Analysis of Three Delays of Maternal Mortality in Federal Government Polyclinic Islamabad

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Submitted for Publication: 22-11-2021
Accepted for Publication 22-08-2023

ABSTRACT

Background: Maternal mortality remains a global health concern, with disparities in outcomes persisting across regions and countries. The Three Delays Model, proposed by Thaddeus and Maine in 1994, has been instrumental in understanding the factors that contribute to maternal mortality. This model identifies three critical delays that, when present, can significantly impact maternal health outcomes. This analysis delves into each delay, examining their implications and proposing strategies for mitigation. **Objective:** To determine the current causes and trends in maternal death and analyze the contribution of three types of delays to maternal mortality. **Study Design:** Retrospective, Descriptive study. **Settings:** Obstetrics and Gynecology Department of Federal Government Polyclinic Islamabad Pakistan. **Duration:** January 2009 to December 2020. **Methods:** All the maternal deaths during this 12 years period were reviewed. All patient's files and hospital records with the most comprehensive information available were reviewed and required information collected on a structured proforma. All the data of women who experienced maternal mortality, defined as death during pregnancy, childbirth, or within the first 42 days after childbirth, and who had sufficient data related to the Three Delays Model, was incorporated. For type of delay Thaddeus and Maine's model was used. All the information was collected via structure proforma and analysis was done using SPSS version 26. **Results:** Total 67 maternal deaths encountered during the study period. Maternal mortality ratio was 77/100,000 live births. Mean age of the patients was 27.34 ± 5.19 years and maximum deaths 44(65.7%) were in the age group of 21-30 years. Maximum patients 21(31.3%) were primigravida. Women were less educated 46(68.7%) of these had education below primary. Non booked accounted for 65.7%. Complications of Sepsis were leading cause in 13 (19.4%) of maternal deaths followed by hemorrhage in 11(16.4%) cases. Type I delay contributing in 36(53.7%) and type II 8(11.9%) and III delays in 6 (8.9%) cases. **Conclusion:** Maternal mortality ratio was observed to the 77/100,000 live births. Type I delay in terms of delay in Seeking help, poverty, family Taboos, ignorance of healthcare facility and lack of awareness observed to the most common. Furthermore, in type II delay the long distance and delayed referral were the common factors and in type III delay the commonest factors found inexperience of surgery and insufficient equipment.

Keywords: Maternal mortality, Delays, Safe motherhood, Emergency obstetric care.

INTRODUCTION

Maternal mortality poses a significant health challenge, particularly in developing nations, where 99% of global maternal deaths occur annually.[1] Each year, more than half a million women succumb to complications related to pregnancy, the majority of which are preventable.[2] Ten countries including Pakistan account for nearly 59% of global burden of maternal deaths.[1] In 2019, Pakistan recorded a maternal mortality ratio of 186 deaths per 100,000 live births, surpassing the

previously declared rate of 178/100,000 in 2015. Both the federal and provincial governments of Pakistan have established the ambitious objective of lowering the maternal mortality rate to 70 deaths per 100,000 live births by the year 2030. This goal is particularly crucial, given that a significant proportion (80-85%) of maternal deaths in developing countries can be traced back to direct obstetric causes such as sepsis, hemorrhage, hypertension and abortion related complications.[4] However, factors such as inadequate healthcare facilities, illiteracy, malnutrition, poor socioeconomic status, domestic violence, and other sociodemographic elements are identified as significant contributors.[5]

Empowering women with education ensuring provision of these basic human rights could help in reducing MMR. Thaddeus and Maine developed a model to check for the factors which contributed considerably in maternal death. This model is widely used now a days to evaluate and correct the possible delay in provision of health care. They assert that delays can manifest at three distinct levels, encompassing a delay in deciding to seek care, a delay in reaching the appropriate facility, and a delay in receiving sufficient care at the facility.[6]

