Evaluation of the role of non-nutritional sucking in the early growth and development of preterm infants

Hongli Fan[1], Pinhong Yang[2]

1Department of Neonatology, Xi 'an Daxing Hospital, Shaanxi 710016, China

2Weinan Maternal and Child Health Hospital Physical Examination Center, Shaanxi Province 714000, China

Introduction. To explore the role of nonnutritional sucking in the early growth and development of preterm infants.

Methods. 112 premature infants from May 2022 to March 2024 were selected, and the envelope method was divided into two groups with 56 cases each. Control group by nasogastric tube intermittent feeding and touch intervention, observation group based on control group combined with nutritional sucking, both groups completed 4 weeks intervention, compare the incidence of feeding related complications, growth, behavioral symptoms, 10min, sucking maturity and intellectual development index (MDI), motor development index (PDI) and complication rate.

Results. Observation group intervention 4 The incidence of feeding-related complications was lower than that of the control group (P <0.05); the early fetal stage and growth were improved after the intervention, and the observation group was higher than the body weight, body length and head circumference in the observation group were higher than the control group (P <0.05); the behavioral symptoms were improved after the intervention; the behavioral symptoms in the observation group were higher than the control group (P <0.05); the oral sucking volume and sucking maturity in 2 weeks and 4 weeks after the intervention, and the oral sucking volume and sucking maturity in 10min in the observation group were higher than that of the control group (P <0. 05); 2 and 4 weeks MDI and PD The I score was improved; the MDI and PDI scores in the observation group were higher than those in the control group

(P <0.05). There was no statistical difference in the complication rates between the two groups (P> 0.05).

Conclusion. the nutritional sucking in premature babies effect, can improve the early growth and development, reduce the incidence of feeding related complications, improve the symptoms of children with behavior, improve the 10min oral sucking and sucking maturity, help to improve the level of intelligence and motor development, and did not increase the incidence of complications, worth popularization and application.

Keywords. Non-nutritional sucking; premature infants; growth and development; behavioral symptoms; oral sucking volume; sucking mature milk; intellectual development index; motor development index

INTRODUCTION

According to the results of Bao Yifeng and others, there are about 15 million premature births worldwide every year, or 10.0% of all live births, which has become a serious health and social problem. Li Liling et al. showed that [2], as a special group, premature infants need to adapt to the new environment after delivery from the mother, and their prognosis and growth and development will affect the family and society. In recent years, with the improvement of the level of neonatal critical emergency medicine, the survival rate of premature infants has been improved by [3]. However, because the digestive system is not fully developed, the incidence of feeding tolerance is high. Intermittent feeding via nasogastric tubes is used for preterm infants In China, although it can reduce the incidence of feeding intolerance in children, but it is easy to cause the reduction of sucking function in children, affecting the early growth and development of [4]. Non-nutritional sucking is the use of the pacifier, put it in the mouth of the children, through the continuous stimulation of the children, can improve their sucking ability, accelerate the formation and maturation of the sucking reflex [5]. At the same time, this method with touch intervention, by stimulating the skin and body of children, help to promote the healthy development of children's body and mind, the development of [6]. This study mainly

investigated the role of non-nutritional sucking in preterm infants, as reported below.

1. DATA AND METHODS

1.1 General information

112 preterm infants from May 2022 to March 2024, and the envelope method was divided into two groups. In the control group, 56 men, 34 males, 22 females, gestational age (28-34) weeks, mean (30.51 ± 2.48) weeks; birth weight (1200-3440) g, mean (28,23.28 ± 59.49) g; mode of delivery: 41 vaginal deliveries, 15 cesarean sections; of children, 39 low-risk preterm, 17 high-risk premature infants; observation group 56 men, 38 males, 18 women, gestational age (28-34) weeks, mean (30.47 ± 2.52) Week; birth weight (1215-3435) g, mean (2853.77 ± 59.59) g; mode of delivery: 39 vaginal deliveries, 17 cesarean deliveries; 37, low-risk and 19 high-risk premature infants. There was no statistical difference between the two groups of general data (P> 0.05).

