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Increased risk of adverse pregnancy outcome among Somali immigrants in Washington state

E. Blair Johnson, MD,[a] Susan D. Reed, MD, MPH,[a,b] Jane Hitti, MD, MPH,[a,b] Maneesh Batra, MD[c]

Department of Obstetrics and Gynecology, University of Washington Medical Center, Harborview Medical Center,[a] and Departments of Epidemiology,[b] and Pediatrics, University of Washington, Seattle, WA[c]

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Objective: The purpose of this study was to compare maternal and neonatal morbidity among Somali immigrants, US-born blacks and whites in Washington state.
Study design: Washington state birth certificate data was linked to hospital discharge records comparing singleton deliveries among Somali immigrants with US-born blacks and whites between 1993 and 2001, in a 1:3 ratio. Outcomes were compared using unconditional multiple logistic regression models calculating odds ratios (ORs), and 95% confidence intervals (95% CIs).
Results: Five hundred seventy-nine pregnancies from Somali women were compared with 2384 and 2435 pregnancies from black and white women, respectively. Nulliparous Somali women were more likely to have a cesarean delivery than black or white control women, OR 1.6 (95% CI, 1.1-2.3) and 2.0 (95% CI, 1.4-2.8), respectively. Among all women who had cesarean deliveries, Somali women more commonly had cesarean deliveries associated with fetal distress and failed induction of labor. They were 9 times more likely than both control groups to deliver after 42 weeks gestation, and 4 times more likely than black women and 8 times more likely than white women to have oligohydramnios. Somali women were more likely to have gestational diabetes and significant perineal lacerations, and less likely to smoke. Newborns of Somali women were at increased risk for prolonged hospitalization, lower 5-minute Apgar scores, assisted ventilation, and meconium aspiration.
Conclusion: Pregnancy outcomes should be evaluated within ethnically and culturally unique groups; Somali immigrants are a high-risk subpopulation.

Obstetric and neonatal morbidity and mortality are known to differ between US black and white women.[1,2] As the ethnic makeup in the US shifts, it is important to analyze health care outcomes among socially and ethnically unique groups.

Over 35,000 Somalis have relocated to the US (US Census data) after civil war in the 1990s prompted the mass exodus of hundreds of thousands of Somali refugees. An estimated 15,000 have settled in Washington state, with the peak of immigration in 1997 and 1998. One of the first encounters that Somali women have

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with the Western health care system is during pregnancy and childbirth. Our experience has been that Somali women are often hesitant to accept obstetric interventions, such as induction of labor or cesarean delivery when indicated. On the contrary, Somali patients have expressed concerns that interventions, such as cesarean delivery, occur too quickly, frequently, and unnecessarily in the US.

This disconnect between our providers and the Somali community we serve led us to further investigate pregnancy and birth outcomes in Somali women. There is a growing literature suggesting an increased risk of obstetric, and even neonatal, complications among women who have previously undergone female circumcision, or ritual cutting of the female genitalia.[3-8] Among Somali women, it is estimated that 98% have undergone circumcision,[9-11] and that up to 80% undergo the most extensive form known as infibulation, which involves partial or total excision of the clitoris, as well as removal of the labia minora and the inner side of the labia majora. Reported obstetric complications from female circumcision include cesarean delivery, prolonged labor, perineal lacerations, hemorrhage, and febrile illness.[4-7] Adverse fetal and neonatal outcomes described include increased fetal distress during labor, 5-minute Apgar scores less than 7, and increased perinatal mortality.[3-6] It is not clear whether the association of female circumcision with these perinatal complications reflects true causality. Rather, the increased risks may be attributable to a Western practitioner's unfamiliarity with circumcision that leads to increased interventions and possibly intervention-related complications. Female circumcision may also be a marker for a cultural identity or cultural beliefs associated with reluctance to accept obstetric interventions that result in delays and subsequent increased complications.

The purpose of this study was to evaluate obstetric and neonatal outcomes of a large Somali immigrant cohort to ascertain whether this group of women represents a high-risk subpopulation.