Type I delay is impacted by elements associated with decision-making, sociocultural factors, and financial and opportunity costs. On the other hand, factors like the proximity to the nearest healthcare facility, travel duration, the accessibility and cost of transportation, as well as road conditions, contribute to Type II delay. Type III delays encompass elements that influence the promptness of effective care delivery once a woman arrives at a healthcare facility. These factors involve deficiencies in supplies, equipment, adequately trained personnel, the competency of available staff, and the overall quality of care. Pakistan reduced its MMR significantly from 2000 to 2017 but there was a rise seen again in 2019 which raised many questions. It could be due to unexpected burden of corona pandemic on health system[8] but recent survey showed no improvement. While after mass vaccination COVID -19 is now of a less concern.[9]

No such study was conducted in Islamabad but one study conducted in one of the provincial capital city identified type I delay as the major contributor (64.7%) followed by type II delay in 32% of the patients.[10] However, such high MMR along with its minimal improvement over time necessitates further research to evaluate contributing factors and their managements so that mothers can be provided with good quality and targeted care. The aim of this study is to outline the diverse socio-demographic features and the three distinct delays associated with maternal mortality in a tertiary care hospital within the public sector, located in the capital city of Pakistan.

Islamabad has a higher literacy rate and is considered one of the most educated and developed city. Aim of this study was to identify that pattern of maternal mortality are same or different from the rest of the Pakistan, which type of delay could be of the most serious concern and require consideration. Identification of the different barriers that women face in achieving the timely and effective medical care should be addressed properly. Our aim is to improve the obstetric care and thus reduce maternal mortality

METHODS

This is a retrospective, descriptive study and was undertaken in obstetrics and gynecology department of Federal Government Polyclinic post graduate medical institute (PGMI) Islamabad from Jan, 2009 - DEC, 2020.

Hospital provides tertiary level maternity care and is the main referral center for Islamabad capital territory (ICT), Gilgit Baltistan, Azad Jammu Kashmir and adjacent areas of Punjab and KP province. Gynecology department is maintaining record of all deaths on a detailed proforma since 1996 and the cases are being discussed in departmental monthly maternal mortality audit meetings since 2005. All the record is kept safe and accessible for research purposes. After taking approval from hospital ethical committee.

The study incorporated all maternal fatalities within this timeframe. A standardized proforma was employed to gather pertinent details concerning age, parity, socio-demographic attributes, booking status, cause of death, and the three types of delays. All maternity record reviewed and information was taken from relatives of deceased women. Booked patients were those who were registered in outpatient gynecology department of polyclinic and having at least one follow up antenatal visits during pregnancy. Cause of maternal death was decided by senior members in maternal mortality meeting after reviewing all record. Three delays were defined as by Thaddeus and Maine.[3]

Information regarding the first and second delay was obtained from interviews with patient's attendants and relatives. Data regarding third delay was taken from patient's case files. Delayed referral from basic health care facility was included in second delay. Data of total deliveries during these years was collected from yearly statistics register which is recorded, maintained and kept by the gynae department and hospital statistician respectively. Data was analyzed by software SPSS version 22, and presented in form of means, frequencies and percentages using descriptive statistics.

RESULTS

During the study period 87656 patients delivered, live births were 86726.There were total 67 maternal deaths, so maternal mortality ratio was 77/100000 live births from 2009-2020 (Table 1).

Table 1: Maternal mortality rate during 2009-2020

Year	Frequency	Percent	Total Deliveries	MMR/100000 Live Births
2009	7	10.4	7709	90
2010	3	4.5	4838	62
2011	7	10.4	9572	73
2012	7	10.4	7742	90
2013	2	3.0	7756	25
2014	4	6.0	6612	60
2015	4	6.0	5330	75
2016	3	4.5	6237	48
2017	9	13.4	6318	142
2018	8	11.9	7991	100
2019	8	11.9	7408	108
2020	5	7.5	5613	89
Total	67	100.0	86726	77

