

The growth rates and influencing factors of preterm and full-term infants

A birth cohort study

Xiong Zhonggui, PhD^{a,*} , Zhang Ping, MD^a, Ke Jian, MD^a, Sun Feimin, MD^b, Xia Zeyuan, MD^b

Abstract

This study aimed to explore the growth rates and influencing factors of the length and weight of preterm and full-term infants in the urban areas of Hubei province to provide a reference for child health and related clinical fields. A birth cohort study was used to analyze the growth rates and influencing factors of the length and weight of preterm and full-term infants using a multivariate regression analysis. The growth rates of the length and weight of preterm infants were significantly lower than those of full-term infants from birth to 3 months of age ($P < .05$), and gradually caught up to the level of full-term infants after 3 months of age ($P > .05$). Meanwhile, there were some influencing factors that had significant differences by their contribution to the growth rates of the length and weight of preterm and full-term infants. This study proposed that perinatal factors were attached more importance to the growth rates of preterm infants in the urban areas of Hubei province.

Abbreviations: 95% CI = 95% confidence interval, GH = growth hormone, IGF-1 = insulin-like growth factor-1, IGFBP-3 = insulin-like growth factor binding protein-3, SD = standard deviation, VIF = variance inflation factor.

Keywords: growth velocity, length, longitudinal study, risk factor, weight

1. Introduction

Longitudinal follow-up of infant growth rates involves conducting regular physical measurements to screen high-risk infants who deviate from the normal trajectory of growth and development. A comprehensive understanding of optimal postnatal growth is of critical importance for improving survival and long-term outcomes in preterm and full-term infants.^[1]

Many international studies have shown that infant growth rates are a nonlinear and significant variation which is a series of alternating processes of rapid growth and stagnation. Based on a global multicenter study, the World Health Organization collected a large sample of longitudinal data of children from 0 to 24 months and cross-sectional data of children from 18 to 60 months to establish the international parameters of the ideal growth rates in 2006.^[2] Subsequently, the INTERGROWTH-21st Project collected a large sample of longitudinal data of children from 0 to 24 months to establish the international references of the growth rates in 2018.^[3]

However, the growth pattern of preterm infants is significantly different from that of full-term infants at different ages of life.^[4] Some previous studies mainly adopted a cross-sectional design which was not suitable for exploring the growth rates

of preterm and full-term infants. Furthermore, longitudinal follow-up has seldom been used to determine the growth rates and influencing factors of preterm and full-term infants. Hence, the dramatic effects of perinatal factors on the growth rate of preterm and full-term infants should be considered to prevent growth retardation.

Therefore, we constructed longitudinal data from a specific birth cohort of singleton preterm and full-term infants during the first year of life. Based on longitudinal data, perinatal factors were paid more importance to the growth rates of preterm infants. Hence, this study aimed to explore the growth rates and influencing factors of the length and weight of preterm and full-term infants and to take effective intervention measures to promote infant growth and development.

2. Material and Methods

2.1. Study subjects

The subjects in this study, a total of 198 paired preterm and full-term infants (102 boys and 96 girls), were enrolled in the Maternal and Child Health Hospital of Hubei Province, Jingzhou City, and Shiyan City from January 2019 to June

This study was supported by the Maternal-Infant Nutrition and Health Research Project, the National Center for Women and Children's Health of the Chinese Center for Disease Control and Prevention (project no.: 2020FYH009).

The authors have no conflict of interest to disclose.

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request and are publicly available.

The funder had no role in the study design, data collection and analysis, decision to publish, or manuscript preparation.

^a Department of Child health, Maternal and Child Health Hospital of Hubei Province, Wuhan, China, ^b Medical College, Wuhan University of Science and Technology, Wuhan, China.

*Correspondence: Xiong Zhonggui, Department of Child Health, Maternal and Child Health Hospital of Hubei Province, 745 Wuluo Road, Hongshan District, Wuhan City 430070, China (e-mail: xiongzonggui@hbfc.com).

Copyright © 2022 the Author(s). Published by Wolters Kluwer Health, Inc.

