ABSTRACT

This study examines associations between geographic origin and risk for congenital infections, through a chart review of women from the St. James Town area of Toronto delivering at Wellesley Hospital in 1996. Foreign-born women (n=203) were significantly less likely than Canadian-born women (n=53) to be HBsAg negative (187/193 vs. 48/48; RR=0.97, 95%CI 0.94–0.99). There was no significant difference in rubella seronegativity, but rubella immunity was unacceptably low in both groups (less than 90%). A number of rubella non-immune women had delivered previously in Canada. Procedures must be implemented to ensure completion of hepatitis B immunization series in affected newborns, and rubella immunization in seronegative women prior to discharge. As well, updating immunization status must become a routine part of the immigration medical examination.

ABRÉGÉ

Cette étude examine les liens entre l'origine géographique et le risque d'infections congénitales à partir de l'examen des dossiers de femmes de St James Town de Toronto ayant accouché à l'hôpital Wellesley en 1996. Les femmes nées à l'étranger (n = 203) avaient une beaucoup plus faible probabilité que les femmes nées au Canada (n = 53) d'être séronégatives à l'antigène de surface de l'hépatite B (187/193 par rapport à 48/48; RR = 0,97, 95 % IC 0,94 – 0,99). Il n'y avait pas de différence significative dans la séronégativité à la rubéole, mais la faiblesse du taux d'immunité contre la rubéole était inacceptable pour les deux groupes (moins de 90 %). Plusieurs femmes non vaccinées contre la rubéole avaient déjà donné naissance à des enfants au Canada. Des mesures doivent être mises en place pour s'assurer que les nouveau-nés concernés reçoivent toute la série de vaccins contre l'hépatite B, et que toutes les femmes séronégatives soient vaccinées contre la rubéole avant leur sortie de la maternité. La mise à jour des vaccinations doit aussi faire partie intégrante de l'examen médical exigé par les procédures d'immigration.

Geographic Origin and Risk for Congenital Infection in a Canadian Inner City: Findings and Implications for Policy

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Recommendations by the Society of Obstetricians and Gynaecologists of Canada (SOGC)¹ and Health Canada,² for antenatal screening to prevent congenital and perinatal infections include screening protocols for rubella, syphilis, hepatitis B, group B streptococcus, Chlamydia trachomatis and gonorrhoea.

These guidelines are based on the prevalence of disease in the Canadian population. However, the makeup of the population continues to change with annual immigration of a quarter million people.³

The prevalence of disease among immigrant groups varies with national and ethnocultural origin, forced versus voluntary migration, and time since arrival in host country.⁴ The current Canadian guidelines, therefore, may not apply well to recent immigrants and refugees.

The Ontario Immunization Schedule includes diphtheria, pertussis, tetanus

(DPT), polio, Hemophilus influenza B, measles, mumps, and rubella (MMR), which are mandatory inoculations for school entry. Hepatitis B vaccination has recently been introduced for Grade 7 students. The World Health Organization (WHO) Expanded Programme on Immunization (EPI) for developing countries includes tuberculosis (BCG), DPT, polio and measles.⁵ The WHO also recommends hepatitis B as part of the immunization regimen, but this is not fully implemented in all countries. Rubella immunization is not included in the EPI, because high levels of adult coverage are difficult to achieve. Vaccination of children could increase the susceptibility of adult women by slowing but not interrupting rubella transmission, which could lead to an increase in cases of congenital rubella syndrome.⁶

While rates of congenital infection are currently low in Canada, there is some indication that these may be increasing, and that immigrant women may be at greater risk.⁷ Research exploring vaccination and immigration is limited, with few North American studies available.⁸⁻¹³ There has been a recent increase in patients seen at the Congenital Infections Clinic of the Hospital for Sick Children, Toronto, many of whom have foreign-born parents.⁷ This has led to questions regarding how well the current screening guidelines are being followed, and whether these guidelines need to be revised.

This study is a preliminary step in the elucidation of the epidemiology of risk factors for congenital infections in different ethnocultural groups. St. James Town, comprising Toronto Census Tracts 64, 65

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and 66, is home to 22,711 people, making it one of the most densely populated areas in Canada.¹⁴ The population includes many recent immigrants and refugees, as well as a number of Canadian-born women of comparably poor socio-economic status. The Wellesley Hospital, located in Census Tract 64, provides obstetrical services to a large portion of St. James Town residents.

By examining these populations, we attempt to better understand risks for congenital infections in Canadian and foreign-born women.

METHODS

From the Wellesley Hospital's database, all women delivering between January 1, 1996 and January 31, 1997 were identified by billing codes and service dates. The group was narrowed to those from the St. James Town area by selecting those with a home postal code in census tracts 64, 65 or 66.¹⁵

We estimated that this would yield a sample of approximately 250 and, based on an estimated background Canadian prevalence of approximately 5%, give the power to detect a difference of 5% in rubella seronegativity ($\alpha=0.05$, $1-\beta=0.8$).

