Maternal Mortality in Ile-Ife, Nigeria: A Study of Risk Factors

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The objective of this study was to determine which background factors predispose women to maternal mortality at the Obafemi Awolowo University Hospital in Nigeria. The study examined 35 cases of maternal death occurring in the hospital during the period 1 October 1989 to 30 April 1991. The control group comprised 35 women who were admitted to the hospital with similar complications during the same period, but who survived. Both cases and controls were investigated for their sociodemographic character-istics, their use of prenatal care, and the incidence of delay in clinical management. The results showed that the maternal deaths involved women who were younger and of poorer socioeconomic status than the women in the control group. Both groups showed an equal lack of prenatal care. However, a higher incidence of delayed treatment was found in the management of the cases of maternal deaths. Maternal mortality in the study population can be reduced through improved transportation and institutional management, and, on a long-term basis, through the adoption of measures to improve the socioeconomic status of women. (STUDIES IN FAMILY PLANNING 1992; 23, 5: 319–324)

High maternal mortality rates in most sub-Saharan African countries are currently a major source of concern to policymakers throughout the world. The medical and obstetric causes of these deaths are now well known. According to the World Health Organization (WHO, 1985), 75 percent of the maternal deaths in Africa are attributable to direct obstetric complications, such as hemorrhage, obstructed labor, infection, toxemia, and unsafe induced abortion. However, it is now clear that these complications are not necessarily fatal; they cause deaths only because they occur within the context of the severe socioeconomic deprivations that are prevalent in these countries.

In Nigeria, several studies (Adetoro, 1987; Chukwu-debelu and Ozumba, 1988; Ogunniyi and Faleyimu, 1988) have shown that maternal mortality is more common among women in the lower socioeconomic class when indices such as education, income level, and type of housing are used. Indeed, Harrison (1985) showed in his study of 22,774 consecutive births in Zaria that education was

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a strong determinant of maternal mortality in Nigeria. He found that among a group of pregnant women who had at least a secondary education, maternal mortality was as low as that in more developed parts of the world. Studies have also demonstrated an increased risk of maternal mortality among young mothers, grandmulti-parous women, and unmarried mothers, due in part to their lower socioeconomic status (Hartfield and Woodland, 1980; Oronsaye et al., 1982; Chukwudebelu and Ozumba, 1988).

The beneficial effects of improved socioeconomic status on maternal mortality are not direct, but are mediated by the interplay of such factors as improved health and reproductive behavior, improved health status, and improved access to health services, as well as by various other unknown mechanisms (Harrison, 1985; Loudon, 1986; Thaddeus and Maine, 1990). In Nigeria, for example, delay in seeking medical care, usually by women in the lower socioeconomic class, has consistently been cited by hospital-based investigators as the most important intermediate risk factor in maternal mortality. However, to date the components of this delay have not been characterized. We need to know whether this delay is due to the patient, to the health-care system, or to difficulties with transportation. It is also possible that all of these factors are equally important, that there is an interaction between them, or that a weighting can be given to them to highlight their relative importance. This information will be relevant as it will enable government and other agencies to plan a rational program of com-

bating the problem of maternal mortality at the community level.

Previous hospital reports on the intermediate determinants of maternal mortality in Nigeria were difficult to interpret because most of the reports did not include an analysis of risk factors in controls. The selection of an appropriate control group is important, as it enables a more meaningful assessment of the contribution of the various factors to maternal mortality.

Methodology

The study was undertaken during the period from 1 October 1989 to 30 April 1991. The cases were pregnant women or recently delivered mothers who were admitted with complications and who died in the university hospital during the period under study. The controls were women who were admitted with similar complications and who were managed in the hospital during the study period, but who survived.

The study included all cases of maternal deaths except those due to ectopic pregnancy and induced abortion. These cases were excluded because data collection was often not complete for them. Thirty-five cases, accounting for 95 percent of late gestational maternal deaths in the hospital during the 18-month period, were included in the study.

