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Multicentre prospective observational study of feeding practices in 30–33 weeks preterm infants

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Keywords:	Nutrition, Infant Feeding, Neonatology

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Manuscripts

Review Only

Multicentre prospective observational study of feeding practices in 30–33 weeks preterm infants

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ABSTRACT**Background**

Current evidence supports progressive feeding in preterm infants. Due to lower necrotising enterocolitis risk, recent studies suggest starting total enteral feeding from birth in 30–33 weeks preterm infants. The feasibility of this practice is unclear.

Aim

Explore feeding practices in 30–33 weeks preterm infants.

Design

Prospective, multicentre, observational study recruiting ten consecutive 30–33 weeks preterm infants from eight UK hospitals.

Results

Eighty infants received their first feed at median of 24 hours, achieving total and full feeds at median of 5 and 8 days, respectively. Eleven infants who achieved total enteral feeding within 24 hours after birth achieved full feeds earlier ($p=0.02$) with shorter hospital stay ($p=0.009$) but were also of older gestation.

Conclusion

Current early feeding approaches in 30–33 weeks preterm infants were found to be conservative. Total enteral feeding from birth is possible in these infants but further studies are needed.

(148 words)

KEY MESSAGES**"What is known about the subject":**

- Recent evidence suggests that earlier and rapid enteral feeding could be achieved in very preterm infants without increasing risk of necrotising enterocolitis or death.
- Compared to extremely preterm infants, there are fewer studies investigating enteral feeding practices in 30–33 weeks preterm infants who have lower necrotising enterocolitis risk.
- Two Indian studies found total enteral feeding from birth in 30–33 weeks preterm infants to be feasible and beneficial.

"What this study adds"

- Half the infants were fed on day 1, achieving total enteral (without intravenous nutrition) and full feeds ($\geq 150\text{ml/kg/day}$) by day 5 and 8, respectively.
- Eleven infants who achieved total enteral feeding by day 1 achieved full feeds earlier ($p=0.02$) with shorter hospital stay ($p=0.009$) but were of older gestation.
- Total enteral feeding from birth is potentially feasible in 30–33 weeks preterm infants in the UK but further studies are needed.

INTRODUCTION

A decision has to be made about how to feed every baby admitted for neonatal care. Conservative approaches have developed in an attempt to prevent necrotising enterocolitis (NEC) but recent meta-analyses have shown that earlier (1) and rapid (2) enteral feeding can be achieved in very preterm infants without increasing the risk of necrotising enterocolitis (NEC) or death. However, these studies concentrate on extremely preterm infants. There are very few studies investigating the early feeding of 30–33 weeks preterm infants, who have a lower risk of NEC, and represent nearly a fifth of preterm infants.

Two studies in India (3, 4) found the provision of total enteral feeding from birth in 30–33 weeks preterm infants to be feasible. Total enteral feeding from birth was defined as providing infants with exclusive enteral feeds without administering intravenous fluids. Infants given enteral feeds alone had improved feed tolerance, shorter hospital stays and reduced intravenous nutrition usage. However, the feasibility of this practice in the UK is uncertain.

AIM

We aimed to explore current feeding practices in 30–33 weeks preterm infants in the UK as well as associated mortality and morbidity (NEC and late-onset sepsis (LOS)).

METHODS

Prospective, multicentre observational study, in ten consecutive 30+0 to 33+6 weeks preterm infants, born and cared for in each of the 8 participating UK neonatal units from July–August 2016. Infants were excluded if they had conditions that made enteral feeding unsafe (e.g. trachea-oesophageal fistula). Feeding data were collected until full feeds was achieved (defined as ≥ 150 ml/kg/day for 3 days). Total enteral feeding was defined as receiving only enteral feeds without

any intravenous nutrition. LOS was defined as sepsis presenting >72 hours after birth requiring ≥ 5 days of intravenous antibiotics. NEC was defined as condition meeting the Stage 2 or 3 of the modified Bell's criteria.

Categorical and continuous data were presented as number of infants (percentage) and median (Interquartile range, IQR) respectively. Growth parameters were presented as mean \pm standard deviation (SD) with Z scores calculated using LMSgrowth 2012 (<http://www.healthforallchildren.co.uk/>). A priori analyses by gestational age and whether total enteral feeding was achieved within 24 hours after birth were performed. Mann-Whitney and chi-squared tests were used to compare continuous and categorical data, respectively. The Jonckheere-Terpstra test was used to compare trends among medians of multiple groups with an ordered pattern.

