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Journal of the Neurological Sciences 258 (2007) 27–32

Journal of the Neurological Sciences

www.elsevier.com/locate/jns

Pregnancy, delivery and perinatal outcome in female survivors of polio

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Received 3 July 2006; received in revised form 5 February 2007; accepted 12 February 2007
Available online 29 March 2007

Abstract

Objective: To investigate possible effects on pregnancy, delivery and perinatal outcome in female survivors of polio.
Methods: In a cohort design, data from the national population based Medical Birth Registry of Norway (MBRN) were used to compare all 2495 births recorded 1967–1998 by female survivors of polio with all 1.9 mill non-polio deliveries. The results were adjusted for time period, maternal age, and birth order by unconditional logistic regression, with effects presented as adjusted Odds Ratios (OR) with a corresponding 95% Confidence Interval (CI) and p values.
Results: Female polio survivors had a higher occurrence of pre-eclampsia (3.4% vs. 2.8%, $p=0.003$, OR = 1.4, CI = 1.1–1.7), gestational proteinuria (1.3% vs. 0.5%, $p<0.001$, OR = 2.0, CI = 1.4–2.8), renal disease prior to pregnancy (1.4% vs. 0.9%, $p=0.001$, OR = 1.8, CI = 1.2–2.5), vaginal bleeding (3.8% vs. 2.0%, $p<0.001$, OR = 1.7, CI = 1.4–2.1), and urinary tract infection during pregnancy (3.5% vs. 2.4%, $p<0.001$, OR = 1.7, CI = 1.4–2.1). Deliveries complicated by obstruction of the birth process were more common in the polio group (6.1% vs. 2.0%, $p<0.001$, OR = 4.8, CI = 4.0–5.6), and cesarean section was performed at a higher rate throughout the time period (13.2% vs. 8.3%, $p<0.001$, OR = 2.7, CI = 2.4–3.1). Infants of polio mothers had a lower mean birth weight (3383 g vs. 3483 g, $p<0.001$), and more often had a birth weight below 2500 g (6.9% vs. 5.2%, $p=0.001$, OR = 1.3, CI = 1.1–1.5). There was no difference regarding pregnancy length. The risk of perinatal death was increased (2.1% vs. 1.1%, $p=0.05$, OR = 1.3, CI = 1.0–1.7).
Conclusion: Pregnancy in female survivors of polio is associated with an increased risk for complications during pregnancy and delivery, as well as an adverse perinatal outcome. Awareness towards risk factors should improve pre-natal care and possibly prevent complications.

Keywords: Polio; Pregnancy; Delivery; Cesarean section; Pre-eclampsia; Perinatal outcome

1. Introduction

Patients with former polio experience difficulties later in life due to sequels after the acute illness. Complications during pregnancy and birth can be related to long-term effects of polio.

The polio virus spreads through the orofecal route, and can infect the anterior horn motor neurons of the spinal cord producing an acute flaccid paralysis [1,2]. Muscle weakness occur in 1–2% of infected persons during the acute illness [3], and is followed by a post-paralytic phase. Nearly 50% of those with acute muscle weakness develop post-paralytic permanent loss of motor function [2,4], affecting limbs, truncal and respiratory muscles. The lower limbs are most frequently affected.

Global polio surveillance is incomplete, but has improved over the years. A total of 10 872 cases of confirmed paralytic polio has been reported since the year 2000 [5]. Vaccination programs have eradicated the large epidemics, but still there are outbreaks of paralytic polio in countries and areas where vaccination is insufficient [6,7]. Estimation of global polio incidence during the 1980’s indicated 200,000–250,000

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0022-510X/$ - see front matter
doi:10.1016/j.jns.2007.02.019

annual cases of paralytic polio [8]. The majority acquired polio in early life. Thus, there is a considerable amount worldwide of women in childbearing age with polio related disability. In Norway, epidemics occurred during the 20th century until the vaccine was introduced in 1954. An estimate of 5000–10,000 persons are still living with polio-related disability in Norway [4].

The aim of this study was to explore if female survivors of polio experience more complications during pregnancy and birth, and how such complications correlate to pregnancy risk factors. These obstetric risks should be known by public health officials in areas of the world where polio outbreaks have occurred during the last three decades. However, this information is difficult to obtain in poor countries with an inadequate infrastructure or ongoing political conflict. The national birth registry of Norway represents a unique tool to identify and examine a cohort of polio survivors during pregnancy.