During the study period, each case of maternal death was systematically recorded and investigated to determine the clinical and social circumstances that led to death. The medical records officer reported each case to the chief medical director of the hospital, who then instituted a medical inquiry into the management of the case. The inquiry sought information about potential errors or delays in the management of the case in the hospital, through interviews with the hospital staff involved in the management of the case and through review of the clinical records by senior colleagues. Any preexisting delays before arrival at the hospital were also investigated by a thorough analysis of the hospital records and by interviewing the relatives and friends of the patient. Additional information was obtained during the monthly clinicopathologic and maternal mortality conferences. Autopsies to establish the medical cause of death were performed in only one-third of the cases, but it was always possible through the systematic analysis of the management procedures to determine whether or not the death had been preventable.

As shown in Table 1, the women in the control group had complications that were similar to those of the maternal death cases, and the rate of operative delivery was comparable in the two groups. The controls were selected

on the basis of a similar but nonfatal complication occurring immediately after a maternal death, and were confined to cases that arrived and were managed in the hospital. In particular, only patients considered to have disease conditions that equalled the severity of the maternal death cases were selected as controls. For example, one case of death from anesthetic complications was compared with an eclamptic woman who was successfully managed with a cesarean section performed under general anesthesia. The clinical management of cases in the control group was investigated by an in-depth study of the case records by senior colleagues and by the oral evidence provided by members of the management team during the weekly departmental maternal morbidity conferences.

Data Analysis

The variables that were obtained and evaluated in the two groups were (1) the sociodemographic characteristics of the patients (age, educational level, parity, and occupational status), (2) their use of prenatal care and number of prenatal visits, and (3) the incidence of treatment delay in the two groups.

The use of prenatal care was defined as registration in the antenatal clinic of the hospital or in any of the health centers affiliated with the teaching hospital, at or before 32 weeks of pregnancy. Delay was defined as a prolonged period (greater than two hours) between the onset of symptoms and presentation of the patient in the hospital. Delay was classified into three phases, according to the scheme proposed by Thaddeus and Maine (1990): (1) Phase 1, failure of the patient to seek appropriate medical care in time; (2) Phase 2, delay in reaching an adequate health-care facility; and (3) Phase 3, delay in receiving adequate care at the facility. Delay in referral from another health-care facility to the university hospital was classified as a Phase 3 delay.

Table 1 Percentage of women experiencing medical complications among 35 cases of maternal death and 35 controls, Ile-Ife, Nigeria, 1 October 1989 to 30 April 1991

Medical complications	Maternal deaths		Controls	
	%	(N)	%	(N)
Postpartum hemorrhage	29	(10)	29	(10)
Obstructed labor and puerperal sepsis	29	(10)	29	(10)
Sickle cell disease	9	(3)	9	(3)
Meningitis	6	(2)	3	(1)
Ruptured uterus	6	(2)	6	(2)
Chronic renal failure	3	(1)	6	(2)
Hepatitis	6	(2)	6	(2)
Tetanus	3	(1)	3	(1)
Eclampsia	9	(3)	11	(4)
Anesthetic death	3	(1)	0	(0)
Cesarean sections	29	(10)	29	(10)

These parameters were assessed independently for the two groups of patients and the observed differences were compared using the chi-square test with the Yates correction where appropriate (for proportions) and the Wilcoxon rank sum test (for the discrete data). An estimate of the risk associated with each of the factors was derived by calculation of odds ratios and relative risks and their confidence intervals.

Results

Sociodemographic Variables

The median age of the cases of maternal deaths was 24.5 years (mean 24.5; range 16–37 years); this was significantly younger ($p<0.01$) than the median age of 27.5 years (mean 27.3; range 18–45 years) of the control group. As shown in Table 2, approximately 34 percent of the cases of maternal deaths were aged 20 years or less, compared with only 11 percent of the control group. In contrast, more women in the control group were in the age range 20–39 years. Similarly, the cases tended to be less parous than the controls, with 17 (48 percent) of the maternal deaths being of parity 0 or 1 compared with 8 (22 percent) in the control group. There was a similar clustering of both cases and controls in the region of grand-multiparity (parity 5 or greater), but there was no difference between the groups, as a similar proportion of them (cases, 34 percent; controls, 31 percent) were grandmultiparas.

