REPRODUCTIVE CHARACTERISTICS OF THE WOMEN AS A DETERMINANT OF MATERNAL DEATH: A COMMUNITY BASED CASE-CONTROL STUDY

Community Medicine

Divya Khanna*	Assistant Professor (MD), Department of Community Medicine, Heritage Institute of Medical Sciences, Varanasi, UP, India.*Corresponding Author
Jai Veer Singh	Professor (MD), Department of Community Medicine & Principal, Hind Institute of Medical Sciences, Barabanki, UP, India
Monika Agarwal	Professor (MD,), Department of Community Medicine, King George's Medical University

ABSTRACT

Background: The WHO estimates that of the 529 000 maternal deaths occurring every year 136 000 take place in India.
Methods: This was a community based case-control study done in rural areas of Lucknow, UP (India) in a period of one year. 90 maternal deaths were identified and were matched with two controls. Data were analysed using SPSS version 17.0 and Open Epi version 2.3. Results have been given in form of Unadjusted and Adjusted Odds ratio.
Results: The most important direct cause of maternal death was Hemorrhage. Anaemia was the most important indirect cause of death. High birth order, short inter-pregnancy interval and young age of conception were found as important risk factors for maternal death
Conclusion: We conclude that women who have higher birth order, smaller inter-pregnancy interval, younger age of conception and have a bad obstetric history have higher chances of maternal deaths.

KEYWORDS

Case-control Study, Risk Factors, Reproductive Health, Maternal Death

Introduction

Though India has made an appreciable progress in improving the overall health status of its population but the pace of decline in trends of maternal mortality and child mortality has been slow and steady.[1] The National Family health survey (NFHS)-1 (1992-93) was the first to provide the national level estimates of maternal mortality ratio (MMR) for India as 437 per 100,00 live births.[2] In the year 2013-2014 MMR of India was 167 per 100,000 live births. MMR of Uttar Pradesh, the most populated stated of India, was second highest as 285 per 100,000 live births. [3]

Several reproductive factors reasons are cited for high maternal mortality in especially in India. One such factor is high parity.[4] Different causes of maternal deaths may develop due to certain reproductive factors working in the background. The aim of our study was to assess the reproductive characteristics which lead a mother towards maternal death.

Methods

This was a community-based case-control study conducted on 90 maternal deaths identified during the one year study. Study participants were the females (age group of 15-49 years) in the study area who either delivered and were alive after 42 days of the postpartum period or died within 42 days of termination of pregnancy in the reference period. All maternal deaths identified in all the rural blocks during the study period were enrolled through snow-balling technique. Maternal death was defined as per ICD-10 coding (Table-1).[5]

The study area was Lucknow district, capital of Uttar Pradesh. As per Census 2011, Lucknow catered a population of 4,588,455 with an average literacy rate of 79.33 Sex Ratio of 940 per 1000 males far below the national average. [6]

Each of the maternal death was matched with two controls. One was a geographical-matched control and other was complication matched control. (Table-1) All controls were drawn from the same community from where the maternal death cases were taken. Maternal deaths were identified through ASHA, and ANM. A home visit was made to the family of deceased after the suitable mourning period. Best suitable respondents were interviewed after taking informed consent. For controls mothers, self-reported symptoms were taken and family was inquired for logistics and health seeking

Data collection was done through two schedules. Verbal autopsy was conducted using UNICEF's maternal and perinatal death inquiry and response tool and was used for ascertaining the cause of maternal death. A pre-tested and semi-structured schedule was used for both cases and controls to identify their reproductive history. ICD-10 definitions were used for complications during pregnancy and delivery. [5]

Data was tabulated on Microsoft Excel Sheet and analyzed by using the software SPSS, Version 17.0 and Open Epi, Version 2.3. All variables were entered as categorical. The appropriate significance test was applied using MacNemar test for paired data and unadjusted odds ratio (OR) and 95 % confidence intervals were calculated for risk factors of maternal death. Risk factors obtained significant in bivariate analysis were subjected to conditional multiple logistic regressions for adjustment and controlling the effect of confounding variables and the results have been given in form of unadjusted OR (UOR) and Adjusted OR (AOR). p value of <0.05 was taken as statistically significant

Ethical Consideration: The study received clearance from the Ethical Board Committee of the King George's Medical University, Lucknow, UP, India. The objective, purpose of the study were explained to all the participants in their local language and written informed consent taken.