2. Materials and methods

2.1. Patient selection

Patients were identified through the Medical Birth Registry of Norway (MBRN), a national registry established in 1967, based on the compulsory notification of all births at 16 or more weeks of gestation. The registry contains medical data on the mother's health before and during pregnancy, on delivery, and on the newborn. A standardized notification form is filled in by the patient's attending physician and midwife, and sent within 9 days after discharge from the hospital. Diagnoses recorded before discharge from the birth institution are noted, and the text in the notification form is coded at MBRN partly according to the International Classification of Diseases, 8th Revision (ICD-8), and partly according to a coding system developed for the registry. MBRN is placed under the Norwegian Institute of Public Health. Complete ascertainment of all births is ensured through a record linkage to the National Population Registry, based on the unique identification number of all inhabitants of Norway.

Our study included all deliveries registered between January 1, 1967 and December 31, 1998. An unchanged notification form was used during this period of time. As the last significant epidemic outbreaks of polio in Norway took place in 1950–1954, we chose not to include births after 1998. Inclusion criteria were defined as all deliveries by women diagnosed with previous polio according to ICD-8 criteria. The polio group consisted of 2495 births by 1758 women. In the majority, the polio-related disability was not further characterized. The reference group consisted of all 1.9 mill deliveries by women without a registered diagnosis of polio. Within the polio group, 60% of deliveries occurred in 1967–1974, 23% in 1975–1979, and 16% in 1980–1998. The corresponding distribution of non-polio births was 28%, 14%, and 58%.

2.2. Variables

The selected variables have been defined by MBRN after consensus among obstetricians, neonatologists and epidemiologists. Demographic variables included age of mother in completed years, the infant's birth order, and type of obstetric institution. Risk factors associated with adverse pregnancy outcome were selected [9,10]: Hypertension, diabetes mellitus, chronic cardiac disease, rheumatic disease, and chronic kidney disease. Outcome measures for pregnancy, obstetrical complications, and the newborn were also selected a priori. Pregnancy complications included: Diabetes mellitus, urinary tract infection, pre-eclampsia, gestational proteinuria (proteinuria detected for the first time during pregnancy), pregnancy-induced hypertension (with/without edema), vaginal hemorrhage, and placental abruption. Pre-eclampsia was defined as proteinuria combined with pregnancy-induced hypertension or threatening eclampsia. Pregnancy-induced hypertension without proteinuria is not included in MBRN's current definition of pre-eclampsia. Obstetrical complications included: Induction of labor (augmentation of delivery not included), presentation anomalies, obstruction of birth process (mechanical obstruction of the fetus passing the birth canal), functional disturbance of birth process (atonia uteri, threatening uterine rupture, dystocia cervix uteri, prolonged labor, slow progression of 2nd stage, secondary delayed contractions, or rapid labor), uterine rupture, birth canal injuries, postpartum vaginal hemorrhage (>500 ml), and intervention during birth (any intervention, cesarean section, forceps, or vacuum). The classification of cesarean sections into elective or emergency procedure was introduced in 1989. Perinatal outcome included: Gestational age in completed weeks, birth weight in grams, complicating neonatal conditions (birth weight <2500 g, gestational age <37 weeks, Apgar score <7 at 1 min and 5 min, and asphyxia during delivery), transfer of the newborn to a pediatric ward, birth defects, and mortality (stillbirth, perinatal mortality). Birth defects were defined as severe or not severe according to a definition by MBRN based on ICD-8. Stillbirths consisted of all fetal deaths ≥ 16 weeks of gestation, occurring before or during birth. Perinatal mortality included all deaths occurring during the first 6 days in live born children ≥ 16 weeks of gestation, and all stillbirths ≥ 28 weeks of gestation (if unknown age of gestation: birth weight >1000 g/birth length >35 cm).

2.3. Statistics

The analyses were based on crude, stratified and adjusted measures, and were performed by SPSS for Windows. Two-sided p values < 0.05 were considered as statistical significant. Arithmetic mean was calculated for maternal age, birth order, gestational length, and birth weight, and analyzed by independent samples T tests to compare the polio and the