

# Audit of feeding practices in the neonatal wards at the Charlotte Maxeke Johannesburg Academic Hospital

L Sepeng,<sup>1</sup> MB ChB; D E Ballot,<sup>2</sup> MB BCh, FCPaed (SA), PhD

<sup>1</sup> Department of Paediatrics and Child Health, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa

<sup>2</sup> Department of Paediatrics and Child Health, Charlotte Maxeke Johannesburg Academic Hospital, Johannesburg, South Africa

Corresponding author: L Sepeng (mntungwasazy@gmail.com)

**Background.** Breastfeeding is the preferred choice of infant feeding. The Baby-Friendly Hospital Initiative (BFHI) is a ten-step plan to help establish successful breastfeeding and is adapted by public sector hospitals in Gauteng. Despite this, rates of breastfeeding in sick and preterm neonates remain low.

**Objective.** To determine feeding practices of neonates in the neonatal wards of the Charlotte Maxeke Johannesburg Academic Hospital (CMJAH) on discharge.

**Methods.** A retrospective review of the CMJAH neonatal database of feeding choices of neonates discharged from the CMJAH neonatal unit between 1 January 2013 and 30 April 2013 was conducted.

**Results.** The records of 404 neonates were studied. A total of 98 (24%) were very low birth weight (VLBW) (<1 500 g), while 306 (75.7%) were >1 500 g or more. Only 94 (23.2%) were discharged on exclusive breastmilk, 232 (57.4%) were discharged on exclusive formula milk and 78 (19.3%) babies were discharged on mixed feeds (both formula milk and breastmilk). Significant variables associated with feeding choices were HIV exposure, perinatal asphyxia and resuscitation at birth and, particularly in the VLBW group, necrotising enterocolitis was found to be statistically significant.

**Conclusion.** Despite the fact that the CMJAH was involved in the BFHI, rates of exclusive breastfeeding were still low. This needs to be urgently addressed with employment of lactation consultants and improved counselling of mothers exposed to HIV on the importance and benefits of breastfeeding.

*S Afr J Child Health* 2015;9(4):133-136. DOI:10.7196/SAJCH.2015.v9i4.895



Human milk is uniquely composed to meet the needs of the human infant, and has been established as the 'optimal form' of nutrition for neonates.<sup>[1]</sup> It contains 0.8 - 0.9% protein, 4.5% fat, 7.15% carbohydrates and 0.2% ash (minerals). There is a high concentration

of lactose, which is an excellent source of carbohydrates, and the fat fraction contains specific triglycerides of palmitic and oleic acid (O-P-O triglycerides) and a large quantity of lipids with trans bonds, which are considered to have health benefits. The principal proteins are casein,  $\alpha$ -lactalbumin, lactoferrin, IgA, lysozyme and serum albumin.<sup>[2]</sup> Breastfeeding delivers immunological advantages to the infant: bifido and lactobacillus bacteria in the breastfed neonate's gastrointestinal system produces lactate and acetate, which lowers pH. The low pH and other substances excreted by these bacteria inhibit the growth of some Gram-positive and Gram-negative bacteria. Bacteria found in breastmilk also detoxify ammonia and other amines; they activate the immune system and thus help fight bacteria that cause disease. Breastfeeding is a significant protector against diarrhoeal disease, respiratory disease and other infections. It tends to result in better nutritional outcomes, including protecting against obesity in overfed populations and against wasting in underfed populations. It has beneficial effects on cognitive functioning and psychosocial development.<sup>[2]</sup> Breastfeeding has also been shown to reduce the incidence of necrotising enterocolitis (NEC) in preterm infants.<sup>[1]</sup>

The Baby-Friendly Hospital Initiative<sup>[3]</sup> (BFHI) is a 10-step plan to help establish successful breastfeeding, and has been adapted by public sector hospitals in Gauteng. Despite this, rates of breastfeeding in the neonatal unit at the Charlotte Maxeke Johannesburg Academic Hospital (CMJAH) are unacceptably low. Possible reasons for this may include reluctance among the staff to promote breastfeeding to

HIV-positive mothers, lack of dedicated lactation counsellors and a lack of facilities for breastfeeding mothers to live in the hospital.