1.2 Inclusion and exclusion criteria

Inclusion criteria: (1) premature infants [7], gestational age of 28-34 weeks; (2) birth weight of 1200-3440g, stable vital signs; (3) complete clinical data, Apgar score of 8-10; (4) parents agreed to provide breast milk 24h at birth; exclusion criteria: (1) congenital malformation with oral diet; (2) loss of pharyngeal reflex or vital organ abnormalities; (3) hearing test, with congenital necrotizing enterocolitis and apnea.

1.3 Methods

After the vital signs of the newborn were stable, the intervention was conducted with low body quality formula, following the Suggestions for Preterm infant breastfeeding in the neonatal intensive Care Unit. The children with Genu were breastfed as soon as possible, and parenteral nutrition could be given [8] when necessary.

Control group: nasogastric tube intermittent feeding without non-nutritional sucking, relying on the gastrointestinal tract peristalsis; put the child on the bed, play light music, and touch the body decoration (such as ring, watch, bracelet, etc.), wash hands, index finger, ring finger and middle finger, with the umbilical as the center,

with "I" (from right to right), "L" (from right to left) and "U" type (from right abdomen to left abdomen), clockwise abdominal massage to promote gastrointestinal peristalsis. When touching the operation, keep the children as gentle and vigorous as possible Even (it is advisable to see the skin wrinkles before the fingertip), touch 3-4 times a day, 10min each time, continuous intervention for 4 weeks.

Observation group: combined with non-nutritional sucking. The newborn was trained with pacifier under hunger to improve the sucking ability, 15min each time. After non-nutritional feeding, the bottle exceeds 10min, 4-6 times a day; observe whether the bottle and the remaining milk were injected through the gastric tube after the gastric tube is restored, ensuring the daily suction tolerance of 120 mL / (kg • d). 4-week intervention was completed in both groups.

1.4 Observing indicators

(1) The incidence rate of feeding-related complications. The incidence of gastric retention, vomiting, fecal hidden blood, abdominal distension and blood stool in the two groups was counted; (2) growth and development. Weight, body length, and head circumference were measured and compared between the two groups; (3) behavioral symptom scores. Before and after intervention, both groups evaluated the behavior ability, general response, passive muscle tone, original reflex and active muscle tone, the higher the score, the better [9]; (4) oral sucking volume and sucking maturity within 10min. In two groups, the oral sucking volume and sucking maturity of the children were recorded before and for 2 weeks and 4 weeks of intervention (the amount of milk sucking in the first 10min of eating was the tolerance ratio of the same age Example) [10]; (5) intellectual development index (MDI), motor development index (PDI). In both groups, MDI and PDI were evaluated by intelligence and motor development, and the higher the score, the better [11]; (6) complications. The incidence of diarrhea, dyspnea, dynamic ileus, constipation and cholestasis were counted in the two groups.

1.5 Statistical analysis

Using SPSS26.0 software, count data line χ 2 test, n (%), measurement data line

t-test, (), P <0.05 significant.

2 RESULTS

2.1 Comparison of feeding complications between the two groups

The incidence of gastric retention, vomiting, fecal hidden blood, abdominal distension and blood stools in the observation group was lower than that in the control group (P <0.05), as shown in Table 1.

Table 1 Comparison of feeding complications between the two groups [n (%)]

group	Example number	gastric retention	vomit	Fecal hidden blood	abdominal distension	bloody stool	incidence
observation group	56	0（0.00）	1（1.79）	0（0.00）	1（1.79）	1（1.79）	3（5.36）
control group	56	3（5.36）	3（5.36）	1（1.79）	1（1.79）	2（3.57）	10（17.86）
x^2	/						6.391
P	/						0.029

2.2 Comparison of growth and development between the two groups

Early fetus and growth improved after the intervention, and the observation group was higher than the control group; early growth and development indicators in the observation group were higher than the control group (P <0.05), as shown in Table 2.

Table 2 Comparison of growth and development between the two groups（$\bar{x} \pm s$）

group	Example number	weight (g)		height（cm）		head circumference（cm）	
		Before the intervention	After the intervention	Before the intervention	After the intervention	Before the intervention	After the intervention
observation group	56	2853.77±59.59	3102.69±68.92#	45.69±3.21	52.34±4.98#	28.32±1.21	31.69±1.45#
control group	56	2853.28±59.49	2985.37±63.49#	45.71±3.23	48.83±3.94#	28.34±1.23	30.01±1.31#
t	/	0.081	6.628	0.063	5.636	0.347	6.029
P	/	0.436	0.000	0.581	0.000	0.881	0.000

Compared with the pre-intervention session,#P<0.05。

2.3 Comparison of behavioral symptoms

The oral symptoms were improved after the intervention; the scores of behavioral symptoms were higher than the control group (P <0.05), shown in Table 3.

