Safe motherhood : severe maternal morbidity in the Netherlands. The LEMMoN study

Zwart, J.J.

CHAPTER 9

Maternal mortality and severe maternal morbidity in Jehovah's witnesses in the Netherlands

van Wolfswinkel M, Zwart JJ, Schutte JM, Pel M, Duvekot JJ, van Roosmalen J.

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Abstract

Objective: To determine the risk of maternal mortality and serious maternal morbidity because of major obstetric haemorrhage in Jehovah's witnesses in the Netherlands.

Design: A retrospective study of case notes.

Setting: All tertiary care centres, general teaching hospitals and other general hospitals in the Netherlands.

Sample: All cases of maternal mortality in the Netherlands between 1983 and 2006 and all cases of serious maternal morbidity in the Netherlands between 2004 and 2006.

Methods: Study of case notes using two different nationwide enquiries over two different time periods.

Main outcome measures: Maternal mortality ratio (MMR) and risk of serious maternal mortality.

Results: The MMR for Jehovah's witnesses was 68 per 100,000 live births. We found a risk of 14 per 1000 for Jehovah's witnesses to experience serious maternal morbidity because of obstetric haemorrhage while the risk for the total pregnant population was 4.5 per 1000.

Conclusions: Women who are Jehovah's witnesses are at a six times increased risk for maternal death, at a 130 times increased risk for maternal death because of major obstetric haemorrhage and at a 3.1 times increased risk for serious maternal morbidity because of obstetric haemorrhage, compared to the general Dutch population.

Introduction

Jehovah's witnesses form a religious society with more than six million members worldwide, 29,500 of which live in the Netherlands. Based on biblical textures, Jehovah's witnesses refuse transfusion of blood or one of its primary components (red and white blood cells, platelets and plasma), even when red blood cell transfusion would be life saving.[1;2]

Major obstetric haemorrhage is the most frequent cause of serious maternal morbidity and is one of the most important causes of maternal mortality.[3;4] Refusal of blood in this medical emergency exposes women who are Jehovah's witnesses to an increased risk of maternal death.[5] We have undertaken a retrospective study of case notes to determine the maternal morbidity and mortality because of major obstetric haemorrhage in Jehovah's witnesses in the Netherlands.

Methods

A retrospective study of case notes of Jehovah's witnesses experiencing serious maternal morbidity and mortality was performed, using two different nationwide enquiries over two different time periods.

All deaths related to pregnancy in the Netherlands are reported to the Maternal Mortality Committee of the Dutch Society of Obstetrics and Gynaecology. Cases reported between 1983 and 2006 were included in a nationwide Confidential Enquiry into Maternal Deaths in the Netherlands. Maternal death was defined according to the World Health Organization's (WHO) International Classification of Diseases, tenth revision (ICD-10).[2;3]

Details about the patients (including religious affiliation) and the course of events that preceded the death of the women were present for all the cases that were included in this confidential inquiry and we selected all Jehovah's witnesses. If available, the original medical files were studied. Cases of serious maternal morbidity were selected from a nationwide enquiry into ethnic determinants of severe maternal morbidity (LEMMoN). All 98 maternity units in the Netherlands participated in this nationwide study. Cases of severe maternal morbidity were included during a 2-year period from 1 August 2004 until 1 August 2006 and classified in one or more of the following five categories: (1) Intensive Care Unit admission, (2) uterine rupture, (3) eclampsia or HELLP syndrome with liver haematoma or rupture, (4) obstetric haemorrhage requiring transfusion of 4 units of red blood cells or more and (5) other serious complications, not meeting the criteria of the other categories.[4] Detailed information and copies of relevant parts of the files were present for all cases that were included in the study. We selected and studied all cases of Jehovah's witnesses reported to this enquiry.

The incidence of maternal mortality and serious maternal morbidity in Jehovah's witnesses was compared with the total incidence of maternal mortality as reported to the Maternal Mortality Committee and with the total incidence of maternal morbidity as reported to the LEMMoN study. The total number of deliveries among Jehovah's witnesses was calculated using the annual national birth rate and the

total number of Jehovah's witnesses in the Netherlands in the years 1983 through 2006. These data are carefully registered by Statistics Netherlands (CBS) and the Watchtower Society respectively.[1;6]

Results

Mortality

In the period of 1 January 1983 to 1 January 2007, 538 cases of maternal mortality were reported to the Maternal Mortality Committee and included in the Confidential Enquiries into Maternal Deaths in the Netherlands. The number of direct maternal deaths (late maternal deaths included) was 385 and 30 of these direct maternal deaths were caused by obstetric haemorrhage.

