ORIGINAL RESEARCH

Analysis of Potential Risks in Abnormal Physical Development Due to Dietary Habits in Preschool Children

Zhenzhen Cao, BD; Xi Dong, BD; Lixin Fan, BD; Ying Zhang, BD; Jingru Ma, BD; Ran Yu, BD

ABSTRACT

Background • The prevalence of abnormal physical development in preschool children is often linked to their dietary habits, necessitating a comprehensive investigation. Understanding the intricacies of these habits is crucial for formulating targeted interventions to enhance the overall health and well-being of this vulnerable population.

Objective • This study aims to explore the dietary habits of preschool children in Shijiazhuang and evaluate their impact on abnormal physical development. The primary objective is to identify key dietary issues, particularly focusing on picky eating, and assess their association with undernutrition and obesity in this age group.

Methods • Utilizing a stratified sampling approach, the study involves preschool children and their caregivers from various kindergartens in Shijiazhuang. On-site medical examinations are conducted to measure height and weight and calculate body mass index (BMI). Additionally, parents were surveyed to gather information on the general aspects and dietary habits of their children. Binary logistic regression analysis was employed to ascertain the correlation between picky eating and the risk of undernutrition and obesity.

Results • The findings indicate that approximately 70% of preschool children maintain a normal BMI, while 16.67% experience undernutrition, and 13.33% face issues of being overweight or obese. Picky eating emerges as the predominant dietary habit issue, affecting 51.33% of the participants. Binary logistic regression analysis identifies picky eating as a significant risk factor for undernutrition and obesity among children.

Conclusions • Picky eating stands out as the primary dietary habit concern for preschool children, concurrently posing a substantial risk for abnormal physical development. Urgent measures are warranted to rectify children's suboptimal dietary habits, elevate nutritional standards, and foster their overall health and development. These findings underscore the imperative need for interventions targeting dietary improvement in preschoolers, contributing to improving their well-being and long-term health outcomes. (*Altern Ther Health Med.* 2025;31(1):459-463).

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INTRODUCTION

The preschool age period, encompassing the years from birth to entry into primary school, typically spans from 0 to 6 years of age.[1] Childhood malnutrition poses a significant global public health concern.[2,3] Scientific investigations affirm that the period between 0 and 6 years is pivotal for the rapid growth and maturation of brain cells, contributing to the swift development of cognitive functions in children. Simultaneously, this phase plays a crucial role in ensuring healthy physical growth and development, necessitating regular assessments of weight gain and linear height growth.[4]

Throughout this phase, children undergo rapid and profound bodily and brain development. This period is characterized by swift and significant changes in brain plasticity, facilitating the acquisition of fundamental cognitive and interpersonal skills.[5-8] The experiences and environment a child encounters during this timeframe profoundly influence their physical, cognitive, emotional, and social development. The preschool age period emerges as a pivotal stage for children's comprehensive growth and maturation, necessitating heightened attention to abnormalities in physical development.

The impact of dietary patterns on the physical growth of young children has gained considerable attention. Suboptimal

dietary patterns and insufficient nutrition can give rise to developmental and educational challenges among preschoolers. As lifestyle and dietary choices continue to evolve, there is an escalating incidence of detrimental eating patterns, leading to an increased prevalence of atypical physical development in preschool-aged children.

Therefore, this study aims to examine the correlation between different unhealthy dietary behaviors and the physical development of preschool children, as well as to suggest pertinent intervention approaches. Simultaneously, we combined Chinese and international research literature on abnormal physical development in preschool children, analyzed research findings from other regions, and provided theoretical support for this study.

The conclusions and findings of this research offer a crucial theoretical foundation and practical guidance for advancing preschool education, children's health care, and related policies in Shijiazhuang. The aim is to mitigate the incidence of abnormal physical development in preschool children, with the overarching goal of enhancing their physical health, promoting comprehensive development, and facilitating overall growth.

METHODS

Study Design

This study was conducted using stratified sampling principles between December 2022 and March 2023. One urban area (Chang'an District) and one rural area (Liuxinzhuang Village) in Shijiazhuang City were selected as survey points. Within each survey point, one kindergarten was randomly chosen, and the subjects included preschool children and their caregivers associated with the selected kindergarten. A total of 160 survey questionnaire samples were collected and matched with 175 samples from children's dietary habits questionnaires. After removing 25 missing values, a final dataset of 150 samples was included for analysis.

Measurement of Height for Preschool Children

This study focused on the precise measurement of the height of preschool children using a standardized children's height-adjustable seat with a precision of 0.1 centimeters. The measurements were conducted in the kindergarten on the same morning.

