

Understanding the Trends of Maternal and Neonatal Mortality in Bangladesh in the Context of South Asia

Halima Akhter¹, Md. Mahbubur Rahman Alam²

¹Department of Anthropology, Shahjalal University of Science and Technology, Sylhet, Bangladesh

²Department of Statistics, Dhaka University, Dhaka, Bangladesh

Email: halima-anp@sust.edu, alam_mr@bibm.org.bd

How to cite this paper: Akhter, H., & Alam, Md. M. R. (2019). Understanding the Trends of Maternal and Neonatal Mortality in Bangladesh in the Context of South Asia. *Advances in Anthropology*, 9, 56-69. <https://doi.org/10.4236/aa.2019.91004>

Received: November 10, 2018

Accepted: January 19, 2019

Published: January 22, 2019

Copyright © 2019 by author(s) and Scientific Research Publishing Inc.

This work is licensed under the Creative Commons Attribution-NonCommercial International License (CC BY-NC 4.0).

<http://creativecommons.org/licenses/by-nc/4.0/>



Open Access

Abstract

Introduction: This article is presenting the overall situation of maternal and neonatal health in Bangladesh in comparison to other South Asian countries. Bringing down the maternal mortality ratio from 569 to 143 was the target for Bangladesh which was achieved up to 176 per 100,000 live births by 2015 but the target as per the Millennium Development Goal 5 was not fulfilled yet and remained as a challenge. Besides, the improvement in reducing the neonatal mortality rate during 1993-2014 shows a national level decline from 52 to 28 per 1000 live births, which is almost half during this period with a percentage change of about 46% and so more care is needed here also. **Objectives and Methods:** The manuscript has three objectives: to present the trends of maternal and neonatal mortality, to explain the maternal and neonatal mortality rate by background characteristics and the causes of maternal and neonatal deaths in Bangladesh on the basis of South Asian perspective. **The main source of data collection and analysis was the secondary sources, from different journals and project reports published between the years 2001 to May 2018.** **Main Text:** In Bangladesh, 35% maternal deaths occurred as indirect causes and 9% causes of deaths are still remaining unidentified. In addition, hemorrhage (31%) and pre-eclampsia-eclampsia (20%) are found two vital causes of maternal deaths with two more causes which are due to obstructed labor (7%), and termination of pregnancy (1%). It is found that Bangladesh has shown a great improvement in maternal mortality ratio by reducing maternal mortality to 176 in 2015 from 569 deaths per 100,000 live births in 1990, with an increase of 69% as progress. On the other hand, it is found that 43% of neonatal deaths in Bangladesh occurred due to birth asphyxia, 24% due to neonatal pneumonia, 22% due to prematurity, 5% due to sepsis, 0.2% due to meningitis and encephalitis, 0.1% due to congenital mal-

formation and 5% causes are still remain undetermined. While comparing the situation to other South Asian countries, it is seen that the causes of neonatal deaths by prematurity are in the highest position that causes 29.7%, 43.8%, 30.8% and 39.3% deaths and birth asphyxia is in the second highest position that causes 22.9%, 18.9%, 23.4% and 20.9% deaths in Bangladesh, India, Nepal and Pakistan respectively. **Conclusion:** This paper will support health researchers and medical anthropologist for further studies and specifically for the health-policy makers and corresponding authorities to take necessary actions for overcoming the obstacles of improving maternal and neonatal health situation in Bangladesh.

Keywords

Maternal Mortality Ratio, Maternal Mortality Rate, Neonatal Mortality Rate, Neonatal Mortality Ratio, Bangladesh, South Asia

1. Introduction

This article is presenting the overall situation of maternal and neonatal health in Bangladesh in comparison to other South Asian countries. South Asia covers about 5.2 million km² (2 million mi²), which is 11.71% of the Asian continent and 3.5% of the world's land surface area. The population of South Asia is about 1.891 billion, about one-fourth of the world's population, making it both the most populous and the most densely populated geographical region in the world. Overall, it accounts for about 39.49% of Asia's population, over 24% of the world population and is home to a vast array of peoples. South Asia region contains eight countries: Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka (El-Saharthy, 2015), still faces huge public health challenges, particularly in maternal and newborn health. So, the maternal and neonatal health of this number of population has a great impact on world population (Desai, 2002).

In South Asia, maternal mortality ratio ranges from 29/100,000 live births in Sri Lanka to 400/100,000 in Afghanistan in 2015 (Bhutta, et al., 2004: p. 816). Bringing down the maternal mortality ratio from 569 to 143 was the target for Bangladesh to achieve Millennium Development Goal 5, that is, to reduce maternal mortality ratio by three-quarters between the years 1990-2015 but Bangladesh has achieved it up to 176 per 100,000 live births by 2015. Though the achievement was good by the time period but the target as per the Millennium Development Goal 5 was not fulfilled yet and remained as a challenge for Bangladesh. For that knowing the causes of it and taking necessary steps for improving maternal health situation in Bangladesh have become essential.