Six cases of mortality in Jehovah's witnesses were identified. All were direct maternal deaths caused by major obstetric haemorrhage and the refusal of red blood cell transfusion was an important factor in the course of events leading to the death of these six women. Hypovolaemic shock causing cardiac failure or post-anoxic encephalopathy was the mode of death. The underlying causes of haemorrhage were: complication of caesarean section (n = 1),[7] uterine atony after manual removal and after spontaneous delivery of the placenta (n = 2). One woman was readmitted after 3 weeks because of severe haemorrhage because of retained placental fragments. Two women had HELLP syndrome. One of them developed disseminated intravascular coagulation (DIC) and postpartum haemorrhage. The other woman with HELLP syndrome also had sickle cell anaemia. She underwent a caesarean section. The procedure was uncomplicated and with limited blood loss, but she died on the ICU because of post-anoxic encephalopathy and cardiac failure (Table 1).

Hysterectomy was not performed in any of these women. The two women suffering from uterine atony were treated with uterine tamponade using an intrauterine balloon and in one of them, arterial embolisation was performed because of persistent bleeding (Table 1).

Between 1983 and 2006, the number of cases of direct and indirect maternal mortality in the Netherlands varied yearly between 10 and 31 cases. The total maternal mortality ratio (MMR) during the study period was 11.7 per 100,000 live births.[4,5] The MMR for direct maternal deaths was 8.4 and the MMR for maternal deaths caused by major obstetric haemorrhage was 0.67. When the six cases of maternal death in Jehovah's witnesses are subtracted, the MMR's are 11.4, 8.2 and 0.52 respectively.

The six selected cases were all direct maternal deaths because of obstetric haemorrhage. They represented 1.1% of total maternal deaths, 1.6% of total direct maternal deaths and 20% of direct maternal deaths caused by obstetric haemorrhage reported to the Maternal Mortality Committee between 1983 and 2006. The total number of deliveries in Jehovah's witnesses during these years was calculated to approximate 8850. This yields a MMR of 68 per 100,000 live births, which is six times higher than the MMR for the general Dutch population and 130 times higher than the MMR for maternal deaths because of major obstetric haemorrhage.

Table 1. Maternal mortality in Jehovah's witnesses.

Nr	Year , age and obstetric history	Course of events	Total blood loss and lowest Hb
1	1986 41y, G3P2	Delivery at term. VE because of prolonged second stage. Major haemorrhage. Readmission after 3 weeks because of persistent bleeding due to placental rest. Manual removal of placental rest. The next day hypovolemic shock due to haemorrhage caused myocardial infarction and death. Autopsy confirmed death due to haemorrhage. **Substandard care**: Not enough data available to identify substandard care	unknown
2	1986 21y, unknown parity OH: unknown	Admitted at 31 weeks because of eclampsia. Fetal death, spontaneous vaginal delivery. Haemorrhage, HELLP and DIC. Death 9 days post partum. **Substandard care:** Not enough data available to identify substandard care	unknown
3	1988 40y, G3P2	Emergency caesarean section at 40,6 weeks because of prolonged second stage and suspected CPD. Difficult extraction. Haemorrhage due to laceration of uterine incision and rupture of uterine vessels. Autopsy confirmed death due to hypovolemic shock. **Substandard care:** Complication of CS not identified as substandard care	4500 ml 1.8 g/dl
4	1995 22y, G4P0 OH: recurrent SA (3x)	Induction of labour at 40,6 weeks with syntocinon because of ruptured membranes for 24 hours. Epidural. Oxytocin because of prolonged first stage. VE because of fetal distress. Placenta spontaneous after oxytocin iv. Haemorrhage due to uterine atony and secondary coagulopathy. **Management:** oxytocin, methylergometrin, tamponade of uterus, sulproston iv and in utero. ICU admission. Volume replacement therapy. Death 3.5 hours post partum due to hypovolemic shock. **Substandard care:** No hysterectomy performed	Unknown 4.0 g/dl
5	1996 30y, G2P1 OH: PROM at 20 weeks, CS at 28 weeks.	Sickle cell anaemia. Admitted twice for sickle cell crisis. Threatening preterm labour at 29 weeks. Nifedipine as tocolytic. HELLP syndrome. At 30 weeks thrombocytopenia (49 x 10^9/L). CS because of maternal condition. ICU admission, death due to cardiac failure and postanoxic encephalopathy . **Substandard care:** CS performed on unstable patient	Unknown 5.9 g/dl (before CS)
6	2006 25y, G3P1 OH: CS, placenta praevia	Delivery at 40,4 weeks. VE because of prolonged second stage. Retained placenta with limited haemorrhage (300 ml). MRP. Haemorrhage due to uterine atony. **Management:** Oxytocin, misoprostol, sulproston, cyklokapron. Tamponade with uterine balloon. Embolisation of internal iliac arteries because of persistent bleeding. Recombinant factor VIII. Death on ICU due to cardiac failure. **Substandard care:** No hysterectomy performed	> 4000 ml 1.3 g/dl