Measurement Procedure. The measurement procedure involved placing the column vertically against the wall with the footrest on level ground. The sliding side plate was positioned perpendicular to the support column. To ensure accuracy, children were required to remove shoes, hats, and heavy coats, with girls letting down their braids. The child stood on the footboard, pulled in the abdomen, straightened the chest, let the hands hang naturally, and placed the heels close together with the toes at an angle of about 60 degrees. Additionally, the knees were together, the eyes looked straight ahead, and the lower edge of the eye socket was parallel to the upper edge of the ear. The heels, hips, and shoulder blades were carefully aligned with the support column, and the head was held straight.

Data Capture and Recording. The measurer, holding the sliding board, observed the child's correct posture and gently lowered the sliding board until it touched the top of the child's skull. The measurement was then recorded by reading the number in the bottom slot of the sliding board. This standardized and precise height measurement process aimed to ensure accurate and reliable data for the assessment of preschool children's growth.

Measurement of Weight for Preschool Children

This study focused on the accurate measurement of the weight of preschool children using a standardized electronic weight scale designed for children. The measurements were conducted in the kindergarten, employing a scale with a precision of 0.1 kilograms and a maximum weight capacity of 160 kilograms.

Measurement Procedure. The weight scale was carefully placed on a flat and hard surface, and the zero point for symmetrical weighing was calibrated before each measurement. Prior to stepping on the scale, the child was required to remove shoes, hats, heavy coats, and any carried items.

Participant Positioning. After powering on the scale, the participants stood upright with their legs symmetrical on the scale. The child maintained a straight posture, with arms naturally hanging at the sides, head up, and eyes looking straight ahead. Importantly, care was taken that the body should not touch anything else during the measurement process.

Recording Measurements. When the weight scale displayed a stable number, indicating the completion of the measurement, the investigator recorded this value. The precision of 0.1 kilograms ensured accurate and reliable data collection, contributing to a comprehensive assessment of the preschool children's weight. This standardized and thorough weight measurement process aimed to provide precise information for evaluating the weight status of preschool children, facilitating a thorough understanding of their growth and development.

Assessment of Growth and Development

This methodology involves evaluating the growth and development of preschool children through the Body Mass Index (BMI). The calculation formula is as follows: BMI = weight (kg) / height (m^2). The interpretation criteria are as follows: BMI < P15 indicates thinness; P15 < BMI < P85 is considered within the normal range; BMI > P85 indicates overweight or obesity.

Survey Questionnaire Structure

Demographic Characteristics. The survey employs a self-designed questionnaire to gather information on the demographic characteristics of preschool children. Key demographic variables include region, gender, age, primary caregiver, and the gender of the primary caregiver.

Dietary Habit Indicators. The questionnaire delves into the dietary habits of preschool children through various indicators. These indicators encompass: (1) Picky Eating,

assessed through a set of seven items, is defined as the exclusive consumption of preferred foods. (2) Food Response: consisting of 6 items, assesses the degree of liking for food among preschool children. (3) Unhealthy Eating Habits: characterized by a set of 5 items, refer to engaging in activities such as playing or watching TV during meals among preschool children (4) Overeating Response: represented by a set of 5 items, involves the evaluation of preschool children's portion sizes during meals.

(5) External Eating, encompassing 5 specific items, focuses on evaluating the influence of changes in tableware, environment, and dietary habits on the eating behaviors of preschool children. (6) Emotional Eating: comprised of 5 distinct items, involves assessing the impact of emotions such as anger, loneliness, and anxiety on the eating habits of preschool children. (7) Lack of Autonomous Eating, encompassing 5 specific items, is designed to reflect the extent to which preschool children exhibit a lack of independent and proactive eating ability.

Each item within the survey is carefully scored on a Likert scale spanning from 1 to 5, offering respondents the flexibility to express the frequency of their habits, ranging from "never (1 point)" to "always (5 points)." The calculation of scores for each dietary habit involves summing the individual item scores and subsequently dividing by the total number of items. A higher resulting score indicates a more pronounced issue with the specific dietary habit under consideration. Crucially, a cumulative score of 3 or above signifies habitual challenges in picky eating, food response, unhealthy eating habits, overeating response, external eating, and emotional eating. Conversely, a score below 3 indicates a recurrent issue related to a lack of autonomous eating. This scoring system not only quantifies the severity of dietary habits but also provides a nuanced understanding of their prevalence among preschool children, enabling targeted interventions for healthier eating behaviors.

Statistical Analysis

The statistical analysis of the gathered data employed SPSS 23.0 (IBM Corporation, Chicago, IL, USA) and GraphPad Prism 9.0 software (GraphPad Software, San Diego, CA, USA). Continuous variables were presented as mean ± standard deviation ($\bar{x} \pm s$), and comparisons between groups were conducted using the *t* test. Categorical data were expressed as [n (%)], and intergroup comparisons were assessed using the chi-square test. $P < .05$ was considered statistically significant, indicating the presence of a meaningful difference in the analyzed parameters.

