

OUT-OF-HOSPITAL DELIVERIES

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INTRODUCTION

Out-of-hospital deliveries can be divided into planned, generally in a prepared setting and attended by medical personnel, and unplanned¹. Unplanned out-of-hospital delivery or delivery en route to the hospital occurs when the woman is entering the active phase of labor rapidly; it can be a stressful and sometimes even hazardous experience. Unplanned out-of-hospital deliveries also carry an increased risk for adverse maternal and perinatal outcomes and specifically hemorrhage and perinatal mortality²⁻¹⁴.

Bateman and colleagues³ reported that patients who delivered out of hospital in the USA were more likely to be African-American, multigravid and to have had no or poor prenatal care. Similarly, other ethnic minorities (Asians living a long way from the hospital in Europe) are also at risk for out-of-hospital deliveries and for adverse pregnancy outcome⁴⁻⁶. Indeed, reducing out-of-hospital deliveries has been cited as an explicit health goal in the USA¹⁵.

The two major forms of postpartum hemorrhage are early postpartum hemorrhage, which occurs within 24 h from delivery, and late postpartum hemorrhage, which takes place between 24 h and 6 weeks after delivery¹⁶. Definitions of each class are provided in Chapter 2; however, the validity of the definitions has not been shown by rigorous evaluation and the processes of estimation of blood loss are suspected (see Chapters 5 and 6).

In one often-quoted article, approximately 5% of all women who underwent vaginal delivery without complications lost more than 1000 ml of blood¹⁷. Having acknowledged this, it is generally agreed that the objective evaluation of bleeding after labor may be difficult, specifically

when bleeding is slow and steady or in the presence of concomitant intra-abdominal bleeding¹⁸. Moreover, the clinical signs of blood loss, such as decrease in blood pressure and increased heart rate, tend to appear late, and only when the amount of blood loss reaches 1500 ml, mainly due to the high blood volume of pregnant women (see Chapter 4 on assessing loss).

Recently, our group performed a large population-based study of risk factors for early postpartum hemorrhage¹⁶. Although this was not the first such study¹⁹⁻²², we were stimulated to characterize women at risk that warrant special attention after birth and consultation about the advisability of out-of-hospital delivery. Early postpartum hemorrhage complicated 0.43% ($n = 666$) of all singleton deliveries included in this study ($n = 154\ 311$). Independent risk factors for early postpartum hemorrhage, which can be of major importance during out-of-hospital deliveries, are presented in Table 1. These risk factors were drawn from a multivariate analysis and included retained placenta, labor dystocia, placenta accreta, severe lacerations, large-for-gestational age newborn and hypertensive disorders¹⁶.

One of the largest studies regarding out-of-hospital deliveries derives from a tertiary medical center, located in the Negev region, in Israel^{12,13}. In this area, most deliveries occur in the hospital, and virtually all newborns and their mothers are brought to the hospital, when delivered outside. This is done mainly because hospital deliveries are entitled to a birth payment from the government, which is also given to newborns who are brought within 24 h to the hospital. The incidence of unplanned, accidental out-of-hospital deliveries was 2% (2328/114 938). Perinatal mortality was significantly higher among out-of-hospital deliveries (odds

ratio (OR) 2.01, 95% confidence interval (CI) 1.4–2.9), as compared to in-hospital deliveries. Parturients who gave birth out of hospital had higher rates of perineal tears and retained placenta, as compared to patients delivered in hospital (Table 2). In addition, patients delivered out of hospital had a higher rate of delayed discharge from hospital, as compared to controls.

GLOBAL RATES OF OUT-OF-HOSPITAL DELIVERIES

The number of out-of-hospital deliveries in the world is not well documented (Table 3). It is important to distinguish between accidental out-of-hospital deliveries and those intended and planned to take place out of hospital, with the attendance of medical personnel. In rural

and remote regions of developing countries, out-of-hospital deliveries occur mainly due to limited access to health services. Often, there is limited access not only to referral health facilities, but even to basic life-saving measures within the home and community. Such out-of-hospital deliveries are associated with high rates of perinatal morbidity and mortality^{2–14,23}.