Material and methods

The Institutional Review Board of the University of Washington approved this population-based retrospective cohort study. The Birth Events Records Database (BERD), which links birth certificate data with the birth hospitalization discharge data for both the mother and child for all nonfederal hospitals in Washington state, was utilized. BERD contains information from the birth certificate about the pregnancy, delivery, infant status, demographic characteristics, and adverse maternal and neonatal outcomes, as well as information from the hospital discharge data including method of payment for medical services rendered and any International Classification of Diseases, 9th Revision (ICD-9) diagnosis and procedure codes for both mother and infant. BERD successfully links approximately 95% of Washington state birth certificates to maternal and infant Comprehensive Hospital Discharge Reporting System (CHARS) records for the delivery hospitalization.[12]

Subjects were drawn from the cohort of women who had singleton births in Washington state between 1993 and 2001. The cases were Somali-born women identified by place of birth obtained from the birth certificate, first available in the registry in 1993. The control groups were selected from the remaining births, identified as US-born black or US-born white from the birth certificate, by generating a random number, 'r,' and then selecting the 'rth' observation in the file of singleton births with the birth year of interest. The process was repeated until 3 black and 3 white controls with the same birth year as the matching case were randomly selected. During this period, 2.2% of Somali, 3.4% of black, and 2.7% of white births were multiple gestations; these were excluded from the analysis. If any participant had more than 1 birth during the study period, only information from the first birth during the study period was included in the analysis.

Obstetric and neonatal outcomes were evaluated among Somali immigrants and compared with US-born black and white women. The primary obstetric outcome of the study was mode of delivery (spontaneous vaginal, operative vaginal, or cesarean delivery). The birth certificate registry does not include data on indication for cesarean delivery; therefore, we created a model that assigned a single indication to each cesarean delivery based upon associated diagnoses from the birth certificate or hospital discharge data. The indications assigned were prioritized in the following order: (1) elective repeat; (2) indicated, to include diagnoses of breech presentation, placenta previa, prolapsed cord, or active genital herpes; (3) fetal distress; (4) dystocia, to include diagnoses of cephalopelvic disproportion, prolonged labor, or dysfunctional labor; (5) failed induction, to include cesarean deliveries after an induction without associated diagnoses 1 to 4; (6) other, to include all remaining cesarean deliveries not included in diagnoses 1 to 5.

Secondary obstetric outcomes included perineal lacerations (none, 1°/2°, 3°/4°/cervical/vaginal), postpartum hemorrhage (yes, no), febrile illness defined as chorioamnionitis, intrapartum fever >38 degrees Celsius, postpartum endometritis, or postpartum fever (yes, no), and maternal transfusion (yes, no).

The primary neonatal outcome of the study was neonatal hospital length of stay (at least 72 hours, greater than 72 hours). Seventy-two hours was chosen as the cutoff to reflect the average length of stay following a cesarean delivery and, therefore, is a good surrogate marker for whether the mother may take her infant home upon maternal discharge after any type of delivery. Secondary fetal/neonatal outcomes (yes, no)

Table I Baseline maternal characteristics

	Somali	US-born black		US-born white	
	n = 579 (%)*	n = 2384 (%)*	OR† (95% CI)	n = 2453 (%)*	OR‡ (95% CI)
Maternal age (y)					
<20	47 (8.2)	464 (19.5)	0.4 (0.3-0.5)	214 (8.7)	0.9 (0.6-1.3)
20-34	462 (80.4)	1719 (72.1)	Referent	1868 (76.2)	Referent
≥35	66 (11.4)	197 (8.4)	1.3 (1.0-1.7)	370 (15.1)	0.7 (0.5-1.0)
Parity					
0	237 (42.7)	966 (41.8)	1.2 (1.0-1.5)	1024 (42.3)	1.2 (1.0-1.5)
1-4	255 (46.0)	1281 (55.5)	Referent	1359 (56.2)	Referent
≥5	63 (11.3)	62 (2.7)	5.1 (3.4-7.6)	37 (1.5)	9.1 (5.8-14.2)
Prepregnancy weight (lbs)					
0-124	96 (25.5)	277 (18.3)	1.2 (0.8-1.7)	396 (19.9)	1.3 (0.9-1.7)
125-140	105 (27.9)	360 (23.8)	Referent	517 (27.4)	Referent
141-158	71 (18.9)	272 (17.9)	0.9 (0.6-1.3)	342 (18.1)	1.0 (0.7-1.4)
≥158	104 (27.7)	607 (40.0)	0.6 (0.4-0.9)	652 (34.6)	0.8 (0.6-1.1)
High school or less	312 (87.9)	1235 (59.1)	5.0 (3.6-7.1)	971 (42.0)	10.0 (7.1-14.1)
Unmarried	129 (22.5)	942 (39.7)	0.2 (0.2-0.2)	615 (25.1)	0.9 (0.7-1.1)
Prenatal visits <8	130 (29.2)	454 (22.9)	1.3 (1.0-1.7)	248 (11.2)	3.3 (2.6-4.2)
Smoker	2 (0.3)	324 (14.0)	0.0 (0.0-0.1)	375 (15.6)	0.0 (0.0-0.1)

