Analysis of the growth and development status of malnutrition and anemia in 352 children aged 0-3 years in Minhang community of Shanghai and evaluation of the effect after intervention

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Abstract: The growth status of 352 malnourished and anemic children aged 0-3 years in Minhang District, Shanghai, were analyzed, and the effectiveness of health interventions was evaluated. The work focused on 352 malnourished and anemic children aged 0-3 years, summarized their health status by conducting two questionnaire surveys, and evaluated the effects of health interventions. The results revealed that the proportion of malnourished and anemic boys (57.10%) was slightly higher than that of girls (42.90%); and malnutrition-induced anemia accounted for 32.95% of the total number of children. The initial symptoms of malnourished children mainly manifested as below-normal height, weight loss, intellectual impairment, developmental delay and decreased muscle tone. Factors such as birth weight, number of infants, mode of delivery, preterm birth, feeding method, complementary feeding, medical history, and educational level of parents and primary caregivers had certain impacts on growth of children. Furthermore, the level of awareness of nutritional disorders knowledge was higher after the intervention compared to before the intervention. In conclusion, health education interventions for malnourished children can effectively improve their condition and enhance their overall health status, warranting widespread application and promotion.

Keywords: Infants, malnutrition, anemia, health education intervention.

INTRODUCTION

In the growing process of children, various reasons may cause the lack of protein or energy in the body, thus destroying the normal metabolic stability of children and causing the self-consumption of body tissues (Kulkarni, 2021; Caicedo-Gallardo, 2021). When malnutrition occurs in children, various organ dysfunction and other nutrient deficiency often occur in succession (Djaurdi, 2021). There are many reasons for malnutrition in children, the most common of which are high metabolic status caused by insufficient nutritional intake, restricted eating, trauma, surgery or infection, and chronic wasting diseases such as tumors or long-term diarrhea (Rivadeneira, 2020; Rahman, 2019). The symptoms of children suffering from malnutrition are mainly concentrated in weight loss, subcutaneous fat loss, edema, anemia, and other aspects (Clark, 2018; Mrimi, 2022). Some children will have clinical manifestations such as feeling of weakness, hypoglycemia, dry skin, hair loss, and large liver (Jesus, 2018). Regardless of the cause of malnutrition, if the body condition is not improved for a long time, it should be diagnosed in time, and the physician should evaluate the nutritional status of the child according to the situation and give the best treatment measures. Clinically, there are two common treatment measures for child malnutrition. The first is to provide personalized nutritional support for children, and the second is to provide treatment for the primary disease (El-Shafie, 2020; Zhang, 2020).

Pediatric anemia is a decrease in the number of red blood cells or hemoglobin content per unit volume caused by some reason in the peripheral blood of the body, which is relatively common in clinic (Leidman, 2018; Lewis, 2020). Due to the rapid development of the body, children often have a high demand for various nutritional elements, so a variety of external stimuli can lead to anemia in children, such as malnutrition and various chronic diseases (Din, 2018). Relevant studies have confirmed that the younger children are, the more likely they are to develop anemia (Varghese, 2019). The prevalence rate of children under 5 years old is about 47%, and that of school-age children is about 25% (Peña-Rosas, 2019; Pandit, 2021). Children with anemia, according to the different causes of the disease, the clinical manifestations are also different. Generally, speaking, when children develop acute anemia, the degree of anemia in this case is usually not too serious, but it may also cause adverse effects on the children's body, and even lead to shock when the degree is deeper (Chiang, 2021; Al-Jawaldeh, 2021). If the child is chronic blood loss, the replacement of hematopoietic function of various organs in the early stage of the disease is better, so the child will almost not have too obvious symptoms. When the replacement hematopoietic function is disabled, the children will usually gradually show corresponding symptoms, and the normal intellectual development and immune function of the children will be affected (Chiang, 2020; Curi-Quinto, 2020). The most common clinical manifestations of children with anemia are that their skin and mucosa are paler than those of healthy children. If the children have anemia for a long time, they will also be...
The inclusion criteria were as follows:
A. Children aged between 0 and 3 with malnutrition
B. Children with complete basic data
C. Children willing to cooperate with the investigation

The inclusion criteria were as follows:
A. Children with severe infectious diseases
B. Children with incomplete basic data
C. Children with serious mental diseases

Methods

Questionnaire

Through literature review and relevant questionnaire design, the questionnaire of this project was developed. After the preliminary investigation, relevant experts were organized to discuss the questionnaire and further improve the content of the questionnaire. In order to ensure the consistency of the questionnaire survey process, uniform survey training and evaluation were conducted before the formal survey. Face-to-face survey was conducted by uniformly trained investigators, who filled in questionnaires. The questions and answers involved in the questionnaire were determined through expert discussion. The contents include children's basic information (main feeders, gender, age, birth mode and disease history after birth, etc.), children's feeding status (feeding method within 6 months, whether breast-feeding, milk substitute addition, types of complementary food, etc.), family economic status (Education level of parents, education level of main feeders, occupation of parents, per capita monthly income of family, etc.) (Jesson, 2018; Gong, 2022). The investigators are specially trained community health and epidemic prevention station personnel. The questionnaire is filled out by the parents of the children, and the individual parents with low education level are asked by the investigators and then filled in on behalf of them.

