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EDITORIAL

The importance of understanding hospital and country-specific case-mix for neonatal patients☆,☆☆

A importância de entender o *case-mix* de pacientes neonatais em hospitais e específicos de um país

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The study by Grandi et al. provides important information about the prevalence and impact of maternal diabetes mellitus on the outcomes of very low birth weight infants in South American neonatal intensive care units (NICUs). They report an overall rate of maternal diabetes of 2.8%, with an increase in prevalence from 2001-2005 of 2.4% to 3.2% over the period between 2006-2010. Also, of the numerous perinatal and neonatal outcomes examined in this cohort of almost 12,000 infants, only severe necrotizing enterocolitis was associated with diabetes mellitus in multivariable regression.[1] These data differ from other published results. Prior studies of the prevalence of gestational diabetes range from an estimated 2-6% of cases across European countries,[2] 5-11% within 15 states of the US,[3] and 16% in Qatar.[4] Several studies from both low- and middle-income countries[5] and developed countries[6] also show diabetes as a risk factor for adverse pregnancy and neonatal outcomes, albeit in the entire population *versus* a specific, high-risk population such as that studied by Grandi et al.[1] What do these findings, or any similar findings, mean for the clinicians or policy makers overseeing the care delivered to high-risk newborns, especially in light of data suggesting that rates of gestational diabetes in other countries is increasing?[7] Practitioners should assess the validity of the results and then determine the potential impact of these results on their practice.

For any study, we should examine whether the data are accurate before any actions are undertaken. Inaccuracies can occur in three major areas:[2] could the diagnosis be made in all women; was the diagnostic test appropriate; and were the data collected on each pregnancy correct. For a condition such as gestational diabetes, women must both receive prenatal care, and have the test to confirm either the presence or absence of the condition. Depending on the hospital, health system, or country's population and social dynamics, access to prenatal care or to the tools needed to make the diagnosis may be limited. Additionally, for diabetes, one standard diagnostic procedure is a 1- or 3-hour glucose test, administered typically at 24-28 weeks gestation. It is not clear what percentage of women who delivered before 28 weeks gestation could have had the diagnosis. These two

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situations could have lower the reported rate of diabetes in this or any other similar study.

Secondly, it is important that the correct diagnostic test is used. Prior studies used different tests to diagnose diabetes.[2] This study group specifically suggested the World Health Organization oral glucose tolerance test, but notes that, with data collection across multiple centers in multiple countries, this criterion was not universally followed. However, the fact that specific tests were encouraged at each center is a positive aspect of the data collection. Finally, larger population-based datasets may not contain the correct information on all patients. For example, mortality rates may differ depending on the data source,[8] likely because of differences in the accuracy of the recorded data, depending on whether registry or vital statistics data are used. The use of a detailed registry of patients such as that of the Neocosur Network, with built in methods to validate the recorded data, improves the reported results. All of these issues may result in inter-hospital variations in health outcomes that have nothing to do with the care delivered, but rather differences in the accuracy of the data or differences in the patients included in the measurement in the first place.[9] With the data structures in place, the accuracy of these data are likely as strong as they can be, without modifying clinical practices at each individual hospital – something that is challenging to do across multiple hospital systems in multiple countries.

After assessing the validity of the data, such reported variation in diabetes mellitus prevalence and impact on outcome then supports the idea that clinicians should *know the patients that they care for*, especially in areas that differ from those areas where many of the reported studies occurred. First, the lower prevalence of diabetes in the NICUs of these 22 hospitals may affect decisions about additional screening of women or quality improvement and education programs to address either the diagnosis or treatment of diabetes in these units. Second, the fact that diabetes was not associated with adverse outcomes in these patients supports other work showing that treatments may have different effects on patient health depending on the geographic setting they are delivered. For example, numerous studies from the developed world show the beneficial effect of antenatal corticosteroids on the disease-free survival of high-risk infants. A recent cluster randomized trial of corticosteroid administration in six low- and middle-income countries (Argentina, Guatemala, India, Kenya, Pakistan, and Zambia), though, found neonatal mortality did not decrease in low birth weight infants, with increased neonatal mortality and maternal infection risk overall in the clusters randomized to processes of care designed to increase use of antenatal corticosteroids.[10] This difference may have occurred because of differences in the baseline maternal health in these six countries and the different health resources available to care for high-risk children in these countries compared to the pregnancies included in previous studies from the developed world.[11] However, there can also be variations in the effect of a specific treatment within a single country. The impact of delivery at a high-volume, high-level neonatal intensive care unit differed across three states in the US, with the survival benefit ranging from 30% to 330% depending on the state. Similar differences were seen in the reduction of common complications of preterm birth.[12] The three states differed in the distribution of racial/ethnic backgrounds, health insurance status, and prevalence of many antepartum complications of pregnancy. Thus, different patient populations may have different medical and genetic risks of disease. However, these regions also differ in the organization of perinatal care, with different processes of care with regard to maternal and infant transport systems, centralization of perinatal services, and regionalization of care.

