Feeding practice outcome for preterm infants in two neonatology units in Buraidah, Saudi Arabia

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حصىلة ممارسات الإطعام في الرضّع المولودين قبل الأوان في وحدتين لرعاية المواليد في بريدة، المملكة العربية السعودية

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الخلاصة: قام الباحثون بإجراء دراسة متابعة لاستقصاء التفاوتات القصيرة الأمد في الحاصلات لدى الرضّع المولودين قبل الأوان، في اثنين من المستشفيات في بريدة، في المملكة العربية السعودية، وذلك بمقارنة العمر الحمل، والوزن عند الولادة، ومحيط الرأس عند الولادة، وفترة المكث. أما قياسات الحاصلات فتتمثلت في الزيادة اليومية للوزن، ونمط الإطعام وقت التخرج من المستشفى، ونمط الإطعام بعد مرور شهر على التخرج منها. وقد لوحظ أن المعدل الوسطي لزيادة الوزن كان أعلى بشكل ملحوظ في المستشفى الأول 9.6 ± 19.7 غرام/يوم منه في المستشفى الثاني 1.2 ± 29.5 غرام/يوم، بعامل دقة مقدار $P = 0.049$. أما النسبة المئوية للرضّع الذين اقتصر فيهم على الإرضاع من الثدي لمدة شهر بعد تخرجهم، فقد كانت 37.5% في المستشفى الثاني و 13.2% في المستشفى الأول، وذلك بعامل دقة مقدار $P = 0.0224$. يتضح من ذلك أن هناك فروقاً واضحة في الحاصلات على مستوى المستشفيات على المدى القصير في نفس المنطقة، مما يؤكد الحاجة لاستمرار المتابعة والتقييم للفروقات في شكل تفتيش على المرحلة المحيطة للولادة.

ABSTRACT We carried out a follow-up study to investigate variation in short-term outcome for preterm infants in 2 hospitals in Buraidah. We compared gestational age, birth weight, head circumference at birth and length of stay. Outcome measures were weight gain/day, feeding pattern on discharge and feeding pattern 1 month after discharge. Mean weight gain was significantly higher in hospital A, 9.6 ± 19.7 g/day compared to -1.2 ± 29.5 g/day in hospital B ($P = 0.049$). The proportion of infants exclusively breastfed 1 month after discharge was 37.5% in hospital B compared to 13.2% in hospital A ($P = 0.0224$). There are clear hospital level differences in short-term outcome in the same region, emphasizing the need for continuous follow-up and evaluation of differences in a perinatal audit.

Effet du mode d'alimentation pour des prématurés dans deux services de néonatalogie à Burayda (Arabie saoudite)

RESUME Nous avons réalisé une étude de suivi pour examiner les variations dans l'effet à court terme pour des prématurés dans deux hôpitaux de Burayda. Nous avons comparé l'âge gestationnel, le poids de naissance, le périmètre crânien à la naissance et la durée du séjour. L'effet était mesuré par le gain de poids/jour, le mode d'alimentation à la sortie de l'hôpital et le mode d'alimentation un mois après. Le gain de poids moyen était significativement plus élevé à l'hôpital A, $9,6 \pm 19,7$ g/jour, par rapport à $-1,2 \pm 29,5$ g/jour à l'hôpital B ($p = 0,049$). La proportion de nourrissons exclusivement allaités au sein un mois après la sortie de l'hôpital était de $37,5\%$ à l'hôpital B contre $13,2\%$ à l'hôpital A ($p = 0,0224$). Il y a de nettes différences en fonction de l'hôpital pour l'effet à court terme dans la même région, soulignant la nécessité d'un suivi et d'une évaluation continus des différences dans un audit périnatal.