Health education intervention

Scientific increase of dietary supplement

According to the specific manifestations of different patients, dietary supplement was added using scientific methods to meet patients’ needs for nutrients. Dietary supplement for different children should be gradually increased from a small amount to ensure that they could fully adapt to the change in the additive amount.

Comprehensive promotion of knowledge about children nutrition

Knowledge about children nutrition should be posted comprehensively on community bulletin boards. The lecture on nutritional knowledge needed to be organized and implemented regularly. The wrong feeding methods adopted by parents should be managed in time to ensure the comprehensive guidance on parents’ feeding of their children.

Adjustment of feeding methods

Reasonable feeding management was performed on different children. Children with loss of appetite should be guided step by step. It must be ensured that parents mastered various feeding techniques and children feeding methods reasonably to improve infants’ physical growth retardation (Chiang, 2020). Anemia in infancy usually causes enlargement of the liver, spleen, and lymph nodes. Therefore, no matter what the cause of anemia is, it will bring adverse effects on the normal growth and development of children, and should be treated by doctors in time (Schechter, 2019; Wu, 2020).

The nutrition and health status of children can reflect the nutrition status and social development level of our country to a certain extent (Sumbele, 2021). In recent years, with the rapid development of the overall economic level of the society and the steady improvement of people's living standards, the incidence of malnutrition in children has been significantly reduced (Małyszko, 2021). However, it has not yet reached the ideal state, especially malnutrition in school-age children is still relatively common, and the detection rate of child malnutrition in different regions is not consistent (Huang, 2021; Islam, 2021). In order to regulate the nutritional status of children more effectively in this area, 352 children aged 0-3 years old in Minhang Community of Shanghai were selected for investigation. The growth and development status of children with malnutrition and anemia were analyzed in detail and the effects of intervention were scientifically evaluated, in order to provide reference for relevant departments to formulate relevant nutrition intervention measures and actively and effectively improve the nutritional status of children.

MATERIALS AND METHODS

General data

A total of 352 children aged between 0 and 3 in Minhang community in Shanghai between July 2019 and April 2020 were selected as the research objects, including 201 boys and 151 girls. Their average age was 9.9±5.4 months and average weight amounted to 2368±117g. The initial symptoms among 352 children with malnutrition mainly included height less than normal level, weight loss, intellectual retardation, and muscle tension retardation. Besides, the nutritional knowledge and behaviors of children’s parents were investigated. After the first questionnaire, health education intervention was carried out. After 9 months, the second questionnaire was implemented. After that, the results of the two questionnaires were compared to analyze health intervention effects. The implementation of this research had been approved by Gumei Community Health Service Center Ethics Committee and children as well as their family members had been informed of the research contents and methods. In addition, they had agreed to sign corresponding informed consent forms.

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C. Children willing to cooperate with the investigation

The exclusion criteria were as follows:
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immunity. In addition, the clinical nursing effects on children and family members’ satisfaction of nursing before and after intervention were compared and analyzed to obtain corresponding research results.

Follow-up revisit
Children underwent return visit interventional treatment, which required their parents’ active cooperation. Besides, follow-up plan was formulated, the purpose of return visit was clarified, the time of return visit was selected and the communication process was designed. Parents were told to get prepared mentally. Physicians needed to effectively communicate with children’s family members and put forward their own proposals in appropriate time to seek approval for the consolidation of treatment outcomes. Children with malnutrition were followed-up to extend intervention pattern design, as shown in fig. 1 below.

Observation indexes
The current malnutrition, anemia, growth, development of 352 children aged between 0 and 3 in Minhang community in Shanghai were analyzed (the main causes included picky eating, unreasonable nutrition arrangement, poverty, premature infants, and parents’ educational levels).

The clinical effects on children before and after health education intervention were analyzed. The specific reference criteria were displayed in tables 1 and 2 below.

Ethical approval
The study was carried out in compliance with guidelines issued by Ethical Review Board and Institutional Biosafety Committee of Gumei Community Health Service Center, Minhang District.

STATISTICAL ANALYSIS
The research data were processed and analyzed by SPSS24.0 statistical software. Measurement data were expressed as mean-standard deviation (X±S). Enumeration data were denoted by percentage. Pairwise comparison was performed by variance analysis. P<0.05 indicated that the difference was statistically significant.