Data extraction was done by the investigators, and data were transcribed to a paper instrument. The Ontario Antenatal Records were checked for: mother's name and date of birth, obstetrician, midwife and/or family physician, gravida, parity, delivery date, rubella titre, VDRL, hepatitis B surface antigen (HBsAg), and group B streptococcus (GBS), gonococcus (GC) and Chlamydia swab results. Country of origin was not consistently recorded in the charts, however the Nursing History form includes specific areas for "Comprehension of English" and "Other Languages Spoken". All languages written here were copied to the instrument. If the only language indicated was English or if these fields were blank, then the full chart was examined for nationality or other languages used. If other data were missing, the hospital charts were also studied. If any data were still incomplete, the patient's primary caregiver was contacted and asked to check the office chart.

TABLE I
Characteristics of Subjects

	Non-EME N=203	EME N=53	Total N=256
Age (mean years)	30.0	28.9	29.8
Gravida (mean)	1.9	2.2	2.0
Parity (mean)	0.6	0.8	0.6
Primiparous (N (%))	111 (55.2%)	27 (51.9%)	138 (54.5%)
EME = Established Market Economies Non-EME = all other WHO regions			

TABLE II
Rubella and Hepatitis Status in Subjects from Other Regions vs. EME Region

	Non-EME N=203 N / Total (%)	EME N=53 N / Total (%)	Relative Risk (95% Confidence Interval)
Rubella Seronegative	24 / 194 (12.4%)	5 / 49 (10.2%)	1.21 (0.49 – 3.02)
HbsAg Seronegative	187 / 193 (96.9%)	48 / 48 (100%)	0.97 (0.94 – 0.99)
EME = Established Market Economies Non-EME = all other WHO regions			

Data were entered into a computer database.¹⁶ Identifying data (name, date of birth, hospital number, physician) were not entered. One language was entered for each subject. If only one language was found in the nurses' notes, then that language was entered. If English or French plus another language were listed, then the other language was entered. If multiple foreign languages were found, then the one listed first was entered.

Language was used to divide the subjects by geographic region, using the classification system developed by the World Bank/WHO for reporting health indices.¹⁷ This system groups countries by socio-economic development, epidemiological homogeneity and geographic contiguity. Those speaking English, French and other Western European languages were classified as Established Market Economies (EME). The other regions are: Formerly Socialist Economies of Europe (FSE), Latin America and the Caribbean (LAC), China (CHN), India (IND), Other Asia & Islands (OAI), Middle Eastern Crescent (MEC), and Sub-Saharan Africa (SSA).

Contingency table analyses for relative risk and 95% confidence intervals were calculated using SPSS for Windows.¹⁶ Fisher's Exact Test was used for all cells with expected values less than five.

Rubella non-immune women were identified and the family physician or obstetri-

cian contacted to determine whether or not these women had since been vaccinated. For multiparous women, place of birth of previous children was determined if possible.

After all data had been entered, the section containing identifying data was destroyed.

This protocol was approved by the Wellesley Hospital Research Institute and Research Ethics Committee.

RESULTS

Two hundred fifty-six charts met the criteria for review. Language information was obtained from all charts. The majority of subjects were either EME ($n=53$; 21%) or OAI ($n=161$; 63%). Of the 53 women in the EME group, 48 spoke English only, 4 spoke French, and 1 spoke Belgian. In the OAI group, most of the subjects were Tamil ($n=97$) or Filipino ($n=60$). There were 10 women from Somalia (SSA), and fewer than 5 women from any other country. Further analyses divided women into only two groups: EME and non-EME.

Characteristics of subjects in these two groups are presented in Table I. The groups were similar in age, gravidity, parity and percentage primiparous.

Eight women had no antenatal care and hence no results for any tests: 3 were from the EME group and 5 were non-EME.

TABLE III
Prevalences for Women of Childbearing Age (Data from Other Studies)

	Canada	EME	FSE	IND	WHO Region CHN	OAI	SSA	LAC	MEC	World
Rubella Seronegative (percent)	2.3–13.3%†			>30% India‡		43% Sri Lanka‡	30% Nigeria‡	43–51% Jamaica‡	25% Israel‡	
HBsAg Seropositive (per 100,000)		1.3*	2.4*	3.1*	2.3*	4.2*	4.9*	2.6*	4.3*	3.0*
EME = Established Market Economies FSE = Formerly Socialist Economies of Europe IND = India CHN = China * data from WHO ¹⁷ for women aged 15–44 in 1990 † data from various Canadian studies, see text for details ^{8,11–13} ‡ countries as indicated, from a review in the WHO Bulletin ²²					OAI = Other Asia & Islands SSA = Sub-Saharan Africa LAC = Latin America & the Caribbean MEC = Middle Eastern Crescent					

Six women (3%) were HBsAg positive, all from the non-EME group. Non-EME women were significantly less likely to be HBsAg seronegative than EME women (see Table II). All affected children had received hepatitis B immunoglobulin and one dose of vaccine prior to discharge.