* Numbers may not add to totals because of missing data; percentages calculated with missing data excluded.
† Comparing Somali women with US-born black women.
‡ Comparing Somali women with US-born white women.

Table II Preexisting maternal disease

	Somali	US-born black		US-born white	
	n = 579 (%)*	n = 2384 (%)*	OR† (95% CI)	n = 2453 (%)*	OR‡ (95% CI)
Antepartum anemia	105 (19.8)	176 (8.7)	2.6 (2.0-3.4)	80 (3.6)	6.6 (4.8-9.1)
Diabetes					
Preexisting	7.1 (1.3)	17 (0.8)	1.6 (0.6-4.2)	10 (0.5)	3.0 (1.0-8.7)
Gestational	29 (5.5)	56 (2.8)	2.1 (1.3-3.3)	67 (3.0)	1.9 (1.2-3.0)
Hypertension	6 (1.1)	146 (2.3)	0.5 (0.2-1.2)	22 (1.0)	1.1 (0.4-3.0)
Genital herpes	24 (4.5)	133 (6.6)	0.7 (0.4-1.1)	103 (4.6)	1.0 (0.6-1.6)
Other§	8 (1.5)	64 (3.2)	0.5 (0.2-1.0)	58 (2.6)	0.6 (0.3-1.3)

* Numbers may not add to totals because of missing data; percentages calculated with missing data excluded.
† Comparing Somali women with US-born black women.
‡ Comparing Somali women with US-born white women.
§ Renal, pulmonary, or cardiac disease.

included: oligohydramnios, meconium, intrapartum fetal distress, admission to the neonatal intensive care unit, 5-minute Apgar score less than 7, requirement of assisted ventilation greater than 30 minutes, and fetal or neonatal demise.

All models were adjusted for the frequency-matching characteristic (year of delivery). We considered possible confounding variables to be demographic characteristics, reproductive, and medical factors suspected to be related to both Somali immigrant mother and obstetric or neonatal outcomes. Obstetric outcomes were stratified into groups of nulliparous and multiparous women. Potential confounders were evaluated with univariate analysis and included in the final model if they altered the odd ratios (ORs) in the univariate analyses by at least 10% and were associated with both the outcome and the exposure. Models were additionally adjusted according to the outcome being evaluated based on a priori assumptions and confounders as described below. We considered gestational age, birth weight, maternal age, and history of previous cesarean delivery to be a priori confounding factors for method of delivery. A priori confounding factors for secondary obstetric outcomes included method of delivery, gestational age, and birth weight. Women who received a cesarean delivery were excluded from the analysis of the secondary obstetric outcome, perineal lacerations. Models of intrapartum fetal outcomes were adjusted for birth weight and gestational age, while neonatal outcomes were additionally adjusted for parity and method of delivery.

