Birth Weight at Hospitalito Atitlán, Guatemala

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Abstract

Staff members of a rural Guatemalan hospital sought more information regarding the birth weights of infants delivered in their facility. A chart review conducted on a random sample of births (n = 221) at Hospitalito Atitlán , Santiago Atitlán , Guatemala from April, 2005 to December, 2007 revealed a 7.7 percent incidence of low birth weight (LBW). This is below the Guatemalan national average of 12 percent. Many infants, however, lagged behind World Health Organization Child Growth Standards for weight, length, and head circumference. Further study is required to determine the origin of this discrepancy, any underlying pathology, and potential nursing interventions to help improve outcomes for mothers and infants served by this hospital.

Indigenous people globally, including those in Latin American, often have marked health disparities compared to non-Indigenous groups (Stephens, Porter, Nettleton, & Willis, 2006; Montenegro & Stephens, 2006). Guatemalan national statistics, however, show that people who are members of Indigenous groups are less likely to give birth to low birth weight (LBW) children than people who are not Indigenous Guatemalans, 10.5 percent versus 12.8 percent (Instituto Nacional de Estadística, et al., 2003).

The incidence of LBW, an infant weighing less than 2500 grams, is important because LBW is associated with a wide variety of negative health outcomes across the lifespan (United Nations Children's Fund & World Health Organization, 2004). Low birth weight infants have either had intrauterine growth retardation, have been born prematurely, or both.(Kliegman, Behrman, Jenson, & Santon, 2007; Lowdermilk & Perry, 2007).

While preterm birth is more specifically related to health problems, LBW is more often reported because it is easier to obtain. Low birth weight is associated with increased neonatal and childhood morbidity and mortality, including hypoxia, hypoglycemia, and genetic anomalies (Kleigman et al., 2007). It is one of the leading causes of infant death in the United States and throughout the world, (Hoyert, Mathews, Menacker, Strobino, & Guyer, 2006; Callaghan, MacDorman, Rasmussen, Qin, & Lackritz, 2006; WHO, 2005) . Health problems extend into childhood with associated physical, behavioral and neurological problems (Bhutta, Cleves, Casey, Cradock, & Anand, 2002; Victora, et al, 2008). Furthermore, infants with low birth weight go on to have more adult illness and disability than their counterparts (Victora et al, 2008).

Low birth weight also reflects maternal health status, as it correlates with maternal nutrition and physical condition (United Nations Children's Fund & World Health Organization, 2004; Lowdermilk & Perry, 2007). Maternal “prepregnancy weight,” “maternal height, prepregnant body mass index, and [maternal] upper arm circumference” are all associated with LBW (Ramakrishnan, 2004, p. 18).

Staff members at the Hospitalito Atitlán (HA) expressed interest in learning more about how patient weights at their hospital compared to international norms (B. Page, personal communication, August 19, 2006). Given the paradox of wide spread Indigenous health disparities in Guatemala and a relatively lower level of LBW among HA newborns, exploring low birth weight among newborns at HA was important because the majority of patients served by the hospital are Tzutujil, members of an Indigenous Mayan group. Learning more about newborn weights may help explain this paradox and help guide the programs and care given to the population by health providers.

This study examines the incidence of LBW among children born at HA between April, 2005 and December, 2007.

Method

Study Design

We conducted a descriptive, cross-sectional study of a simple random sample of infants who were born in one hospital between April 2005 and December 2007. In this non-experimental study the variable of interest is birth weight. All children born at HA between April 1, 2005 and December 31, 2007 were eligible for the project. The study was reviewed and approved by the HA medical director and the Johns Hopkins Medicine Institutional Review Board.

Sample selection

The study was conducted at a community hospital in Guatemala which currently sees approximately 250 births per year (L. Abraham, personal communication, August, 2006).To select participants, all patient encounters from April 1, 2005 to December 31, 2007 were reviewed in the hospital's computerized database. A list of potentially eligible patients was compiled using specific diagnostic criteria. From this list a random sample of 221 births was selected. Given the estimated 250 births a year, we can assume, at most, about 667 eligible births in the period reviewed. Thus the sample represents at least 33 percent of eligible births. Whenever possible, the charts of both mother and infant were located and examined for information. All data were transcribed directly from the chart to a Microsoft Excel spreadsheet by the principal investigator (JY). The reviewer did not attempt to extrapolate or infer information that was not documented. Statistical analysis of the data was performed using Microsoft Excel 2004 and SPSS software.

Results

Infant Characteristics

There were 221 infants in the sample, 114 females (52.3%) and 104 males (47.1%). The infants' birth weight ranged from 1600 grams to 4800 grams. The mean birth weight was 3050.4 grams, the median birth weight was 3080.0 grams, and standard deviation was 451.4 grams. Seventeen infants (7.7%) weighed less than 2500 grams, the international standard for low birth weight (United Nations Children's Fund & World Health Organization, 2004). A cluster of nine infants (4.1%) weighed 2500 grams.