On the other hand, child health is the purview of pediatrics and it is concerned with the health of infants, children and adolescents, their growth and development, and their opportunity to achieve full potential as adults. Neonatal

death is defined as a death during the first 28 days of life (0 - 27 days). World-wide, 2.6 million neonatal deaths occurred in 2016 (WHO, 2018). Over two-thirds of these early child deaths are due to conditions that could be prevented or treated with access to simple, affordable interventions. The reduction of neonatal deaths is a high priority for the international community, especially in view of the increased attention on the Sustainable Development Goals 3.2. The South Asia region accounts for almost one-third of global mortality in neonates and children under 5 years of age. Despite of wide disparities in socio-economic and health indicators, many countries in this region are unlikely to reach SDG 3.2 which means reducing neonatal mortality to at least as below as 12 per 1000 live births and ends preventable deaths of them by 2030. And so, in this article it is tried to present, analyze and interrelate recent data in such a way that the barriers could be identified easily for taking actions.

2. Methods and Objectives

This manuscript has written considering three objectives: to present the trends of maternal and neonatal mortality, to explain the maternal and neonatal mortality rate by background characteristics and the causes of maternal and neonatal deaths in Bangladesh on the South Asian perspective. Data has been collected from secondary sources, for example, articles published in the Elsevier, Lancet, WHO, UNICEF, BBMS, NIPORT between the year 2001 and May 2018 and then tables and graphs have been prepared from those data to analyze the situation of maternal and neonatal health in Bangladesh in comparison to other South Asian countries.

3. Maternal and Neonatal Mortality in Bangladesh

This manuscript has been divided and described in to two main parts, maternal mortality and neonatal mortality. The key concept is explored for each category firstly in the South Asian context and then by background characteristics with the causes of maternal and neonatal deaths in Bangladesh.

3.1. Causes of Maternal Mortality in Bangladesh

In 2013, 289,000 maternal deaths took place globally (World Bank 2014). Maternal mortality has declined by 45% since 1990-2013, and while considerable progress has been made particularly in recent years, it is now extremely unlikely that the goal of reducing maternal mortality by 75% will be met. Women face the higher risk of maternal death in South Asia and Sub-Saharan Africa. The most important direct causes are hemorrhage, hypertension, abortion, and sepsis. The most frequent complications are anemia and depression, but prolonged and obstructed labor has the highest burden of diseases because of disabilities associated with fistulas. The risk of maternal deaths has two components: the risk of getting pregnant, which is a risk related to fertility and its control or lack of control; and the obstetric risk of developing a complication and dying while pregnant or in labor. The obstetric risk is highest at the time of delivery. The accele-

ration of maternal deaths reduction will require improving quality of care in referral and primary health care facilities (Filippi, Chou, Ronsmans, Graham, & Say, 2016: p. 2).

The causes of maternal mortality are mainly direct and indirect obstetric complications. According to the last two surveys of Bangladesh Maternal Health Service and Maternal Health Survey (NIPORT et al, 2001, 2010) during the period of 2001-2010, number of maternal deaths for direct obstetric causes decreased from 225 to 123 per 100,000 maternal deaths, about 50% reduction of the maternal deaths. However, no reduction has been found in case of indirect obstetric complications (49 in 2001 and 68 in 2010).

Among the causes of maternal deaths, 31% in Bangladesh occurred due to hemorrhage, 20% due to pre-eclampsia-eclampsia, 7% due to obstructed labor, 1% due to termination of pregnancy, 35% due to indirect maternal deaths and 9% causes are still remaining unidentified (Figure 1). So, more study could be done to figure out the indirect causes of maternal deaths in Bangladesh to reduce maternal mortality and also new policies could be adopted for minimizing maternal deaths occurred for hemorrhage.

3.2. Maternal Mortality Ratio and MMRate in Bangladesh

The Peoples Republic of Bangladesh covers an area of 147,570 km² (56,980 mi²). It is the world's eighth most populous country and world's third largest Muslim majority country having a vast population of 162,951,560 (2016), almost 90% of which are Muslim. Bangladesh shared its land borders with India and Myanmar (Barma). The country's maritime territory in the Bay of Bengal is roughly equal to the size of its land area (CIA, 2012). The maternal mortality pattern has been improved during the last decade according to the last survey on maternal mortality and health (BMMS, 2010). The maternal mortality ratio (MMR) has been decreased to 194 per 100,000 live births in 2010 from 322 in 2001. The similar pattern has also been found as expected in maternal mortality rate (MMRate), the rate has been reduced to 170 maternal deaths per 100,000 women of reproductive age in 2010 from 367 in 2001 (NIPORT et al, 2001, 2010). The percentage change in MMR and MMRate are estimated at about 40% and 57% during the period of 2001-2010. According to World Fact Book (2017) the estimated MMR is 176 per 100,000 live births, which indicates that the target of MMR (143 maternal death per 100,000 live births) has not been yet fulfilled by 2015 though the reduction rate was tremendous during 2001-2010.