Table III Delivery characteristics

	Somali n = 579 (%)*	US-born black n = 2384 (%)*	OR† (95% CI)	US-born white n = 2435 (%)*	OR‡ (95% CI)
Gestational age at delivery (wk)					
<37	37 (6.5)	242 (10.3)	0.7 (0.5-1.0)	175 (7.3)	1.0 (0.7-1.4)
≥37-<42	449 (78.6)	2055 (87.8)	Referent	2174 (90.8)	Referent
≥42	85 (14.9)	43 (1.8)	9.0 (6.0-13.5)	46 (1.9)	9.0 (6.0-13.2)
Birth weight (g)					
<2500	37 (6.3)	230 (9.7)	0.7 (0.5-1.0)	122 (5.0)	1.3 (0.8-1.9)
2500-3999	473 (82.4)	1968 (83.3)	Referent	1972 (80.3)	Referent
≥4000	65 (11.3)	164 (6.9)	1.7 (1.2-2.2)	359 (14.7)	0.8 (0.6-1.0)
Breech presentation	16 (3.0)	74 (3.7)	0.8 (0.5-1.5)	82 (3.7)	0.8 (0.5-1.5)
Labor induction	111 (19.2)	421 (17.7)	1.1 (0.9-1.4)	511 (20.9)	0.9 (0.7-1.1)
Labor dystocia	45 (8.6)	150 (7.4)	1.2 (0.8-1.7)	141 (6.4)	1.4 (1.0-2.0)

* Numbers may not add to totals because of missing data; percentages calculated with missing data excluded.
† Comparing Somali women with US-born black women.
‡ Comparing Somali women with US-born white women.

Table IV Method of delivery: nulliparas

	Somali n = 237 (%)*	US-born black n = 966 (%)*	OR†,‡ (95% CI)	US-born white n = 1024 (%)*	OR†,§ (95% CI)
NSVD/VBAC	125 (52.8)	655 (67.8)	referent	668 (65.3)	referent
Operative vaginal delivery	33 (13.9)	84 (8.7)	2.1 (1.3-3.4)	133 (13.0)	1.4 (0.9-2.1)
Cesarean delivery	79 (33.3)	227 (23.5)	1.6 (1.1-2.3)	222 (21.7)	2.0 (1.4-2.8)
Modeled indications‖					
Dystocia	10 (12.7)	46 (20.3)	1.0 (0.5-2.1)	50 (22.5)	1.0 (0.5-2.0)
Fetal distress	27 (34.2)	41 (18.1)	3.1 (1.8-5.2)	28 (12.6)	4.9 (2.8-8.5)
Indicated	7 (8.9)	27 (11.9)	1.2 (0.5-2.8)	42 (18.9)	0.8 (0.4-1.9)
Failed IOL	13 (16.4)	26 (11.5)	2.3 (1.2-4.7)	17 (7.7)	3.9 (1.9-8.1)
Other	22 (27.8)	87 (38.3)	1.2 (0.7-2.0)	85 (38.3)	1.3 (0.8-2.2)

* Numbers may not add to totals because of missing data; percentages calculated with missing data excluded.
† Odds ratio adjusted for gestational age, birth weight, and maternal age.
‡ Comparing Somali women with US-born black women.
§ Comparing Somali women with US-born white women.
‖ Odds ratio not adjusted. However, when the fetal distress indication was adjusted for gestational age, odds ratios remained significant.

In an attempt to assess the impact of acculturation on our outcomes, we also stratified our analyses by time period (1993-1997 and 1998-2001), with the knowledge that 1997-1998 was the peak of Somali immigration to our state, and by length of residence in Washington state (less than 2, or at least 2 years).

Unconditional logistic regression models were used to compute OR estimates via the method of maximal likelihood. Multinomial regression was performed in the analyses of method of delivery, modeled cesarean indications, and perineal lacerations. Multinomial regression allows comparison of multiple outcomes (eg, comparing vaginal delivery with either cesarean delivery or operative vaginal delivery). This contrasts with multiple logistic regression, in which only 2 outcomes are compared (eg, vaginal deliveries vs cesarean delivery). Ninety-five percent CIs for the ORs were calculated from the modeled standard errors and the normal approximation. Statistical analyses were performed using STATA software version 7.0 for personal computer (College Station, Tex).

Results

Two hundred sixty-six Somali women, 151 US-born black women, and 86 US-born white women had more than 1 singleton birth during the study period and information from these 503 pregnancies were excluded from the analysis. After these exclusions, the cohort included 579 singleton births to Somali women, 2384 singleton births to US-born blacks, and 2453 singleton births to US-born whites.