Mean age of the women was 27.34 ± 5.17 year. Youngest loss was of 18 years old girl and most of the women(76.1%) who died were of 30 years or less in age. Number of deaths of primigravida were tragically high 21(31.3%) while mean parity was 1.69 ± 1.76. Education status was poor among the women 46(68.7 %) had formal education level of primary or below. Only four (5.97%) women were having tertiary level of education which seems to be significantly affecting their choices as none of these women suffered type 1 or 2 delay (table 2). Most of our patients lived in urban areas 45 (67.2%) while rural area women accounted for 32.8%. About 87% of rural women faced at least one type of delay while among urban women 32 % faced no delay and 11% faced type III delay so about 57% were those with type I, II delays which showed their relatively better understanding of the disease process and better availability of resources. Majority of patients were non booked 65.7%. Table.2

Table 2: Distribution of delays observed in relation to sociodemographic & obstetric factors of deceased women

Age groups	<20	2	5	0	0	7(10.4)
	21-30	11	24	4	5	44(65.7)
	≥31	4	10	1	1	16(23.9)
Education	5	10	29	3	4	46 (68.7)
	6-10	4	10	2	1	17(25.4)
	>10	3	0	0	1	4(6.0)
Parity	0,1	10	17	2	4	35(52.2)
	2-4	4	16	2	1	28(41.8)
	5 & above	3	1	1	1	4(6.0)
Place of Living	Rural	3	16	2	1	22(32.8)
	Urban	14	23	3	5	45(67.2)
	Total	17	39	5	6	67

Anesthesia complications, cardiac diseases, encephalitis, fulminant hepatic failure and tuberculous meningitis were common indirect causes, as shown in table 3.

Table 3: Direct and indirect causes of maternal death

Causes of maternal death	N (%)
Direct MM	
Sepsis	13 (19.4%)
Obstetric hemorrhage	11 (16.4%)
HTN and its related complications	10 (14.9%)
Pulmonary embolism	6 (9.0%)
Septic abortion	4 (6.0%)
Total	44 (65.7%)
Indirect MM	
Anesthesia complications	3 (4.5%)
Cardiac disease	3 (4.5%)
Viral encephalitis	3 (4.5%)
Liver failure	3 (4.5%)
Dengue	2(3.0%)
Tuberculous meningitis	2 (3.0%)
Transfusion reaction	2 (3.0%)
Miscellaneous	5 (7.5%)
Total	23 (34.3%)

Anemia was found to be a contributing factor as it was present in 39(58.2%) cases. Type I delay was the most frequent background cause of maternal deaths contributing in 36(53.7%), followed by type II and type III delays 8(11.9%) and 6 (8.9%) of cases. No delay was detected in 17(25.4%) cases. Most frequent reason for type I delay was delay in seeking help 14 (20.8%) followed by poverty 7(%), familial taboos, lack of awareness of medical facility, lack of awareness of the gravity of situation were other common causes although mostly it was combination of these factors and was difficult to designate one reason. In type II delays main cause was late referral 3(44.7%). Surgery by inexperienced surgeon and lack of equipment accounts for most of type III delay. Table.4

Table 4: Distribution of cases according to three types of delays to maternal mortality (n=67)

Types of delay		N	%
Type -I	Delay in Seeking help	20	29.9%
	Poverty	7	10.4%
	Family Taboos	4	6.0%
	Ignorance of healthcare facility	2	3.0%
	Lack of awareness	2	3.0%
	Refusal to treatment	1	1.5%
Type-II	Transport	2	3.0%
	Long distance	3	4.5%
	Late Referral	3	4.5%
Type -III	Delay in surgery	1	1.5%
	Delay in dialysis	1	1.5%
	Surgery by inexperienced surgeon	2	3.0%
	Lack of Equipment	2	3.0%
	No delay	17	25.4%

Causes of the maternal mortality were statistically insignificant according to types of delay (p->0.05). Table. 5

Table 5: Type of delay in relation to cause of death.