Table 3 Comparison of behavioral symptoms between the two groups (points,)

group	time point	capacity for action	一般反应	Passive muscle tone	primary reflection	Active muscle tone
observation group	Before the intervention	3.29±0.62	3.11±0.56	3.21±0.64	3.34±0.69	3.32±0.67

（n=56）	After the intervention	6.74±0.79#*	6.81±0.85#*	6.78±0.82#*	6.91±1.02#*	6.87±0.89#*
control group	Before the intervention	3.31±0.64	3.13±0.58	3.23±0.66	3.36±0.71	3.34±0.69
（n=56）	After the intervention	5.03±0.71*	5.01±0.73*	5.34±0.75*	5.42±0.99*	5.41±0.96*

# P <0.05; * P <0.05 vs preintervention

2.4 Comparison of oral sucking volume and sucking maturity of the two groups in 10min

Both oral sucking volume and maturity increased in 2 weeks and 4 weeks after intervention; the oral sucking volume and maturity in the observation group were higher than that in the control group (P <0.05), as shown in Table 4.

Table 4 Comparison of oral sucking volume and sucking maturity of the two groups in 10min

（$\bar{x} \pm s$）

group	Example number	Oral volume (mL in 10min)			Sucking on the maturity of (%)		
		Before the intervention	After 2 weeks of intervention	After 4 weeks of intervention	Before the intervention	After 2 weeks of intervention	After 4 weeks of intervention
observation group	56	5.69±0.94	22.42±2.59#	48.78±4.42#*	9.64±0.96	48.53±5.22#	91.59±6.95#*
control group	56	5.71±0.96	14.98±2.12#	32.53±3.69#*	9.66±0.98	24.29±3.16#	67.45±5.51#*
t	/	0.063	5.219	4.349	0.059	6.124	5.434
P	/	0.672	0.000	0.000	0.561	0.000	0.000

# P <0.05; * P <0.05 compared with 2 weeks after the intervention

2.5 Comparison of the MDI and PDI scores between the two groups

MDI and PDI scores were improved in both intervention groups at 2 and 4 weeks; MDI and PDI scores in the observation group were higher than the control group (P <0.05), as shown in Table 5.

Table 5 Comparison of MDI and PDI scores between the two groups (points,)

group	Example number	MDI			PDI		
		Before the intervention	After 2 weeks of intervention	After 4 weeks of intervention	Before the intervention	After 2 weeks of intervention	After 4 weeks of intervention
observation group	56	63.59±3.41	77.34±5.98#	83.20±6.37#*	58.34±4.43	73.25±5.96#	79.69±6.82#*
control group	56	63.61±3.43	70.29±5.12#	74.56±5.63#*	58.36±4.45	64.20±4.84#	72.53±5.45#*
t	/	0.194	6.092	5.549	0.351	5.783	6.121
P	/	0.536	0.000	0.000	0.935	0.000	0.000

# P <0.05; * P <0.05 compared with 2 weeks after the intervention

2.6 Comparison of the two complication groups

There was no statistical difference in the two groups (P> 0.05), as shown in Table 6.

Table 6 Comparison of two groups[n（%）]

group	Exampl	diarrhoe	Breaspdyspne	dynamic	astrictio	cholestasi	incidenc

	e number	a	a after feeding	ileus	n	s	e
observation group	56	1（1.79）	0（0.00）	0（0.00）	1（1.79）	0（0.00）	2（3.57）
control group	56	1（1.79）	1（1.79）	1（1.79）	1（1.79）	1（1.79）	5（8.93）
x^2	/	/	/	/	/	/	1.371
P	/	/	/	/	/	/	0.242