Somali deliveries from 1993 to 2001 in Washington state were almost exclusively confined to urban areas in

Table V Method of delivery: multiparas

	Somali n = 342 (%)*	US-born black n = 1418 (%)*	OR†,‡ (95% CI)	US-born white n = 1429 (%)*	OR†,§ (95% CI)
NSVD/VBAC	270 (79.0)	1045 (73.7)	referent	1117 (78.2)	referent
Operative vaginal delivery	13 (3.8)	52 (3.7)	0.9 (0.4-1.7)	62 (4.3)	0.9 (0.4-1.7)
Cesarean delivery	59 (17.2)	321 (22.6)	0.8 (0.5-1.1)	249 (17.5)	1.1 (0.7-1.6)
Modeled indications‖					
Elective repeats	16 (27.1)	160 (49.8)	0.4 (0.2-0.7)	132 (53.0)	0.5 (0.3-0.9)
Dystocia	6 (10.2)	17 (5.3)	1.4 (0.5-3.5)	12 (4.8)	2.1 (0.8-5.6)
Fetal distress	13 (22.0)	24 (7.5)	2.1 (1.1-4.2)	13 (5.2)	4.2 (1.9-9.1)
Indicated	7 (11.9)	33 (10.3)	0.8 (0.4-1.9)	30 (12.1)	1.0 (0.4-1.1)
Failed IOL	3 (5.1)	7 (2.2)	1.7 (0.4-6.5)	5 (2.0)	2.5 (0.6-10.5)
Other	14 (23.7)	80 (24.9)	0.7 (0.4-1.2)	57 (22.9)	1.0 (0.5-1.9)

* Numbers may not add to totals because of missing data; percentages calculated with missing data excluded.
† Odds ratio adjusted for gestational age, birth weight, and maternal age.
‡ Comparing Somali women with US-born black women.
§ Comparing Somali women with US-born white women.
‖ Odds ratio not adjusted. However, when the fetal distress indication was adjusted for gestational age, odds ratios remained significant.

Table VI Maternal morbidity: nulliparas

	Somali n = 237 (%)*	US-born black n = 966 (%)*	OR†,‡ (95% CI)	US-born white n = 1024 (%)*	OR†,§ (95% CI)
Preeclampsia	22 (9.7)	67 (8.1)	1.1 (0.6-1.8)	79 (8.5)	1.1 (0.6-1.8)
Perineal lacerations‖					
First/second degree	55 (34.8)	262 (35.5)	1.4 (0.9-2.1)	323 (40.3)	1.0 (0.7-1.5)
Third/fourth degree/other¶	36 (22.8)	46 (6.2)	4.8 (2.8-8.3)	107 (13.3)	1.9 (1.2-2.2)
Febrile illness#	33 (13.9)	65 (6.7)	2.0 (1.2-3.2)	53 (5.2)	2.7 (1.6-4.5)
Postpartum hemorrhage	8 (3.4)	28 (2.9)	1.1 (0.5-2.7)	36 (3.5)	1.3 (0.6-2.9)
Maternal transfusion	7 (3.0)	3 (0.3)	7.6 (1.9-31.0)	5 (0.5)	6.0 (1.7-21.5)

* Numbers may not add to totals because of missing data; percentages calculated with missing data excluded.
† Odds ratios for preeclampsia adjusted only for maternal age. All other odds ratios adjusted for method of delivery, gestational age, and birth weight. Odds ratios for postpartum hemorrhage adjusted for perineal laceration.
‡ Comparing Somali women with US-born black women.
§ Comparing Somali women with US-born white women.
‖ Women who received cesarean deliveries excluded from analysis of lacerations.
¶ Other includes cervical lacerations, vaginal lacerations, and vulvar lacerations.
# Odd ratios additionally adjusted for diabetes.

and around Seattle: 60% at our institution, 20% at other hospitals in Seattle, 15% at hospitals in the suburban areas surrounding Seattle, and the remaining 5% in urban and rural areas throughout the state. The majority of Somali women started prenatal care in the first trimester. Although more white women received prenatal care in their first trimester than black and Somali women, there was no statistical difference between groups. Additional demographic information and baseline characteristics of the cohort are shown in Tables I and II. Somali women were more likely than black and white control women to be grand multiparas, nonsmokers, to have had 12 years of education or less, to be anemic, and to have gestational diabetes. Compared with black control women, they were more apt to be at least 35 years old. Somali women were more likely to have fewer prenatal visits when compared with white control women.

