69

Out-of-Hospital Deliveries

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INTRODUCTION

Out-of-hospital deliveries can be divided into planned and unplanned[1]. The former generally occur in a prepared setting and are attended by medical personnel; the latter generally occur when the woman is entering the active phase of labor rapidly and may take place en route to the hospital or at the home itself. In either event, unplanned out-of-hospital delivery can be a stressful and sometimes even hazardous experience. Unplanned out-of-hospital deliveries carry an increased risk for adverse maternal and perinatal outcomes, specifically hemorrhage and perinatal mortality[2–14].

Out-of-hospital deliveries are not confined to countries with low resources and where home deliveries are the rule rather than the exception. In countries with high resources, specific groups are more likely to experience out-of-hospital deliveries than the general population. For example, Bateman *et al.*[3] reported that patients who delivered out-of-hospital in the USA were more likely to be African-American, multigravid and to have had little or no prenatal care. Similarly, other ethnic minorities such as Asians living a long way from the hospital in Europe are also at risk for out-of-hospital deliveries and for adverse pregnancy outcome[4–6].

In one often-quoted article, albeit written almost 50 years ago and not repeated to our knowledge, approximately 5% of all women who underwent vaginal delivery without complications lost more than 1000 ml of blood[15]. Assuming that this is correct, it has enormous implications for any woman who undergoes an out-of-hospital delivery because the objective evaluation of bleeding after delivery may be difficult in the absence of trained health care providers, especially if bleeding is slow and steady or in the presence of concomitant intra-abdominal bleeding[16]. Of equal importance, 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 Chapters 9–11). Here again, a woman delivering out of hospital would appear to be at greater risk should this occur and not be noticed or monitored.

Our group performed a large population-based study of risk factors for early postpartum hemorrhage (PPH)[17]. Although this was not the first such evaluation[18–21], we were stimulated to characterize women at risk who warrant special attention after birth and, in particular, consultation about the advisability of out-of-hospital delivery. Early PPH complicated 0.43% (n = 666) of all singleton deliveries included in this study (n = 154,311). Independent risk factors for early PPH, 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 disorders[16].

One of the largest studies regarding out-of-hospital deliveries derives from our hospital, a tertiary medical center located in the Negev region, Israel[12,13]. In this area, most deliveries do occur in the hospital, and virtually all newborns and their mothers are brought to the hospital if 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 to the hospital within 24 h of birth. The incidence of unplanned, accidental out-of-hospital deliveries in this study was 2% (2328/114,938). These deliveries were described as unattended, as opposed to deliveries that were out-of-hospital but attended by skilled personnel. 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 with in-hospital deliveries. In addition, parturients who gave birth out-of-hospital had higher rates of perineal tears and retained placenta, as compared with patients delivered in hospital (Table 2). Finally, patients

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. Adapted from Sheiner *et al.*, 2005[17]

	Odds ratio	*95% CI*	*p Value*
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

delivered out-of-hospital had a higher rate of delayed discharge from hospital as compared with 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 or without 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 (see Chapter 64). Often, access to referral health facilities and basic life-saving measures is equally lacking within the home and community. These latter intended out-of-hospital deliveries are associated with high rates of perinatal morbidity and mortality[2–14,22].

Hospital delivery is not a panacea as evidenced by a report from the Pan American Health Organization (PAHO), which documented the fact that 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%[23]. Unfortunately, this trend was not accompanied by a corresponding decrease in maternal and perinatal mortality. Rather, even greater variations in neonatal and maternal mortality were seen in countries with high rates of institutional delivery. According to some authors, this may be due to unnecessary interventions, such as cesarean section and episiotomy, which may lead to increased morbidity and even mortality[24,25]. Efforts are being made to promote the use of evidence-based interventions in these countries[23].

In other reports from developed countries, the incidence of accidental out-of-hospital deliveries varied from 0.1 to 2%[7,13,26–28]. 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[29,30]. 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 period[26]. Women with unplanned out-of-hospital deliveries 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 0.4/1000 births). This trend changed by the 1990s when the rate 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 obstetric facilities[7].