A number of studies have been done on infant feeding in South Africa (SA), the majority conducted in the KwaZulu-Natal (KZN)<sup>[4-9]</sup> and Western Cape<sup>[10-11]</sup> provinces. In the Gauteng province,<sup>[11]</sup> the study on feeding was done with relation to prevention of mother-to-child transmission (PMTCT) in the preterm infant.

Several studies in KZN have looked at the beneficial effects of human milk on decreasing rates of paediatric infections such as NEC and sepsis.<sup>[4-8]</sup> The objective was to look at the feasibility of providing donor breastmilk to neonates in a resource-limited neonatal premature unit. It was found that staff attitudes influenced the uptake of donor breastmilk.<sup>[4,6,7]</sup> Studies in HIV-positive mothers showed that those neonates who were exclusively breastfed showed significantly lower rates of diarrhoeal diseases and had lower rates of hospitalisation. In addition, there was an association with better developmental scores and growth parameters during long-term follow-up, and mothers who exclusively breastfed had lower rates of postnatal depression.<sup>[8]</sup>

In the Western Cape, Goga *et al.*<sup>[9,10]</sup> conducted a prospective observation study between HIV-exposed neonates and unexposed neonates between the ages of 6 and 9 months. They concluded that HIV-positive mothers were more diligent with good feeding practices and this was mainly owing to good PMTCT counselling sites, emphasising the importance of the presence of an encouraging health worker.

Goga *et al.*<sup>[10]</sup> also looked at three districts that were part of a trial and which reflected different socioeconomic conditions: rural-urban prevalence and HIV prevalence rates were considered. They found that there were still barriers to exclusive breastfeeding and that

measures should be put into place to reduce or even break these barriers.

The objective of the current study was to audit feeding choices in babies discharged from the neonatal unit at CMJAH.

## Methods

The CMJAH neonatal unit prospectively collects information upon discharge of neonates for clinical audit. The data are entered into a database managed by Research Electronic Data Capture (REDCAP), hosted by the University of the Witwatersrand.<sup>[12]</sup> The current study is a review of the neonatal database. Babies who had been admitted to the CMJAH neonatal unit within 72 hours of birth and who were discharged from hospital between 1 January and 30 April 2014 were enrolled; those who died or were transferred to other hospitals were excluded.

Babies who were admitted to the neonatal intensive care unit (NICU) were excluded from the study as these were the sickest neonates and this may have negatively affected mothers' ability to establish breastfeeding. There was no sleep-in facility available for breastfeeding mothers with sick newborn or preterm neonates.

The only such facility was the Kangaroo Mother Care (KMC) unit, which has 15 beds, where mothers of preterm neonates approaching discharge could do continuous KMC. Mothers were counselled as to the benefits of breastfeeding by attending staff, but formula milk was provided to those neonates whose mothers chose not to breastfeed.

There was no donor breastmilk available and no dedicated lactation counsellors in the neonatal ward during the study period. The variables found to be statistically significant were defined as follows: resuscitation – all neonates who received bag-mask ventilation, chest compressions, resuscitative drugs or intubation; and NEC – Bell stages 2 and 3.

## Statistical analysis

Data were described using standard statistical methods using SPSS version 21 (IBM, USA). Continuous variables were normally distributed, so mean and standard deviation (SD) were used as measures of central tendency. Categorical data were described using frequencies and percentages.

Babies were divided into groups according to feeding choice: breastmilk only; formula milk only; or mixed feeds. They were also grouped by birth weight: <1 500 g and ≥1 500 g. These groups (feeding choice and birth weight) were compared using  $\chi^2$  analysis for categorical variables and unpaired tests for continuous variables. Logistic regression was also done using the method of feeds as the multinomial variable against the various demographic and clinical characteristics as input variables. Those variables with a