3 DISCUSSION

Preterm infants are special newborns, whose body organs are not fully developed, with small gestational age and low weight, leading to a higher incidence of related complications and poor prognosis, which has become an important cause of neonatal death [12]. In recent years, with the continuous development of medical technology, the survival rate of premature infants has been improved, but compared with normal newborns, the physical function of premature infants is not mature, and the growth of the fetus after childbirth is obvious [13]. In this study, the incidence of feeding-related complications was lower in the observation group than in the control group (P <0.05); early fetal life and growth were improved after both intervention, and the observation group increased The high amplitude was higher than that of the control group; the body length and head circumference of the observation group were higher than that of the control group (P <0.05), non-nutritional sucking can reduce the incidence of feeding-related complications in premature infants, contribute to the early growth and development, and facilitate their recovery. Analysis of reasons: non-nutritional sucking as a non-drug intervention method, the purpose of sucking is to improve the swallowing dysfunction of the children. By preventing the pacifier in the mouth of the children's mouth, it can continuously stimulate the vision and feeling of the children, help to calm the mood of the children, and improve the tolerance of iatrogenic

stimulation [14]. At the same time, this method can stimulate the oral vagus nerve in children, increase Add sucking times, through regular intervention and stimulation, can help them to establish rhythmic swallowing, which can promote the growth of the gastrointestinal tract, development, accelerate the early growth and development rate of premature infants [15].

As a common intervention method of premature infants, nasal feeding can improve the symptoms of children, but the method has obvious disadvantages, mainly manifested in the following aspects: (1) nasal feeding stimulation swallowing reflex is limited, easy to cause sucking and swallowing function, cause children mouth eating difficult [16]; (2) the intervention method effect, the effect of time is long, and the intervention measures have obvious differences, increase the economic burden of children's families, and prolong the hospital time [17]. In this study, behavioral symptoms improved after intervention; the observation group scored higher behavioral symptoms than the control group ($P < 0.05$); both groups The sucking volume and sucking maturity in 10min in 2 weeks and 4 weeks after intervention, and the sucking volume and sucking maturity of observation group in 10min were higher than the control group ($P < 0.05$). From the results, it was seen that non-nutritional sucking could improve behavioral symptoms and improve the sucking volume and sucking maturity in 10min, and most children could benefit from it. Reasons: The effect of non-nutritional sucking is similar to oral movement training, which can improve the perception normalization of oral organs and inhibit abnormal movement patterns. Through regular stimulation or pressing the children's hydibular hyoid muscle, tongue and other oral functional areas, are helpful to improve the oral cavity The motor function of the masticatory muscles and tongue, thus enhancing the flexible learning and initiative of the swallowing reflex [18]. In this study, MDI and PDI scores were improved in 2 and 4 weeks; MDI and PDI scores in the observation group were higher than the control group ($P < 0.05$). There was no statistical difference in the complication rate between the two groups ($P > 0.05$), and the results showed that non-nutritional sucking could improve the intelligence and motor

development level of premature infants, and the intervention safety was high. Analysis of reasons: non-nutritional sucking can be adjusted according to its feeding frequency, feeding amount, help children establish the body mechanism and ability to resist external adverse factors, It is helpful to balance the intestinal flora, promote gastrointestinal peristalsis, and is conducive to the early recovery of [19-20] of gastrointestinal function in children.

To sum up, the nutritional sucking in premature effect, can improve the early growth and development, reduce the incidence of feeding related complications, improve the symptoms of children with behavior, improve the 10min oral sucking and sucking maturity, help to improve the level of intelligence and motor development, and did not increase the incidence of complications, worth popularization and application.

REFERENCES

[1] Bao Yifeng. Effect of lactase combined with non-nutritional sucking on feeding intolerance and early growth and development in preterm infants [J]. Maternal and Child Health in China, 2023,38 (23): 4592-4595.

[2] Li Liling, Hu Xiaojing. Progress in non-nutritional breast sucking in promoting oral feeding in preterm infants [J]. Chinese Nursing Journal, 2022,57 (22): 2728-2732.

[3] Chen Na, Ren Yuehong, Liu Xiao'en, et al. Effect of non-nutritional sucking, sugar water sucking in relieving pain caused by radial artery blood collection in premature infants [J]. Hebei Medicine, 2023,45 (9): 1380-1383.

[4] [4]Hashem H R.Evaluation of the Postnatal Effects Induced by Diazinon on the Growth of the Mice Offspring and the Development of Their Cerebellar Cortex[J].Cells， tissues,organs,2022,211（5）:539-554.

