

The effects of migration on neonatal intensive care outcomes

More than 230 million people around the world are international immigrants. Once ethnically-homogenous societies, especially in Europe and other western countries like Australia and the US, are now increasingly ethnically-diverse. The implications of ethnically-diverse perinatal factors (eg fetal growth and differences in fetal maturity) are important, especially in neonatal intensive care where time-critical management decisions are often based on data extrapolated from ethnically-homogenous populations (eg Caucasians). This article examines available evidence to demonstrate that recognition of the diversity in immigrants worldwide must be acknowledged and that further study to obtain important data to guide clinical management is urgently needed to optimise current perinatal care.

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Key points

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1. Global immigration is increasing rapidly and almost 50% of all immigrants are females of childbearing age.
2. Ethnically-different infants have different growth parameters and organ maturity that will have significant implications on their outcomes if they require neonatal intensive care.
3. Local population data, especially in terms of fetal growth and projected outcomes for high-risk infants, must be revised, particularly in countries with high immigrant flows to reflect critically important management decisions.

Over the last few decades, migration, the movement of people across borders, has increased from 2.3% of the world's population in 1990, to 3.2% in 2013. Currently, approximately 232 million people around the world are considered 'international migrants' with half living in one of ten developed nations of the world (**TABLE 1**). The ethnic profiles of these once relatively homogeneous societies have consequently changed considerably as the origins of international migrants are predominantly composed of people from countries such as Mexico, China, India, the Philippines and Vietnam.¹

The impact of different new ethnicities and peoples on a country's healthcare services has become a critical public health issue in developed countries. New immigrants, due to different physiognomies, cultures and lifestyle practices, bring with them medical and other health issues that may not have been a problem in the indigenous population or in people that have been resident in that country for more prolonged periods. New immigrants may develop medical problems because of the impact of lifestyle changes necessitated by living in environments completely different to their native land.

Conversely, the 'immigrant paradox' has also been a recognised entity since the 1960s.² In this situation, arrivals from deprived regions become healthier in their new country than even original inhabitants, probably from improved

lifestyle changes. This is a counter-intuitive phenomenon because marginalised and impoverished people usually have consistently poorer outcomes³ but this phenomenon may also be explained in part by the effects of selection. In many cases of migration (whether due to physical ability or bureaucratic selection), only the fittest and healthiest people can (or are allowed) to migrate. This is illustrated by the significantly increased risk of affluent migrants, eg Asian Indians in the US who predominantly migrate for employment opportunities. This population has been noted to be at significantly higher risk of

	Number of international migrants (million)
United States	45.8
Russian Federation	11
Germany	9.8
Saudi Arabia	9.1
United Arab Emirates	7.8
United Kingdom	7.8
France	7.5
Canada	7.3
Australia	6.5
Spain	6.5

TABLE 1 Approximately half of the 232 million international migrants in the world live in ten countries.¹

developing conditions like diabetes mellitus and cardiovascular disease⁴ and may set up increased risk factors for future problems for the infant.⁵

The impact of migration on perinatal outcomes

It is therefore important to recognise that the risks of health problems are not similar for migrants of different ethnic origins. Women compose about half (48%) of international migrants¹ and in 2010/11, about 100 million persons aged 15 years old and over (ie of reproductive potential) were living outside their country of birth in OECD (Organisation for Economic Co-operation and Development) countries (a 36% increase from 2000/1).¹

This has profound potential impact on perinatal outcomes both within and outside similar ethnic groups. One study, for example, examined the associations between adverse pregnancy outcomes, socio-demographic factors and parental immigrant status in 838,975 births in Hong Kong between 1995 and 2009, the majority of whom were of Asian origin. Mothers from South and South East Asia had a consistently higher risk of compromised pregnancy outcomes compared to locally-born Hong Kong mothers, including low birthweight (<2,500g) infants. In contrast, mothers from mainland China and other developed countries were more likely to have high birthweight (4,500g) infants.⁶ Either of these problems may cause considerable perinatal complications, such as prolonged length of stay or birth trauma from difficult deliveries and under-recognition of these issues may directly (and indirectly) lead to an increased risk of morbidity (and even mortality) for the mother-infant dyad.