VE = vacuum extraction, DIC = disseminated intravasal coagulation, CPD = cephalo-pelvic disproportion, SA = spontaneous abortion, PROM = premature rupture of membranes, CS = caesarean section, EPO = erythropoietin, IUFD = intrauterine fetal death, MRP = manual removal of the placenta,

Serious maternal morbidity

A total of 2552 cases were included in the nationwide enquiry into ethnic determinants of severe maternal morbidity. Among these, there were 1606 cases of major obstetric haemorrhage. From this study, we identified ten cases of serious maternal morbidity in Jehovah's witnesses (0.39% of included cases). The serious maternal morbidity in all ten cases were because of major obstetric haemorrhage (0.62% of cases of major obstetric haemorrhage) and refusal of red blood cell transfusion was an important causative or contributory factor in all of these.

The ten selected cases delivered in tertiary care centres (n = 4), general teaching hospitals (n = 3) and other general hospitals (n = 3). Home delivery under supervision of a midwife was planned in one woman (patient no. 15). She was transferred to hospital because of a prolonged first stage of labour and fever.

In seven women, haemorrhage occurred after vaginal delivery, one of which was a vacuum extraction and in the other three after caesarean section. The underlying causes of haemorrhage were: retained placenta (n = 2), uterine atony (n = 3), laceration of cervix and vagina (n = 2) and retained placental fragment with laceration of cervix (n = 1). The woman who underwent a vacuum extraction developed sepsis with coagulopathy and experienced haemorrhage without signs of uterine atony or laceration. One woman was readmitted 3 weeks after initial discharge from hospital because of severe haemorrhage of unidentified cause (Table 2).

Active management of the third stage of labour with oxytocin was carried out in all cases. Haemorrhage was treated with volume replacement, one or more uterotonic agents (oxytocin, sulproston, methylergometrin, misoprostol) and ferrous sulphate. In five women (patients no. 7, 8, 9, 10 and 16), this treatment was sufficient. Five patients (patients no. 11, 12, 13, 14 and 15) had haemoglobin concentrations of 3.7 g/dl or less. All five were admitted to the intensive care unit and received erythropoietin. One was treated with arterial embolisation and in two women, hysterectomy was performed. Two women (patients no. 11 and 13) were transferred to the Academic Medical Centre in Amsterdam because of the availability of hyperbaric oxygen therapy in this hospital, but in both cases, the treatment eventually was not necessary. One woman (patient no. 16) initially refused blood, but she decided to accept transfusion 1 day postpartum (Table 2).

In the years 2004 through 2006, the number of deliveries in the Netherlands was 358,874, corresponding with a birth rate of 11.9 per 1000 inhabitants.[4,6] A total of 1606 cases of serious morbidity caused by major obstetric haemorrhage were included in the LEMMoN study, yielding a risk of 4.5 per 1000 births.

During these years, a stable number of 29,500 active members were registered at the society of Jehovah's witnesses in the Netherlands.[1] Using national fertility statistics, it is estimated that, in the study period, there were 700 deliveries in women who are Jehovah's witnesses. This yields a 14 per 1000 risk for Jehovah's witnesses, 3.1 times higher than the risk for the total pregnant population.