Twenty-nine subjects (12%, 95%CI 7.9–16.0%) were rubella seronegative (non-immune), and 12 of these (41%) were multiparous. There was a non-significant trend toward higher rubella seronegativity in non-EME women (see Table II). In the EME group, 4/5 seronegative women were multiparous (80%); in the non-EME group 8/24 were multiparous (33%). All 10 of the multiparous seronegative women for whom place of birth of previous children was available, had delivered a child in Canada. None of the rubella seronegative women had been vaccinated prior to discharge; 21 of the rubella negative women were traced, and at nine months after the last delivery, only 8 (38%) had been vaccinated. Three women (14%) were pregnant again at the time of contact, so vaccination was deferred; 2 women (10%) refused vaccination. One physician reported that 8 (38%) women had been counselled regarding vaccination but had not yet been vaccinated.

No significant differences were found between EME and non-EME with respect to other diseases screened for, and there were no significant results in geographic sub-group analyses (data not shown).

DISCUSSION

As expected, subjects belonged to diverse ethnocultural groups. Since our study

sought to elucidate differences between Canadian-born women and newcomers, analyses compared the EME group with a conglomerate of those in all other groups. While language is not an ideal surrogate for country of origin, the fact that the large majority of those classified as EME spoke English only, and the knowledge that this area is highly populated with new arrivals to Canada, add to the face validity of this division. In using this purposive sample from St. James Town, it should be noted that our results are not necessarily generalizable to the city of Toronto as a whole or to immigrant communities in other urban centres.

Current immigration procedures require medical history and physical examination, chest x-ray, urinalysis and syphilis serology. If indicated, stool cultures for typhoid and paratyphoid and cultures for tuberculosis may be performed. No documentary or serological proof of immunization status is required.¹⁸

Our study found that all the EME women were HBsAg negative, while six non-EME women were positive. This is congruent with WHO global data¹⁷ that shows hepatitis prevalence to be lowest in the EME (see Table III). Over 90% of hepatitis B carriers live in the developing world¹⁹ and studies have shown that rates are high among immigrant groups migrating from non-EME to EME countries.^{9,20} With the recent inclusion in the EPI of hepatitis B vaccination for countries with HBsAg of two percent or more, global seroprevalence rates are likely to decrease.^{19,21}

In our sample, all infants of HBsAg-positive mothers had been given immuno-

globulin and the first dose of hepatitis B vaccine prior to discharge. We have no data, however, on administration of subsequent doses of vaccine.

There are limited published data on rubella seronegativity rates in Canada. Recent serosurveys of women of childbearing age in Manitoba, Ontario, British Columbia and Quebec have found rates of seronegativity ranging from 2.3 to 13.3%.¹³ This is consistent with other North American studies.^{11,12} In a survey of developing countries,²² the proportion of women of childbearing age found to be non-immune was less than 10% in 13 countries, 10–24% in 20 countries, and at least 25% in 12 countries (see Table III).

Our study found a non-significant trend toward higher rubella seronegativity in non-EME versus EME women. Both rates were higher than predicted. Of great concern is the fact that rubella seronegativity among women in our study was three times the target of 4% set by the 1994 Canadian Mumps and Rubella Consensus Conference.²³ Of even greater concern is the observation that nearly half of the rubella seronegative women were multiparous and that many of these women had delivered previously in Canada. None of the 29 rubella seronegative women had been vaccinated in the immediate postpartum period, and only one third had been vaccinated by the time their physician was contacted (i.e., 9–24 months postpartum). This is similar to findings in a recent study from Québec, which found that only 79 of 200 seronegative women had been vaccinated prior to discharge.²⁴ The Consensus Conference calls for the maintenance of a 99% in-hospital postpartum immunization rate.

This study provides information on risk for congenital infections that are routinely screened for, in a specific population. It emphasizes the need to follow current recommendations while suggesting that geographic origin may indeed be an additional risk factor for susceptibility to certain diseases.

There are profound implications for public health policy. Public health needs to play a role in ensuring that the hepatitis B immunization series is initiated in hospital, and completed in the community, and that follow-up serological testing is done. Routine immigration medical procedures should be modified such that those without documentary proof of rubella vaccination or serological proof of immunity are automatically vaccinated with MMR upon entering the country. This should also apply to the other immunizations routinely provided to those who are born in Canada (i.e., tetanus, diphtheria, polio, hepatitis B, pertussis and HiB, depending on age). Procedures must be implemented such that all rubella seronegative women are offered vaccination prior to hospital discharge, similar to the standing orders that exist for administration of Rho(D) immune globulin. As our findings demonstrate, rubella seronegativity among Canadian-born women giving birth is still high, hence strategies must be developed to identify and vaccinate all seronegative women in their early reproductive years, prior to first pregnancy.

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