Causes of MM	N	%	Types of Delay				p-values
			No delay	Type 1	Type 2	Type 3	
Sepsis	13	19.4	2	7	3	1	
Hemorrhage	11	16.4	3	7	0	1	
HTN	10	14.9	2	4	2	2	>0.05
PULM EMB	6	9.0	4	2	0	0	
Miscellaneous	27	40.2	6	16	3	2	

DISCUSSION

This study was conducted to determine the current trends in maternal mortality in one of the tertiary care hospitals in capital city of a developing country, Pakistan, and to identify background delays in maternal mortality which need to be acted upon to reduce MMR. In this study maternal mortality ratio was 77/100000 live births. In Pakistan maternal mortality ratio was 431/100000 live births in 1990 currently it was 178/100000 live births in 2015.[3] It started to decline in till 2017(140/100000) but again in 2019 a rise observed (186/100000).[7]

The greatest impact was observed in rural regions, where the maternal mortality ratio (MMR) was 199 per 100,000 live births. In contrast, urban areas had a lower MMR of 158 per 100,000 live births. In our study, however, the MMR was recorded at 77 per 100,000 live births. It is easily justifiable as this represents a small chunk of population which mainly includes urban area and better socioeconomic conditions. The federal and provincial governments of Pakistan aim to decrease the maternal mortality rate to 70 deaths per 100,000 live births by the year 2030.[9] In our study 90 % of rural women were non booked only 44% patients received any antenatal care mostly belonged to urban area. A study conducted in Karachi showed 3.8% booked cases and 60% patients received no antenatal care at all.[11] Similar findings observed in India and study reveals that patients who didn't receive any antenatal care more frequently faced all III types of delay.[13]

Egypt being more educated country than Pakistan showed more common help seeking behavior a study showed most of the women got some type of healthcare only 7.2 % never attended antenatal care.[14] A study conducted in rural Sindh demonstrated that few of our women received reasonable care during pregnancy and childbirth (6.4%). Skilled birth attendants, comprising health professional services, were accessible to 56.1% for antenatal care, 40.8% for both antenatal and childbirth care, and 22.3% for antenatal, childbirth, and postnatal care. Only 6.4% reported utilizing all services related to

pregnancy and postpartum. Barriers identified included limited awareness of affordable health services, low health literacy, and challenges in accessing health services. A lack of respectful maternity-care was also found to be a major concern.[15] An integrated review agreed that good antenatal care reduces chances of complications during pregnancy and so worst outcomes can be avoided.[12]

Education also seemed to play pivotal role as in our study not a single woman from rural area had education above primary level which effects their choices. In this study 68.7% received primary education or less this is in line with a study conducted in civil hospital Karachi in which 68% women received no formal education[11]. Another study states worst educational status in rural areas where 62% women received no formal education in comparison to 34% in urban areas. Only 14% of rural women possess secondary or higher education.[5] Educating women is the need of the day. Systemic review demonstrated that, the income and the educational level were inversely proportional to opting for and availability of professional help and the refusal of the treatments offered.[11]

Direct causes of maternal death found to be common than indirect one. Sepsis was leading cause of maternal mortality accounting for 36.5% of maternal deaths followed by Complications of hypertension and hemorrhage. This is in contrast to civil hospital Karachi study where hemorrhage, hypertension and unsafe abortion were leading cause of direct maternal deaths[5]. A study in neighboring country with similar socioeconomic conditions also reported complications of hypertension to be the leading direct cause followed by hemorrhage and sepsis.[13]

A study in Mozambique a sociodemographic region shows slightly different findings, common direct causes were hemorrhage, hypertension and sepsis but among indirect causes HIV was commonest.[16] No maternal death observed due to HIV in our setup during study period however it may be due to not routinely performed HIV screening in our antenatal patients because of low prevalence. A study in Egypt found cesarean section complications to be 3rd common cause, that's also alarming and need reduction in cesarean section rate.[17] The primary cause of maternal mortality was preeclampsia/eclampsia, accounting for 55% of cases. Obstetric hemorrhage, including placenta previa, postpartum hemorrhage, and rupture uterus, was the cause in 35% of deaths. Complications arising from caesarean sections and medical conditions associated with pregnancy were linked to 5% of maternal deaths each. Viral encephalitis, cardiac disease, tuberculosis meningitis, fulminant hepatic failure and dengue fever were the major indirect causes of maternal deaths. Indirect causes vary among different settings even in

same country. However cardiac diseases and hepatic failure demands early intervention.