Table 2. Severe maternal morbidity in Jehovah's witnesses.

Nr	Age, parity and obstetric history	Course of events	Total blood loss and lowest Hb
7	39y, G10P6 OH: IA, SA (2x) , preterm labour (4x)	Cerclage and progesterone because of recurrent SA and preterm labour. Spontaneous vaginal delivery at 41,4 weeks. Haemorrhage due to retained placental fragment and cervical laceration. **Management:** Oxytocin, sulproston. MRP. Suturing of cervix. Ferrous sulphate. **Substandard care:** Not identified	3800 ml 6.6 g/dl
8	40y, G18P7 OH : IUFD, recurrent SA (10 x), placental abruption, VE	Preterm labour at 35,5 weeks. Elective CS because difficult VE in obstetric history. Peroperative haemorrhage due to uterine atony. **Management:** Oxytocin, methylergometrin, sulproston, ferrous sulphate. **Substandard care:** Not identified	1500 ml 6.9 g/dl
9	27y, G2P1 OH: obstetric haemorrhage	Spontaneous vaginal delivery at 40,5 weeks. Retained placenta with moderate haemorrhage (700 ml). MRP. Haemorrhage due to uterine atony. **Management:** Oxytocin, sulproston, methylergometrin, ferrous saccharate. **Substandard care:** Not identified	3500 ml 6.0 g/dl
10	29y, G1P0	Spontaneous vaginal delivery at 39.5 weeks. Haemorrhage due to retained placenta. **Management:** Oxytocin. MRP. Ferrous saccharate. **Substandard care:** Not identified	2600 ml 3.9 g/dl
11	25y, G2P1	Induction with prostaglandins at 38,5 weeks because of pre-eclampsia. Haemorrhage due to laceration of cervix and vagina. **Management:** Suturing of cervix and vagina. Oxytocin, sulproston, tranexamic acid, recombinant factor VII. Embolisation uterine arteries after persistent bleeding. ICU admission, EPO, darbepoietin alpha, ferrous saccharate. MgSO4 because of convulsions of uncertain underlying cause. **Substandard care:** No hysterectomy performed	2800 ml 3.1 g/dl
12	28y, G1P0	Bells palsy at 38,5 weeks. Hypertension. Spontaneous labour at 40,2 weeks, oxytocin because of prolonged second stage. Haemorrhage due to laceration of cervix and vagina and secondary coagulopathy. **Management:** Suturing of cervix and vagina. ICU admission. Oxytocin, sulproston, cyklokapron, desmopressin, EPO, ferrous saccharate, coagulation factors [1]. **Substandard care:** Not identified	4000 ml 3.5 g/dl
13	25y, G2P1 OH: CS	Repeat elective CS at 40,4 week. Haemorrhage due to uterine atony. **Management:** Oxytocin, sulproston. Hysterectomy after persistence of bleeding. ICU admission. EPO, ferrous saccharate, dopamin, noradrenalin. **Substandard care:** Not identified	2000 ml 2.4 g/dl
14	39y, G3P1	Emergency CS at 40,5 weeks because of prolonged second stage. Haemorrhage 1000 ml. Management: Oxytocin, ferrous saccharate. After 15 days haemorrhage of unidentified cause and shock. **Management:** Misoprostol. Hysterectomy. ICU admission,. EPO, ferrous saccharate. **Substandard care:** :Not identified	unknown 2.6 g/dl

15	32y, G1P0	Spontaneous labour at 38,0 weeks. Intended home delivery. Transfer to hospital because of prolonged first stage and maternal fever (40.3°C). VE because of poor fetal condition on CTG. Sepsis with coagulopathy. Haemorrhage 1000 ml. **Management:** Oxytocin, sulproston, amoxicillin/clavunalate potassium. ICU admission. EPO. **Substandard care:** Planned home delivery. Hospital unprepared to refusal of transfusion. No non-transfusion declaration present.	1000 ml 3.7 g/dl
16	38y, G4P3 OH: preterm labour	Cer vical cer clage because of preterm labour in OH. Spontaneous labour at 39,1 weeks. Haemorrhage 1500 ml due to uterine atony. **Management:** Oxytocin, cyklokapron. ICU admission. Accepted blood transfusion one day post partum. **Substandard care**: Not identified	1500 ml 5.1 g/dl