In a report by the Pan American Health Organization (PAHO), currently, 79% of deliveries in the Region of the Americas take place in institutional settings, with only a few countries in the Region reporting institutional deliveries below 50%²⁴. Unfortunately, the trend of increasing institutional deliveries in the Americas has not resulted in a corresponding decrease in maternal and perinatal mortality. In fact, there are even greater variations

Table 1 Independent risk factors for early postpartum hemorrhage, which can be of major importance during out-of-hospital deliveries. Results from a multiple logistic regression model. Data are expressed as odds ratio, 95% confidence interval (CI) and *p* values for statistical significance. Adapted from Sheiner *et al.* *J Matern Fetal Neonatal Med* 2005;18:149–54¹⁶

	Odds ratio	95% CI	<i>p</i>
Retained placenta	3.5	2.1–5.8	< 0.001
Labor dystocia, second stage	3.4	2.4–4.7	< 0.001
Placenta accreta	3.3	1.7–6.4	< 0.001
Lacerations	2.4	2.0–2.8	< 0.001
Large for gestational age	1.9	2.4–1.6	< 0.001
Hypertensive disorders	1.6	2.1–1.2	< 0.001

Table 2 Pregnancy and labor complications of patients delivered out of hospital in comparison to patients delivered in hospital. Adapted from Sheiner *et al.* *J Reprod Med* 2002;47:62–30¹³

Characteristics	Out of hospital (<i>n</i> = 2328)	In hospital (<i>n</i> = 114 938)	<i>p</i>
Lack of prenatal care	809 (34.8%)	10 822 (9.4%)	< 0.001
Perineal tear grade 1–2	435 (18.7%)	16 178 (14.1%)	< 0.001
Perineal tear grade 3–4	4 (0.2%)	77 (0.1%)	0.056
Retained placenta	27 (1.2%)	693 (0.6%)	< 0.001
Small for gestational age	233 (10.0%)	6 809 (5.9%)	< 0.001
Large for gestational age	145 (6.2%)	11 774 (10.2%)	< 0.001
Perinatal mortality	29 (1.2%)	718 (0.6%)	< 0.001
Delayed discharge from hospital	911 (39.7%)	35 343 (31.1%)	< 0.001

Table 3 Rates of planned and unplanned out-of-hospital deliveries in the world

Country	Reference	Rate (%)
<i>Planned out-of-hospital deliveries</i>		
United States and Canada	Johnson <i>et al.</i> ²⁹	1
Netherlands	Anthony <i>et al.</i> ³²	33
<i>Home births in developing countries</i>		
Ethiopia-southern	Sibley <i>et al.</i> ³³	90
India	Kodkany ³⁴	50
<i>Unplanned out-of-hospital deliveries</i>		
Israel, Negev region	Sheiner <i>et al.</i> ¹³	2
UK	Scott <i>et al.</i> ²⁷	0.3
Finland	Viisainen <i>et al.</i> ⁷	0.1
Scotland catchment	Rodie <i>et al.</i> ²⁸	0.6

in neonatal and maternal mortality among countries with high rates of institutional delivery. This is perhaps due to unnecessary interventions, such as Cesarean section and episiotomy, which may lead to increased morbidity and even mortality^{25,26}. Efforts are being made in order to promote evidence-based interventions in these countries²⁴.

In a few reports from developed countries, the incidence of accidental out-of-hospital deliveries varied from 0.1 to 2%^{7,13,27-29}. Factors associated with accidental out-of-hospital deliveries include multiparity and lack of prenatal care, which by themselves might increase the risk for adverse perinatal outcome^{30,31}.