The implementation of policies directing perinatal care must recognise that these differences are important public health issues, especially in areas of large immigrant populations. For example, an examination of the impact of immigration on pre-eclampsia, eclampsia and hospitalisation in 9.03 million deliveries (of which 3.03 million were to immigrant women), found that immigrant women from sub-Saharan Africa, Latin America and the Caribbean were at consistently higher risks of developing pre-eclampsia/eclampsia while East Asian and European immigrants were at lower risk, even when compared to native-born women.⁷ A condition like pre-

eclampsia can be insidious in presentation and, if unrecognised, can be rapidly fatal for both the mother and the infant.^{7,8}

On the other hand, a relatively new phenomenon that has been noticed is the mitigation of health risks by increasing assimilation. For example, a review of perinatal deaths in Brussels between 1998 to 2008, found that women from Morocco, sub-Saharan Africa and Turkey had an 80% excess in perinatal mortality ($p < 0.0001$) compared to Belgians but that this risk was not apparent in those with Belgian citizenship at delivery.^{9,10}

The effects of ethnicity and immigrant status on NICU outcomes

NICU practice in different countries

Infants requiring neonatal intensive care unit (NICU) admissions are usually the sickest of all newborn infants. Conditions that necessitate NICU admission range from prematurity to infection and congenital malformations and vary considerably from country to country and even from hospital to hospital. In many developing countries, infants with certain conditions (eg extreme prematurity) may not be offered the opportunity for intensive care because of resource limitations. This difference in NICU accessibility is particularly pertinent in those born at the extremes of prematurity (<28 weeks' gestation), where a 'grey zone'¹¹ for active resuscitation of infants at borderline viability is dependent on a combination of practitioner and parental attitudes, resource availability and the birth condition of the infant. In Japan, for example, the Japanese Motherhood Protection Act decreased the 'limits of gestational viability' from 24 to 22 completed weeks' gestation in 1991. Japan had survival rates of 31% and 56% for infants born between 22 and 23 weeks' gestation, respectively, during 2002 to 2004¹² but whether the same outcomes could be achieved for Japanese infants delivering in other countries without this edict is uncertain.

In the US, for example, the limits of gestational viability are state-dependent and range from 19-28 weeks' gestation¹³ while the World Health Organization (WHO) recommends a birth weight of 1,000g (or equivalent to a gestation of 28 weeks) as the threshold for which international perinatal mortality comparisons be made¹⁴ and infants below

these gestational ages may not be offered resuscitation.

Size matters

In the NICU, birth weight, as well as gestation, is one of the most important factors governing chances of survival. Estimated fetal weight, especially in the absence of accurate gestation dating, is an important indicator of the infant's chances of intact survival. Decisions in high-risk pregnancies are often made on the basis of best available data and often critical-decisions, eg whether to resuscitate a high-risk infant or not, need to be made in extremely time-pressured situations, such as in the delivery room. Most information that is available to NICUs caring for extremely high-risk infants (ie in developed countries) is obtained from, again, ethnically-homogenous populations.¹⁵ Whether these data are applicable to ethnically-different new arrivals are uncertain as it is only in recent years that such figures are emerging.^{12,16} For example, Asian Indian infants in the US were almost twice as likely to be classified as very or moderately low birth weight than Asian Chinese infants, even if the mothers were born in the US,¹⁷ while children of mixed parentage had birth weights that were intermediate between children born of parents of a single-ethnicity.¹⁸

This may create a dilemma because there are also ethnic differences in susceptibility to common neonatal morbidities, which must be taken into account when high-risk pregnancies are managed. A study of 1,006 newborn infants born between 22-32 weeks' gestation in the US (white 54.3%, black 21.7%, Hispanic 13.7% and other 10.3%), found that black infants, despite being born at lower gestational ages and birth weights than the other groups, had no differences in morbidity and mortality.¹⁹ Indeed, the severity of hyaline membrane disease, one of the most important determinants of early survival in preterm infants, seems to be less severe in black infants, especially after 32 weeks' gestation.²⁰ Furthermore, the incidence of meconium-stained amniotic fluid, a sign of fetal maturity, is statistically more frequent in black and Asian preterm infants, suggesting that fetal lung maturation may occur significantly earlier in these races than in white infants (who contribute the predominant source of perinatal data).²¹

NICU outcomes in New South Wales

The author examined specifically the outcomes of 11,979 children (and their 10,982 mothers) who required NICU admission and who were born in the state of New South Wales (NSW), Australia, between 2000 and 2006.²² NSW is the most populated state in Australia and has received a steady increase of migrants over the last three decades. Immigrants were predominantly white Europeans in the years following World War Two but these have been recently superseded by new migrants from the Indian subcontinent and China.²³ NSW has almost 90,000 births per annum and in the study, 9,813 (81.9%) infants were born to Australian-born mothers and 2,166 (18.1%) infants to immigrant mothers, compared to 167,673 of 605,501 births in NSW between 2000 and 2006, (27.7%, $P < 0.001$).²³

The mothers in this study originated from 122 countries. Most (10,727, 89.5%) were from high-income regions, including Australia, while 1,040 and 147 were from middle and low-income regions, respectively. The predominant immigrant groups were from New Zealand and the Pacific Islands, followed by the Middle East, United Kingdom, Europe, North Asia, Africa, Americas and then South Asia. The majority of mothers were Caucasian. No difference in birth weights between the groups was found and this may have been because fetal weight differences become more pronounced from 35–36 weeks' gestation.²⁴

Australian-born mothers were significantly younger (three times more likely to be teenagers) and more likely to use illicit drugs. However, they were also less likely to have gestational diabetes mellitus, fetal growth restriction or delivery by caesarean section. The predominant indication for NICU admission for their infants was prematurity and the infants were more likely to be mechanically ventilated, receive surfactant and to develop common neonatal morbidities such as retinopathy of prematurity and chronic lung disease. Five-minute Apgar scores, however, were highest in infants of Australian-born mothers but lowest in African and New Zealand/Oceania infants, a substantial proportion of who were of Pacific Islander origin. Congenital abnormalities were most likely in Asian (1.5 times) and Middle Eastern (2.0 times)

infants and the latter were the least likely to survive to NICU discharge (88.5%).