Delivery characteristics are shown in Table III. Somali women were 9 times more likely than either black or white control women to deliver postdates ($\geq$42 weeks gestation). Compared with black control women, Somali women were more likely to deliver a large infant ($\geq$4000 g).

Data regarding the method of delivery are presented in Tables IV and V. Nulliparous Somali women had an approximately 2-fold increased risk of having a cesarean delivery compared with black or white control women. Cesarean deliveries were more commonly associated with fetal distress and failed induction of labor among nulliparous Somali women. Additionally, nulliparous

Table VII Maternal morbidity: multiparas

	Somali n = 342 (%)*	US-born black n = 1418 (%)*	OR†,‡ (95% CI)	US-born white n = 1429 (%)*	OR†,§ (95% CI)
Preeclampsia	9 (3.0)	52 (4.3)	0.7 (0.3-1.4)	45 (3.5)	0.8 (0.4-1.7)
Perineal lacerations‖					
First/second degree	139 (49.1)	297 (27.1)	2.7 (2.0-3.6)	454 (38.5)	1.7 (1.3-2.3)
Third/fourth degree/other¶	21 (7.4)	15 (1.4)	8.8 (4.2-18.4)	33 (2.8)	3.7 (2.0-7.1)
Febrile illness#	16 (4.7)	52 (3.7)	1.4 (0.7-2.7)	23 (1.6)	2.9 (1.4-5.8)
Postpartum hemorrhage	22 (6.4)	43 (3.0)	1.9 (1.1-3.3)	40 (2.8)	2.5 (1.3-4.4)
Maternal transfusion	2 (0.6)	5 (0.4)	1.2 (0.2-9.0)	1 (0.1)	4.7 (0.3-88.6)

* Numbers may not add to totals because of missing data; percentages calculated with missing data excluded.

† Odds ratios for preeclampsia adjusted only for maternal age. All other odds ratios adjusted for method of delivery, gestational age, and birth weight. Odds ratios for postpartum hemorrhage also adjusted for perineal laceration. Among multiparas, perineal lacerations additionally adjusted for previous cesarean delivery.

‡ Comparing Somali women with US-born black women.

§ Comparing Somali women with US-born white women.

‖ Women who received cesarean deliveries excluded from analysis of lacerations.

¶ Other includes cervical lacerations, vaginal lacerations, and vulvar lacerations.

Odd ratios additionally adjusted for diabetes.

Table VIII Fetal and neonatal morbidity/mortality

	Somali n = 579 (%)*	US-born black n = 2384 (%)*	OR†,‡ (95% CI)	US-born white n = 2453 (%)*	OR†,§ (95% CI)
Intrapartum morbidity					
Oligohydramnios	62 (11.7)	68 (3.4)	3.7 (2.5-5.4)	30 (1.4)	7.9 (4.9-12.5)
Meconium	150 (28.6)	236 (11.6)	2.6 (2.0-3.3)	120 (5.4)	6.4 (4.8-8.5)
Fetal distress	59 (11.3)	121 (6.0)	1.9 (1.4-2.7)	83 (3.7)	3.1 (2.1-4.5)
Postpartum morbidity					
Neonatal LOS >72 hours	72 (13.2)	193 (9.7)	1.7 (1.2-2.4)	151 (7.0)	2.3 (1.6-3.4)
Admission to NICU	15 (2.6)	86 (3.6)	0.6 (0.3-1.2)	76 (3.1)	0.7 (0.3-1.3)
Apgar score at 5 minutes <7	25 (4.4)	50 (2.1)	3.1 (1.8-5.3)	28 (1.1)	5.2 (2.9-9.6)
Assisted ventilation >30 minutes	17 (3.3)	17 (0.8)	3.8 (1.8-7.9)	7 (0.3)	11.1 (4.1-30.0)
Meconium aspiration syndrome	52 (10.0)	14 (0.7)	14.4 (7.5-27.6)	7 (0.3)	27.7 (12.2-62.7)
Birth trauma	5 (1.0)	8 (0.4)	3.2 (0.8-12.3)	14 (0.6)	1.9 (0.6-6.4)
Perinatal mortality					
Stillbirth	9 (1.6)	32 (1.3)	1.6 (0.5-5.0)	12 (0.5)	2.9 (0.8-10.2)
Neonatal demise	1 (0.2)	26 (1.1)	0.2 (0.0-1.4)	11 (0.5)	0.4 (0.0-3.9)

LOS, length of stay.