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Introduction

Neonatal intensive care has experienced tremendous growth in the past 30 years. This expansion in capacity grew out of neonatology's proven effectiveness in improving birth-weight-specific outcomes and was coupled to efforts to regionalize care through a system of unit classification and maternal and newborn transport [1–3]. But availability of service is not the only issue; quality of service varies from one centre to another. Variation in practices and outcomes in the neonatal intensive care unit is well known, even in industrialized countries [4]. There was a significant variation in the risk-adjusted mortality rates in 17 neonatal intensive care units included in one particular evaluation done in Canada [5]. This variation in practices and outcomes was observed despite Canada's universal health insurance system [6]. Such variation has also been noticed in other countries, e.g. Finland [7].

The aim of our study is to document variation in the short-term outcomes of preterm infants in 2 hospitals in Buraidah, Saudi Arabia.

Methods

A follow-up study was carried out over a 6-month period, June–December 2001, on preterm infants born in the neonatology units in the 2 hospitals in Buraidah (hospital A: $n = 47$; hospital B: $n = 36$). Inclusion criteria were a) infants born at the study hospital, b) gestational age < 37 weeks. Infants with congenital anomalies or complications were excluded. The following variables were compared: gestational age, birth weight, head circumference at birth, weight at the start of study, discharge weight, feeding pattern at discharge, and length of stay. To obtain representative

data, feeding pattern was not altered during the study. For comparison, the following clinical outcomes were determined: weight gain/day during hospitalization (weight measured during the night shift, without clothing, using digital electronic scales) discharge feeding pattern and feeding pattern 1 month after discharge. Feeding pattern 1 month after discharge was also compared with that of a reference sample of full term infants. This reference sample (200 infants) was selected from infants attending the first immunization visit to the primary health care centre at the age of 6 weeks. For each of 10 primary health care centres in Buraidah, 20 infants were selected at random from the vaccination list.

Statistical analysis was done with SPSS version 10, using the *t*-test to compare quantitative data and chi-squared test to compare qualitative data.

Results

There were 94 preterm infants recruited into the study, and 83 of these completed it, 47 from hospital A and 36 from hospital B. Table 1 shows that the 2 groups of infants were comparable regarding gestational age, birth weight, head circumference at birth, weight at the start of study, age at discharge and length of stay.

Mean weight gain was significantly higher in hospital A, 9.6 g/day, than in hospital B, -1.2 g/day, $P = 0.049$ (Table 2).

Although, no statistically significant difference was found between the 2 hospitals regarding feeding pattern at discharge, the rate of exclusive breastfeeding 1 month after discharge was greater for hospital B, $P = 0.024$ (Table 2).

Compared to a group of full term infants (191 infants out of 200; 9 were excluded owing to incomplete data) at the age of 6 weeks, the preterm infants were more

Table 1 Comparison of pre-term infants in two hospitals in Buraidah, Saudi Arabia

Variable	Hospital A (n = 47)	Hospital B (n = 36)	Total (n = 83)	P-value
Gestational age (weeks)	33.76 (1.89)	33.9 (2.74)	33.84 (2.28)	0.727
Birth weight (g)	1856.4 (373.9)	1888.9 (455.5)	1870.0 (408.0)	0.722
Head circumference at birth (cm)	30.89 (2.49)	30.09 (2.49)	30.54 (2.51)	0.154
Weight at start of study (g)	1854 (370.3)	1873 (459)	1862 (408.6)	0.837
Age at discharge (days)	17.13 (17.37)	16.19 (16.49)	16.7 (16.89)	0.805
Length of hospital stay (days)	13.27 (15.05)	14.77 (15.94)	13.93 (15.37)	0.663

Values are mean (standard deviation).

likely to be on exclusive formula feeding (59.3%) than normal infants (19.9%), $P = 0.0001$. The feeding pattern of preterm infants compared to normal infants 1 month after discharge is shown in Table 3.

