consensus reaching process involving a panel of experts from different fields.

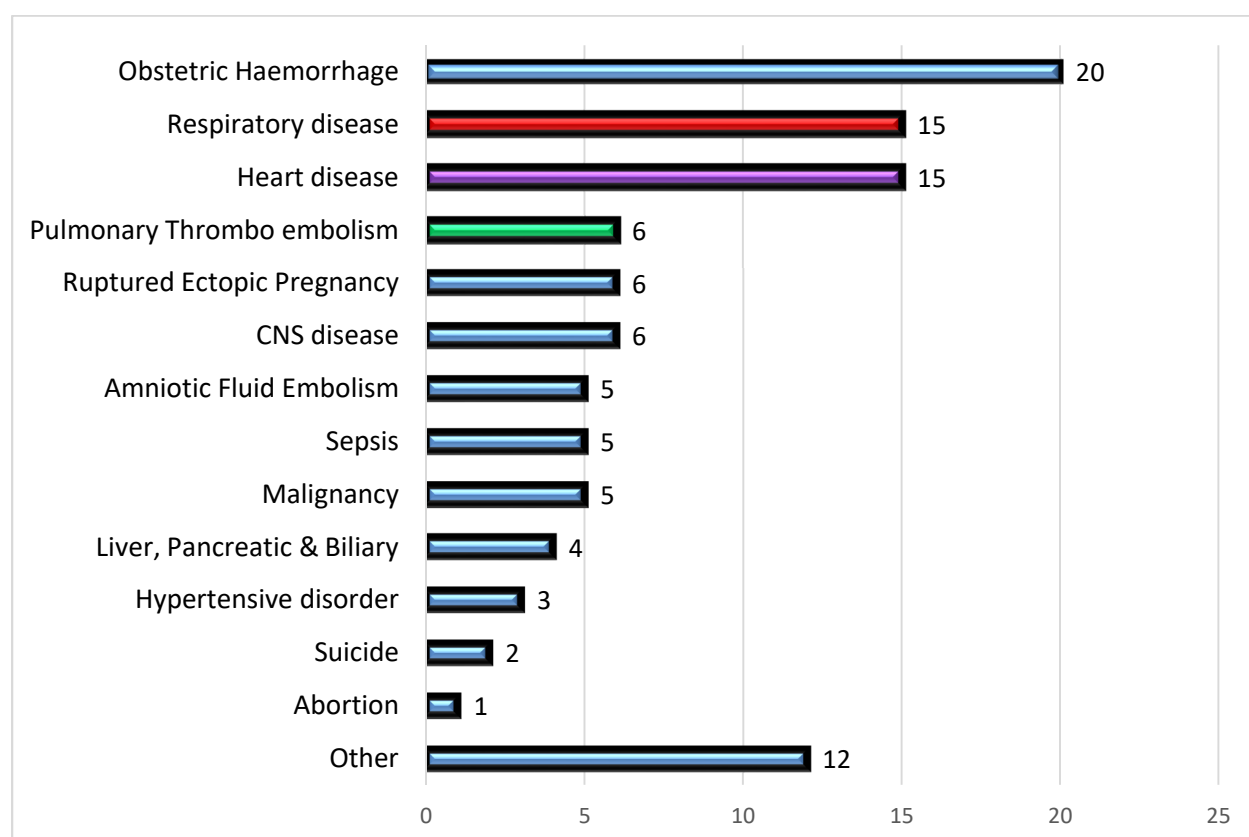
Figure 8: Coverage of conducting post-mortems on index cases

Year	MDs	%
2012	118	92%
2013	119	96%
2014	112	95%
2015	113	96%
2016	112	94%
2017	127	98%
2018	105	96%

More than half (52%) of the deaths were direct maternal deaths while 47% were indirect and 1% were uncertain. Causes of the maternal deaths reported in 2018 are indicated in figure 9. The leading causes were obstetric haemorrhage (n=20), respiratory disease (n=15) and heart disease (n=15). These three causes were rotating over the past few years as the leading causes of maternal deaths in the country.

Of the 20 maternal deaths due to obstetric haemorrhage three deaths each had been reported from uterine rupture and vaginal/cervical/perineal tear and two due to either placenta praevia or placenta accrete. Eleven of the deaths from respiratory disease had been due to influenza virus infections. Cardiomyopathy (n=05) and rheumatic heart disease (n=04) were the leading heart diseases.