* Numbers may not add to totals because of missing data; percentages calculated with missing data excluded.

† Odds ratios for intrapartum morbidities adjusted only for gestational age and birth weight. Odds ratios for postpartum morbidities adjusted for gestational age, birth weight, method of delivery, and parity.

‡ Comparing Somali women with US-born black women.

§ Comparing Somali women with US-born white women.

Somali women were twice as likely to have an operative vaginal birth as black control women. Although multiparous Somali women were not at greater risk for operative vaginal delivery or cesarean delivery than either control group; those who did have a cesarean delivery, similar to the nulliparas, were more likely to have a diagnosis of fetal distress compared with black and white control women. Even when cesarean delivery indications were adjusted for gestational age, these associations remained significant. Risks for cesarean delivery with an associated diagnosis of fetal distress were approximately 3 and 5 times higher among Somali nulliparous women compared with black and white nulliparous women, and 2 and 5 times higher among Somali multiparous women compared with black and white multiparous women, respectively.

Tables VI and VII demonstrate maternal morbidities. All Somali women were at increased risk of significant perineal lacerations. Nulliparous Somali women were almost 5 times more likely than black control women, and 2 times more likely than white control women, to have third- and fourth-degree lacerations compared with

an intact perineum. Multiparous Somali women had an increased risk of both minor (first or second degree) and more severe (third, fourth, cervical or vaginal) lacerations when compared with both control groups; compared with black control women, 3-fold minor, 9-fold severe, and compared with white control women, 2-fold minor, and 4-fold severe. Perineal lacerations (minor or severe) associated with operative deliveries were equally as common among Somali, black and white women. Regarding other maternal morbidities, Somali women were more likely to have a febrile illness than all control women except black multiparous women. Transfusions were more common among Somali nulliparous women than both control groups, and the risk of postpartum hemorrhage was increased among Somali multiparous women when compared with control groups. There was no difference in the risk for preeclampsia between Somali immigrants and black and white control women.

Table VIII presents morbidity and mortality of the fetuses and neonates. During labor, Somali pregnancies were more likely than black or white control women to have oligohydramnios, meconium, or fetal distress. Upon delivery, Somali infants were at increased risk of 5-minute Apgar scores less than 7, the need for assisted ventilation, and meconium aspiration syndrome compared with both black and white newborns.

Somali women were approximately 2 times less likely to be able to take their infant home within 72 hours compared with black or white control women. However, Somali newborns were not at increased risk for NICU admission. There was a trend toward an increased risk of stillbirths among Somali women, particularly when compared with white control women, but this did not reach statistical significance.

Stratification of the cohort into 2 time periods, 1993 to 1997 and 1998 to 2001 did not reveal significant differences that would suggest a temporal relationship to outcomes. Similarly, stratifying the cohort by length of residence in Washington state (less than 2, or at least 2 years) did not alter our results (data not shown).

Comment

Pregnancy complications and obstetric and neonatal outcomes are usually described within the context of broad racial and ethnic categories: white, black, Asian, Native American and Pacific Islander.[2] Our study underscores the importance of evaluating outcomes by ethnically and culturally unique groups. Our findings demonstrate a clear difference, and poorer outcomes, between women who were born in Somalia compared with US-born black or white women.