Table1. Case and control definitions

Cases	
Inclusion Criteria	Maternal death (ICD-10[5] definition) is defined as death of a woman during pregnancy or within 42 days from the end of pregnancy, irrespective of the duration and site of pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not accidental or incidental causes.
Exclusion Criteria	1. Non co-operative families 2.Mothers who died due to accidental/incidental causes 3. Late maternal deaths (ICD-10[5] definition: deaths due to direct or indirect obstetric causes after 42 days of termination of pregnancy but less than one year of termination of pregnancy.) 4. Maternal deaths due to rare non- pregnancy related causes (like leukaemia, burns) were not enrolled because of difficulty in finding matched controls. 5. Mothers residing in urban part of Lucknow during the study period.

	Controls
Inclusion criteria	**Geographical matched control:** Defined as mother who lived in same village where a maternal death took place and had delivered normally in the same reference period without any obstetric complications (which needed urgent hospitalization) during ante-/intra-/post-natal period and was alive after 42 days of post-partum period. Random selection was done from the list of deliveries that took place in same geographical area and in same reference period using ASHAs delivery register. **Complication matched control:** was defined as a mother who had a similar biomedical complication (either direct obstetric causes or indirect medical causes of morbidity which needed hospitalization) and was admitted for the complication at a tertiary health centre of Lucknow such as district hospitals or medical college for management but survived and was alive after 42 days of post-partum period.
Exclusion criteria	1. Non co-operative families 2. Mothers who did not deliver in the reference period 3. Mothers residing in urban part of Lucknow during the study period.

Results

A total of 90 maternal deaths were identified during the study duration. These were matched with 90 geographical controls and 87 complication controls. Three cases of maternal death were from Hepatitis,Tuberculosis and Tetanus for which complication matched control could not be identified from the given community. Seventy-three deaths (82.2%) occurred due to the direct cause of maternal death. The most common direct cause of maternal death was Hemorrhage (37, 41.1%), followed by Peurperal Sepsis (16,17.8%), Ruptured Uterus/Obstructed Labour (9,10%), Pre-Eclampsia/Eclampsia (8,8.9%). Three cases of deaths due to abortion and one death due to maternal tetanus was reported. Sixteen deaths occurred due to indirect causes of maternal death. Amongst indirect causes, Anemia (14, 15.6%) was the most important cause of death.

The distribution of reproductive risk factors amongst maternal deaths and the geographical matched controls, who were apparently healthy till 42 days of post-partum period, were compared. It was seen that the age of first conception (<21 years), birth order (>4), inter-pregnancy interval (<1 year) were the statistically significant risk factors on univariate analysis using Mac-Nemar test. Being a primi-gravida or past bad obstetric history or history of cesarean section were not found as significant risk factors. After adjustment with multinomial regression it was observed that age of first conception (<21 years), birth order (>4), inter-pregnancy interval (<1 year) continued to be the significant risk factors. (Table-2) After adjustment the age at first conception (<21 years) raised the odds of deaths by three-fold (OR 3.3; 95% CI 1.2-8.7). Higher birth order (>4) also raised the odds of death by three-fold (OR 3.1; 95% CI 1.1-9.1). Similarly inter-pregnancy interval of ≤1 year also raised the odds of death by three-fold (OR 3.5; 95% CI 1.3-9.4).

