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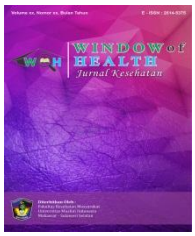

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The Relationship between Nutritional Status and Worm Infection with the Intellectual Ability: A Case of Children Aged 6-12 Years in Jungkat Village

Wolly Candramila[1,C], Yulia Kurniati[2], Asriah Nurdini Mardiyyaningsih[3]
[1,2,3]Departement of Mathematics and Natural Science Education, Faculty of Teacher Training and Education, University of Tanjungpura, Indonesia
Email Corresponding Author([C]): wolly.candramila@fkip.untan.ac.id
wolly.candramila@fkip.untan.ac.id [1], yuliakurniati@student.untan.ac.id [2], asriah.nurdini.m@fkip.untan.ac.id [3]

ABSTRACT

The prevalence of worm infection in Indonesia remains high, reaching 21.6% in 2022, with significant impacts on children, including decreased cognitive function and growth impairments. Theoretically, children who are in high-risk environments for worm infection and delayed growth have a high potential to have low intelligence. This study aimed to describe the nutritional status, worm infection, and intellectual ability of elementary school children in Jungkat Village, and to analyze the interrelationships between these factors. A cross-sectional study was conducted in four elementary schools in Jungkat Village from June to August. A total sampling approach was applied, with 626 children aged 6–12 years who met the inclusion criteria (enrolled in the schools and obtained parental consent). Data were collected via anthropometric measurements, a worm infection questionnaire, and Raven's Progressive Matrices (RPM), and analyzed using multinomial logistic regression. More than 70% of children had a normal nutritional status, but stunting (20.78%), overweight (7.67%), and obesity (7.67%) indicated a dual burden of malnutrition. The prevalence of worm infection is notably high (29.71%), while intellectual assessments indicate that 60.86% of children fall into the below-average or defective categories. Interestingly, children in Jungkat Village appear to adapt to worm infections, as these do not seem to impair intellectual capacity. Despite having a mostly normal nutritional status, many individuals still demonstrate below-average intellectual abilities, suggesting that other determinants, beyond nutrition and infection, may play a stronger role. Further studies are recommended to explore genetic, environmental, and educational factors that may influence children's intellectual development.

Keywords: Elementary school children; intellectual ability; Jungkat village; nutritional status; worm infection

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Email :
jurnalwoh.fkm@umi.ac.id
Phone :
+62 82188474722

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INTRODUCTION

The prevalence of worm infections in Indonesia is relatively high, reaching 21.6% according to the Indonesian Nutritional Status Study of 2022. Comparatively, other countries also face significant challenges with worm infections. In Rwanda, a nationwide survey testing 17,360 individuals revealed a 38.7% prevalence of intestinal worm infections, with preschool-aged children having a 30.2% infection rate. Among the detected worms, roundworms were the most common (27.0%), followed by whipworms (11.6%) and hookworms (10.7%) (1). In China, a study conducted in Jiangsu Province found a 0.08–2.07% infection rate of pinworms among preschool children. The infection rates were statistically higher in private preschools compared to public ones, with older age and poor hygiene habits being significant risk factors in private settings, while low family income levels were a risk factor in public settings (2). The primary factors contributing to the transmission of worm infections are climate and topography (3). Additionally, insufficient hygiene practices, lack of knowledge, and low socioeconomic conditions and levels of awareness also contribute to the incidence of worm infections (4–6). The significant impact of worm infections is particularly evident in children, including a decline in cognitive function. This occurs because essential nutrients required for growth are absorbed by the worms. Deficiencies in iron and macro-nutrients can hinder physical growth, development, activity, and intelligence in children. Therefore, children who frequently experience worm infections over extended periods may suffer from a decline in human resource quality (7–9).