The educational background of the patients is analyzed in Table 2, where it is demonstrated that the cases of maternal deaths were statistically less likely to have received a formal education than were members of the

control group. Two-thirds of the cases did not receive a formal education, compared with only about one-tenth of the controls. The cases of maternal deaths and the controls were equally divided according to employment status. Twelve (34 percent) of the maternal deaths were unemployed compared with 8 (23 percent) in the control group ($p>0.05$).

Use of Prenatal Care

There was a high rate of nonuse of prenatal care by both the cases of maternal deaths and the controls. However, there was no statistically significant difference between them in this aspect, since an equal proportion of them (66 percent in each group) did not use prenatal care (not shown). Also, of the 12 patients who had prenatal care in each group, the median number of prenatal visits made by the maternal death cases (4.0, range: 1–8 visits) was not significantly different from the median number of visits (4.5, range: 1–9 visits) made by the controls.

Further analysis revealed that 8 of the 12 maternal deaths who registered for prenatal care used the university hospital's obstetric facility (66 percent) compared with 7 of 12 controls (59 percent). This difference, however, was not statistically significant.

Incidence of Delay

In a large proportion of both cases and controls, labor had commenced at home or in another institution before the patients were transferred to the university hospital. Only in three cases of maternal deaths (9 percent) and in six controls (17 percent) were the women admitted for primary management of labor in the university hospital. As shown in Table 3, the incidence of delay was greater in the group of maternal deaths, with 83 percent of the maternal deaths showing significant delay compared with only 51 percent of the controls. Phase 1 delay was more frequent in the control group, however. In contrast, there were more Phase 2 and Phase 3 delays in the group of maternal deaths.

An inquiry into the reasons for the Phase 1 delays revealed that these had resulted from (1) patients wanting to deliver at home (four cases and six controls) and

Table 2 A comparison of sociodemographic characteristics of 35 cases of maternal death and 35 controls, Ile-Ife, Nigeria, 1 October 1989 to 30 April 1991

Characteristic	Maternal deaths %	Maternal deaths (N)	Controls %	Controls (N)
Age				
<20	34	(12)	11	(4)
20–39	51	(18)	74	(26)
≥40	14	(5)	14	(5)
Parity				
0	31	(11)	14	(5)
1	17	(6)	8	(3)
2–4	17	(6)	46	(16)
≥5	34	(12)	31	(11)
Education				
None	66	(23)	11	(4)
Primary	14	(5)	40	(14)
Secondary	17	(6)	34	(12)
Postsecondary	3	(1)	14	(5)
Employment status				
Employed	66	(23)	77	(27)
Unemployed	34	(12)	23	(8)

Table 3 Analysis of causes of delay in 35 cases of maternal death and 35 controls, Ile-Ife, Nigeria, 1 October 1989 to 30 April 1991

Type of delay	Maternal deaths %	Maternal deaths (N)	Controls %	Controls (N)
No delay	17	(6)	49	(17)
Phase 1	23	(8)	29	(10)
Phase 2	20	(7)	6	(2)
Phase 3	40	(14)	17	(6)

Source: The three phases of delay are based on Thaddeus and Maine, 1990.

(2) patients starting labor in the church and wanting to deliver in the church (two cases and three controls). Three patients (two cases and one control) did not leave their homes in time to reach the hospital. In one case of maternal death, this delay was caused by the woman's fear that the nurses would be angry with her because she was carrying her tenth pregnancy, in spite of the previous advice given to her not to do so. The woman had refused any method of contraception.

Phase 2 delays (difficulties with transportation) were noted in seven of the maternal deaths and in two controls. This difference was not the result of unequal distances that the patients in the two groups had to travel. The estimated distance that the cases of maternal deaths had to travel (median, 4.0 kilometers; range, 1–60 kilometers) was not significantly different from that of patients in the control group (median, 4.0 kilometers; range, 1–45 kilometers).

