



# intestinal perforation in preterm neonates < 32 weeks' gestation within the first 10 days of life: risk factors and outcomes

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## Background

- Single center clinical experience showed an increasing incidence of necrotizing enterocolitis(NEC) in preterm neonates < 32 weeks of age.
- Risk factors, clinical characteristics, radiological features and histopathological findings of this population with early NEC are not well described in the literature.
- There is a paucity of data on functional gut outcomes - duration of NPO, TPN, time taken to establish full feeds, time taken to establish a growth trajectory, need for extra calories and motility agents for preterm infants with spontaneous intestinal perforation (SIP) and necrotizing enterocolitis

## Objectives

- Characterize the risk factors, clinical, radiological, and histological features of preterm infants with SIP and NEC in the first 10 days of life
- Compare the nutrition and growth characteristics as well as long-term outcomes of the two patient populations

## Methods

- 9-year single-center retrospective study from April 1, 2013, to March 31, 2022.
- Preterm infants < 32 weeks' gestation admitted to the Neonatal Intensive Care Unit (NICU) at McMaster Children's Hospital who had a spontaneous intestinal perforation, NEC, NEC requiring surgery within the first 10 days of life were included.
- Baseline demographic data, clinical and radiological profiles, functional gut function, and long-term outcome data were collected.
- Mann-Whitney U test and Fischer's exact test were used for comparing continuous and categorical variables across the two groups.

## Results

Table 1: Demographic characteristics and risk factors

	NEC (n= 29)	SIP (n= 22)	P value
Gestational age in weeks	26.01 ±2.81	26.45 ±2.47	0.335
Birth weight in grams	949.6 ±344	883.3 ±303	0.309
Apgar score @5 minutes	7 (4.75, 8)	7 (6, 8)	0.905
Chorioamnionitis	12 (41.4%)	4 (18.2%)	0.077
FGR	2 (6.9%)	3 (18.8%)	0.33
Abnormal dopplers	1/29 (3.4%)	3/16 (18.8%)	0.08
Culture positive sepsis in first 10 days	9 (52.9%)	6 (50%)	0.876
Indomethacin/ ibuprofen exposure	11 (37.9%)	12 (54.5%)	0.267
Surgical treatment of PDA	1 (3.4%)	2 (9.1%)	0.396
Inotropes within the first 10 days	15 (51.7%)	12 (54.5%)	0.842
Hydrocortisone within the first 10 days	7 (24.1%)	6 (27.3%)	0.799
Umbilical arterial catheter insertion	6 (20.7%)	8 (36.4%)	0.214
Age of first surgical intervention	9 (6, 10)	6.5 (5, 8)	<b>0.016</b>
Penrose drain insertion as initial surgical intervention	8 (27.6%)	11 (50%)	0.101
Exploratory laparotomy as initial surgical intervention	17 (58.6%)	9 (40.9%)	0.21
Total number of surgical interventions	2 (1, 3)	2 (1, 2)	0.266

Table 2: Clinical profile

	NEC (n= 29)	SIP (n= 20)	P value
Clinical features			
- Gastric aspirates	12 (41.4%)	10 (50%)	0.551
- Abdominal distension	19 (65.5%)	13 (65%)	0.97
- Abdominal discoloration	4 (13.8%)	7 (35%)	0.08
- Decreased BS	5 (17.2%)	1 (5%)	0.199
- Blood in stools	3 (10.3%)	0 (0%)	0.26
- Abdominal tenderness	5 (17.2%)	1 (5%)	0.379
- Brady-Desat spells	7 (24.1%)	4 (20%)	1
- Lethargy	5 (17.2%)	0 (0%)	0.07
- HD instability	7 (24.1%)	4 (20%)	1
- Metab acidosis	10 (34.5%)	3 (15%)	0.129
Radiographic features	(n= 29)	(n= 21)	
- Pneumatosis intestinalis	11 (37.9%)	0 (0%)	<b>0.001</b>
- Portal venous gas	2 (6.9%)	1 (4.8%)	1
- Dilated bowel loops	6 (20.7%)	5 (23.8%)	1
- Pneumoperitoneum	13 (44.8%)	20 (95.2%)	<b>0.000</b>
Histopathological findings	(n= 17)	(n= 8)	
- Necrosis	8 (47.1%)	5 (62.5%)	0.673
- Inflammation	12 (70.6%)	7 (87.5%)	0.624
- Hemorrhage	5 (29.4%)	3 (37.5%)	1