**Table 1. Characteristics of feeds (for whole group)**

Variables	Feeds, n (%)			p-value
	Breastmilk only	Formula only	Breastmilk and formula (mixed)	
Inborn	78 (22.5)	197 (56.8)	72 (20.7)	0.738
Para 1	32 (24.1)	69 (51.9)	32 (24.1)	0.719
Gravida 1	23 (19.5)	68 (57.6)	27 (22.9)	0.322
Attended antenatal care	81 (24.3)	188 (56.3)	65 (19.5)	0.830
Teenage mothers	0	6 (66.7)	3 (33.3)	0.497
Caesarean section	52 (21.3)	142 (58.2)	50 (20.5)	0.765
HIV-positive	12 (10.6)	95 (84.1)	6 (5.3)	<0.001
Anti-tuberculosis treatment	0	4 (80)	1 (20)	0.440
Early sepsis	2 (25.0)	3 (37.5)	3 (37.5)	0.601
Late sepsis	2 (13.3)	12 (80.0)	1 (6.7)	0.403
Resuscitation	19 (17.6)	74 (68.50)	15 (13.9)	0.024
Respiratory pathology	34 (21.7)	83 (60.55)	25 (18.25)	0.210
Birth asphyxia	7 (31.8)	13 (59.1)	2 (9.1)	0.040
Patent ductus arteriosus	1 (10)	8 (80)	1 (10)	0.177
NEC	2 (66.7)	1 (33.3)	0	0.448
NCPAP	26 (23)	70 (61.9)	17 (15.0)	0.194
Birth defect	4 (57.1)	1 (14.3)	2 (28.6)	0.050

NCPAP = nasal continuous positive airway pressure.

*p*-value <0.1 on univariate analysis were included.

If the infant required non-invasive ventilation by means of continuous positive airway pressure, the date of initiation and date of being weaned off were recorded, as during this time initiation of feeds would be delayed. Variables which were similar in nature were grouped together to facilitate analysis (e.g. hyaline membrane disease and transient tachypnoea of the newborn were classified as respiratory illness).

## Results

A total of 404 neonates were enrolled. Out of the group, 197 (48.8%) were female and 207 (51.2%) were male. The mean birth weight was 3 372 g. Of the 404 infants studied, 98 (24.0%) were very low birth weight (VLBW) and 306 (75.7%) were >1 500 g at birth. Only 94/404 (23.2%) of the total group were discharged on exclusive breastmilk, 78 (19.3%) were discharged on mixed feeding (both formula and breastmilk) and 232 (57.4%) neonates were discharged on exclusive formula milk. Various factors postulated to affect feeding choice are compared in Table 1. Significant factors found were HIV-exposed neonates, neonates who had birth asphyxia post delivery and required resuscitation, and in the VLBW group, NEC was also found to be statistically significant (Table 2).

## Discussion

Breastfeeding rates in the CMJAH neonatal unit remain unacceptably low: 42.5% of all babies discharged from the unit received breastmilk, but only 23.2% of neonates were discharged on exclusive breastmilk. Irrespective of birth weight, the preferred method of feed was still formula feeds (57.4%).

The most significant factors associated with feeding choice in the whole group were: birth asphyxia (*p*<0.040), maternal HIV status (*p*<0.001) and resuscitation (*p*<0.024). In the VLBW group, NEC was found to be significant (*p*<0.024). It is surprising that the lack of breastfeeding was not different between VLBW and bigger neonates (Table 3), as establishing breastfeeding in sick preterm neonates is more challenging than in bigger, healthier neonates.

The reasons for the very low rate of breastfeeding were not evaluated in the present study, but may relate to the fact that there was no dedicated lactation counsellor assigned to the neonatal ward and no donor breastmilk available during the study period. Establishing breastfeeding in sick and preterm neonates in a busy, understaffed neonatal unit is more effort than formula feeding, and adequate support in terms of education, dedicated staff and donor breastmilk is essential. There was also no sleep-in facility for breastfeeding mothers