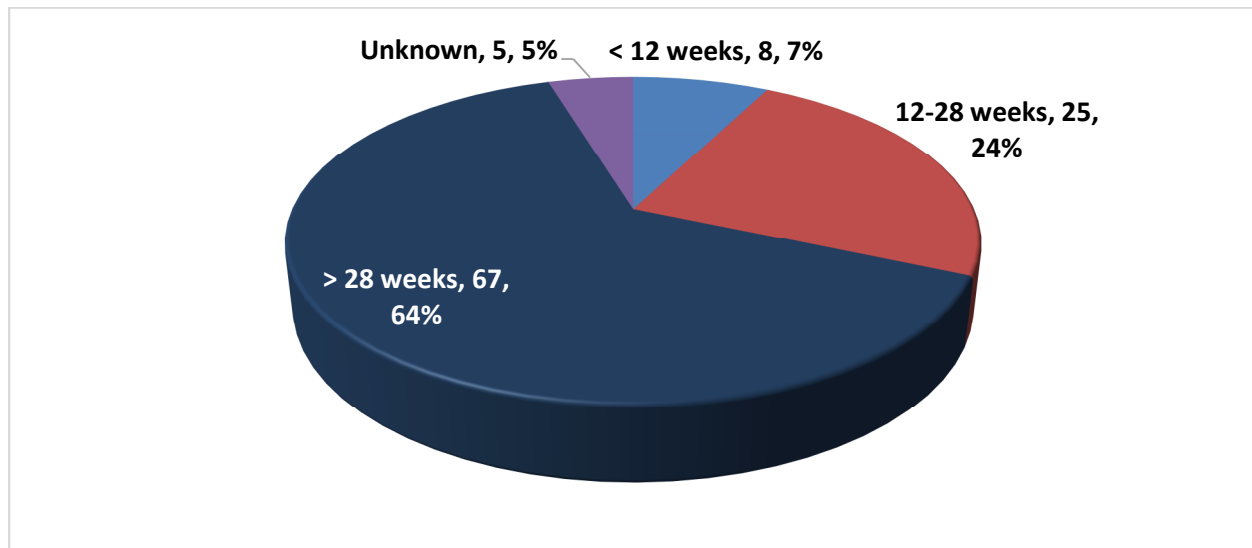
Figure 9: Leading causes of maternal deaths 2018



It is worth noting the large reduction of abortion-related deaths and liver disease in the index year. It should be noted that there were 38 maternal suicides reported in the year 2018. However, only indirect and direct cases which fulfill the maternal death definition were included in the analysis.

Majority of women (n=67; 64%) were in advanced stage of the pregnancy (> T3) when they died (Figure 10).

Figure 10: Period of gestation completed before the death or delivery



More than half the deaths (n=67; 64%) had occurred either during postnatal or post-abortion period. The rest were during the antenatal period (n=38; 36.2%). Of the 67 deaths that occurred during either postnatal or post-abortion period, nine (13%) had occurred within 6 hours, six (9%) within 6 to 24 hours and 52 (78%) after 24 hours of partum/abortion.

Type of delivery of the dead women are presented in table 2. One third of the women (n=33; 31%) who died, delivered either by caesarian section or hysterectomy. Two deaths were due to complications of the caesarian section.

Table 2: Type of delivery of the women died

Type of delivery	N	%
Not delivered / Abortions	34	32.4
Normal vaginal delivery	11	10.5
Assisted VD (Vaccum / forceps)	27	25.7
LSCS / Hysterotomy	33	31.4
Total	105	100.0

Table 3 indicates the indications of the caesarian sections. The main indications of caesarian sections were medical condition complicating pregnancy, pregnancy induced hypertension, fetal distress and past sections.

Table 3 : Indications of caesarian sections

Indication	N	%
Medical condition complicating pregnancy	8	24.2
PIH	5	15.2
Fetal distress	4	12.1
Past sections	3	9.1
Elderly mother	2	6.1
Uterine rupture	2	6.1
Placenta accreta / Placenta previa	2	6.1
Severe IUGR & PIH	1	3.0
Twins	1	3.0
Not recorded	5	15.2
Total	33	100.0

Table 4 indicates the main outcome of the pregnancy. A live baby was delivered by half of the women (50.5%) cases.

Table 4 : Outcome of pregnancy

Outcome of pregnancy	N	%
Not delivered	29	27.7
Live birth	53	50.5
Stillbirth	15	14.3
Ectopic	6	5.7
H. mole	1	1.0
No details	1	1.0
Total	105	100.0

A majority (n=87; 83%) of women were cared at a hospital before they died (Table 5). Twelve women were pronounced dead on admission to a hospital. Out of the women died at hospital, a