This is an open-access article distributed under the terms of the Creative Commons Attribution-Non Commercial License 4.0 (CCBY-NC), where it is permissible to download, share, remix, transform, and buildup the work provided it is properly cited. The work cannot be used commercially without permission from the journal.

How to cite this article: Zhonggui X, Ping Z, Jian K, Feimin S, Zeyuan X. The growth rates and influencing factors of preterm and full-term infants: A birth cohort study. Medicine 2022;101:34(e30262).

Received: 18 May 2022 / Received in final form: 14 July 2022 / Accepted: 15 July 2022

<http://dx.doi.org/10.1097/MD.00000000000030262>

2020. All subjects were Han Chinese in the urban areas of Hubei province. Hence, a birth cohort study was used in this scientific design. The matching conditions were preterm and full-term infants of the same gender, the same age (no more than ± 7 days), the same residential community, and the same healthy status.

In this study, the inclusion criteria were singleton live births of preterm infants with gestational ages of 24^{+0} to 36^{+6} weeks in the case group, and full-term infants with gestational ages of 37^{+0} to 42^{+6} weeks in the control group. Meanwhile, the exclusion criteria were as follows: twin or multiple; assisted reproduction; severe congenital malformations and genetic metabolic diseases at birth; foreigners whose parents were non-Chinese; maternal height < 145 cm; maternal age < 18 years, or > 40 years; mothers who had sustained smoking, alcoholism, and/or drug dependence during pregnancy; mothers who had taken some adrenocortical hormones, or immunosuppressants continuously for >1 month during pregnancy; mothers had severe anemia (hemoglobin <60 g/L), diabetes, preeclampsia, eclampsia, hyperthyroidism or hypothyroidism, heart and kidney insufficiency, or chronic hypertension during pregnancy.^[5]

2.2. Clinical observation

Longitudinal follow-up data were collected regularly from routine health visits for preterm and full-term infants. Child health physicians or pediatricians who conducted professional training regularly monitored the length and weight of preterm and full-term infants at birth, and at 1, 3, 6, 9, and 12 months of age using the standard method of physical measurements. During the follow-up period, there were 6 monitoring times in total: the first monitoring time was conducted within 24 hours after birth (completed by provincial and municipal delivery institutions), and the other monitoring times were conducted at the corresponding points of physical measurements (completed by provincial and municipal maternal and child health institutions). The length and weight of preterm and full-term infants were measured in a supine position by using a height/weight measuring appliance (Kangwa, Wuhan, China; length range 30 to 105 cm with digit counter readings precise to 0.1 cm, and weight range 0 to 60 kg with digit counter readings precise to 0.01 kg). Finally, the length and weight of preterm and full-term infants were calculated as the average values of the 2 physical measurements.

2.3. Epidemiological investigation

Influencing factor data were also regularly collected from routine health visits for preterm and full-term infants. Child health physicians or pediatricians who conducted professional training investigated infant parents or guardians regarding the influencing factors of preterm and full-term infants using a self-designed questionnaire. The survey contents of the influencing factors were as follows: general demographic data, such as infant name, gender, and age; parental height, occupation, education level, family upbringing mode, environmental structure, economic status, and other family conditions; maternal smoking, drinking, drug dependence, assisted reproduction, gestational weeks, delivery pattern, and other perinatal conditions during pregnancy; infant birth length, birth weight, Apgar score, feeding pattern, supplementary food addition, and other nutritional conditions; previous infant health status and family disease history.

2.4. Quality control

Strict measures of quality control were adopted in accordance with the implementation plan of this study. The survey

methods for quality control were as follows: the height/weight measuring appliance was inspected annually according to the national standard, and professional evaluation and verification were conducted before the clinical observation of the height and weight of preterm and full-term infants; 2 investigators measured each infant twice in line with the standardized methods of physical measurements. The errors of the length and weight in the 2 measurements were no >0.1 cm and 0.01 kg, respectively. The third measurement was conducted if the errors in the 2 measurements exceeded the allowable ranges of the length and weight. Finally, only 2 measurements were recorded on a registration form if the errors of the corresponding measurements were within the allowable ranges of the length and weight; the technical guidance group regularly conducted on-site supervision and inspection to evaluate the standard methods of physical measurements; all investigation cards were subjected to preliminary review and reexamination after physical measurements. Only investigation cards that were confirmed to be correct could be regarded as the qualified cards; the lost follow-up rate of all subjects was controlled within 10%.