The most striking difference between the groups was in the Phase 3 delays, which were experienced by 14 cases of maternal death and by six patients in the control group. Further analysis revealed that in the 14 cases of maternal death, these deaths resulted from (1) incorrect treatment in four patients, (2) lack of facilities in four cases, (3) poor staff attitude in four cases, and (4) delay in referral from the health centers in two patients. Phase 3 delays in the six patients in the control group were due to delays in referring patients from the health centers.

The results of cross-tabulation revealed that mothers with Phase 1 and 2 delays in both cases and controls were significantly younger than mothers without delay or with a Phase 3 delay. In the cases of maternal death, four of the eight women with Phase 1 delays and four of the 10 women in the control group were aged 20 years and younger. Similarly, 50 percent of the women in the control group who had Phase 2 delays and nearly 43 percent in the group of maternal deaths were 20 years old or younger. There was no significant difference in delays according to the parity of the women. A weighting of the risk of death associated with each factor was determined by calculating the respective odds ratios and relative risks. The results presented in Table 4 indicate that a maternal age of less than 20 years and the presence of Phase 2 and 3 delays are associated with an increased risk of maternal mortality. In contrast, maternal education had a significant beneficial effect, with even a primary education showing a significant improvement over no education. To determine the independent effect of maternal age separate from that of parity, we stratified the outcomes by age according to the various parity groups and calculated the Mantel-Haenszel weighted odds ratio. The results revealed a weighted odds ratio of 3.6 and a relative risk of 1.5 for a maternal age of less

Table 4 Odds ratios (OR) and relative risks (RR) of background factors for maternal mortality

Variable[a]	OR	RR
Age (20–35)		
<20 years	4.2	1.88**
>35 years	1.2	1.1
Parity (1–4)		
Nulliparity	2.4	1.4
≥ Para 5	0.9	1.0
Education (none)		
Primary	0.07	0.3**
≥ Secondary	0.07	0.34**
Use of prenatal care	1.0	1.0
Delay (none)		
Phase 1	2.3	1.7
Phase 2	9.9	3.0*
Phase 3	6.6	2.7*

Note: *Differences between categories are statistically significant at p<0.01; **differences between categories are statistically significant at p<0.001. [a] The reference categories are shown in parentheses.

than 20 years (p<0.02). This indicates that young maternal age has a deleterious effect on maternal mortality separate from that associated with parity.

Discussion

The study showed that the cases of maternal deaths were younger than the women in the control group, that there was a higher proportion of teenage girls among the group of maternal deaths, and that the risk of mortality was increased with young maternal age. This finding confirms previous retrospective data (Adetoro, 1987; Harrison et al., 1985; Chukwudebelu and Ozumba, 1988), which suggest that young women are particularly at risk of dying during childbirth in Nigeria. This result was not necessarily due to the effects of primigravidity and its increased obstetrics risks, since the association remained even after controlling for parity. However, we found a high incidence of Phase 1 and 2 delays among the young women in the cases of maternal deaths, indicating a significant delay in seeking care by young gravidas. This difference may be due to inequities in socioeconomic status between young mothers and older women. Young mothers are more likely to be from the lower socioeconomic class and are more likely to be unmarried, and therefore are more likely to delay seeking care when there is a complication in pregnancy.

In this study, the strongest socioeconomic differential between the cases and the controls was in educational level, with the maternal death cases showing less educational achievement and a higher proportion of illiteracy than the controls. It was particularly noteworthy that none of the teenagers in the group of maternal deaths had had a formal education, whereas three of the four teenagers in the control group had had one. It is difficult

to determine how education mediates its beneficial effects on the outcome of pregnancy, but the most likely direct route is through the improvement of access to an appropriate health-care facility. It has been postulated that better-educated women are more likely to choose the appropriate health-care center and are more likely to report in time when there are complications of pregnancy (Loudon, 1986; Walker, 1986). The results of this study confirm this proposition, because there were fewer instances of delay among the better-educated women in the control group.