**Table 2. Characteristics of feeds in VLBW**

Variables	Feeds, n (%)			p-value
	Breastmilk	Formula milk	Breastmilk and formula	
Inborn	19 (21.6)	53 (60.2)	16 (18.2)	0.744
Para 1	19 (25.0)	16 (53.3)	8 (26.7)	0.298
Gravida 1	4 (14.3)	15 (65.2)	6 (21.4)	0.135
Attended antenatal care	19 (25.0)	43 (56.6)	14 (18.4)	0.180
Caesarean section	15 (23.1)	39 (60.0)	11 (16.9)	0.856
Teenage mothers	0	2 (66.7)	1 (33.3)	0.155
HIV-positive	3 (9.4)	27 (84.4)	2 (6.3)	0.011
Anti-tuberculosis treatment	0	2 (100)	0	0.673
Early sepsis	0	1 (100)	0	0.726
Late sepsis	1 (7.7)	11 (84.6)	1 (7.7)	0.177
Cranial sonar	6 (13.0)	30 (65.2)	10 (27.1)	0.350
Resuscitation	2 (7.7)	20 (76.9)	4 (15.4)	0.099
Respiratory pathology	18 (20.0)	53 (61.6)	15 (17.4)	0.949
Birth asphyxia	-	-	-	-
Patent ductus arteriosus	0	8 (80.0)	2 (20.0)	0.367
NEC	2 (100)	0	0	0.024
NCPAP	9 (16.1)	36 (64.3)	11 (19.6)	0.106
Birth defect	0	2 (100)	0	0.524

**Table 3. Characteristics of feeds in babies >1 500 g**

Variables	Feeds, n (%)			p-value
	Breastmilk	Formula milk	Breastmilk and formula	
Inborn	59 (22.8)	143 (55.2)	57 (22.0)	0.714
Para 1	26 (25.0)	53 (51.0)	25 (24.0)	0.842
Gravida 1	19 (21.1)	50 (55.6)	21 (23.3)	0.907
Attended antenatal care	62 (23.8)	146 (55.9)	53 (20.3)	0.991
Caesarean section	36 (20.1)	102 (57.0)	41 (22.9)	0.128
Teenage mothers	0	4 (66.7)	2 (33.3)	0.383
HIV-positive	9 (11.1)	68 (84.0)	4 (4.9)	0.000
Antituberculosis treatment	0	2 (66.7)	1 (33.3)	0.635
Early sepsis	2 (28.6)	2 (28.6)	3 (42.9)	0.476
Late sepsis	1 (25.0)	2 (50.0)	1 (25.0)	0.949
Cranial sonar	2 (25.0)	2 (25.0)	4 (50.0)	0.123
Resuscitation	17 (20.5)	54 (65.1)	12 (14.5)	0.125
Respiratory pathology	22 (22.25)	55 (58.1)	19 (19.65)	0.743
Birth asphyxia	8 (36.4)	8 (36.4)	6 (27.3)	0.154
Patent ductus arteriosus	2 (50.0)	2 (50.0)	0	0.367
Necrotising enterocolitis	0	1 (100)	0	0.815
NCPAP	9 (19.1)	28 (59.6)	10 (21.3)	0.712
Birth defect	0	8 (84.3)	2 (28.6)	0.079

with sick neonates. Many of the mothers live far away and transport is expensive.

CMJAH is a tertiary obstetric referral centre and many of the mothers are ill at the time of delivery. The majority of babies requiring admission are delivered by emergency caesarean section, most often owing to pregnancy-induced hypertension. Establishing breastfeeding is more difficult in these circumstances.

It is more challenging to latch a newborn within an hour of birth and discuss feeding choices with an ill mother. The strong association with maternal HIV exposure and lack of breastfeeding may reflect reluctance on the part of health workers to promote breastfeeding in HIV-infected mothers. It may also reflect a lag in implementing a change in the feeding policy (HIV-infected mothers were provided with formula in Gauteng until early 2012). Ongoing education and training of health workers in the BFHI and provincial feeding policies is crucial.

### Study limitations

This was a retrospective study confined to evaluating the type of feeding on discharge from the CMJAH neonatal unit. Feeding choice is a complex, multifactorial issue, and many of the possible factors involved could not be investigated (as outlined above). A prospective study including various staff and maternal factors that influence feeding choice should be conducted in the unit, therefore further prospective research study is needed.

### Conclusion

Despite the fact that CMJAH is involved in the BFHI, the rates of exclusive breastfeeding were still low. Reasons for this were not studied but could include inadequate education of healthcare workers, lack of lactation counsellors, maternal illness, lack of sleep-in facilities and no donor breastmilk. Maternal factors, including previous breastfeeding experience, socioeconomic status, attendance at antenatal clinics and level of education, would also influence feeding choices, but these were beyond the scope of this study. Establishing breastfeeding in sick neonates requires a team approach with dedicated counsellors and ongoing training of healthcare workers.

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