3.3. Maternal Mortality Ratio in Bangladesh

It is seen that Bangladesh has shown a great improvement in maternal mortality ratio by reducing maternal mortality to 176 in 2015 from 569 deaths per 100,000 live births in 1990, with an increase of 69% as progress (Figure 2). The key contribution to this reduction was a drop in mortality risk mainly because of improved access to and use of health facilities. Furthermore, a number of positive changes occurred during this period, for example, fertility decreased and the

proportion of births associated with high risk to mother fell, income per head increased sharply and the poverty rate fell down; and the education levels of women of reproductive age improved substantially (El Arifeen, et al., 2014).

3.4. MMR and MMRate by Background Characteristics in Bangladesh

Table 1 is presenting the MMRate in Bangladesh according to women's residence, age and household wealth status. The MMR in rural area reduced at a considerable number from 326 in 2001 to 199 in 2010 compared to urban area where the percentage change has been estimated at about 32% against 39% in rural area. However, the MMR and MMRate in rural area (MMRate: 179 in 2010) are found still higher than those in the urban area (MMR: 178 and MMRate: 143 in 2010) in both 2001 and 2010.

The MMR and MMRate for mother's age group of 30-34 show worse condition than other age groups. Improvement rate for MMR and MMRate for this is 22% and 41%, where the condition of mother's age group 15-19 is better. Both of its MMR and MMRate in 2010 are below 100 and improvement ratio that is the progress between 2001 and 2010 is about 71% and 78%.

From the mothers' age group of 35 - 39 it is clear that the MMRate and MMR both have increased by 24 and 435 respectively from the year 2001 to 2010 where the maternal mortality ratio has increased nearly twice by that time period and the mothers of this age group definitely requires more concentration to reduce the maternal deaths in Bangladesh.

There is also an impact of wealth status in both MMR and MMRate, so variety has been seen in maternal mortality on the basis of wealth. MMR and MMRate among the women of middle wealth quintile are surprisingly high in both the study year 2001 and 2010 (MMR: 473 per 100,000 live births in 2001 and 278 in 2010; MMRate: 527 per 100,000 women of reproductive age in 2001 and 402 in 2010). The improvement has been observed in MMRate of highest wealth quintile is below 100 and in 2010, the MMR has been decreased 40% than 2001 (208 to 123 per 100,000 maternal deaths). The ratio of improvement in MMR and MMRate of middle wealth quintile is relatively 41% and 55% which indicates to a hope of much improvement (NIPORT et al., 2001, NIPORT et al., 2010).

3.5. Trends of Maternal Mortality Ratio in South Asia

The success in the reduction of MMR at national level among eight South Asian countries can be seen in the **Figure 3** where in Afghanistan MMR decreased 70% during the 15 years period (MMR: 1340 in 1990 and 396 in 2015) which is still a high rate.

The improvement has been observed (**Figure 3**) in Sri Lanka where MMR is significantly below 100 and followed by Maldives. In other countries, the figures have been reduced but not at the expected level. For Bangladesh, over last 25 years MMR has decreased from 569 to 176 which is a very positive sign but still there is a long way to go to achieve success like Sri Lanka.

Table 1. Differentials in MMR and MMRate by background characteristics in Bangladesh.

		MMRate (Per 100,000 women of reproductive age)		MMR (Per 100,000 live births)	
		2001	2010	2001	2010
Residence	Urban	233	143	262	178
	Rural	386	179	326	199
Wealth quintile	Lowest	499	254	343	234
	Second	392	165	302	182
	Middle	527	239	473	278
	Fourth	272	116	268	143
Mother's age	Highest	177	93	208	123
	15 - 19	228	51	170	49
	20 - 24	439	209	236	130
	25 - 29	535	238	358	194
	30 - 34	499	293	517	402
	35 - 39	262	286	493	928
	40 - 44	387	56	1946	561
	45 - 49	149	42	2436	1798

Source: NIPORT et al., 2001, NIPORT et al., 2010.

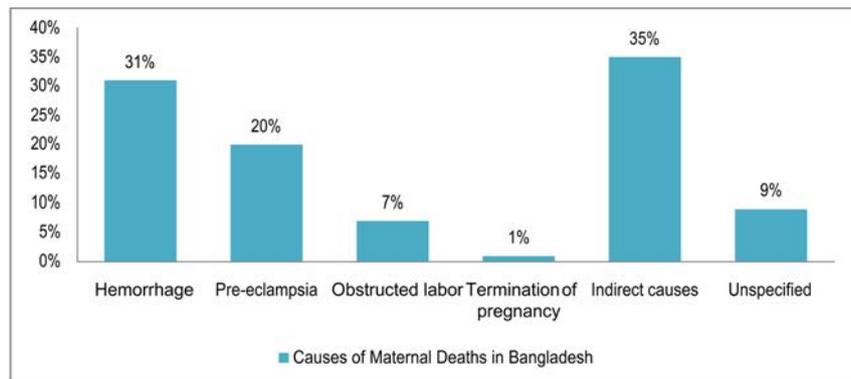


Figure 1. Causes of maternal deaths in bangladesh (NIPORT et al., 2010).