Others[1] have compared perinatal complications among Somali immigrants versus ethnic Norwegians, and reported an increased risk of labor induction, fetal distress, secondary arrest of labor, prolonged second stage of labor, operative delivery, need for emergency cesarean delivery, Apgar scores less than 7, and stillbirths. They were unable to conclude whether the differences in outcome could be attributable to infibulation or were reflective of other sociocultural or medical factors. Our study findings were similar with the exception that we evaluated gestational age at delivery, and found an increased risk for postdatism. Somali women were 9 times more likely to deliver at or beyond 42 weeks with concomitant increased risk of adverse sequelae of postdatism: oligohydramnios, fetal distress, and meconium. This is in contradistinction to US-born blacks that were at increased risk of prematurity. The only other published paper regarding Somali birth outcomes was published in Canada, but relied on patient recall and had no comparison groups.[6] To the best of our knowledge, ours is the first study investigating birth outcomes of Somali immigrants in the US. Furthermore, we chose to compare Somali women with US-born blacks and US-born whites to further clarify birth differences.

It is not clear why Somali gestations are prolonged. Prolonged gestations may in part account for the higher risk of cesarean delivery among nulliparas, cesareans for fetal distress among both nulliparas and multiparas, longer neonatal lengths of stay (greater than 72 hours but less than 31 days), lower Apgar scores, the need for prolonged assisted ventilation, oligohydramnios, and meconium aspiration. One might question the accuracy of dating Somali pregnancies. Roughly half of this Washington Somali cohort delivered at our institution where early dating ultrasounds are routine making the diagnosis of postdatism most likely accurate. In addition, the characteristics associated with postdate pregnancies, low amniotic fluid volumes, and meconium aspiration were observed.

Our study has several limitations. First, the quality of the birth certificate data may not be accurate for some variables (eg, number of prenatal visits, prepregnancy weight, maternal illnesses, socioeconomic status), and would underestimate the effects of these risk factors and reduce ability to assess confounding influences. Second, assuming acculturation improves outcomes, it would be useful to compare complications within groups by degree of acculturation. We did not have any direct measures of acculturation, but the 2 surrogate markers, time of immigration and number of years of residence in the United States, did not reveal significant differences among outcomes. Considering interpreter use (or lack thereof) as a marker of acculturation, it would have been informative to compare outcomes among Somali women who required an interpreter with those women who did not. This information unfortunately was not available in the birth registry. Finally, we ideally should compare Somali immigrant birth outcomes in the

United States with birth outcomes in Somalia, but no data exists from Somalia for comparison. While the estimated prevalence of female circumcision in the Somali population is known to be high,[9-11] the circumcision type or degree among this Somali cohort is not known, as this information is not recorded in the birth registry or by ICD-9 codes. This limits the conclusions that can be drawn regarding the relationship between female circumcision and adverse perinatal outcomes.

In order to suggest improvements, it is useful to identify factors that may be responsible for the increase in adverse birth outcomes among Somali women and their newborns. Postdatism probably plays a major role. Perhaps the hesitance of the Somali women to accept indicated obstetric interventions in a timely fashion contributes to poorer outcomes; unfortunately, this information is not well captured in hospital discharge data or birth certificate information. Female circumcision may contribute to several complications. It is likely that the increased risk of significant perineal lacerations among all Somali women is a direct consequence of female circumcision, and highlights the importance of taking down anterior labial fusion, after safely infiltrating with local anaesthetic as the baby crowns, in women with a constricted vaginal introitus. However, it is not clear that other demonstrated perinatal complications can be attributed to female circumcision, as suggested in the literature to date.[1-6] Perhaps obstetric practitioners unfamiliar with the custom are more likely to recommend a cesarean delivery, doubting that a baby might be able to traverse such a small introitus without causing severe lacerations, or at all. Perhaps the vulvar skin hood among circumcised females maintains a blind space around the urethra, encouraging growth of organisms as reflected in the increased risk of intrapartum and postpartum febrile illness. No studies exist that would better inform us as to the validity of this supposition. And nonetheless, for most identified complications, female circumcision is not a plausible explanation.

By addressing the obstetric concerns of the Somali community, we hope to translate the findings from this study, and thereby improve pregnancy outcomes for this group of immigrant women. There is a need for cultural ambassadors to bridge the gap between Western medicine and immigrant communities. Our goal is to provide culturally sensitive care that results in less threatening obstetric interventions through targeted community-wide educational forums for Somali families.

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