In Australia, health care is available on an equitable basis to all residents but mothers born outside Australia were found to be at significantly higher risk of perinatal conditions that could significantly affect maternal and fetal outcomes. Whether this is due to the inherent genetic differences in the mothers themselves or to a difference in accessing health care is uncertain. Such problems were already noted in the Pacific Islander population more than 20 years ago and around the world, diseases secondary to lifestyle and dietary changes persist even after adjustment for socioeconomic differences.²⁵

To completely understand the effects of immigration on NICU outcomes, further information must be examined including time spent in the new country, paternal ethnicity and employment and education status.²⁶ Immigration is a fluid process and nowadays, due to easier transport and decreased border control restrictions, it is not uncommon for migrants to live in multiple different countries within a short time or even to return to their native country after living a few years as an immigrant.¹ However, it must be emphasised that the fluidity of immigration makes it increasingly necessary to recognise that existing data regarding outcomes for high-risk pregnancies and infants may not necessarily be applicable to infants of migrant parents. As almost 50% of global immigrants are females of childbearing ages, the policies regarding health care delivery for this high-risk group needs to urgently encompass changes brought about by rapidly increasing movement of people around the world, as any decision made in that critical period around birth will have long-standing (and possibly serious) consequences for the patient, their families and their communities.

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IN THE NEWS



Inability to breastfeed is associated with depression

A cohort study of 14,000 women in England highlights the need to support new mothers who want to breastfeed but are unable to do so.

Using data from a longitudinal survey, researchers examined how breastfeeding affects a mother's mental health. They analysed how long mothers had breastfed for and how long they had breastfed exclusively. Women who planned to breastfeed but had not managed to were 2.5 times more likely to develop postpartum depression (PPD) than women who had no intention of breastfeeding.

Women who had not planned to breastfeed, but did so exclusively for four weeks, had a significantly reduced risk of PPD when compared to women who had not planned to breastfeed and did not.

The work, carried out by researchers from the Universities of Seville, Cambridge, Essex and London, has been published in the *Maternal and Child Health Journal*.¹

However, as a cohort study, it cannot prove that not breastfeeding causes PPD – it merely shows an association.

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MRI reveals brain abnormalities in late preterm infants

Moderate and late preterm (MLPT) infants born at 32-36 weeks' gestation may have smaller brains and other brain abnormalities that could lead to long-term developmental problems, according to a study published online in the journal *Radiology*.¹

Australian researchers performed magnetic resonance imaging (MRI) on 199 MLPT infants and 50 infants born at term. They compared the size and maturation of multiple brain structures between the two groups and looked for signs of brain injury. Injury rates were similar between the groups but MLPT birth was associated with:

- smaller brain size at term-equivalent age

- less myelination in one part of the brain
- immature gyral folding.

Much of the existing knowledge on preterm birth and brain development has been drawn from studies of individuals born very preterm (<32 weeks' gestation). The researchers plan to follow the infants in the study group through childhood to learn more about the relationship between brain abnormalities and later outcomes.

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Accurate twin pregnancy growth chart data published

The Twins and Multiple Births Association (Tamba) and St George's Hospital, London, have published accurate twin growth charts in the *Ultrasound in Obstetrics and Gynecology* journal.¹ The growth charts should improve the identification of intrauterine growth restriction in twins at increased risk of premature delivery or stillbirth.

The risk of preterm delivery is much higher in multiple births, with 50% of all twin pregnancies resulting in a premature delivery. "There are no accurate growth charts for twin pregnancies at the moment. Twin babies are measured using singleton charts and clinicians must use their judgement to decide how the pregnancy is progressing," says one of the authors of the study, Consultant Obstetrician Asma Khalil from St George's Hospital.

Data for the development of a robustly constructed growth chart for twin pregnancies came from a cohort study of biometric measurements, collected prospectively, in the second and third trimesters of twin pregnancies by nine hospitals as part of the Southwest Thames Obstetric Research Collaborative



Dr Asma Khalil with Toby and Marta Kayll and their newborn twins.

(STORK). The final data set included 9,866 second and third trimester ultrasound examinations in 2,125 pregnancies. Measurements included head circumference, biparietal diameter, abdominal circumference and femur length.

The twin pregnancy growth charts will be rolled out to all hospitals in the UK over the coming year.

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