These examples illustrate differences the casemix of individual hospitals, and how the effect of common treatments may differ depending on this casemix. It is likely, though, that the patients included in these above studies and the study by Grandi et al. also differed in social factors such as housing, education, and income. While not as frequently measured in perinatal and neonatal studies, these ''social determinants of health'' may influence both the prevalence of diseases such as diabetes and also the ultimate outcome of these conditions. Latin America is not immune from these adverse social determinants,[13] and in fact the parallel private/public systems that are common in many Latin American countries may differ from those systems that care for patients in many studies of neonatal health and treatment.[14] More research needs to focus on how these factors affect the health and outcomes of these high-risk patients.

In summary, the study by Grandi et al. illustrates the importance of understanding the patients cared for by health care groups, whether hospitals, states, or countries, and how they respond to specific treatments. Practitioners discuss personalized medicine, where treatments are given depending on a patient's genetic, medical, and social background. We should think about how different patient populations have different risks of disease that require subtle changes to management plans in order to optimize patient outcomes. Understanding of these best practices is needed to optimize perinatal and neonatal health.

Conflicts of interest

The author declares no conflicts of interest.

References

1. Grandi C, Tapia JL, Cardoso VC. Impact of maternal diabetes mellitus on mortality and morbidity of very low birth weight infants: a multicenter Latin America study. J Pediatr (Rio J). 2015;91:234–41.
2. Buckley BS, Harreiter J, Damm P, Corcoy R, Chico A, Simmons D, et al. Gestational diabetes mellitus in Europe: prevalence, current screening practice and barriers to screening. A review. Diabet Med. 2012;29:844–54.
3. DeSisto CL, Kim SY, Sharma AJ. Prevalence estimates of gestational diabetes mellitus in the United States. Pregnancy Risk Assessment Monitoring System (PRAMS), 2007-2010. Prev Chronic Dis. 2014;11:E104.
4. Bener A, Saleh NM, Al-Hamaq A. Prevalence of gestational diabetes and associated maternal and neonatal complications in a fast-developing community: global comparisons. Int J Womens Health. 2011;3:367–73.

5. Wang Z, Kanguru L, Hussein J, Fitzmaurice A, Ritchie K. Incidence of adverse outcomes associated with gestational diabetes mellitus in low- and middle-income countries. Int J Gynaecol Obstet. 2013;121:14–9.
6. Rosenberg TJ, Garbers S, Lipkind H, Chiasson MA. Maternal obesity and diabetes as risk factors for adverse pregnancy outcomes: differences among 4 racial/ethnic groups. Am J Public Health. 2005;95:1545–51.
7. Ferrara A. Increasing prevalence of gestational diabetes mellitus: a public health perspective. Diabetes Care. 2007;30: S141–6.
8. Anthony S, van der Pal-de Bruin KM, Graafmans WC, Dorrepaal CA, Borkent-Polet M, van Hemel OJ, et al. The reliability of perinatal and neonatal mortality rates: differential under-reporting in linked professional registers *vs* Dutch civil registers. Paediatr Perinat Epidemiol. 2001;15:306–14.
9. Gibson E, Culhane J, Saunders T, Webb D, Greenspan J. Effect of nonviable infants on the infant mortality rate in Philadelphia, 1992. Am J Public Health. 2000;90:1303–6.
10. Althabe F, Belizán JM, McClure EM, Hemingway-Foday J, Berrueta M, Mazzoni A, et al. A population-based, multifaceted strategy to implement antenatal corticosteroid treatment *versus* standard care for the reduction of neonatal mortality due to preterm birth in low-income and middle-income countries: the ACT cluster-randomised trial. Lancet. 2014, pii: S0140-6736(14)61651-2.
11. Costello A, Azad K. Scaling up antenatal corticosteroids in low-resource settings? Lancet. 2014, pii: S0140-6736(14)61699-8.
12. Lorch SA, Baiocchi M, Ahlberg CE, Small DS. The differential impact of delivery hospital on the outcomes of premature infants. Pediatrics. 2012;130:270–8.
13. de Andrade LO, Filho AP, Solar O, Rígoli F, de Salazar LM, Serrate PC, et al. Social determinants of health, universal health coverage, and sustainable development: case studies from Latin American countries. Lancet. 2014, pii: S0140-6736(14)61494-X.
14. Cotlear D, Gómez-Dantés O, Knaul F, Atun R, Barreto IC, Cetrángolo O, et al. Overcoming social segregation in health care in Latin America. Lancet. 2014, pii: S0140-6736(14)61647-0.