Examples for planned home births are found in 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 US and Canada during the year 2000 were assessed. The rate of planned home delivery was 1.6%[28]. A statistical report on home births in the US during the years 1990–2006 showed an interesting trend. After a gradual decline from 1990 to 2004, the percentage of out-of-hospital births increased from 0.87% in 2004 to 0.90% in 2005 and 2006. Home birth rates were higher for non-Hispanic white women, married women, women aged 25 and over, women with previous children, and higher in rural counties of less than 100,000 population. Home births were less likely to be preterm, low birth weight, or multiple deliveries.

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 cities[31].

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

Table 2 Pregnancy and labor complications of patients delivered out-of-hospital compared with patients delivered in hospital. Adapted from Sheiner *et al.*, 2002[13]

	Out-of-hospital (n = 2328)		*In hospital (n = 114,938)*		
Characteristics	*n*	%	*n*	%	*p Value*
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	6809	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 (%)*
Planned out-of-hospital deliveries		
United States and Canada	Johnson *et al.*[28]	1
Netherlands	Anthony *et al.*[31]	33
United States	MacDorman *et al.*[32]	0.9
Home births in developing countries		
Ethiopia southern	Sibley *et al.*[33]	90
India	Kodkany *et al.*[34]	50
Nairobi, Kenya	Bazant *et al.*[35]	33
Pakistan	Ayaz *et al.*[36]	44
Unplanned out-of-hospital deliveries		
Israel, Negev region	Sheiner *et al.*[13]	2
UK	Scott *et al.*[26]	0.3
Finland	Viisainen *et al.*[7]	0.1
Scotland catchment	Rodie *et al.*[27]	0.6

Ethiopia, over 90% of births take place at home in the presence of unskilled attendants[33].

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 rates[37], 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 PPH. On the other hand, encouraging data now show that simple interventions in community settings can make a change in maternal morbidity, neonatal mortality, stillbirths and perinatal mortality[38].

OUT-OF-HOSPITAL DELIVERY AND POSTPARTUM HEMORRHAGE

Our group[14] compared maternal and neonatal outcomes in out-of-hospital versus in-hospital deliveries in a prospective study. Unplanned out-of-hospital deliveries resulted in a statistically significant higher rate of PPH (OR 8.4, 95% CI 1.1–181.1, $p = 0.018$) (Table 4).

PPH due to uterine atony is the primary direct cause[39] of maternal mortality globally and this statement is equally true for those who deliver out-of-hospital and those who deliver at the most well equipped institute for obstetric care. 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 cases of 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 PPH to its position as the number one killer of women during childbirth[22]. These factors are exacerbated by the prevalence of anemia, estimated to affect half of all pregnant women in the world[40].

Table 4 Maternal outcomes of patients with unplanned out-of-hospital deliveries and the control group. Adapted from Hadar *et al.*, 2005[14]

	Unplanned out-of-hospital deliveries (n = 151)		*Control group (n = 151)*		
Characteristics	*n*	*%*	*n*	*%*	*p Value*
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	0.157
Antibiotic treatment	2	1.3	0	0	0.157
Sutures of vaginal tears	25	16.6	18	12.0	0.249
Revision of uterus cavity	6	4.0	0	0	0.013
Hospitalization (days)	3.2 ± 0.9		2.95 ± 0.6		0.111

Women who deliver out-of-hospital also do not benefit from active management of the third stage of labor, a methodology which clearly is associated with reductions in acute PPH and acute severe PPH (see Chapter 14). A retrospective study from Ghana compared active versus expectant management in a rural setting at Holy Family Hospital in Berekum[41]. The study found that PPH (blood loss = 500 ml) occurred less often in the actively managed group (OR 0.8, 95% CI 0.7–0.9). McCormick and colleagues[42] 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, reduced the risk of PPH due to uterine atony without increasing the incidence of retained placenta or other serious complications. Oxytocin is preferred over syntometrine, but misoprostol can be used effectively to prevent hemorrhage in situations where parenteral medications are not available (see Chapters 34 and 42). Misoprostol is easily used, effectively administered orally, and can be stored at room temperature for a relatively long period. It is important to keep in mind, however, that uterotonics such as misoprostol can only prevent PPH due to uterine atony; other causes of PPH (such as uterine rupture, cervical tear and vaginal injury, retained placenta, etc.) are unaffected[43]. Misoprostol is currently registered for obstetric and gynecologic use in Brazil, Peru, Egypt, France, Russia, Spain, India, Nepal, Bangladesh, Ghana, Kenya, Nigeria, Sudan, Tanzania, Uganda and Zambia[5,44]. To date, few studies describe misoprostol use at home births other than in the context of an intervention study[45] (see Chapter 42).