2.5. Ethics statement

This study was conducted in accordance with the Declaration of Helsinki guidelines. The study protocol was approved by the Ethics Committee of the Maternal and Child Health Hospital of Hubei Province. Meanwhile, informed written consent was obtained from all parents or guardians of preterm and full-term infants.

2.6. Statistical analysis

Epidata 4.4 (Epidata Association, Odense, Denmark) was used to establish the related database, and SPSS 20.0 (IBM Corp., Armonk, NY) was used to conduct the logic check and statistical analysis. The growth rates of the length and weight of preterm and full-term infants were in accordance with the normal distribution of quantitative data.

In descriptive analysis, the growth rate of the length or weight was defined as follows: the growth rate = $X_i - X_{i-1}$, $M_i - M_{i-1}$, where X_i was the absolute value of the length or weight of a certain age group, X_{i-1} was the absolute value of the length or weight of the adjacent previous age group, M_i was a certain age group, and M_{i-1} was the adjacent previous age group. The differences in the growth rates between preterm and full-term infants were expressed as the mean and 95% confidence interval (95% CI).

Based on descriptive analysis, a 1:1 paired t test was used for the growth rate of the length or weight between preterm and full-term infants, and the significance test level was set at $P < .05$. Furthermore, taking y (length or weight) as a dependent variable and x_i as an independent variable, a multivariate regression analysis was used for the influencing factors between preterm and full-term infants, and the significance test level was set at $P < .05$.

3. Results

3.1. Baseline characteristics

Of the 216 study participants (110 boys and 106 girls), 18 were lost to preterm and full-term infants (8 boys and 10 girls), and the missing follow-up rate was 8.33% in the longitudinal follow-up study.

3.2. Growth rate of the length

The growth rate of the length of preterm infants was significantly lower than that of full-term infants from birth to 3

months ($P < .05$). With the increase of age, there was no significant difference in the growth rate of the length between preterm and full-term infants from 3 to 12 months ($P > .05$). It was suggested that the length of preterm infants showed catch-up growth after 3 months of age, and gradually reached the level of full-term infants, as shown in Tables 1 and 2.

3.3. Growth rate of the weight

The growth rate of the weight of preterm infants was significantly lower than that of full-term infants from birth to 3 months ($P < .05$). With the increase of age, there was no significant difference in the growth rate of the weight between preterm

and full-term infants from 3 to 12 months ($P > .05$). It was suggested that the weight of preterm infants showed catch-up growth after 3 months of age, and gradually attained the level of full-term infants, as shown in Tables 3 and 4.

3.4. Influencing factors of the growth rate of the length

Taking y (length) as the dependent variable, and x_i (5 factors) as the independent variables, there were 2 positive variables of gestational weeks and birth length, and 2 negative variables of gender and delivery times, which had the significant differences in their contribution to the growth rate of the length of preterm infants, as demonstrated in Table 5.

Table 1
Growth rate of male infants by age-specific length (cm).

Age (mo)	Growth rate (cm/m)		Difference		t	P
	Preterm	Full term	Mean (95% CI)	SD		
Birth-	3.61	4.95	-1.34 (-1.71 to -0.97)	0.37	3.585	<.01
1-	3.22	3.72	-0.50 (-0.73 to -0.27)	0.23	2.246	<.05
3-	1.98	2.14	-0.16 (-0.27 to -0.05)	0.11	1.444	>.05
6-	1.30	1.42	-0.12 (-0.20 to -0.04)	0.08	1.516	>.05
9-12	1.12	1.19	-0.07 (-0.18 to 0.04)	0.11	0.626	>.05

Growth rate: absolute values of the length increase per month. Difference: mean of the growth rate of the length between preterm and full-term infants. 95% CI = 95% confidence interval, SD = standard deviation.