RESULTS

General data on children
The statistical results of basic information for 352 malnourished and anemic children are summarized in Table 3. Among all malnourished children, boys and girls accounted for 57.10% and 42.90% respectively. It is evident that the proportion of malnourished and anemic boys is slightly higher than that of girls. The average age was (9.9±5.4) months, and the average weight was (2368±117) g. The initial diagnosis revealed that 186 children were classified as mildly malnourished, accounting for 52.85%. Additionally, 116 children were diagnosed with anemia, representing 32.95%. Additionally, a total of 50 children were diagnosed with severe malnutrition, accounting for 14.20%.

Incidence of malnutrition
As displayed in fig. 2 below, 70 children with malnutrition were 1 to 2 months old, 23 were 3 to 4 months old, 110 were 5 to 8 months old, 70 were 9 to 12 months old, 25 were 13 to 18 months old, 28 were 19 to 24 months old, and 26 were 25 to 31 months old. The initial symptoms among 352 children with malnutrition mainly included height less than normal level, weight loss, intellectual retardation, and muscle tension retardation. A total of 34 children suffered from muscle tension retardation, 60 suffered from height less than normal level, 230 suffered from weight loss, and 28 suffered from intellectual retardation, as illustrated in fig. 2 below.

Analysis of causes of the incidence of malnutrition
The results of the questionnaire survey are presented in Table 4. It clearly indicates that factors such as birth weight, number of babies, mode of delivery, preterm birth, feeding method, complementary feeding, the medical history of children, educational levels of both parents, and the educational level of the primary caregiver have certain impacts on the growth and development of toddlers. Among them, the highest proportion of malnourished children based on birth weight is observed in those weighing equal to or greater than 2,500g, with 344 cases accounting for 97.73%. The highest proportion of single-birth infants is observed in the category of babies with 237 cases, accounting for 67.33%. Regarding the mode of delivery, the highest proportion is found in naturally delivered infants, with 168 cases representing 47.73%. The majority of children, 342 cases or 97.16%, are not born prematurely. Among the feeding methods, the highest number of cases, 195 in total, accounting for 55.40%, were breastfed. In terms of complementary feeding, the majority of cases, 297 in total, accounting for 84.38%, exhibited inappropriate practices. Among all malnourished children, the highest proportion, 61.08%, corresponds to those without any medical history. Concerning the educational level of fathers, the highest number of cases, 294 in total, accounting for 83.52%, had at least a college degree. Similarly, among mothers, the highest number of cases, 296 in total, representing 84.09%, had at least a college degree. The primary caregiver, in the majority of cases (246 cases or 69.89%), had an educational level of at least a college degree. Moreover, 180 cases, accounting for 51.14%, had no complications during pregnancy or lactation for the mother.

Intervention results
The number of cases falling into the score ranges of 0-59, 60-79, and 80-100 for the first assessment of nutritional disorder knowledge were 124, 148, and 80 respectively. For the second assessment, the corresponding numbers of cases were 20, 154, and 178. The differences between the two assessments were statistically significant (P<0.05), as
Table 1: Assessment criteria for disease outcomes and effective management

<table>
<thead>
<tr>
<th>Items</th>
<th>Reference criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disease outcomes (NA)</td>
<td>The results of final return visit (0=closure, 1=improvement, 3=serve to mild, 4=hemoglobin increased by or over 5g, 5=ineffective, 6=referral, 7=mild to serve, 8=no return visit, and 9=hemoglobin increased less than 5g)</td>
</tr>
<tr>
<td>Effective management (NC)</td>
<td>0=improvement in at least one return visit, 1=closure, 3=referral completion, 4=hemoglobin increased by or over 5g, 5=all return visit results were ineffective, 6=no return visit, and 7=only one return visit and hemoglobin increased less than 5g</td>
</tr>
</tbody>
</table>
Preparation before return visit

Agree on a return visit time

Prepare basic information of children

Simplified treatment

Fill in the questionnaire for children

The current status of the child was recorded and evaluated

Counseling, dietary advice

Implementation of return visit

Fig. 1: Process extended intervention during follow-up revisit.

Fig. 2: Incidence of malnutrition.
Note: A showed the number of children with different months of age and muscle tension retardation as the initial symptom. B displayed the number of children with different months of age and height less than normal level as the initial symptom. C illustrated the number of children with different months of age and weight loss as the initial symptom. D presented the number of children with different months of age and intellectual retardation as the initial symptom.
illustrated in fig. 3. After the intervention, there were 250 cases showing improvement in disease conditions and 102 cases with no improvement. The number of cases with effective management was 278, while 74 cases did not achieve effective management. As for follow-up compliance, there were 83 cases with standardized follow-up and 269 cases without. The number of cases with improved knowledge of nutritional disorders was 179, while 173 cases did not show improvement.