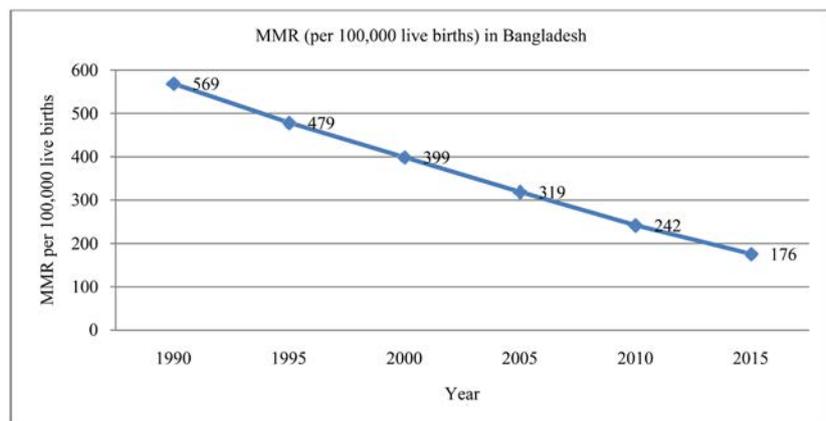


Figure 2. MMR in Bangladesh (WHO et al. 2015).

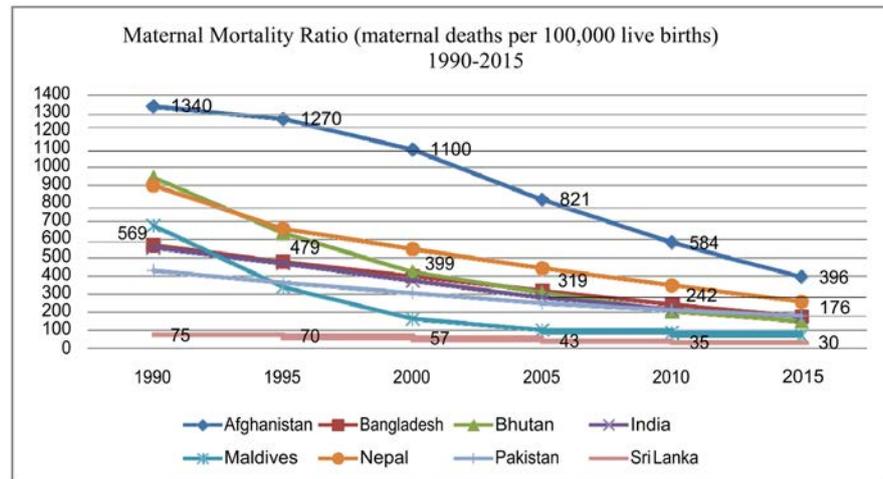


Figure 3. Maternal Mortality Ratio in South Asia (WHO et al. 2015).

3.6. Neonatal Mortality in South Asia

More than one-third of the neonatal deaths in the world occur in three South Asian countries—India, Pakistan and Bangladesh. Among all these countries, India has the largest number of neonatal deaths primarily because of large number of births (Lawn et al. 2005, UNICEF, 2004). According to the estimates neonatal mortality rates are highest in Pakistan (51 per 1000 live births) followed by Bangladesh (50 per 1000 live births) followed by India (47 per 1000 live birth) and Nepal (39 per 1000 live births) (NIPORT et al., 2001; Save the children, 2001; Save the children, 2002; Costello & Dharma 2000).

Among the various persistent problems, neonatal mortality is one of the leading factors that kill 33 newborns per 1000 live births in South Asia (SA) (Acharya, et al., 2013: p. 95). Neonates have the highest risk of death among all children. It is estimated that almost 99% of the world's neonatal deaths occur in low-income and middle-income countries, primarily in South Asia and Sub-Saharan Africa. In the SEA region-India, Nepal Bangladesh, Myanmar and Indonesia contribute to 99% of the total neonatal deaths. Out of these, India has a 76.6% contribution to the regional burden of neonatal deaths (WHO et al., 2007).

3.7. Causes of Neonatal Deaths in South Asia

According to a report of Linda Bartlett, the major causes of neonatal deaths in South Asia region, Diarrhea (28%), Sepsis/Pneumonia (26%), Tetanus (23%), Pre-term birth (6%) are major (Lawn, et al., 2005). According to the data of UNICEF in 2015, data on the causes of neonatal deaths in Pakistan, Nepal, India, and Bangladesh are presented in the following graphs for comparative analysis.