Discussion

Daily evaluation of body weight is standard practice in the care of preterm infants. Weight changes in the first week of life pri-

Table 2 Outcome parameters for preterm infants in two hospitals in Buraidah, Saudi Arabia

Variable	Hospital A (n = 47)	Hospital B (n = 36)	Total (n = 83)	P-value
Weight gain (g/day), mean (SD)	9.6 (19.7)	1.2 (29.5)	4.8 (24.9)	0.049
Discharge feeding				
Mixed (formula + breast)	9.3% (4/43) ^a	19.4% (7/36)	13.9% (11/79) ^a	0.214
Exclusive formula	90.7% (39/43) ^a	80.6% (29/36)	86.1% (68/79) ^a	0.315
Feeding after 1 month				
Mixed	26.3%	6.3%	20.4%	0.040
Exclusive formula	60.5%	56.3%	59.3%	0.880
Exclusive breast	13.2%	37.5%	20.4%	0.024

SD = standard deviation.

^aData missing for 4 infants.

Table 3 Comparison of feeding patterns of preterm infants and full term infants at the age of 6 weeks

Feeding pattern	% of preterm in Hospital A (n = 47)	% of preterm in Hospital B (n = 36)	% of full term group (n = 191)	P-value	
				Hospital A vs full term infants	Hospital B vs full term infants
Mixed	26.3	6.3	39.8	0.121	0.0002
Exclusive formula	60.5	56.3	19.9	0.00001	0.00001
Exclusive breast	13.2	37.5	40.3	0.0009	0.89

marily reflect fluctuation in total body fluid, whereas changes beyond the second week of life are more a reflection of growth in response to nutritional support [8]. Since mean age at discharge in our study was just over 2 weeks, weight gain reflects not only growth but also fluid balance. Mean weight of infants at the start of the study was > 1800 g for both hospitals and the discharge feeding pattern was not significantly different, but weight gain/day and proportion of infants exclusively breastfed 1 month after discharge were significantly different. This may be a result of different practices, workloads, resources, efficiency or other factors during hospitalization.

The higher proportion of exclusive breast-feeding 1 month after discharge cannot explain the lower daily weight gain in hospital B because there was no significant difference between the feeding patterns on discharge between hospitals A and B (Table 1).

Although it is possible eventually to achieve a weight gain of 14–16 g/kg per day in hospitalized preterm infants (comparable to intrauterine weight gain), catch-up growth does not occur before the time of discharge [9,10]. Published data from similar studies showed that mean weight gain during the first 2 weeks of hospitalization is 15–16 g/day [11,12].

In hospital B, a programme to support breast-feeding under the Baby Friendly Hospital Initiative was in progress during the study period. The effectiveness of this programme was reflected in the rate for exclusive breastfeeding 1 month after discharge, which was significantly higher than for infants from hospital A ($P = 0.024$), but comparable to full term Saudi Arabian infants at the same age (Table 2). The effectiveness of the Baby Friendly Hospital Initiative has also been demonstrated in other studies [13,14].

American investigators who studied the breastfeeding patterns of low-birth-weight infants (1500–2500 g) on the day of hospital discharge and 4 weeks later found that 38% of infants were exclusively breastfed on the day of discharge and 40% of infants were exclusively breastfed at 4 weeks [15]. Exclusive breast-feeding in full term children at 6–8 weeks, 40.3% in our study, is comparable to published data from other Saudi Arabian studies. In Riyadh, studies showed that 32.4% and 22.1% of the Saudi Arabian infants were exclusively breastfed at 3 and 6 months respectively [16]. The same study showed that 18.2%, 48.4% and 65.0% were exclusively bottle-fed at 3, 6 and 12 months respectively. Data from Australia showed that over half the children

in the study had been bottle-fed with infant formula at some stage [17].

Our study supports previously published evidence that low birth weight (most preterm infants are in this category) has a strong and consistent effect on infant feeding pattern [18]. Mothers of preterm infants need support and advice to successfully initiate and sustain breastfeeding in the neonatal intensive care unit setting by expressing milk until the infant is well enough to put to breast [11]. This could be done by providing education and support through a lactation specialist, who can facilitate breastfeeding in the neonatal intensive care unit setting.