Table 2
Growth rate of female infants by age-specific length (cm).

Age (mo)	Growth rate (cm/m)		Difference		t	P
	Preterm	Full term	Mean (95% CI)	SD		
Birth-	3.51	4.78	-1.27 (-1.62 to -0.92)	0.35	2.914	<.01
1-	2.86	3.34	-0.48 (-0.67 to -0.29)	0.19	2.379	<.05
3-	1.92	2.07	-0.15 (-0.26 to -0.04)	0.11	1.770	>.05
6-	1.30	1.42	-0.12 (-0.19 to -0.05)	0.07	1.142	>.05
9-12	1.22	1.29	-0.07 (-0.18 to 0.04)	0.11	0.428	>.05

Growth rate: absolute values of the length increase per month. Difference: mean of the growth rate of the length between preterm and full-term infants. 95% CI = 95% confidence interval, SD = standard deviation.

Table 3
Growth rate of male infants by age-specific weight (kg).

Age (mo)	Growth rate (kg/m)		Difference		t	P
	Preterm	Full term	Mean (95% CI)	SD		
Birth-	1.05	1.32	-0.27 (-1.00 to -0.46)	0.73	3.704	<.01
1-	0.93	1.19	-0.26 (-0.70 to -0.18)	0.44	2.389	<.05
3-	0.48	0.54	-0.06 (-0.33 to -0.21)	0.27	1.293	>.05
6-	0.26	0.33	-0.07 (-0.40 to -0.26)	0.33	1.230	>.05
9-12	0.29	0.31	-0.02 (-0.27 to -0.23)	0.25	0.376	>.05

Growth rate: absolute values of the weight increase per month. Difference: mean of the growth rate of the weight between preterm and full-term infants. 95% CI = 95% confidence interval, SD = standard deviation.

Table 4
Growth rate of female infants by age-specific weight (kg).

Age (mo)	Growth rate (kg/m)		Difference		t	P
	Preterm	Full term	Mean (95% CI)	SD		
Birth-	1.04	1.27	-0.23 (-1.01 to -0.55)	0.78	3.056	<.01
1~	0.89	1.15	-0.26 (-0.70 to -0.18)	0.44	2.775	<.05
3~	0.47	0.53	-0.06 (-0.34 to -0.22)	0.28	2.365	>.05
6~	0.23	0.30	-0.07 (-0.35 to -0.21)	0.28	1.884	>.05
9~12	0.24	0.28	-0.04 (-0.25 to -0.17)	0.21	1.103	>.05

Growth rate: absolute values of the weight increase per month. Difference: mean of the growth rate of weight between preterm and full-term infants. 95% CI = 95% confidence interval, SD = standard deviation.

Table 5**Influencing factors of the growth rate of infants by age-specific length (cm).**

Model	Nonstandardized coefficient		Standardized coefficient			Collinearity statistics	
	B	SD	B	t	P	δ	VIF
Constant	-7.361	.624		-11.806	.000		
Group	-.113	.037	-.101	-3.031	.003	.870	1.150
Gender	-.132	.045	-.116	-2.954	.004	.993	1.007
Delivery times	-.069	.036	-.061	-2.944	.043	.976	1.024
Gestational weeks	.064	.013	.210	4.893	.000	.522	1.915
Birth length	.167	.012	.636	13.898	.000	.462	2.166

B = coefficient, SD = standard deviation, δ = tolerance error, VIF = variance inflation factor.**Table 6****Influencing factors of the growth rate of infants by age-specific weight (kg).**

Model	Nonstandardized coefficient		Standardized coefficient			Collinearity statistics	
	B	SD	B	t	P	δ	VIF
Constant	35.315	1.950		18.116	.000		
Group	-.249	.140	-.058	-2.776	.047	.855	1.170
Delivery times	-1.103	.417	-.087	-2.646	.009	.864	1.157
Pregnancy-induced hypertension syndrome	-1.017	.358	-.088	-2.841	.005	.965	1.036
Gestational weeks	.241	.049	.206	4.932	.000	.529	1.889
Birth weight	.002	.000	.615	14.216	.000	.495	2.022

B = coefficient, SD = standard deviation, δ = tolerance error, VIF = variance inflation factor.