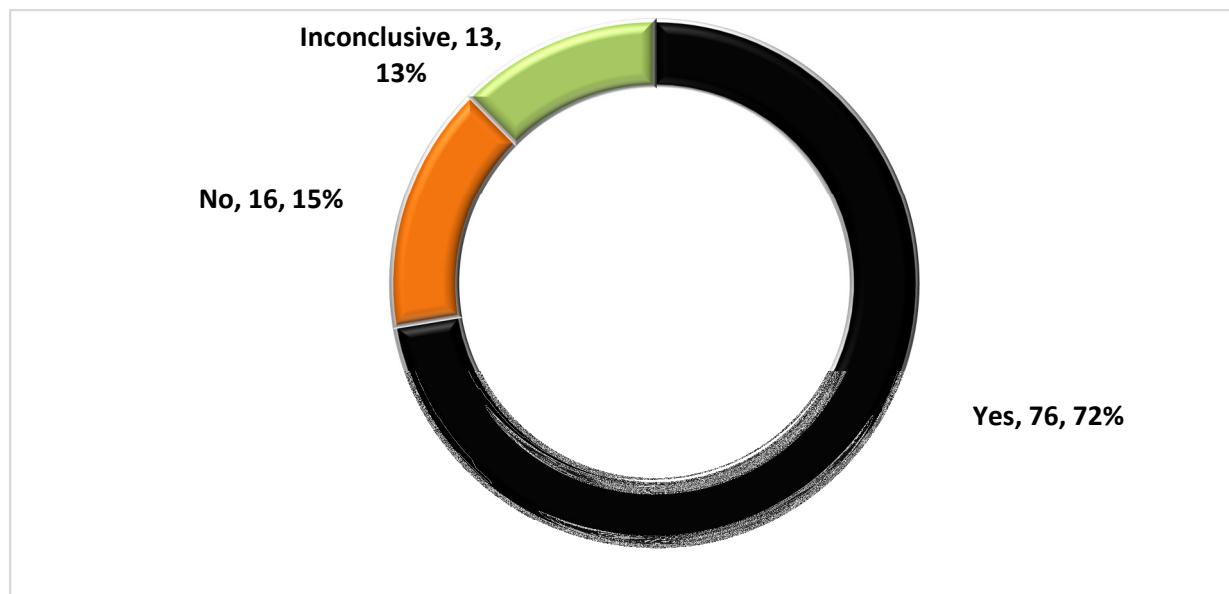
majority (n=61; 70%) died at a teaching or a provincial general hospital and 23 (26%) at a base or a district general hospital. There were two deaths from rural hospitals and one from a private hospital.

Table 5: Place of death

Place of death	N	%
Hospital	87	82.9
On admission	12	11.4
Home	4	3.8
In transit	2	1.9
Total	105	100.0

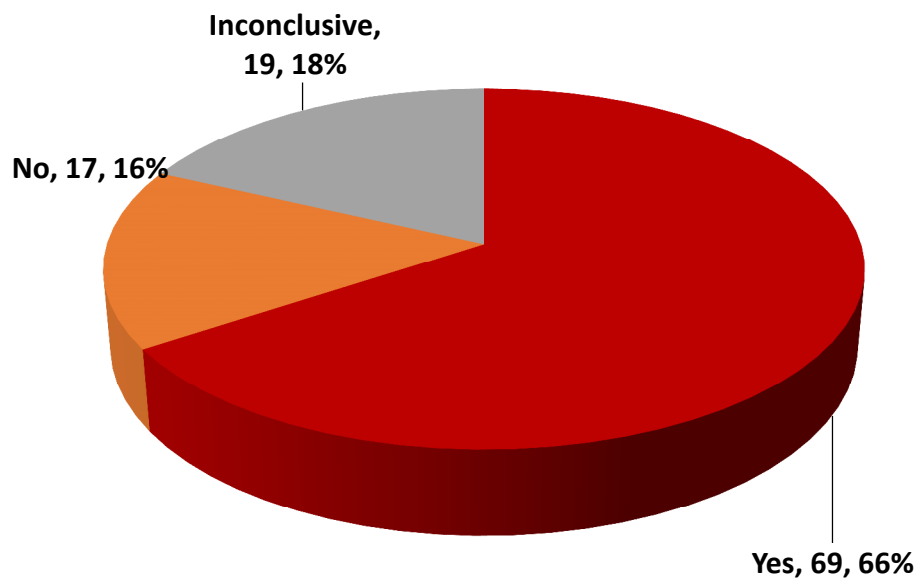
Three delays (seeking, reaching and treating) were assessed in confirmed maternal deaths. Delays were identified in 76 (72%) deaths (Figure 11). Delay in seeking care was attributable to 50 (66%) cases. Suboptimal care provision, both at field and hospital, was revealed in 49 (64%) cases.

Figure 11: Presence of delays



Out of the 1052 maternal deaths reported, 69 (66%) were categorized as *preventable* based on the expert opinion (Figure 12).