## Results

Table 3: Outcomes

	NEC (n= 29)	SIP (n= 22)	P value
Time to full feeds (150 ml/kg/day)	48.5 (27, 102.25)	35.5 (27.5, 44.75)	0.251
Time to full fortified feeds	51.5 (29.5, 87.5)	36 (26, 43)	0.11
Duration of NPO	20 (8, 33)	16 (12, 22)	0.381
Duration of TPN	52 (12, 113)	38 (21, 49)	0.455
Median days to grow 20-30g off PN (n=15)	71 (30.5, 124)	36 (30, 43)	0.09
Supp PN for growth	5/18 (27.8%)	1/17 (5.9%)	0.09
Extra cals >24 kcal/oz	9/18 (50%)	10/14 (71.4%)	0.22
Total bili (n=24)	73 (47.5, 90.25)	85 (59, 140.5)	0.17
Direct (n=24)	33 (11.8, 58.5)	32 (11, 86.85)	0.68
>34µmol/L	12/24 (50%)	8/19 (42.1%)	0.61
Use of Ursodiol	1 (3.4%)	5 (22.7%)	<b>0.034</b>
Use of PPI	8 (27.6%)	10 (45.5%)	0.186
Use of motility agents	4 (13.8%)	8 (36.4%)	0.06
Ostomies	19/27 (70.4%)	10/21 (47.6%)	0.11
Surgical resection	23/27 (85.2%)	14/21 (66.7%)	0.13
G tube	2/27 (7.4%)	1/21 (4.8%)	0.71
Duration of central line insertion days	46 (14, 103)	35.5 (19, 70.75)	0.568
Culture positive sepsis post 10 days	8 (27.6%)	6 (27.3%)	0.937
IVH ≥ Grade 2	12(41.4%)	7(31.8%)	0.484
BPD	13(44.8%)	14(63.6%)	0.183
ROP requiring treatment	10(34.5%)	13(59.1%)	0.06
Length of stay	92 (14, 153)	101 (44.25, 150.5)	0.805
Mortality	11 (37.9%)	4 (18.2%)	0.125