According to **Figure 4**, data on causes of neonatal deaths in Bangladesh, India, Nepal and Pakistan are respectively, Birth asphyxia causes 22.9%, 18.9%, 23.4% and 20.9% deaths, prematurity causes 29.7%, 43.8%, 30.8% and 39.3% deaths, sepsis causes 19.9%, 13.6%, 18.40% and 17.2%, congenital anomalies

causes 12.7%, 11.1%, 13.4% and 5.7% deaths, diarrheal disease 0.7%, 0.7%, 0.7% and 1.2%, acute respiratory infection causes 5.9%, 5.1%, 5.6% and 5.9%, an injuries causes 0.9%, 0.8%, 0.8% and 2.7% neonatal deaths. This figure indicates that, most of the neonatal deaths occurred in all these four counties due to prematurity and also the condition of neonatal deaths is almost same and need to concentrate on this.

3.8. Causes of Neonatal Deaths in Bangladesh

In Bangladesh the main causes of neonatal mortality are birth asphyxia, prematurity, birth injuries and acute respiratory infections (ARI).

It is found that 43% of neonatal deaths in Bangladesh (Figure 5) occurred due to birth asphyxia, 24% due to neonatal pneumonia, 22% due to prematurity, 5% due to sepsis, 0.2% due to meningitis and encephalitis, 0.1% due to congenital malformation and 5% causes are still remain undetermined (Source: Halim, et al. 2016: p. 7).

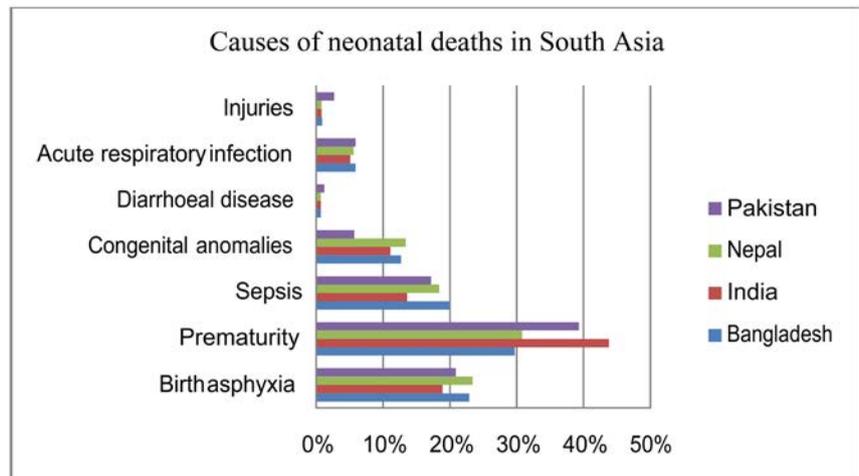


Figure 4. Comparative variation in the causes of neonatal deaths in Pakistan, Nepal, India and Bangladesh. Source: UNICEF, 2015.

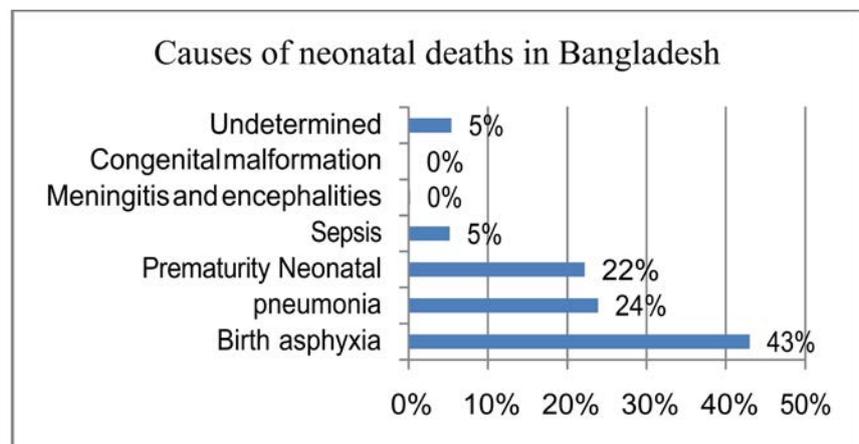


Figure 5. Causes of neonatal deaths in Bangladesh. Source: Halim 2016.

3.9. Trends of Neonatal Mortality in Bangladesh

Figure 6 shows the improvement in reducing the neonatal mortality rate during 1993-2014 extracted from BDHS surveys. National level NMR declined from 52 to 28 per 1000 live births which is almost half during this period with a percentage change of about 46% (NIPORT et al., 1994, 1997, 2000, 2004, 2007, 2011, 2014).

3.10. Neonatal Mortality Rate in Bangladesh by Background Characteristics

Table 2 shows neonatal mortality rate according to women's residence, age, education, household wealth status and child's sex. The neonatal mortality rate in rural area is reduced from 66 in 1994 to 31 in 2014 which is almost half. In compared to rural area neonatal mortality rate in urban area is relatively low 44 in 1994 to 21 in 2014 per 1000 live births. But the rate of improvement in rural area (53%) is almost equal to urban area (52%).