IA = induced abortion, SA= spontaneous abortion, IUFD = intrauterine fetal death, CS = caesarean section, VE = vacuum extraction, EPO = erythropoietin, MRP = manual removal of the placenta. 1: recombinant factor VII, recombinant factor VIII, factor II / VII / IX / X

Substandard care

Substandard care in cases of maternal mortality and serious maternal morbidity is discussed and defined by the Maternal Mortality Committee. In our case series, substandard care was identified in five patients. In three patients (patients no. 4, 6 and 11), hysterectomy was not timely performed. One woman (patient no. 15) was planned to deliver at home. The hospital she was transferred to was not informed about her attitude towards blood transfusion and therefore not prepared for the situation. The required non-transfusion declaration was not present in her medical record. In patient no. 5, a CS was performed while she was haemodynamically unstable.

Discussion

We found that women who are Jehovah's witnesses are at a six times increased risk for maternal death, at a 130 times increased risk for maternal death because of major obstetric haemorrhage and at a 3.1 times increased risk for serious maternal morbidity because of obstetric haemorrhage, as compared to the general Dutch population.

To our knowledge, only three other studies studied the obstetric risks of women who are Jehovah's witnesses, including 332, 33 and 90 women. In the two largest studies, two cases and one of maternal death, respectively, were identified, resulting in a 44-fold and 65-fold increased risk of maternal death.[5;8] In our study, we used two large nationwide enquiries of maternal mortality and serious maternal morbidity. Therefore, a relatively large number of Jehovah's witnesses experiencing maternal morbidity or serious maternal morbidity could be selected. As the study was not performed in a prospective setting, we did not have exact data on the total number of deliveries in Jehovah's witnesses. We used demographic data to give a reliable estimation instead.

In the Nationwide Enquiry into ethnic determinants of severe maternal morbidity (LEMMoN), women were included in the category of major obstetric haemorrhage if the haemorrhage required

transfusion of 4 units of red blood cells or more. Consequently, Jehovah's witnesses could not be included in this category. Instead, they were included in the category for Intensive Care Unit admission or were reported in the last category, in which cases were reported if there were other serious complications that did not meet the criteria of the other categories.

It is important to realise that in case of acute haemorrhage, red blood cell transfusion is not always immediately required. Although guidelines suggest a transfusion threshold at a haemoglobin concentration of 7.0–8.0 g/dl, concentrations of 5.0 g/dl or more are usually well tolerated if isovolaemia is maintained. In a study on healthy individuals, Weiskopf et al. found that acute isovolumetric reduction of haemoglobin concentration to 5.0 g/dl does not appear to cause inadequate tissue oxygenation.[9]

There are limited data available on outcomes at concentrations below 5.0 g/dl. Two retrospective studies on patients who declined blood transfusion, mostly Jehovah's witnesses, found that morbidity and mortality rates were extremely high below this level,[10,11] but survival has been reported at Hb rates below 2.0 g/dl and even as low as 1.4 g/dl.[12;13]

Since the first introduction of the doctrine of blood by the society of Jehovah's witnesses, the policy has been changed several times, causing confusion in clinicians when they are confronted with these issues.[14;15] A clear statement about the acceptance of different blood components was published in the society's official magazine The Watchtower in 2004: 'Though all witnesses should refuse autologous or heterologous transfusions of blood or one of its major components, the society states that each member should decide for him or herself whether or not to accept treatment with other blood products like coagulation factors and erythropoietin'.[16;17] Sometimes, the use of a cell saver during surgery is accepted because continuity with the circulatory system is maintained. These individual choices can make a big difference in management options in cases of major obstetric haemorrhage. Therefore, the exact possibilities for each patient and the available alternatives to red blood cell transfusion should be discussed early in pregnancy.

Most hospitals are rarely confronted with the care for pregnant Jehovah's witnesses and even more scarcely with obstetric haemorrhage in these women. Therefore, centralisation of care for these patients is advisable and each hospital treating Jehovah's witnesses should have a protocol for the obstetric care and the management of obstetric haemorrhage of these patients.

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