A 2003 Cochrane Review of active versus expectant management of the third stage of labor[46] included five randomized, controlled trials and found that, for all women, including women deemed at low risk for PPH, active management decreased the incidence of PPH (both 500–1000 ml and >1000 ml), shortened the third stage of labor, decreased the amount of maternal blood loss and the need for blood transfusion and additional therapeutic uterotonic agents. The incidence of PPH 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 rather than expectantly managed, one case of PPH (defined as blood loss of 500 ml) will be averted, whereas the number needed to treat for averting blood loss of greater than 1000 ml would be 57. Actively managed women lost less blood (weighted mean blood loss of 79.33 ml less) than those who managed expectantly. In addition, the third stage was an estimated 9.77 minutes shorter in actively managed women. The authors of this review concluded that the use of routine uterotonic agents to prevent PPH can reduce maternal mortality by 40%[47].

Data on types and incidences of maternal morbidities in communities with limited access to health services are scarce[22]. Bang and colleagues found,

in their prospective observational study conducted in Gadchiroli, India, that the incidence of maternal morbidity was 52.6%. The most common intrapartum morbidities were prolonged labor (10.1%), prolonged rupture of membranes (5.7%), abnormal presentation (4.0%) and primary PPH (3.2%)[22]. The postpartum morbidities included secondary PPH (15.2%). In their study, mothers and neonates were prospectively observed at home in 39 villages without interventions. The study included a population of approximately one million parturients. Most deliveries in the area were conducted by traditional birth attendants (TBAs) 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. While it provided interesting information, it also had certain limitations. In particular, the 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 PPH[48]. Trial participants were attended by TBAs. The TBAs compared blood loss in live born singleton deliveries in the early suckling mothers ($n = 2104$) and in controls ($n = 2123$). The frequency of PPH (loss greater than 500 ml) was similar in both groups, 7.9% in the suckling compared with 8.4% in the controls.

Prual and colleagues reported the frequency of morbidity in a population-based survey of a cohort of 20,326 pregnant women in six West African countries[49]. The main direct cause of severe maternal morbidity was 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 *et al.*[50], in a double blind, randomized, controlled trial, sought to evaluate the impact of oral misoprostol on PPH compared with standard treatment in the home birth situation in rural Gambia, with measured blood loss, postpartum hemoglobin, and 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 per cent of births occur at home and maternal mortality in the study area was estimated at 424/100,000 live births in a reproductive age mortality survey, with PPH 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 PPH (measured blood loss 2200 ml) and disseminated intravascular coagulation due to malaria (measured blood loss 300 ml).

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

Country	*Reference*	*PPH in out-of-hospital deliveries*
West Africa	Prual *et al.*[49]	3.1%
Malawi	Bullough *et al.*[48]	8.4%
Ghana	Geelhoed *et al.*[41]	17.4%
India	Bang *et al.*[22]	3.2%
Israel	Hadar *et al.*[14]	5.3%
Israel	Sheiner *et al.*[13]	3.2%
Scotland	Rodie *et al.*[51]	0.6%
Mexico (Jalisco)	Avalos-Huízar *et al.*[52]	12%

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

CONCLUSIONS

The fact that so many women deliver in domiciliary conditions clearly affects their risk of PPH. Our research has, for the first time, established an odds ratio of 8.4 for PPH in out-of-hospital deliveries[14]. This number represents an urgent call to the medical community to change this circumstance whenever and wherever possible, as is detailed in other chapters of this book. All births should be attended by adequately trained personnel. Misoprostol has an important role for the prevention of PPH. Misoprostol is a reasonable option where parenteral administration of a uterotonic is not feasible. It is easily used, effectively administered orally, and can be stored at room temperature for a relatively long period. Nevertheless, it is important to keep in mind that misoprostol can only prevent PPH due to uterine atony; other causes of PPH are unaffected. 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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