Neonatal mortality rate on the basis of mother's age shows that, the age group of mother's < 20 years age has the highest rate of mortality from the year 1994 to 2014 and the rate of reduction is 62% from 81 in 1994 to 31 in 2014. On the other hand, situation of age group 20 - 29 is much better compared to others (56 in 1994 and 27 in 2014) though the success rate of all the age group is higher than 50%.

Table 2. Differentials in neonatal mortality rate by background characteristics.

		Neonatal mortality rate per year						
		2014	2011	2007	2004	2000	1997	1994
Residence	Urban	21	32	33	44	42	41	44
	Rural	31	33	41	47	52	56	66
Mother's education	No education	26	32	47	51	55	58	71
	Primary incomplete	31	38	35	44	51	56	56
	Primary complete	31	32	44	51	43	45	55
	Secondary incomplete	33	30	39	38	-	-	-
	Secondary complete or higher	13	33	21	35	41	45	41
Wealth quintile	Lowest	35	34	48	55	-	-	-
	Second	35	38	44	43	-	-	-
	Middle	34	32	40	50	-	-	-
	Fourth	23	33	32	39	-	-	-
	Highest	14	23	27	42	-	-	-
Child's sex	Male	31	39	42	52	55	60	71
	Female	26	26	36	40	46	49	56
Mother's age	<20 years	31	45	55	58	72	70	81
	20 - 29	27	26	30	37	41	47	56
	30 - 39	28	26	38	48	40	47	57

Source: NIPORT et al., 1994, 1997, 2000, 2004, 2007, 2011, 2014.

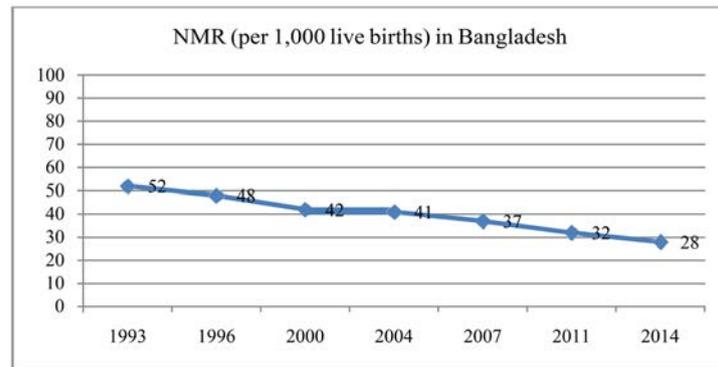


Figure 6. Neonatal mortality rate (per 1000 live births) in Bangladesh.

Mother's education has also an impact on neonatal mortality which is presented by demographic and health survey report (BDHS 1994-2014). Result of Table 4 presents that, the situation of mother's having no education is comparatively worse (71 in 1994 and 26 in 2014) than others and its improvement rate is 63%. But mothers completed secondary education has the lowest rate in mortality (41 in 1994 and 13 in 2014) having an improvement rate of about 68%.

Neonatal mortality rate among the women of lowest wealth quintile are surprisingly high (55 per 1000 live births in 2004 and 35 in 2014). The improvement has been observed in neonatal mortality of highest wealth quintile is 14 in 2014, the neonatal mortality has been decreased 56% than 2004 (41 per 1000 live births). The ratio of improvement in neonatal mortality of lowest wealth quintile is relatively slow (36%).

Neonatal mortality rate on the basis of child's sex shows high rate of mortality among the male child in all the study year from 1994 to 2014 (71 in 1994 and 31 in 2014) where mortality rate among female child is relatively low (56 in 1994 and 26 in 2014). But the improvement rate in both the group is almost equal and higher than 50%.

4. Conclusion

So, overall it is seen that in Bangladesh, among the causes of maternal deaths, 35% due to indirect maternal deaths and 9% causes are still remaining unidentified. In addition to this the main reasons have found hemorrhage (31%) and pre-eclampsia-eclampsia (20%). Besides, there are some other causes of maternal deaths found and those are due to obstructed labor (7%), and termination of pregnancy (1%). It is found that Bangladesh has shown a great improvement in maternal mortality ratio by reducing maternal mortality to 176 in 2015 from 569 deaths per 100,000 live births in 1990, with an increase of 69% as progress. Even though reducing maternal mortality for achieving the sustainable development goal of the country is essential. So, more studies could be done to find out the indirect causes of maternal deaths in Bangladesh to reduce maternal mortality and also new policies could be adopted for minimizing maternal deaths occurred for hemorrhage.