In our study among 61.5% of deceased mothers, type I delay was the main contributing factor followed by type II delay in 15.3%. The most common reason for first delay was delay in seeking help other causes were poverty, familial taboos, lack of awareness about seriousness of disease and financial issues. Mostly a combination of factors was observed. Lack of education directly effects all factors of type I delay. Type II delay was due to late referral from basic health facility, long distance and difficulty in getting transport. This implies scarcity of good health facilities in periphery also no proper referral system. In civil hospital Karachi study second delay was found to be most common followed by first delay.[5]

The most common reason of type III delay in our study was surgery done by inexperienced surgeon and lack of equipment. One woman died because ventilator was not available even in all nearby health facilities. Delayed surgical intervention was due to delay in getting reports of investigations, reaching proper diagnosis and non-availability of operation theater facility. Difficulty in getting blood products and late surgical intervention were the main reasons of type III delay in study of Civil hospital Karachi.[5]

A study in Malawi has somewhat contradictory results. They observed more common type III delay than type II or I. There were 151 maternal deaths during one year. Type III delay was responsible for 96.8% of them. Factors contributing to the issue involved extended waiting periods before receiving any form of assessment or treatment at healthcare facilities, unavailability of essential medications, insufficient skilled personnel, errors in diagnosis including missed and incorrect assessments, and delays or inaccuracies in administering treatment.[18]

A study conducted in Indonesia showed interesting finding. They claim that it's a fair play between delay in seeking assistance and delay in having prompt treatment (31.8%). Financial constraints and type II delay were not a big concern for them because of their somewhat organized referral system and easy access of healthcare facility. However, they were not satisfied by treatment given in primary facilities.[19-21] To decrease the maternal mortality ratio in hospitals, it is crucial to explore methods that promote the early referral of challenging obstetric cases from basic health facilities. This includes enhancements in blood banking, emergency and intensive care facilities within hospitals. On a broader scale, the establishment of free maternity services at regional and national levels is essential. Moreover, the concept of safe motherhood needs to be approached in a multidisciplinary manner within hospital settings. Some

of the most relevant departments include Anaesthesia, Haematology and blood transfusion, Radiology, Medicine especially renal dialysis, surgery and neonatology. Protocols for managing the common obstetric complications should be prepared and boldly displayed in all relevant departments of the hospital. Maternal mortality indicates status of women in society. Large country level studies are required to find deficiencies in health system and then appropriate measures need to be taken.

CONCLUSION

The study's conclusion reveals a maternal mortality ratio of 77/100,000 live births. The predominant factors contributing to Type l delays include a delay in seeking help, poverty, family taboos, ignorance of healthcare facilities, and lack of awareness. Type ll delays are primarily attributed to long distances and delayed referrals, while Type lll delays are commonly associated with inexperience in surgery and insufficient equipment. These findings underscore the need for targeted interventions to address these specific factors and improve maternal healthcare outcomes.

LIMITATIONS

Thorough investigation of women who died but failed to report was not possible, and the absence of a control group further limits the study's scope. For some variables, a small sample size resulted in inadequate statistical power for certain analyses. The socioeconomic class was a crucial variable, but the data were deficient. Although efforts were made to address this by combining categories for educational attainment, the study was unable to conduct an in-depth analysis of the association between the cause of death and the type of delay.

SUGGESTIONS / RECOMMENDATIONS

Thoughtful measures need to be taken to improve educational status of the women, legislation against early marriages. Antenatal care should be easily accessible and mandatory. And lastly significant improvement needed in countrywide reproductive health care services in terms of provision of life saving equipment, means of transport and proper structured referral system.

CONFLICT OF INTEREST / DISCLOSURE

None.

ACKNOWLEDGEMENTS

this project has been instrumental in shaping the final manuscript.

REFERENCES

1. WHO. Maternal Mortality. 2018: Fact sheets. Available at: http://www.who. int/en/news-room/fact-sheets/detail/maternal-mortality

2. McGaw-Binn A, Standard-Goldson A, Ashley D, Walker G, MacGillivray I. A ccess to care and maternal mortality in Jamaican hospitals: 1993-1995.Int J Epidemiol 2001;30:796-801.