In a large population-based study in the Negev region in Israel, the incidence of accidental out-of-hospital deliveries was 2% (2328/114 938)¹³. These deliveries were described as unattended, as opposed to deliveries that were out of hospital but attended by skilled personnel.

A report from a District General Hospital in the UK indicated a low incidence of 0.31% of unplanned out-of-hospital deliveries occurring over a 3-year period²⁷. Women were multiparous, and 11 of 14 deliveries (78.6%) occurred during the night, between the hours of 20.00 and 08.00, suggesting difficulties in access to the hospital.

In a study from Finland, a trend was found towards a decrease in accidental out-of-hospital deliveries between 1963 and 1973: from 1.3 to 0.4 per 1000 births. Nevertheless, this trend was changed by the 1990s when the figures rose up to 1/1000. This change was attributed to the closing of small hospitals in remote parts of the country, leading to inconvenient access to perinatal facilities⁷.

In a retrospective case-control study, women who delivered accidentally out of hospital in the catchment area in Scotland during a given study period were identified. Of all deliveries, 117 women delivered 121 babies accidentally out of hospital. The rate was 0.6% of all deliveries registered at the hospital²⁸.

Examples for planned home births are found in the following two studies. In a prospective study designed to evaluate the safety of home births in North America, all home births involving certified professional midwives across

the United States and Canada during the year 2000 were assessed. The rate of planned home delivery was 1.6%²⁹.

In the Netherlands, approximately one-third of births are planned home deliveries, attended by midwives. In this cross-sectional study, maternal demographics associated with home birth included multiparity, age above 25 years and living in small as opposed to large cities³².

The condition is quite different in undeveloped countries. In these areas, home birth with unskilled attendants is the norm, and maternal and neonatal mortality rates are high. Unfortunately, the rates and outcomes of these out-of-hospital births are grossly underreported. The causes for this situation include inadequate emergency care and home-based care by attendants who are poorly equipped or educated to respond to emergencies, leading to inappropriate or delayed action. For example, in rural southern Ethiopia, over 90% of births take place at home in the presence of unskilled attendants³³.

In most parts of the world, postpartum hemorrhage accounts for 35–55% of maternal deaths. In India, maternal mortality rates are estimated at 560/100 000 live births. In rural India, at least 50% of births occur at home³⁴. These figures are reported in a recent study which presents a design for a randomized, placebo-controlled, clinical trial conducted in four primary health center areas of Belgaum District, Karnataka, India. The main goal of this study was to assess the effectiveness of misoprostol 600 µg orally in reducing the incidence of acute postpartum hemorrhage. Misoprostol would be administered by minimally trained midwives to women randomized to receive misoprostol or placebo immediately post-delivery of the infant. A secondary goal of this study was to test the international and community collaborations necessary for the conduct of this study, so that it could serve as a model for future studies in rural settings throughout the developing world for reducing maternal mortality and morbidity.

In conclusion, the number of out-of-hospital deliveries in the world is not well documented. Although it is widely accepted that the quality of maternity care is a main determinant of maternal and fetal morbidity and mortality rates³⁵,

the lack of statistical information on out-of-hospital deliveries is a severe limitation for further evaluation of the relationship between out-of-hospital deliveries and maternal morbidity and mortality in general and specifically postpartum hemorrhage.

OUT-OF-HOSPITAL DELIVERY AND POSTPARTUM HEMORRHAGE

Our group¹⁴ compared maternal and neonatal outcomes in out-of-hospital vs. in-hospital deliveries in a prospective study. Unplanned out-of-hospital deliveries resulted in a statistically significant higher rate of postpartum hemorrhage (OR 8.4; 95% CI 1.1–181.1; $p = 0.018$) (Table 4).