On the other hand, the main causes of neonatal deaths in Bangladesh are birth asphyxia, prematurity, birth injuries and acute respiratory infections (ARI). It is found that 43% of neonatal deaths in Bangladesh occurred due to birth asphyxia, 24% due to neonatal pneumonia, 22% due to prematurity, 5% due to sepsis, 0.2% due to meningitis and encephalitis, 0.1% due to congenital malformation and 5% causes are still remain undetermined. While comparing the situation to other South Asian countries, it is seen that the causes of neonatal deaths by prematurity are in the highest position that causes 29.7%, 43.8%, 30.8% and 39.3% deaths and birth asphyxia is in the second highest position that causes 22.9%, 18.9%, 23.4% and 20.9% deaths in Bangladesh, India, Nepal and Pakistan respectively. Even though the improvement in reducing the neonatal mortality rate during 1993-2014 shows a national level decline from 52 to 28 per 1000 live births which is almost half during this period with a percentage change of about 46%, more studies and policies could be taken to reduce the neonatal mortality in Bangladesh, especially on neonatal deaths caused for prematurity and birth asphyxia.

On September 25th 2015, countries adopted SDGs to end poverty, protect the planet, and ensure prosperity for all as part of a new sustainable development agenda. The commitment to “leave no-one behind” is a key feature of the SDGs. The goals are not considered to have been met if those who are most vulnerable and hard to reach are not included. As the sustainable development goals (SDGs) are a new, universal set of goals, targets and indicators that UN member states will use to frame their development agendas and political policies over the next 15 years, Bangladesh has set some policies to achieve the goals within the time period, for examples, as a part of achieving SDG 3, ensures healthy lives and promotes wellbeing for all at all ages, under-5 mortality rate to be reduced from 41 to 37 per 1000 live births, maternal mortality ratio to be reduced from 170 to 105 per 100,000 live births, immunization, measles (% of children under 12 months) to be increased to 100%, maternal mortality ratio to be reduced from 170 to 105 per 100,000 live births, births attended by skilled health staff to be increased to 65%, reduction of total fertility rate to 2.0, and increases contraceptive prevalence ate to 75%.

It is expected that this article will give an overall idea about the position of Bangladesh, in comparison to other South Asian countries in achieving the SDG-3 by understanding the basic features of special importance like increasing skilled birth attendance during deliveries and hospital based deliveries, enhancing female education etc., which might have direct or indirect effects on the reduction of maternal and neonatal mortality in Bangladesh.

Contributors

Halima Akhter, conceptualized the analysis and gave ideas of the whole manuscript preparation from setting objectives to putting references. Besides, organizing the manuscript with tabulation and graphical presentation was conducted

by her with writing abstract, giving the title and completing the whole paper in her own ideas of writing from the introduction, each section and subsections, objectives, methods, and conclusion.

Md. Mahbubur Rahman, Associate Professor, BIBM, Department of Statistics, Dhaka University, Bangladesh for reviewing statistical facts and graphs.

Especially thanks goes to **Kazi Moriom Jahan** for supporting in secondary data collection and data gathering.

Funding & Ethical Concerns

N/A as it is a review article

Declaration of interests

We declare no competing interests.

References

- Acharya, U., Atwood, S. J., Putten, M. V., Joshi, A. K., & Ghimire, A. (2013). Distal Causes for Neonatal Mortality in South Asia. *Journal of Indian Research*, 1.
- Bhutta, Z. A., Gupta, I., de'Silva, H., Manandgar, D., Awasthil, S., Hossain, S. M. M., & Salam, M. A. (2004). Maternal and Child Health: Is South Asia Ready for Change? *BMJ*, 328, 816-819. <http://www.bmj.com/>
<https://doi.org/10.1136/bmj.328.7443.816>
- Central Intelligence Agency (2012). World Fact Book 2012.
<https://www.cia.gov/library/publications/download/download-2012/index.html>
- Costello, & Dharma (2000). *Improving Newborn Infant Health in Developing Countries*. London: Imperial College Press, c2000. xxxii570 p:ill
<https://trove.nla.gov.au/work/35207093?q&versionId=43740550>
- Desai, P. B. (2002). Cancer Control Effort in Indian Subcontinent. *Japanese Journal of Clinical Oncology*, 32, S13-S16.
- El Arifeen, S., Hill, K., Ahsan, K. Z., Jamil, K., Nahar, Q., & Streatfield, P. K. (2014). Maternal Mortality in Bangladesh: A Countdown to 2015 Country Case Study. *Lancet*, 384, 1366-1374. [https://doi.org/10.1016/S0140-6736\(14\)60955-7](https://doi.org/10.1016/S0140-6736(14)60955-7)
- El-Saharthy, S. (2015). South Asia's Quest FOR Reduced Maternal Mortality: What the Data Show.
<http://blogs.worldbank.org/health/south-asia-s-quest-reduced-maternal-mortality-what-data-show>
- Filippi, V., Chou, D., Ronsmans, C., Graham, W., & Say, L. (2016). *Levels and Causes of Maternal Morbidity and Mortality*. International Bank for Reconstruction and DEVELOPMENT.
https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=15&cad=rja&uact=8&ved=0ahUKEwjNjo_qw4LcAhUNXysKHbrXCu84ChAWCDswBA&url=http%3A%2F%2Fwww.dcp3.org%2Fsites%2Fdefault%2Ffiles%2Fchapters%2FV2C3Filippi_01_1915.pdf&usg=AOvVaw2vGDEPMzdmlQWWXB5i-CJz
- Halim, A., Dewez, J. E., Biswas, A., Rahman, F., White, S., & Broek, N. D. V. (2016). When, Where, and Why Are Babies Dying? Neonatal Death Surveillance and Review in Bangladesh. *PLoS ONE*, 11, e0159388.
<https://doi.org/doi.10.1371/journal.pone.0159388>