There was no difference between the cases and controls in the use of prenatal care, contrary to the results found in previous studies (Harrison, 1985; Ogunniyi and Faleyimu 1985; Walker, 1986), which suggests that nonuse of prenatal care is a strong high-risk factor in maternal mortality. Although this study was not specifically designed to answer the important question regarding the value of prenatal care in reducing maternal mortality, certain inferences can be made, nevertheless. It is possible that the use of prenatal care may reduce the rates of pregnancy-related complications, but it is clear from this study that once complications develop at home, the prior use of prenatal care is unlikely to have a significant impact on the outcome. What then becomes important is the rapidity with which the patient gets to an appropriate health-care facility and the quality of care she receives at the center. It is also clear from this study that nonuse of prenatal care is not confined to poorly educated women of low socioeconomic status, since the better-educated women in the control group also failed to register for prenatal care. The important point, however, is that unregistered women of low socioeconomic status are less likely to have access to quality care when they develop complications in pregnancy and are, therefore, more likely to die.

The study revealed a significantly higher incidence of delay in the group of maternal deaths for women of poorer socioeconomic status. Phase 1 delays (decision to seek care) had equal prevalence in the two groups, but Phase 2 and 3 delays were more frequent in the group of maternal deaths. This sequence of events is logical, because whatever may have prevented the patients from registering for prenatal care may also have prevented them from seeking medical care in time when they developed complications.

Phase 1 delays included patients who intended to deliver at home or in the church. These are inappropriate places for women to attempt delivery in Nigeria, and it is our view that their use delays entry into an appropriate health-care delivery system. The factors that women consider in their choice of care—and factors that predispose them to Phase 1 delay—are likely to be com-

plicated in Nigeria and can only be isolated after a careful investigation of the prevailing sociocultural attitudes and practices. However, the factors that could be important include religious or cultural preferences, cost considerations, and previous experiences with the health-care system. In particular, a result of the recent decline in the national economy of Nigeria is that women avoid hospital delivery because of its perceived high cost, selecting to deliver in cheaper places instead.

The study showed that difficulties with transportation were an important cause of delay in the cases of maternal deaths. Because this was found not to be a result of increased distance from the hospital, other characteristics of the groups and of transportation in this community may explain the difference. Kamara (1991) has presented results of focus-group discussions among rural women in Nigeria indicating that such features of transportation as the absence of vehicles, irregular traffic, bad roads, high fares, and unfriendly drivers may more effectively hinder transportation than the physical distance from the health centers. These factors are likely to affect women of low socioeconomic status more severely, and they may explain the higher frequency of transportation difficulties in the group of maternal deaths.

It is of particular interest that as many as 14 cases of maternal death had delays that were attributable to inadequacies in the health-care delivery system. These deaths were mostly due to delayed referrals from the health centers, lack of facilities, incorrect treatment, and poor attitude of staff. The results of this study indicate that improving the quality of care provided by the health-care delivery system could lower maternal mortality by nearly 40 percent in the university hospital (the percent of deaths that were the result of Phase 3 delay). This finding supports the view of Maine (1991), who advocates the strengthening of the capability of health-care institutions to handle obstetric emergencies as a significant step toward solving the problem of maternal mortality in Africa. This process should involve the training, retraining, motivation, and supervision of staff, provision of adequate supplies, and advocacy of effective methods of management in health-care institutions.

In conclusion, delays are important factors in maternal mortality in the hospital teaching unit in Ile-Ife, Nigeria. The most important causes of delay are those related to poor transportation and to inadequacies in the health-care delivery system. These, in turn, are exacerbated by the poor socioeconomic status of women. Correction of the transportation and institutional factors, and, on a long-term basis, adoption of measures to improve the socioeconomic status of women, are very likely to reduce maternal mortality in this population. The causes of poor transportation are complicated, and cor-

rection of the problem is likely to require an innovative approach that should include community mobilization and participation. The institutional factors are more likely to be correctable in the short term and should be undertaken by the individual institutions and the supporting government or nongovernmental organizations. The most important components are the retraining of staff regarding the importance of early referral of patients, prompt attention to patients with pregnancy complications, and the provision of appropriate management tools in the institutions. The concept of a revolving fund for high-risk obstetric care is worth considering in areas where resources are genuinely scarce.

Acknowledgments

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