3. Pakistan Maternal Mortality Survey 2019: Key Indicators Report. Islamabad, Pakistan, and Rockville, Maryland, USA: NIPS and ICF.: National Institute of Population Studies (NIPS) [Pakistan] and ICF, 2020 2020.

4. Audrey S, Procter S. Employers' views of promoting walking to work: a qualitative study. International Journal of Behavioral Nutrition and Physical Activity. 2015 Dec;12(1):1-0.,

5. Hanif M, Khalid S, Rasul A, Mahmood K. Maternal mortality in rural areas of Pakistan: challenges and prospects. Rural Heal. 2021 Jun 7;27:1040-7.

6. Thaddeus S, Maine D, Too far to walk: maternal mortality in context. Soc Sci Med 1994; 38:1091- 1100.

7. Pakistan Maternal mortality ratio, 1960-2021 -knoema.com. https://knoema.com/atlas/Pakistan/topics/Health/Health-Status/Maternal- mortality-ratio

8. Kakar AH, Siddique A. Pakistan Faces Unprecedented Healthcare Crisis Amid Mounting Coronavirus Infections.(2020).

9. Maternal mortality ratio in Pakistan still too high, shows report - Pakistan - DAWN.COM. https://www.dawn.com/news/1595085

10. Iqbal M, Muhammad Z, Akhtar Z, Naz T. The three delays of maternal mortality in a teaching hospital. Journal of Medical Sciences. 2017;25(2):231-5.

11. Shah N, Hossain N, Shoaib R, Hussain A, Gillani R, Khan NH. Socio-demographic characteristics and the three delays of maternal mortality. J Coll Physicians Surg Pak. 2009 Feb 1;19(2):95-8.

12. Santos PS, Belém JM, Cruz RD, Calou CG, Oliveira DR. Applicability of the Three Delays Model in the context of maternal mortality: integrative review. Saúde em Debate. 2023 Jan 6;46:1187-201.

13. Sk MI, Paswan B, Anand A, Mondal NA. Praying until death: revisiting three delays model to contextualize the socio-cultural factors associated with maternal deaths in a region with high prevalence of eclampsia in India. BMC pregnancy and childbirth. 2019 Dec;19:1-1

14. Mohammed MM, El Gelany S, Eladwy AR, Ali EI, Gadelrab MT, Ibrahim EM, Khalifa EM, Abdelhakium AK, Fares H, Yousef AM, Hassan H. A ten year analysis of maternal deaths in a tertiary hospital using the three delays model. BMC Pregnancy and Childbirth. 2020 Dec;20:1-8.A

15. Maheen H, Hoban E, Bennett C. Factors affecting rural women's utilisation of continuum of care services in remote or isolated villages or Pakistan–A mixed-methods study. Women and Birth. 2021 May 1;34(3):257-65.

16. Chavane LA, Bailey P, Loquiha O, Dgedge M, Aerts M, Temmerman M. Maternal death and delays in accessing emergency obstetric care in Mozambique. BMC Pregnancy Childbirth. 2018 Mar 22;18(1):71.

17. Mgawadere F, Unkels R, Kazembe A, van den Broek N. Factors associated with maternal mortality in Malawi: application of the three delays model. BMC pregnancy and childbirth. 2017 Dec;17:1-9.

18. Amin MM, Ibrahim MS, Ali AE. Values of Application of Three Delays Model to Maternal Mortality Scenarios at Sohag Univeristy Hospital Bidirectional Cohort Study. The Egyptian Journal of Hospital Medicine. 2021 Apr 1;83(1):812-6.

19. Indarti J, Solihin A, Suastika AV, Wardhani DP, Ramadhani MT, Afdi QF, Syafitri SM, Ikhsan M, Alda

20. K. Three-Delay Model on Maternal Mortality Cases in Tertiary Referral Hospital in Indonesia. eJournal Kedokteran Indonesia. 2021 Sep 1;9(2):99

21. Shaeen SK, Tharwani ZH, Bilal W, Islam Z, Essar MY. Maternal mortality in Pakistan: Challenges, efforts, and recommendations. Annals of Medicine and Surgery. 2022 Sep 1;81:104380