3.5. Influencing factors of the growth rate of the weight

Taking y (weight) as the dependent variable, and x_i (5 factors) as the independent variables, there were 2 positive variables of gestational week and birth weight, and 2 negative variables for delivery times and pregnancy-induced hypertension syndrome, which had the significant differences in their contribution to the growth rate of the weight of preterm infants, as demonstrated in Table 6.

4. Discussion

In recent years, the life quality of preterm infants has remarkably improved with the continuous development of healthy conditions and close cooperation between obstetrics and pediatrics.^[6] Relevant research has shown that there is a vital “opportunity window” for the growth rates of preterm infants within 2 to 3 months of corrected age, which will play an extremely important role in future growth and development. According to the recommendation of the American Academy of Pediatrics, the physiological functions of various organ systems in preterm infants are not mature enough after birth. The goal of the growth rates of preterm infants is to approach the growth rates of full-term infants in the first year of life. However, the growth rates of preterm infants are significantly different from those of full-term infants because preterm infants are prone to cumulative malnutrition and growth restriction.^[7] Therefore, continuous monitoring of the growth rates of preterm infants is a critical field in pediatric clinics and child health.^[8,9]

Most scholars believe that birth length and birth weight are positively correlated with the growth rates of the length and weight of preterm and full-term infants.^[10] Birth length is the main indicator for fetal linear growth, which is closely related to infant growth retardation. Meanwhile, birth weight is the common index for fetal nutritional status, which is also correlated with infant cumulative malnutrition.^[11] The research results of Vieira et al showed that the correlation between birth length and growth retardation or adult short stature in preterm infants was significantly higher than that in full-term infants. For example, the risk of adult short stature in preterm infants with a birth

length <-2 SD was 7 times higher than that in full-term infants. Simultaneously, the risk of adult short stature in preterm infants with a birth weight <-2 SD was 4 times higher than that in full-term infants. In other words, it was suggested that birth length and birth weight played an important role in the growth rates of preterm and full-term infants.^[12]

The growth trajectories of the length and weight of preterm infants were obviously different from those of full-term infants from birth to 3 months of age.^[13] This study showed that the growth rates of the length and weight of preterm infants were significantly lower than those of full-term infants from birth to 3 months of age. Toftlund et al^[14] also reported that the catch-up growth of preterm infants mainly occurred from birth to 3 months of age.^[15] With regard to the catch-up growth, Amissahr et al showed that the advent of preterm formula or breast milk fortifiers might be helpful in a more customized approach to the growth rates of preterm infants. Consequently, preterm infants could reasonably supplement additional calories to present an obvious trend of catch-up growth.^[16] Relevant studies have shown that some minerals, such as zinc, copper, iron, and magnesium, regulated heat metabolism through the oxidative phosphorylation pathway, which could significantly promote the growth rates of preterm infants.^[17]

However, the growth trajectories of the length and weight of preterm infants were rather close to those of full-term infants after 3 months of age.^[18] This study showed that the growth rates of the length and weight of preterm infants gradually reached the level of full-term infants after 3 months of age. Arora et al^[19] reported that there was no significant difference in the growth rates between preterm and full-term infants after 3 months of age. It depended on continuous breastfeeding and timely addition of weaning food after 6 months of age. Therefore, Continuous breastfeeding and timely weaning food could effectively accelerate the growth rates, and control the potential risk of adult diseases in preterm infants.^[20]