RESULTS

Demographic Profile of Preschool Participants

This study encompassed a cohort of 150 preschool children as its research subjects. Of these, 53.33% hailed from urban areas, while 46.67% were from rural settings. Gender distribution revealed that 56.67% were boys, and 43.33% were girls. The age distribution was as follows: 33.33% were 3 years old, 32% were 4 years old, and 34.67% were 5 years old. The primary caregiver for the majority of the children was the mother, constituting 77.33%, and among these caregivers, 84% were female (refer to Table 1). These demographic characteristics provide a comprehensive overview of the composition of the preschool children participating in the study.

Table 1. General Information about the Research Subjects

Demographic Characteristics	Number of Participants	Percentage (%)
Region		
Urban	80	53.33
Rural	70	46.67
Gender		
Male	85	56.67
Female	65	43.33
Age		
3 years old	50	33.33
4 years old	48	32.00
5 years old	52	34.67
Primary Caregiver		
Mother	116	77.33
Father	22	14.67
Grandparents	12	8.00
Gender of Primary Caregiver		
Male	24	16.00
Female	126	84.00

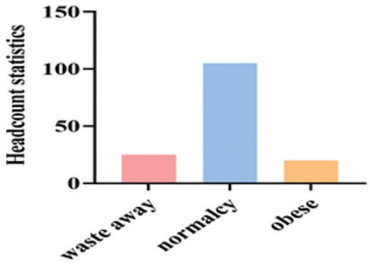
Note: The table presents general demographic information of research subjects, including region, gender, age, primary caregiver, and gender of primary caregiver. Data is expressed as counts (n), and percentages are based on the total number of participants in each category.

Table 2. Growth And Development of Preschool Children

Growth Status	The Number of Children	%
Lean	25	16.67
Normal	105	70.00
Overweight Obese	20	13.33

Note: The table illustrates the distribution of preschool children based on their growth status. Data is presented as counts (n), and percentages are calculated relative to the total number of participants.

Figure 1. Distribution of Physical Development Among Preschool Children



Note: The figure illustrates the distribution of physical development among preschool children. The majority of children exhibit normal physical development, while some cases of thinness and obesity are also observed.

Preschool Children's Growth and Development

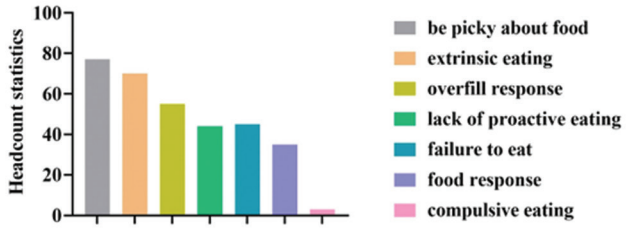
In this study, a careful examination of the 150 participants revealed distinct patterns in their growth and development. Notably, 25 subjects exhibited stunting issues, accounting for a detection rate of 16.67%. The majority, comprising 105 children, fell within the normal growth range, representing a detection rate of 70%. Additionally, 20 subjects were identified with issues related to overweight or obesity, constituting a detection rate of 13.33%, refer to Table 2 and Figure 1. This comprehensive analysis highlighted the diverse growth traits observed among the preschool children involved in the study.

Table 3. Status of Dietary Habits of Preschool Children

Dietary Habits	The Number of Children	%
Picky Eating Habits	77	51.33
Extrinsic Eating Habits	70	46.67
Overfeeding Response Habits	55	36.67
Lack Of Proactive Eating Habits	44	29.33
Unhealthy Eating Habits	45	30.00
Food-Responsive Habits	35	23.33
Emotional Eating Habits	3	2.00

Note: The table depicts the prevalence of various dietary habits among preschool children. Data is presented as counts (n), and percentages are calculated relative to the total number of participants.

Figure 2. Prevalence of Dietary Habits Among Preschool Children



Note: The figure depicts the prevalence of various dietary habits among preschool children. Picky eating emerges as the most prevalent issue, followed by externally-driven eating habits, overeating response habits, lack of proactive eating habits, unhealthy eating habits, food-responsive habits, and emotional eating habits.

Table 4. Relationship Between Dietary Habits of Preschool Children and Growth and Development

Dietary Habits	Number of Participants	Slender Figures	χ^2	*P* value
Picky Eating Habits			0.73	<.05
Yes	77	20		
No	73	5		
Extrinsic Eating Habits			0.56	.81
Yes	70	15		
No	80	10		
Overfeeding Response Habits			0.59	.18
Yes	55	7		
No	95	18		
Lack of Proactive Eating Habits			0.67	.59
Yes	44	5		
No	106	20		
Unhealthy Eating Habits			0.61	.51
Yes	45	6		
No	105	19		
Food-Responsive Habits			0.70	.78
Yes	35	4		
No	115	21		
Emotional Eating Habits			--	1.00
Yes	3	0		
No	147	25		

Note: The table presents the relationship between various dietary habits of preschool children and their growth and development. Data is displayed as counts (n).