RESULTS

Demographics

Eighty infants were recruited from seven lead (Birmingham, Bristol, King's College London, Leeds, Newcastle, Nottingham and Sheffield) and one local (Worcestershire) units. The median (IQR) gestational age was 32+3 (31+1–33+0) weeks and mean (SD) for birthweight as well as head circumference were 1728 (382) g and 29.3 (1.9) cm, respectively. There were 41 (51%) males, 5 (13%) sets of twins, and 1 (4%) set of triplets. One infant died and her data up to day of death had been included.

Enteral feeding practices

Infants received their first feed at a median (IQR) of 24 (11–43) hours of age. Forty-two (53%), two (3%) and thirty-two (40%) infants received maternal breastmilk, donor breastmilk and formula milk, respectively as their first feed. The type of milk received was not specified in 4 (5%) infants. Waiting for breastmilk was reported as the reason for delay in starting feeds in 43 (54%) infants (**Table 1**).

Table 1: Reason reported for the delay in starting enteral feeds from birth in eighty 30 – 33 weeks preterm infants in the multicenter prospective observational study.

* Infants may have more than one reason.

Reason*	Number of Infants (%)
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Absent umbilical artery end diastolic flow on antenatal scans	5 (6%)
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Others	4 (5%)

Feeds were increased at a median (IQR) rate of 24 (17–32) ml/kg/day, achieving full feeds on a median (IQR) of 8 (6–11) days. A median (IQR) of 5 (2–9) days of intravenous nutrition was given.

Thirty-one (39%) infants had central venous access.

Outcome

79 infants survived to discharge from hospital which was at a median (IQR) of 26 (16–39) days. Two (3%) infants developed NEC. One infant, from a set of twins born at 31+5 weeks gestation died at 5 days of age. She was enterally fed up to 45ml/kg/day on day 3 when she developed stage 3 NEC. The other was an infant born at 30+1 weeks gestation who developed Stage 2 NEC at 14 days of age after tolerating full enteral feeds for four days. His NEC was managed conservatively.

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34 **DISCUSSION**

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32 33 34 **CONCLUSION**

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8 9 10 **COMPETING INTEREST**

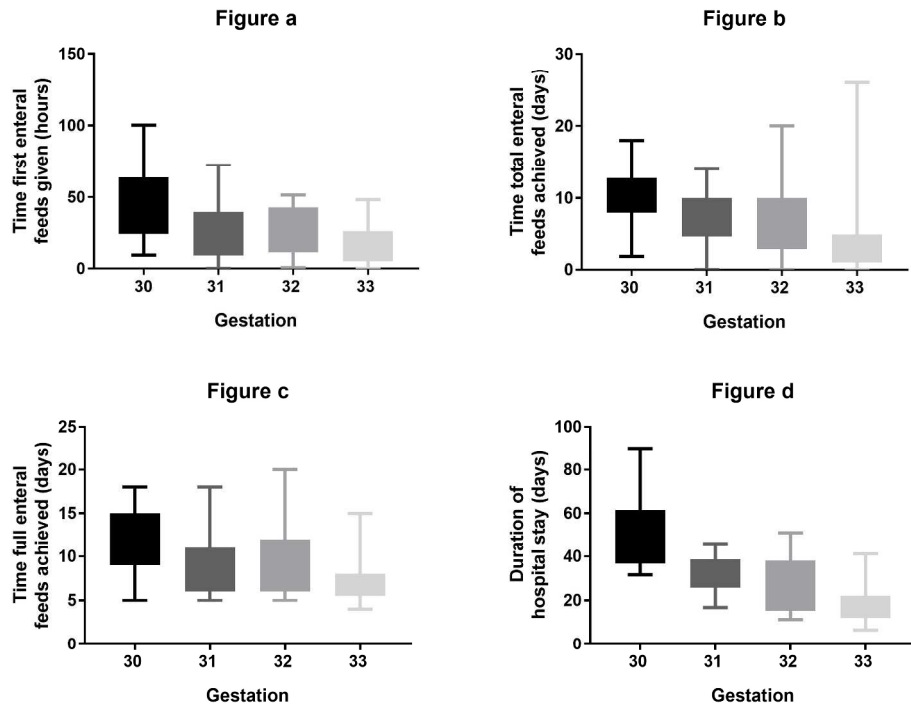
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12 None declared.
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15 16 17 **FUNDING**