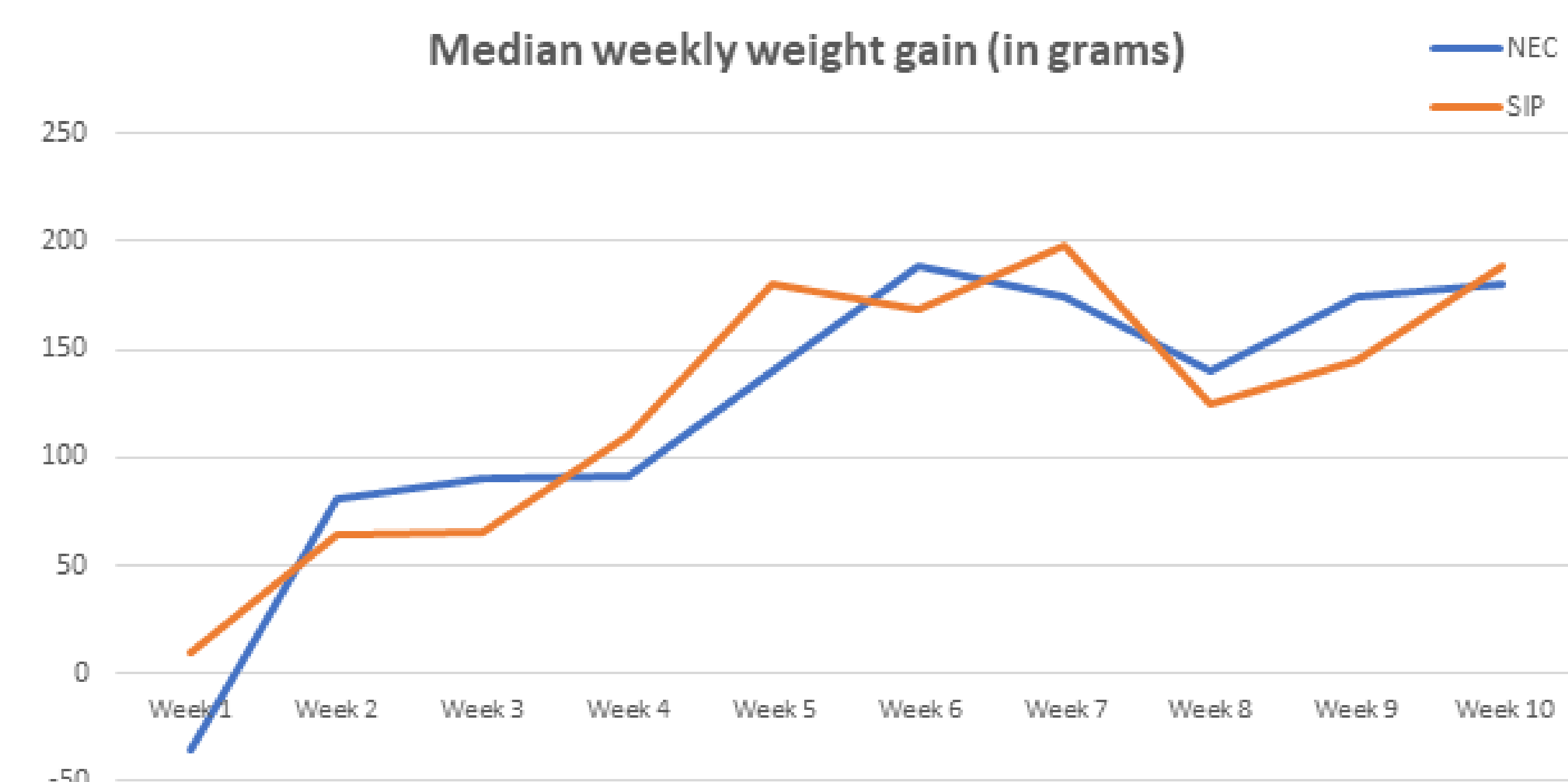


Figure 1a: Weekly median weight gain in grams

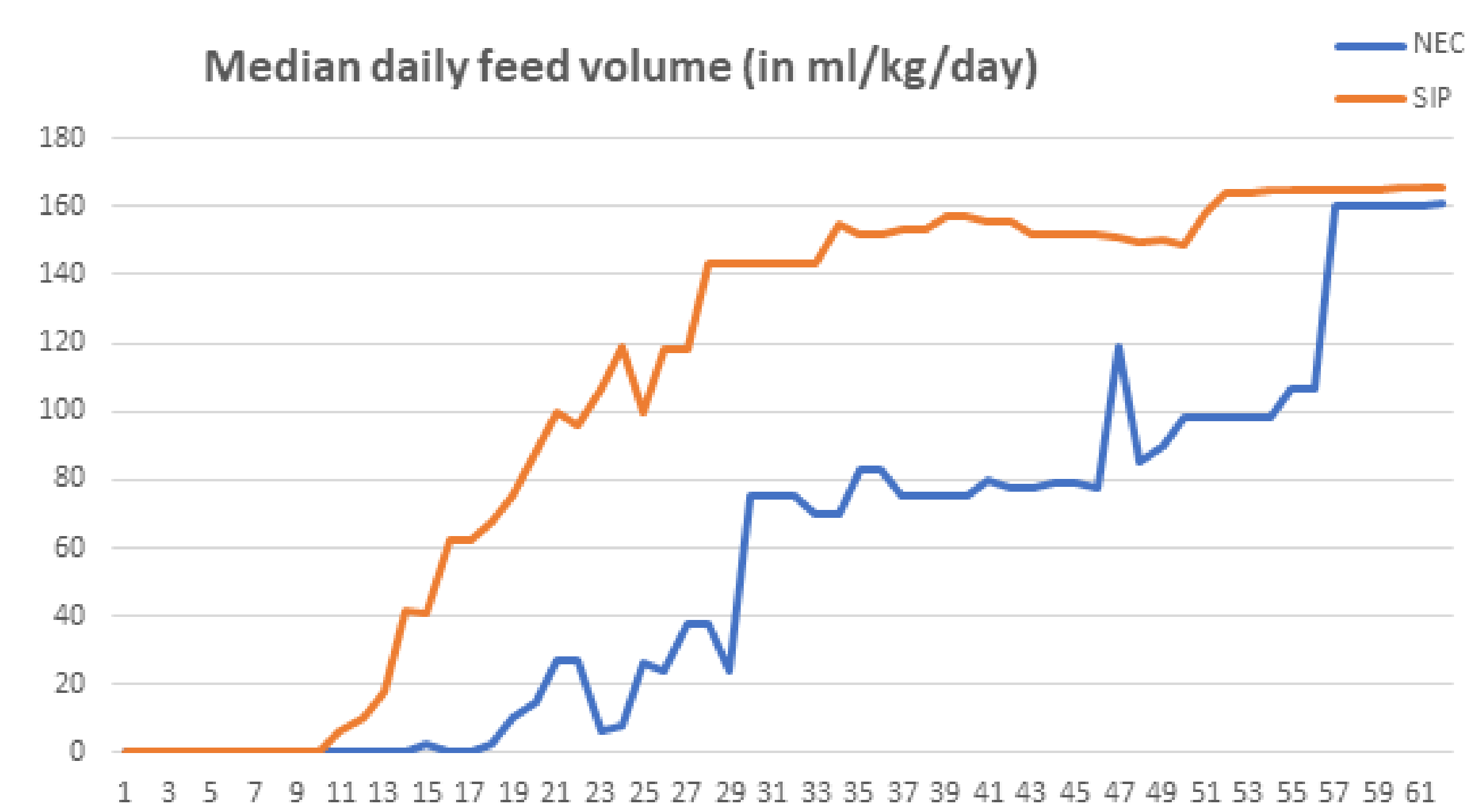


Figure 1b: Daily median feed volume in ml/kg/day over 2 months post diagnosis

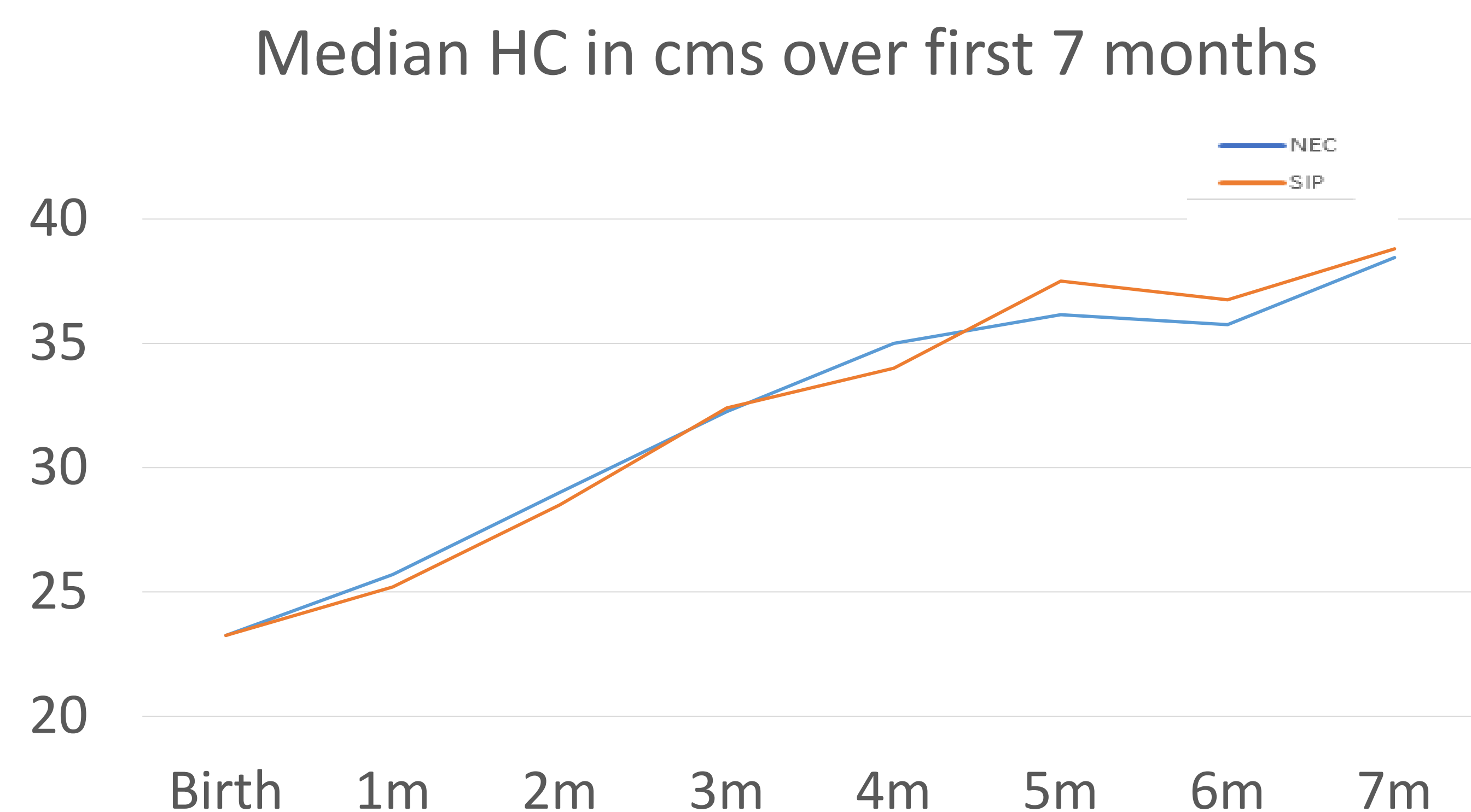


Fig 1c: Monthly median head circumference in cms over the first 7 months

## Conclusions

Although SIP is considered a benign gastrointestinal condition with favorable outcomes in neonates, our single-center comparative data showed that NEC and SIP had comparable nutrition and growth outcomes in preterm neonates.