- Lawn, J. E., Cousens, S., & Zupan, J. (2005). 4 Million Neonatal Deaths: When? Where? Why? *Lancet*, 365, 891-900.
- National Institute of Population Research and Training (NIPORT) (1994). *Mitra and Associates, and ORC Macro 1995 Bangladesh Demographic and Health Survey 1993-1994*. Dhaka, Bangladesh, and Calverton, Maryland: NIPORT, Mitra and Associates, and ORC Macro.
- National Institute of Population Research and Training (NIPORT) (1997). *Mitra and Associates, and ORC Macro 1998 Bangladesh Demographic and Health Survey 1996-1997*. Dhaka, Bangladesh, and Calverton, Maryland: NIPORT, Mitra and Associates, and ORC Macro.
- National Institute of Population Research and Training (NIPORT) (2000). *Mitra and Associates, and ORC Macro 2001 Bangladesh Demographic and Health Survey 1999-2000*. Dhaka, Bangladesh, and Calverton, Maryland: NIPORT, Mitra and Associates, and ORC Macro.
- National Institute of Population Research and Training (NIPORT) (2001). *Mitra and Associates, and ORC Macro 2003a Bangladesh Maternal Mortality and Health Care Survey 2001: Preliminary Results*. Dhaka, Bangladesh: NIPORT, MEASURE Evaluation, and ICDDR, B.
- National Institute of Population Research and Training (NIPORT) (2004). *Mitra and Associates, and ORC Macro 2005 Bangladesh Demographic and Health Survey 2004*. Dhaka, Bangladesh, and Calverton, Maryland: NIPORT, Mitra and Associates, and ORC Macro.
- National Institute of Population Research and Training (NIPORT) (2007). *Mitra and Associates and ORC Macro 2009 Bangladesh Demographic and Health Survey 2007*. Dhaka and Calverton, MD: NIPORT, Mitra and Associates, and Macro International.
- National Institute of Population Research and Training (NIPORT) (2010). *Mitra and Associates and ORC Macro 2011 Bangladesh Maternal Mortality and Health Care Survey 2010: Preliminary Results*. Dhaka: NIPORT, MEASURE Evaluation and ICDDR, B.
- National Institute of Population Research and Training (NIPORT) (2011). *Mitra and Associates and ORC Macro 2013 Bangladesh Demographic and Health Survey 2011*. Dhaka and Calverton, MD: NIPORT, Mitra and Associates and ICF International.
- National Institute of Population Research and Training (NIPORT) (2014). *Mitra and Associates and ORC Macro 2016 Bangladesh Demographic and Health Survey 2014*. Dhaka and Calverton, MD: NIPORT, Mitra and Associates and Macro International.
- Save the Children (2001). *Annual Report 2001*.
<https://www.savethechildren.org/content/dam/usa/reports/advocacy/annual-report/sc-2001-annualreport.pdf>
- Save the Children (2002). *Annual Report 2002*.
<https://www.savethechildren.org/content/dam/usa/reports/advocacy/annual-report/sc-2002-annualreport.pdf>
- United Nations Fund for Children (UNICEF) (2015). *Annual Reports 2015*.
https://www.unicef.org/publicpartnerships/files/2015ARR_ChildProtection.pdf
- World Bank (2014). *289,000 Women Died in 2013 Due to Complications in Pregnancy and Child Birth*.
<http://blogs.worldbank.org/opendata/289000-women-died013-due-complications-pregnancy-and-childbirth>
- World Health Organization (2018). *Eastern Mediterranean Region Framework for Health Information Systems and Core Indicators for Monitoring Health Situation and Health*

System Performance 2017. <http://www.who.org>

World Health Organization WHO, United Nations Fund for Children, United Nations Population Fund, World Bank Group and the United Nations Population Division (2015). *Trends in Maternal Mortality: 1990 to 2015*. Geneva: WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division.

<http://www.who.int/reproductivehealth/publications/monitoring/maternal-mortality-2015/en/>

World Health Organization, United Nations Fund for Children, United Nations Population Fund and the World Bank (2007). *Maternal Mortality in 2005*. Geneva: WHO, UNICEF, UNFPA and the World Bank. http://www.who.int>whosis>mme_2005