Table2. Comparison of maternal deaths with their geographical controls by the reproductive health characteristics

Characteristic	Sub-category	Case No. (%) N=90	Control No. (%) N=90	Unadjusted OR (95% CI)
Age at first conception	<21	60	24	2.3(1.6-3.2)*
	≥21	30	66	Reference
Gravida	Primi	23	17	1.3(0.95-1.68)
	Others	67	73	Reference
		N=67	N=73	
Birth order	>4	14	4	1.5(1.04-2.04)*
	≤3	53	69	Reference
Past bad obstetric history	Yes	45	47	1.03(0.7-1.4)
	No	22	26	Reference
Inter-pregnancy interval	≤1 year	41	22	1.9(1.4-2.7)*
	>1 year	26	51	Reference
History of caesarean section	Yes	5	2	1.2(0.8-1.7)
	No	62	71	Reference

*p value was found to be significant

The distribution of reproductive risk factors amongst maternal deaths and the complication matched controls, who developed the same complication but survived, were compared. It was seen that the age of first conception (<21 years), past bad obstetric history, inter-pregnancy interval (<1 year) were the statistically significant risk factors on univariate analysis using Mac-Nemar test. Being a primi-gravida or

having higher birth order or history of cesarean section were not found as significant risk factors. (Table-3) However, after adjustment with multinomial regression it was observed that only inter-pregnancy interval (<1 year) continued to be the significant risk factor. After adjustment the inter-pregnancy interval of ≤1 year raised the odds of death by nine-fold (OR 9.1; 95% CI 3.3-25.2).

Table3. Comparison of maternal deaths with their complication matched controls by the reproductive health characteristics

Characteristic	Sub-category	Case No. (%) N=87	Control No. (%) N=87	Unadjusted OR (95% CI)
Age at first conception	<21	58	42	1.5(1.1-1.96)*
	≥21	29	45	Reference
Gravida	Primi	20	13	1.2(0.8-1.6)
	Others	67	74	Reference
		N=67	N=74	
Birth order	>4	14	13	1.1(0.8-1.6)
	≤3	53	61	Reference
Past bad obstetric history	Yes	45	33	1.6(1.1-2.2)*
	No	22	41	Reference
Inter-pregnancy interval	≤1 year	41	11	2.8(1.9-4.1)*
	>1 year	26	63	Reference
History of caesarean section	Yes	5	2	1.2(0.9-1.7)
	No	62	72	Reference

*p value was found to be significant

Discussion

In the present study the majority of maternal deaths were due to direct causes amongst which obstetric hemorrhage was the most important cause of death. Amongst the indirect causes Anemia was the most important cause of death. This finding is in line with the figures from India and worldwide.[7,8]

In the present study the age at first conception by the mother was found as an important risk factor for maternal death specially compared to geographical control but not against complication matched control. This finding suggests that younger age of conception is a risk factor for development of obstetric complications which if left unattended may lead to maternal death. Our finding was in line with previous studies.[9]

We observed that higher birth order (>4) ie.grand-multiparity and short inter-pregnancy interval were important risk factors for maternal death when compared to both geographical and complication matched control. This finding suggests that too early and too many pregnancies are responsible for both development of complication and maternal death. Our finding is in line with previous studies done in Indian-setup.[10,11] The exhaustion of maternal heath reserves combined with overburdening the mother with care of so many children and lack of sensitivity towards maternal health both by the mother herself and her family contributes to development of complication and ultimately leading to death because of lack of timely critical management. It is stated that women who have pregnancies that are "too early, too late, too many, too close" are the ones who die.[12]

In our study the mothers who were primi-gravida were not found to have significant risk for maternal death. Study from Jharkand[13] has reported to have higher risk of death in Primgravida and a study from

Maharashtra[11] has stated no role of being primi-gravida as a risk factor. This finding can be party explained by limited sample size which may have masked the effect of weaker risk factors. Further studies, over a longer study period, is needed in order to include a larger sample of the women.

Conclusion

We conclude that women who have higher birth order, smaller inter-pregnancy interval, younger age of conception and have a bad obstetric history have higher chances of maternal deaths. Thus these women should be screened as high-risk population and cost-effective strategies and innovations should be encouraged to ensure that these women deliver in a safe environment.

Conflict of interest: We declare that we have no conflict of interest.
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