Postpartum hemorrhage due to uterine atony is the primary direct cause³⁵ of maternal mortality globally. Management strategies in developed countries involve crystalloid fluid replacement, blood transfusions, and surgery. Such definitive therapies are often not accessible in developing countries, particularly in out-of-hospital deliveries. The lack of skilled attendants at delivery who can provide even the minimum of care, long transport times to facilities that can manage uterine atony or severe lacerations of the genital tract, and unattended obstructed labor leading to a ruptured uterus, elevate postpartum hemorrhage to its position as the number one killer of women during child birth³⁶. These factors are exacerbated by the prevalence of anemia, which is estimated to affect half of all pregnant women in the world³⁷, with this figure rising to 94% in Papua New Guinea, 88% in India, and 86% in Tanzania³⁸.

Anemia is rarely detected or treated during pregnancy and often exacerbated by malarial and other parasitic diseases³⁹.

Although the vast majority of patients with postpartum hemorrhage have no identifiable risk factor, young age at marriage^{40,41} and low contraceptive use among many women in the developing world result in high total fertility rates, which result in more grand multiparous women giving birth in low-resource countries compared with more developed countries⁴².

A retrospective study from Ghana compared active vs. expectant management in a rural setting at Holy Family Hospital in Berekum⁴³. The study found that postpartum hemorrhage (blood loss = 500 ml) occurred less often in the actively managed group (OR 0.8; 95% CI 0.7–0.9). McCormick and colleagues⁴⁴ published a systematic review of studies that assessed the efficacy of active management of the third stage in low-resource settings. Active management of the third stage of labor, especially the administration of uterotonic drugs, reduces the risk of postpartum hemorrhage due to uterine atony without increasing the incidence of retained placenta or other serious complications. Oxytocin is preferred over syntometrine, but misoprostol also can be used to prevent hemorrhage in situations where parenteral medications are not available (see Chapters 16–19).

A 2003 Cochrane Review of active versus expectant management of the third stage of labor⁴⁵ included five randomized, controlled trials and found that, for all women, including women deemed to be at low risk for postpartum hemorrhage, active management decreased the

Table 4 Maternal outcomes of patients with unplanned out-of-hospital deliveries and the control group. Adapted from Hadar *et al.* *J Reprod Med* 2005;50:832–6¹⁴

Characteristics	Unplanned out-of-hospital deliveries (<i>n</i> = 151)	Control group (<i>n</i> = 151)	<i>p</i>
Vaginal tears	27 (17.9%)	18 (12.0%)	0.087
Postpartum hemorrhage	8 (5.3%)	1 (0.6%)	0.018
Postpartum endometritis	2 (1.3%)	0	0.157
Antibiotic treatment	2 (1.3%)	0	0.157
Sutures of vaginal tears	25 (16.6%)	18 (12.0%)	0.249
Revision of uterus cavity	6 (4.0%)	0	0.013
Hospitalization (days)	3.2 ± 0.9	2.95 ± 0.6	0.111

incidence of postpartum hemorrhage (both 500–1000 ml and > 1000 ml), shortened the third stage of labor, decreased the amount of maternal blood loss, decreased the need for blood transfusion, and decreased the need for additional therapeutic uterotonic agents. The incidence of postpartum hemorrhage of 500 ml or more was reduced in the actively managed group (relative risk 0.38; 95% CI 0.32–0.46). These figures mean that for every 12 women who are actively managed rather than expectantly managed, one case of postpartum hemorrhage (defined as blood loss = 500 ml) will be averted, whereas the number needed to treat for averting blood loss greater than 1000 ml would be 57. Women who were actively managed lost less blood, with a weighted mean blood loss of 79.33 ml less than those who were expectantly managed. The third stage was an estimated 9.77 min shorter in actively managed women. The use of routine uterotonic agents to prevent postpartum hemorrhage can reduce maternal mortality by 40%⁴⁶.