Lengths ranged from 35 centimeters to 58 centimeters (mean = 48.6, median = 48.0, standard deviation = 3.6). Head circumferences ranged from 18 centimeters to 39 centimeters (mean = 32.8, median = 33.0, standard deviation = 2.2). See Table 1 for a summary of infant characteristics.

Table 1: *Birth Weight, Length, and Head Circumference in Sampled Infants*

	Birth Weight[a] (g)	Birth Length[b] (cm)	Head Circumference[c] (cm)
Mean	3050.4	48.6	32.8
95% Confidence Intervals for Means	2990.9- 3109.9	48.1- 49.1	32.5-33.1
Median	3080.0	48.0	33.0
Standard Deviation	451.4	3.6	2.2
Minimum	1600	35	18
Maximum	4800	58	39

[a]N=221 [b]N=194 [c]N=192

Discussion

The incidence of LBW found at HA (7.7%) was lower than the incidence for Indigenous people throughout Guatemala (10.5%) and the national incidence (12.0 %) (Instituto Nacional de Estadística, et al., 2003). The reason for this difference was not clear from our study. To more fully understand the implications of the 7.7 percent finding two issues should be examined, the distribution of sampled infant weights and the infants' relation to World Health Organization growth standards.

There is cluster of nine infants (4.1%) at 2500 grams. It seems likely, based on clusters at other "round" numbers, that some weights may have been rounded up or down. However, even if the entire group was rounded up from below 2500 grams, the result would be 11.8 % incidence of low birth weight, which is still slightly below the national average of 12.0 percent.

A second issue was that many children were below the weight, length, and head circumference growth standards established by the World Health Organization. See Table 2. According to the WHO, "the standards describe normal child growth from birth to 5 years under optimal environmental conditions and can be applied to all children everywhere, regardless of ethnicity, socioeconomic status, and type of feeding" (World Health Organization, 2006, p. 307). These standards were created based on studies conducted in several countries, in an attempt to make the results broadly applicable (World Health Organization, 2006).

Table 2 : *Birth weight, length, and head circumference at various percentiles for sampled infants and WHO Growth Standards*

Infant sex/Percentile	Weigh (g)	Length (cm)	Head Circumference (cm)
Male 3rd percentile	2100/2400	42.7/46.3	30.0/32.1
Female 3rd percentile	2200/2400	41.0/45.6	30.0/31.7
Male 50th percentile	3100/3300	49.0/49.9	33.0/34.5
Female 50th percentile	3000/3200	48.0/49.1	32.0/33.9
Male 97th percentile	4200/4300	56.3/53.4	37.3/36.9
Female 97th percentile	3800/4200	54.0/52.7	37.0/36.1

Note. All numbers are presented sample/WHO.

The WHO standards offered a way to compare the sampled infants with their international peers. However, because the WHO standards are relatively new their implications are still being explored. A number of articles comparing the WHO standard to older growth measures found that the new standard had variable impact on the level of underweight identified, sometimes increasing and sometimes decreasing (de Onis, Onyango, Borghi, Garza, & Yang, 2006; Fenn & Penny, 2008; Prost, et al., 2008). Two studies found that the WHO standard showed more underweight early on, followed by a lower level as children age (de Onis, et al., 2006; Prost, et al., 2008). At the same time, some experts contend that definitions and norms should be specific to individual populations in order to have genetic and environmental homogeneity when possible (Kliegman, et al., 2007).

Further investigation is required to verify the study results that children born at HA are smaller than their international peers and to learn more about those differences. The relatively small size of the sample may play some role. However, other questions remain, including whether HA children are experiencing some sort of growth restriction or stunting, and whether the WHO standards are applicable to the Santiago Atitlán community.

Based on the findings of de Onis, Onyango, Borghi, Garza, & Yang (2006) and Prost, et al. (2008), examining children's growth over time would be important. Such longitudinal exploration would clarify the growth trajectories of these children. Validation specific to the Santiago Atitlán community may be appropriate. A comparison to children from another Guatemalan community may also prove useful.

This project has a number of limitations. A major issue limiting generalizability of findings is selection bias. Only one site is represented in the sample and we lack a complete understanding of who seeks care at that site compared to the general population. The data collection process involved transcribing all data twice, into different computer programs, and translating the data from Spanish into English, increasing the risk of error in the data set. An inherent problem in any chart review is that some information may be missing. Despite these limitations, this project can provide assistance to local pediatric and maternal health care providers in their efforts to improve care to mothers and babies.

Additional exploration is necessary to verify the apparently lower incidence of LBW, to determine if the lag in growth exhibited by the HA infants in comparison to the WHO growth standards is a matter of concern, and to identify contributing factors in either case. Longitudinal study will be helpful in answering that question, and will guide pediatric health care professionals as they focus health resources.

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Appendix

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