Relationship Between Dietary Habits and Growth

This study investigated the dietary habits of preschool children, unveiling insightful patterns that may impact their growth and development. Among the observed habits, picky eating exhibited the highest detection rate at 51.33%, closely followed by external eating habits at 46.67%. Overeating response habits were identified in 36.67% of the subjects, while lack of active eating habits and poor eating habits were noted at rates of 29.33% and 30%, respectively. Food response habits registered at 23.33%, whereas emotional eating habits exhibited the lowest detection rate at 2%, refer to Table 3, Figure 2.

Impact of Picky Eating on Childhood Stunting: Single-Factor Analysis

In this study, an examination of the connection between children's growth and their dietary habits was conducted through a single-factor analysis. The findings revealed a statistically significant impact of picky eating habits on the prevalence of stunting among children ($P < .05$). Notably, no other dietary habit issues exhibited statistical significance in influencing the nutritional status of the children, refer to Table 4. This focused analysis explains the distinctive role of picky eating habits in contributing to stunting, providing valuable insights into the intricate relationship between dietary behaviors and children's growth outcomes.

DISCUSSION

The early childhood stage is a critical period for the optimal development and growth of young minds.[11] During this phase, the child's brain undergoes rapid and substantial progress, acquiring essential cognitive abilities such as working memory, attention, and inhibitory control.[12] Adequate nutrition obtained through dietary intake serves as a fundamental ground for the healthy growth and development of children.[13] In our research, we specifically focus on investigating the impact of children's dietary patterns on their physical development.

Unhealthy eating behaviors emerge as a prominent risk factor for irregular physical development in preschool children.[14] These detrimental eating habits may endure into adulthood, potentially contributing to an aggravation of dietary and weight-related challenges later in life.[15] In our study encompassing 150 preschool children, we discovered that selective eating stands out as a significant detrimental dietary behavior among them.

The implications of selective eating in children include a lack of dietary variety, distorted nutrient consumption, diminished levels of iron and zinc intake, and an increased vulnerability to compromised growth and infectious pathogens, thereby elevating the risk of illness.[16] These findings align with our research, underscoring selective eating as a pivotal risk factor for irregular physical development in children.[17]

While selective eating is often considered a typical aspect of child development, it typically resolves during the preschool years.[18] The origins of this behavior may be linked to the child, parents/caregivers, and their interactions.[19] Consequently, we advocate for parental/caregiver intervention in addressing selective eating in children, fostering increased interaction with selective eaters to ameliorate their condition and promote healthy growth and development.

Furthermore, children's culinary preferences are commonly established during early childhood, with most toddlers requiring up to 15 attempts at a new food before incorporating it into their regular diet.[20] Thus, we encourage parents to offer a wider array of food choices from an early age and integrate a diverse selection of foods into the regular diet to prevent selective eating behavior.

Our study revealed noteworthy associations between dietary habits and physical development. Picky eating emerged as a significant factor contributing to stunting, underscoring its role in shaping children's growth trajectories. The prevalence of unhealthy eating habits, such as external eating and overeating responses, demonstrated the multifaceted nature of dietary challenges among children.

Study Limitation

Despite the valuable insights gained from this study, several limitations should be acknowledged. Firstly, the cross-sectional nature of the research design restricts our ability to establish causal relationships between dietary habits and physical development. Longitudinal studies would offer a more nuanced understanding of the dynamic relations over time. Additionally, the reliance on self-reported data, especially regarding dietary habits, introduces the possibility of recall bias and social desirability bias. Moreover, the study's sample, while representative of the specific geographic location, may not generalize to broader populations. Furthermore, the use of a single-factor analysis may oversimplify the complex interactions within the studied variables. Future research should consider addressing these limitations to enhance the robustness and applicability of findings in the realm of childhood dietary behaviors and physical development.

CONCLUSION

In conclusion, selective eating emerges as a noteworthy dietary concern for preschool children, acting as a potential risk factor for irregular physical development. We advocate for heightened parental interaction with selective eaters and the introduction of a diverse range of dietary options from early childhood. This approach aims to enhance selective eating habits, elevate the nutritional well-being of children, and foster their overall healthy development. Recognizing the important role of early dietary exposure, our conclusion underscores the importance of proactive parental interventions in shaping the long-term eating behaviors and physical well-being of preschool children.

CONFLICTS OF INTEREST

The authors report no conflict of interest.

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AUTHOR CONTRIBUTION

Zhenzhen Cao and Xi Dong Contributed equally to the work.

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None

AVAILABILITY OF DATA AND MATERIALS

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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