The data on the types and incidences of maternal morbidities in communities with limited access to health services are scarce²³. Bang and colleagues found, in their prospective observational study in Gadchiroli, India, that the incidence of maternal morbidity was 52.6%, 17.7% during labor and 42.9% during puerperium. The most common intrapartum morbidities were prolonged labor (10.1%), prolonged rupture of membranes (5.7%), abnormal presentation (4.0%) and primary postpartum hemorrhage (3.2%). The postpartum morbidities included secondary postpartum hemorrhage (15.2%). In their study, mothers and the neonates were prospectively observed at home in 39 villages without interventions. It included a population of approximately one million parturients. Most deliveries in the area were conducted by traditional birth attendants and family members. This is the first reported study in a rural setting in a developing country where labor and the puerperium were prospectively observed at home in a systematic and objective manner to measure the incidence of maternal morbidities. This study had certain limitations which should be kept in mind while extrapolating the results. Their sample may underestimate the incidence

of morbidities because many hospital deliveries (which may have a higher proportion of problems) were not studied.

Another randomized, controlled trial was carried out to determine whether suckling immediately after birth reduces the frequency of postpartum hemorrhage⁴⁷. The trial participants were attended by traditional birth attendants. Traditional birth attendants recorded blood loss in the early suckling group and in the control group in 2104 and 2123 deliveries of liveborn singletons, respectively. The frequency of postpartum hemorrhage (loss greater than 500 ml) was 7.9% in the suckling group and 8.4% in the control group. Prual and colleagues reported the frequency of such morbidity as revealed in a population-based survey of a cohort of 20 326 pregnant women in six West African countries⁴⁸. The main direct causes of severe maternal morbidity were hemorrhage (3.05 per 100 live births); in this report 23 cases involved uterine rupture (0.12 per 100). Case fatality rates were high for hemorrhage and varied from 1.9% for antepartum or peripartum hemorrhage to 3.7% for placental abruption. The high case fatality rates of several complications reflected a poor quality of obstetric care.

Walraven and colleagues⁴⁹, in their double-blind, randomized, controlled trial, sought to evaluate the impact of oral misoprostol on postpartum hemorrhage compared with standard treatment in the home birth situation in rural Gambia, with measured blood loss, postpartum hemoglobin, change in hemoglobin level between the last antenatal care visit and 3–5 days postpartum as outcome measures. The study was carried out in 26 primary health-care villages of the North Bank East Health Division, The Gambia, West Africa. Seventy-two percent of births occur at home and maternal mortality in the study area has been estimated at 424/100 000 live births in a reproductive age mortality survey, with postpartum hemorrhage as the most important direct cause of maternal mortality. There were two maternal deaths in the study population (maternal mortality ratio for study population of 163 per 100 000 live births; 95% Poisson CI 20–595), both in the misoprostol group. These deaths were attributed to postpartum hemorrhage (measured blood loss 2200 ml) and disseminated

Table 5 The risk for postpartum hemorrhage in out-of-hospital deliveries

Country	Reference	Postpartum hemorrhage in out-of-hospital deliveries
West Africa	Pruai <i>et al.</i> ⁴⁸	3.1%
Malawi	Bullough <i>et al.</i> ⁴⁷	8.4%
Ghana	Geelhoed <i>et al.</i> ⁷	17.4%
India	Bang <i>et al.</i> ²³	3.2%
Israel	Hadar <i>et al.</i> ¹⁴	5.3%
Israel	Sheiner <i>et al.</i> ¹³	3.2%

intravascular coagulation due to malaria (measured blood loss 300 ml), respectively.

Table 5 summarizes the existing, limited data regarding the association between out-of-hospital deliveries and postpartum hemorrhage.

CONCLUSIONS

The fact that so many women deliver in domiciliary conditions clearly affects their risk of having postpartum hemorrhage. It is widely accepted that the quality of maternity care is a main determinant of maternal mortality rates. Our research has, for the first time, established an odds ratio of 8.4¹⁴. This number represents an urgent call to the medical community to change this circumstance whenever possible, as is detailed in other chapters of this book. All births should be attended by adequately trained personnel. More effective strategies are needed to convince women with high-risk pregnancies to deliver in a hospital which has access to emergency referral services.

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