During the first year of life, there were significant differences in the growth rates of the length and weight of preterm and full-term infants at different stages.^[21] Specifically, the growth rates of preterm and full-term infants have been attributed to the regulatory mechanism of growth hormone, insulin-like

growth factor-1 (IGF-1), and insulin-like growth factor binding protein-3 (IGFBP-3). As for the regulatory mechanism, growth hormone was an important regulator for the growth rates of preterm infants in a pulsed pattern, and IGF-1 formed a complex with IGFBP-3 which was closely related to the growth rates of preterm infants. Amina et al reported that the serum levels of IGF-I and IGFBP-3 in preterm infants were lower than those in full-term infants ($P < .001$). However, the serum levels of IGF-I and IGFBP-3 expressed the first secretion peak after 2 to 3 months of age, and then showed a slow downward trend in preterm infants.^[22] Consequently, the serum levels of IGF-I and IGFBP-3 were closely related to the growth rates of the length and weight of preterm and full-term infants.

Based on this study, perinatal factors were attached more importance to the growth rates of preterm infants from birth to 3 months of age.^[23] This study also demonstrated that there were some variables of birth length, birth weight, gestational weeks, delivery times, and pregnancy-induced hypertension syndrome which were the influencing factors by their contribution to the growth rates of preterm infants. Zhang et al^[24] revealed that perinatal factors were related to the growth rates of preterm infants. Besides gene polymorphisms, various perinatal factors jointly participated in the regulation mechanism of IGF-1 and IGFBP-3, which finally resulted in intrauterine growth retardation (IUGR) and the growth rates of preterm infants.^[25] Therefore, multidisciplinary interventions should be developed to promote the growth rates of preterm infants within the first 3 months of age.

This study has some limitations. First, we did not recruit enough samples to unveil more risk factors for the growth rates of preterm infants owing to the loss of health visits at the corresponding points of physical measurements. Second, we did not compare the growth rates of preterm and full-term infants in the urban and suburban areas of Hubei province.

In a future study, we should establish a birth cohort study of the growth rates of preterm and full-term infants with an increased duration of physical follow-up. Furthermore, we should conduct a multicenter study of the growth rates of preterm and full-term infants in a larger sample size stratified by gender and region.

5. Conclusions

In general, the growth rates of infants are a nonlinear and significant variation which is a series of alternating processes of rapid growth and stagnation. This study showed that the growth rates of the length and weight of preterm infants were significantly lower than those of full-term infants from birth to 3 months of age, and gradually caught up to the level of full-term infants after 3 months of age. Furthermore, there were some influencing factors that had significant differences in their contribution to the growth rates of the length and weight of preterm and full-term infants. It was proposed that perinatal factors were paid more importance to the growth rates of preterm infants. Therefore, we should establish a growth model to implement the effective intervention measures for growth and development of preterm infants.

Author contributions

Zhonggui Xiong designed the project, and composed this study for several times. Ping Zhang and Jioen Ke conducted the statistical analysis for this study. Feimin Sun and Zeyuan Xia collected the clinical and epidemiological data for more than 1 year.

Acknowledgements

We thanked all parents or guardians for their participation in this study, and all researchers for their work in clinical observation and epidemiological investigation.