[5] Du Weiwei, Han Aimin, Liu Wenqiang, et al. The role of HO-1 and HMGB 1 in the onset of bronchopulmonary dysplasia in premature infants and their value in the recent evaluation of nervous system development [J]. Zhejiang Medical, 2022,44 (4): 365-369.

[6]Yamamoto N，Inoue R，Makino Y，et al.Tracking the Structural Development of Amyloid Precursors in the Insulin B Chain and the Inhibition Effect by Fibrinogen[J].The journal of physical chemistry. B，2022，126（51）:10797-10812.

[7] Huo Jingyu, Ke Lijun, Wang Qi. Effectiveness of early swallowing function training combined with non-nutritional sucking in preterm infants with oral feeding difficulties [J]. Medical Clinical Research, 2024,41 (1): 102-105.

[8] Perera A，Gnanaguruparan S，Kodali A，et al.Abstract 17346: The Causal Role of Obstructive Sleep Apnea （OSA） in Atrial Fibrillation （AF）: A Systematic Review and Meta-Analysis of Mendelian Randomization Studies[J].Circulation，2023，148（Suppl_1）:A17346-A17346.

[9] Huo Jingyu, Ke Lijun, Wang Qi. Effectiveness of early swallowing function training combined with non-nutritional sucking in preterm infants with oral feeding difficulties [J]. Medical Clinical Research, 2024,41 (1): 102-105.

[10] Wang Jieli, Yan Yilan, Wu Longyan. The effects of non-nutritional sucking combined with kangaroo nursing on radial artery puncture pain and body development in premature infants [J]. Zhejiang Medical, 2023,45 (22): 2439-2442.

[11] Pan Xiaocui. Effect of early total enteral feeding of different nutritional preparations on growth and development, nutrition, and feeding tolerance in very low birth weight preterm infants [J]. Journal of Clinical and Pathology, 2022,42 (6): 1363-1368.

[12] Xia Yurong. Analysis of the intervention of early microfeeding combined with nonnutritional sucking on hyperbilirubinemia in preterm infants [J]. Shanxi Medical Journal, 2022,51 (13): 1526-1527.

[13] [13]Envelope V K Y A P，BSVS，B A Y，et al.Genome-wide analysis of long non-coding RNAs under diel light exhibits role in floral development and the circadian clock in Arabidopsis thaliana[J].International Journal of Biological Macromolecules，2022，223（Pt B）:1693-1704.

[14] Xu Dongmei, Lin Mei, Huang Zhirong, etc. Effect of breast milk olfactory stimulation combined with non-nutritional sucking on feeding effects in preterm infants [J]. Journal of Nursing, 2022,37 (15): 28-31.

[15] Nabi Z， Samanta J， Chavan R，et al.Role of Novel Motorized Enteroscopy in the Evaluation of Small Bowel Diseases[J].Journal of Clinical Gastroenterology，2023，58（4）:349-359.

[16] Cheng Xiu. Effect of non-trophic sucking combined with abdominal touch on feeding intolerance and behavioral status of very low birth body mass infants [J]. Maternal and Child Health in China, 2022,37 (17): 3165-3168.

[17] Yang Fan, Wu Jun, Kong Chao, male, etal. Non-nutritional sucking combined with convenient curling to relieve the pain of intramuscular injection in term newborns [J]. Journal of Nursing, 2022,37 (6): 9-11.

[18] [18] Jacot D，Gizha S，Orny C，et al.Development and evaluation of an artificial intelligence for bacterial growth monitoring in clinical bacteriology[J].Journal of Clinical Microbiology，2024，62（5）：e0165123.

[19] Song Shuang, Chen Fang, Fu Yuehua. Intervention effect of oral exercise training combined with non-nutritional sucking on infant swallowing dysfunction [J]. Clinical and Pathology Journal, 2022,42 (5): 1093-1098.

[20]Aoki T , Nishida N , Kudo M .Current Perspectives on the Immunosuppressive Niche and Role of Fibrosis in Hepatocellular Carcinoma and the Development of Antitumor Immunity:[J].Journal of Histochemistry & Cytochemistry, 2022, 70(1):53-81.

Corresponding Author:

Pinhong Yang

Weinan Maternal and Child Health Hospital Physical Examination Center, Shaanxi Province 714000, China

E-mail: 18091307200@163.com