Our study showed that there is a clear hospital-level difference in the same region in short-term outcome for weight gain and feeding pattern of preterm infants. This emphasizes that outcomes should be con-

tinuously followed up and that differences should be evaluated in a perinatal audit procedure. Further studies are needed to evaluate the effect of different factors like type of practice and workload on the outcome of preterm infants. Our study supports evidence from other studies that Baby Friendly Hospital Initiatives have a positive impact on breastfeeding.

After the completion of our study, these 2 neonatal care units were amalgamated into a single unit as part of the planned changes to the system. The neonatal care unit is now in a new building in a new hospital in Buraidah.

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References

1. Goodman DC et al. Are neonatal intensive care resources located according to need? Regional variation in neonatologists, beds, and low birth weight newborns. *Pediatrics*, 2001, 108(2):426–31.
2. Little G, Merenstein G. Towards improving the outcome of pregnancy, 1993: perinatal regionalization revisited. *Pediatrics*. 1993, 92(4):611–2.
3. Hack M, Klein N, Taylor H. Long-term developmental outcomes of low birth weight infants. *Future child*, 1995, 5(1): 176–96.
4. Horbar JD. The Vermont Oxford network: evidence-based quality improvement for neonatology. *Pediatrics*, 1999, 103(1 suppl. E):350–9.
5. Sankaran K et al. Variation in mortality rates among Canadian neonatal intensive care units. *Canadian Medical Association journal*, 2002, 166(2):173–8.
6. Lee SK et al. Variations in practice and outcomes in the Canadian NICU network: 1996–1997. *Pediatrics*, 2000, 106(5):1070–9.
7. Tommiska V et al. A national short-term follow-up study of extremely low birth weight infants born in Finland in 1996–1997. *Pediatrics*, 2001, 107(1):E2.
8. Bauer K et al. Body composition, nutrition, and fluid balance during the first two weeks of life in preterm neonates weighing less than 1500 grams. *Journal of pediatrics*, 1991, 118:615–20.
9. Greer FR. Feeding the preterm infants after hospital discharge. *Pediatric annals*, 2001, 30(11):658–65.
10. Alexander GR et al. A United States national reference for fetal growth. *Obstetrics and gynecology*, 1996, 87:163–8.

11. Barton AJ, Danek G, Owens B. Clinical and economic outcomes of infants receiving milk in the NICU. *Journal of the Society of Pediatric Nurses*, 2001, 6(1): 5–10.
12. Kennedy KA, Tyson JE, Chamnanvanikij S. Early vs delayed initiation of progressive enteral feedings for parenterally fed low birth weight or preterm infants. *Cochrane database of systematic reviews*, 2002, Issue 2.
13. Cattaneo A, Buzzetti R. Effect on rates of breastfeeding of training for the Baby Friendly Hospital Initiative. *British medical journal*, 2001, 323:1358–62.
14. Fairbank L et al. A systemic review to evaluate the effectiveness of intervention to promote the initiation of breast-feeding. *Health technology assessment*, 2000, 4(25):1–171.
15. Hill PD, Ledbetter RJ, Kavanaugh KL. Breastfeeding patterns of low-birth-weight infants after hospital discharge. *Journal of obstetric, gynecologic, and neonatal nursing*, 1997, 26(2):189–97.
16. Al-Ayed IH, Qureshi MI. Breastfeeding practices in urban Riyadh. *Journal of tropical pediatrics*, 1998, 44(2):113–7.
17. Wyne AH, Spencer AJ, Szuster FS. Infant and child feeding practices: a preliminary investigation. *Australian dental journal*, 1997, 42(1):54–8.
18. Adair LS, Popkin BM. Low birth weight reduces the likelihood of breast-feeding among Filipino infants. *Journal of nutrition*, 1996, 126(1):103–12.

Managing newborn problems: a guide for doctors, nurses and midwives

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