In contrast, the disease among 102 children was not improved. As displayed in Figure 3C below, there were 278 cases receiving effective management and 74 cases without receiving effective management. As presented in Figure 3D below, the number of the cases undergoing standard follow-up before and after intervention were 37 and 315, respectively. After intervention, 83 cases received standard follow-up and 269 didn’t experience standard follow-up. The difference between the two assessment results demonstrated statistical significance (P<0.05). As demonstrated in Figure 3E below, there were 179 cases with improved understanding rate of nutritional disease knowledge and 173 cases with unimproved understanding rate of nutritional disease knowledge. The results of health education intervention were shown in detail in fig. 3 below.

DISCUSSION

Malnutrition tends to occur in children under 3 years old, which poses a serious threat to children's health and may even lead to child death if measures are not taken in time (Gong, 2022). Nutrition is to maintain life and promote the growth and development of children. Malnutrition is an invisible killer that seriously affects children's health, which can directly cause children's growth and development disorders (Tallman, 2022; Leidman, 2020). In recent years, clinical studies have shown that giving necessary nursing interventions to malnourished children can improve the health awareness rate of family members and reduce the incidence of malnourished children (Petry, 2020). Therefore, our hospital gave necessary health education intervention measures to 352 children aged 0–3 years in this community. In this work, 352 malnourished and anemic children aged 0-3 years in Minhang Community of Shanghai were selected as test subjects, and the growth and development status of the children were analyzed in the form of questionnaire survey. Health education intervention was conducted after the first questionnaire survey, and the second questionnaire survey was conducted 6 months later. The results of two questionnaires were compared to analyze the effect of health intervention. From the results of the first questionnaire survey, the basic information statistics showed that 57.10% of the children were male and 42.90% were female. The proportion of boys suffering from malnutrition and anemia was slightly higher than that of girls. 116 children with anemia caused by malnutrition accounted for 32.95%, which was close to the anemia rate of children and adolescents in various provinces and cities (20%-40%). Among the 352 malnourished children, 70 cases were malnourished from January to February, 23 from March to April, 110 from May to August, 70 from September to December, 25 from 13 to 18 months, 28 from 19 to 24 months, and 26 from 25 to 31 months. The initial symptoms of malnutrition in 352 children were mainly concentrated in four aspects: lower than normal height, weight loss, low intellectual development, and low muscle tone. Among them, the total number of children with low muscle tone was 34 cases, the total number of children with lower than normal body length was 60 cases, the total number of children with weight loss was 230 cases, and the total number of children with low intellectual development was 28 cases. It can be observed that the main symptom of children with malnutrition is lower than normal body length. The causes of infant malnutrition are mainly related to improper diet, parents' education level and feeding methods. It has little to do with economic factors or lack of food. Infant period is mainly due to insufficient breast milk, and failed to add supplementary food in time or
artificial feeding is not scientific, can’t guarantee the quality and quantity of adequate supply. Children entering early childhood, especially the only child's partial eating, picky eating phenomenon is more prominent, resulting in unbalanced diet nutrition, easy to cause malnutrition. In addition, some diseases and dysfunction of the digestive tract can also cause malnutrition. In short, children's malnutrition is caused by many factors, parents should give timely attention, especially in the diet and living habits to give correct guidance. Parents of young children should strengthen the education of scientific parenting knowledge, use computer nutrition meals, adjust diet scientifically and reasonably, achieve color, fragrance and taste, meet children's different nutritional needs, improve their appetite, and arrange timely and quantitative meals. In addition, dietary hygiene should be strengthened, digestive tract diseases and dysfunction should be reduced, comprehensive management of children's diseases should be strengthened and malnutrition should be effectively prevented and prevented fundamentally, to promote the healthy growth of children. Proper diet and parents' cultural knowledge are especially important. The diet structure is not reasonable. The diet is dominated by carbohydrates, and the content of protein and fat is low, which is an important cause of infant malnutrition. The disease factor is the most important factor leading to infant malnutrition. After illness, children's food intake and absorption are reduced, and nutritional deficiency and increased consumption will lead to malnutrition (Akomo, 2020). Unreasonable addition of complementary foods and low birth weight children often fail to catch up with normal growth in early childhood, leading to developmental delay of preschool children (Engidaye, 2019). Stunting is more difficult to correct in malnourished children than in the other two types. In conclusion, if necessary, health education interventions are given to malnourished children, their symptoms can be significantly improved and their families’ awareness of scientific feeding knowledge can be significantly increased, which is very beneficial to the growth and development of children.

CONCLUSION

The initial symptoms of malnutrition in 352 children were mainly concentrated in four aspects: lower than normal height, weight loss, low intellectual development and low muscle tone. Health education intervention for children with malnutrition can effectively improve the condition of children, improve the health level of children, worthy of popularization and application. However, due to the limited sample size, the research scope should be further expanded in future studies.

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