Figure 12: Preventability of maternal deaths



At each district level national maternal mortality reviews, these cases were discussed, deficiencies identified and the recommendations were formulated. These details were included in relevant district maternal mortality minutes and disseminated to all stakeholders.

Notable issues

The national MMR that need to be achieved by 2030 is 10 per 100,000 live births and it is believed that significant amount of work will have to be done by all the relevant stakeholders if we are to reach the target. Furthermore, deficiencies identified during district and national maternal mortality reviews, both at feild and hospital level, should be translated into action without further delay. Notable issues identified are as follows;

A large proportion of maternal deaths were categorized as preventable deaths and a significant number of women who died did not receive expected care both at field and hospital levels. This emphasizes the need for clinical governance and accountability culture within the maternal care service delivery systems.

Though efforts have been made over the years to reduce the district disparity of health indices, 2018 MMR data indicate that certain districts (eg: Mulativ, NuwaraEliya, Kegalle, Trincomalee and Puttalam) have a very high MMR compared to other districts. However, several strategies

have been employed by the Ministry of Health to improve the human and physical resources in these districts. It has already been identified that these districts need subnational targets and district specific action plans if the district disparity is to be diluted.

Twenty women died of obstetric haemorrhage in 2018 and it has been one of the leading causes of maternal deaths over the years. In-depth analysis of the deaths due to obstetric haemorrhage highlight the following shortcomings.

- Lack of adherence to national guidelines by both field and hospital staff (eg: non-use of Partogram and MEOWS charts)
- Lack of monitoring during intrapartum and post-partum periods (eg: not considering vital parameters as indicators of blood loss and not objectively assessing the blood loss)
- Lack of communication between senior and junior staff has led to delays in informing seniors about complications
- Cases of morbidly-adherent placenta has been reported high in recent past and some deaths have been attributed to mismanagement of such cases.
- Planned home deliveries by extremist groups

Above findings reiterate importance of adhering to national guidelines. However, some guidelines need to be revised according to the latest available evidence. Furthermore, a mechanism needs to be in place to monitor the use of national guidelines by both field and hospital staff.

Over the years both respiratory diseases and heart diseases are increasing and expected that they will be the next major causes in years to come. Of the 15-maternal death due to respiratory causes, 11 have been due to H1N1 influenza virus. In-depth analysis of the 11 H1N1 cases indicates suboptimal management and lack of adherence to national guidelines. Introducing the H1N1 vaccine to the national vaccination schedule could prevent further H1N1 related deaths and feasibility of introducing the vaccine should be assessed as early as possible. Following issues were identified after analyzing the heart disease related maternal deaths.

- It was noted that some heart diseases were detected fairly late
- Cardiovascular system was not objectively examined at antenatal clinics
- Not receiving optimal care at strategic points of care

Deficiencies in the service provision of family planning methods were identified as an area that needs urgent improvement. A significant proportion of the women who died in 2018 had an unmet need for family planning. Lack of focused supervision at field level and not considering family planning as an important aspect mainly due to increasing societal pressure were identified as possible reasons behind this deficiency. There were concerns about the quality of the family planning methods offered at the private sector.

Several other issues related to hospital quality care were also identified during the reviews.

- Inadequacy of human resources (eg: Consultants – Eg: Obstetricians, Cardiologists, Anesthetists/ Medical officers / Nurses)
- Lack of multi-disciplinary care at the beginning of the case presentation or pregnancy
- Substandard documentation
- Referrals seen by junior doctors
- Poor care by admitting officers – examination and documentation
- Lack of 24 hour facilities in certain hospitals – OT, Lab, Blood bank
- Inadequate care at the time of discharge – proper vaginal examination and referral

Similarly, several issues related to field quality care were also identified during the reviews.

- Lack of communication between field staff and between preventive & curative sectors
- Inadequate supervision
- Human resource issues – lack of PHMs, supervising officers
- Substandard documentation (eg: Family Planning / Maintenance of RED-book)

National level dissemination of the outcome of the maternal death reviews was conducted on 30th January 2020 at FHB with the participation of all the stakeholders.

Acknowledgements;

Sri Lanka College of Obstetricians and Gynaecologists (SLCOG) played a pivotal role in contributing to reviewing cases at national level and expert review at district level. Professional colleges of Anaesthesiologists and Forensic Pathologists also contributed in the maternal death review process.

Maternal and Child Morbidity and Mortality Surveillance Unit of FHB collated all documents related to index cases, compiled case scenarios, conducted national maternal mortality reviews, sent minutes of the reviews, processed data, analysed data and disseminated the outcome among all stakeholders.

At the health region level, Regional Director of Health Services (RDHS), hospital heads, Medical Officer – Maternal & Child Health (MOMCH) and Medical Officer of Health (MOH) coordinated maternal mortality surveillance and conducting NMMRs.

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