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12 No ethical approval was sought as this was purely an observational study exploring feeding practices
13 in 30–33 weeks preterm infants in eight neonatal units across the UK. There was no new
14 intervention proposed as part of the study. Each participating unit was advised to register the work
15 with their local audit department.
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79 infants survived to discharge from hospital which was at a median (IQR) of 26 (16–39) days. Two (3%) infants developed NEC. One infant was from a set of twins born at 31+5 weeks gestation

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7 surgical findings on day 3 of age. Unfortunately, she died 2 days later. Her twin brother was born just
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9 above the 25th centile for birthweight. He did not develop NEC despite being managed similarly.
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14 The other was an infant born at 30+1 weeks gestation, weighing 50th centile for birthweight. He
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38 However, our study was limited by a small sample size and the results were likely to be confounded
39 by gestational age. This was because infants who were totally enterally fed within 24 hours after
40 birth were also of higher gestational age. Mature infants were more likely to be given total enteral
41 feeding, tolerate milk feeds, and be discharged sooner with lower risk of complications.
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49 Hence, an adequately powered pragmatic randomised controlled trial is needed to assess whether
50 providing total enteral feeding from birth in 30–33 weeks preterm infants improves outcomes and
51 reduces hospital stay without increasing the risk of NEC in the UK. The trial would require a clear
52 pathway to obtain parental consent and to allow deviation from study protocol for medical needs.
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58 The trial is needed to re-evaluate current enteral feeding practices and enhance understanding of
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3 enteral feeding physiology in moderate preterm infants which may differ from early preterm infants.
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5 This is crucial as total enteral feeding from birth may also be beneficial in resource rich settings like
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7 the UK. It may prevent unnecessary use of intravenous nutrition and venous access which are
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9 associated with infection and metabolic complications. It may also improve maternal-infant bonding
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11 experience by reducing the time of maternal-infant separation through earlier establishment of
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16 17 18 **CONCLUSION**

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46 47 48 **COMPETING INTEREST**

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50 None declared.
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53 54 55 **FUNDING**

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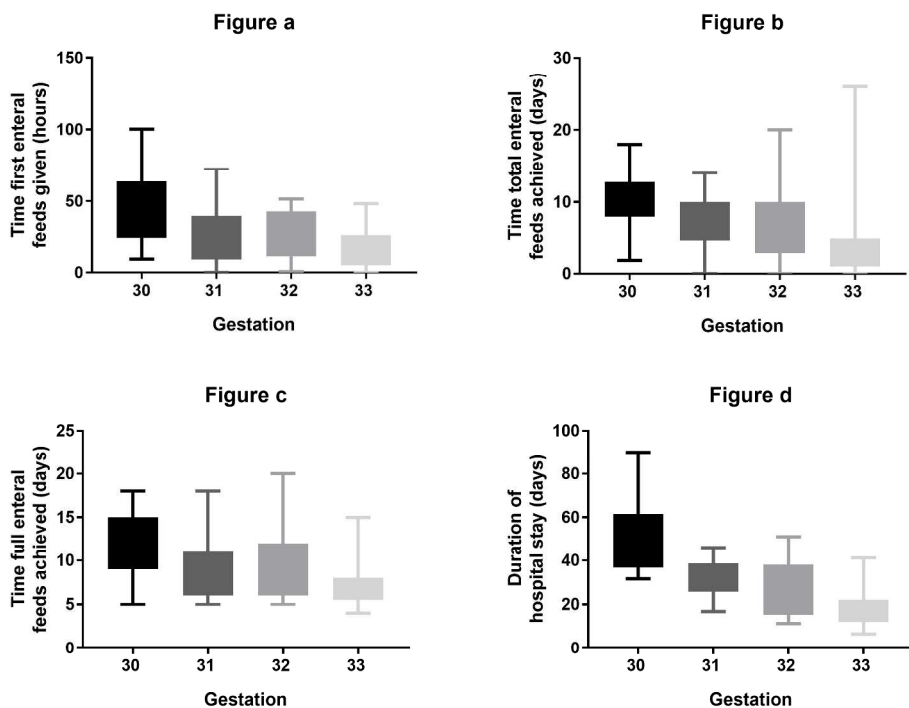
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3 **Figure 1: Box and whisker plots depicting the time first enteral feed (a), time total enteral feeds**
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5 **achieved (b) time full enteral feeds achieved (c) and duration of hospital stay (d) in infants at 30-33**
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7 **completed weeks of gestation at birth.**

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9 The box represents the interquartile range, while the whiskers represent the minimum and
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11 maximum values.
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13 14 15 16 **REFERENCES**

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