References

- Embleton ND, Korada M, Wood CL, et al. Catch-up growth and metabolic outcomes in adolescents born preterm. *Arch Dis Child*. 2016;101:1026–31.
- World Health Organization (WHO). The World Health Organization child growth Standards. 2006. Available at: <https://www.who.int/childgrowth/standards/> [access date May 20, 2020].
- Villar J, Ismail LC, Urias ES, et al. The satisfactory growth and development at 2 years of age of the INTERGROWTH-21st fetal growth standards cohort support its appropriateness for constructing international standards. *Am J Obstet Gynecol*. 2018;218:S841–54.
- Sankilampi U. One size may not fit all when it comes to growth references for preterm infants. *Acta Paediatr*. 2016;105:228–9.
- Xiao WQ, Zhang LF, He JR, et al. Comparison of the INTERGROWTH-21st standard and a new reference for head circumference at birth among newborns in Southern China. *Pediatr Res*. 2019;86:529–36.
- Hoon LH, Kyu NO, Sil CY. Neonatal outcomes of very low birth weight infants in Korean neonatal network from 2013 to 2016. *J Korean Med Sci*. 2019;34:e40.
- Giuliani F, Cheikh Ismail L, Bertino E, et al. Monitoring postnatal growth of preterm infants: present and future. *Am J Clin Nutr*. 2016;103:635S–47S.
- Zhang L, Li Y, Liang S, et al. Postnatal length and weight growth velocities according to Fenton reference and their associated perinatal factors in healthy late preterm infants during birth to term-corrected age: an observational study. *Ital J Pediatr*. 2019;45:1.
- Rochow N, Landau-Crangle E, So HY, et al. Z-score differences based on cross-sectional growth charts do not reflect the growth rate of very low birth weight infants. *PLoS One*. 2019;14:e0216048.
- Kang L, Wang H, He C, et al. Postnatal growth in preterm infants during the first year of life: a population-based cohort study in China. *PLoS One*. 2019;14:e0213762.
- Griffin IJ, Tancredi DJ, Bertino E, et al. Postnatal growth failure in very low birth weight infants born between 2005 and 2012. *Arch Dis Child Fetal Neonatal Ed*. 2016;101:F50–5.
- Vieira MC, Relph S, Persson M, et al. Determination of birth-weight centile thresholds associated with adverse perinatal outcomes using population, customised, and intergrowth charts: a Swedish population-based cohort study. *PLoS Med*. 2019;16:e1002902.
- Fenton TR, Nasser R, Eliasziw M, et al. Validating the weight gain of preterm infants between the reference growth curve of the fetus and the term infant. *BMC Pediatr*. 2013;13:92.
- Toftlund LH, Halken S, Agertoft L, et al. Catch-up growth, rapid weight growth, and continuous growth from birth to 6 years of age in very-preterm-born children. *Neonatology*. 2018;114:285–93.
- Landau-Crangle E, Rochow N, Fenton TR, et al. Individualized postnatal growth trajectories for preterm infants. *JPEN J Parenter Enteral Nutr*. 2018;42:1084–92.
- Amisshah EA, Brown J, Harding JE. Protein supplementation of human milk for promoting growth in preterm infants. *Cochrane Database Syst Rev*. 2020;9:CD000433.
- Nilsson A, Mardinoglu A, Nielsen J. Predicting growth of the healthy infant using a genome scale metabolic model. *NPI Syst Biol Appl*. 2017;3:1–9.
- Zhao Z, Ding M, Hu Z, et al. Trajectories of length, weight, and bone mineral density among preterm infants during the first 12 months of corrected age in China. *BMC Pediatr*. 2015;15:91.
- Arora A, Manohar N, Hector D, et al. Determinants for early introduction of complementary foods in Australian infants: findings from the HSHK birth cohort study. *Nutrition J*. 2020;19:1–10.
- de Beer M, Vrijkotte TGM, Fall CHD, et al. Associations of infant feeding and timing of linear growth and relative weight gain during early life with childhood body composition. *Int J Obesity*. 2015;39:586–92.
- Zhang L, Lin J, Liang S, et al. Comparison of postnatal growth charts of singleton preterm and term infants using World Health Organization standards at 40–160 weeks postmenstrual age: a Chinese single-center retrospective cohort study. *Front Pediatr*. 2021;9:595882.
- Amina A, Abdelmoneim K, Nesma A, et al. Correlation between insulin like growth factor-1 and anthropometric measurements of premature infants. *J Nepal Paediatr Assoc*. 2016;36:24.
- Pizzi C, Cole TJ, Richiardi L, et al. Prenatal influences on size, velocity and tempo of infant growth: findings from three contemporary cohorts. *PLoS One*. 2014;9:e90291.
- Zhang T, Zhao L, Ding W, et al. The influence of perinatal and maternal factors on physical growth at 12 months in prematurely born infants treated in the neonatal intensive care unit: a retrospective chart review and a prospective cohort study. *Int J Nurs Stud*. 2020;109:103656.
- Martin A, Connelly A, Bland RM, et al. Health impact of catch-up growth in low-birth weight infants: systematic review, evidence appraisal, and meta-analysis. *Matern Child Nutr*. 2017;13:e12297–310.