Tropical regions are areas where worm infections are commonly found, yet their management is often neglected (10). Poor environmental sanitation increases the likelihood of worm infections (11,12). As reported by [NO_PRINTED_FORM] (13) in Suka Village, Tigapanah District, significant risk factors increased due to playing in the soil, while the risk was reduced through latrine use and the habit of handwashing after activities. In another study, [NO_PRINTED_FORM] (14) reported that hygiene habits were significantly associated with a decrease in STH prevalence. Odagiri et al. (2021) further noted that 80% of households in Indonesia still rely on on-site sanitation, nearly half of which are “uncontained” septic tanks, and one in ten discharge untreated waste directly into the environment. Areas with high population density had higher rates of septic tank emptying, yet the average was only 17%. In sparsely populated areas, emptying was rarely reported. Poorer households were more likely to use groundwater for drinking, making them more vulnerable to the impacts of unsafe sanitation. Children who grow up in environments with poor sanitation require significant attention to prevent worm infections during their developmental years (15,16). Growth and developmental delays represent a serious issue for both developed and developing countries. Good cognitive growth and development can be assessed through optimal increases in weight, height, and head circumference as a child age (17). Therefore, addressing growth disruptions and worm infections in affected areas requires effective interventions and monitoring from various stakeholders.

The environmental sanitation conditions in Jungkat Village, Mempawah Regency, West Kalimantan are relatively concerning. The primary livelihoods in Jungkat Village are entrepreneurship (66.11%), agriculture and livestock (19.88%), and fishing (5.62%) (data.kalbarprov.go.id, 2022). In Jungkat Village, a portion of households still rely on rainwater and river water for domestic and drinking purposes, and many latrines fail to meet the standards set by Minister of Health Regulation No. 3 of 2014. The village's proximity to the sea causes the river to experience tidal flooding due to saltwater intrusion. Primary school children are frequently observed playing in the river or drainage ditches during high tide. Due to limited data on local environmental sanitation, information on the study site was obtained through direct observation (unpublished data). These conditions create a setting conducive to the transmission of gastrointestinal infections, including helminthiasis, and may contribute to growth and developmental disorders associated with inadequate sanitation.

Stunting prevalence in Jungkat Village was reported to be notably high in 2019. Of the 77 stunting cases recorded in Jongkat District, Mempawah Regency, West Kalimantan Province, 22 cases originated from Jungkat Village (Tribun News, Mempawah.com, August 30, 2019). This finding was corroborated by nutrition staff at the Jongkat Health Center during direct interviews conducted in the pre-research survey on June 14, 2022. At the broader regional level, the incidence of stunting in Mempawah Regency remains relatively elevated at 25.1%, according to the Indonesian Nutritional Status Study (SSGI) 2022. Although these statistics indicate that stunting cases remain high, the underlying causes are multifactorial — including inadequate nutrition, poor environmental sanitation, and infectious diseases. Andini et al. (2021) found that STH infections are associated with poorer nutritional status; meanwhile, Amnur et al. (2025) showed that STH infections can reduce macronutrient intake among stunted toddlers. A recent meta-analysis also estimated that STH infections may increase the risk of stunting in Indonesia by approximately 44.4% (18)

To date, there have been no published reports on the nutritional status, worm infection profiles, and intellectual development of primary school-aged children in Jungkat Village. Moreover, the interplay between nutritional status, helminth infections, and intellectual development has rarely been investigated in high-risk settings such as Jungkat Village. This study seeks to fill this gap by describing the nutritional status, indications of worm infections, and intellectual development of children in the area, and by examining the relationships between these variables. Nutritional status will be assessed using height-for-age and body mass index-for-age (BMI-for-age) indices, intellectual development will be measured through age-appropriate intelligence tests, and worm infection indicators will be evaluated using structured questionnaires. By focusing on an underexplored population, this research provides novel insights into the potential links between nutrition, parasitic infection, and cognitive development, with the ultimate goal of informing interventions to improve child health and quality of life in Jungkat Village. This study aims to investigate the relationship between nutritional status, worm infection indicators, and intellectual development among primary school-aged children in Jungkat Village.

METHOD

This study employs a cross-sectional method, with data collection conducted from June to August 2023. The research ethics application was submitted to the Ethics Committee of the Faculty of Medicine, Tanjungpura University. The study locations include four primary schools: SDN 01, 03, 04, and 06 Jungkat. The characteristics of the study area, where the residents of Jungkat Village live, are illustrated in Figure 1. Jungkat Village directly borders the sea and features small rivers and ditches that traverse the area. During the rainy season, high tides increase the volume of water around the residential areas. In these conditions, it is common to see children playing in the high tide waters in Jungkat Village.

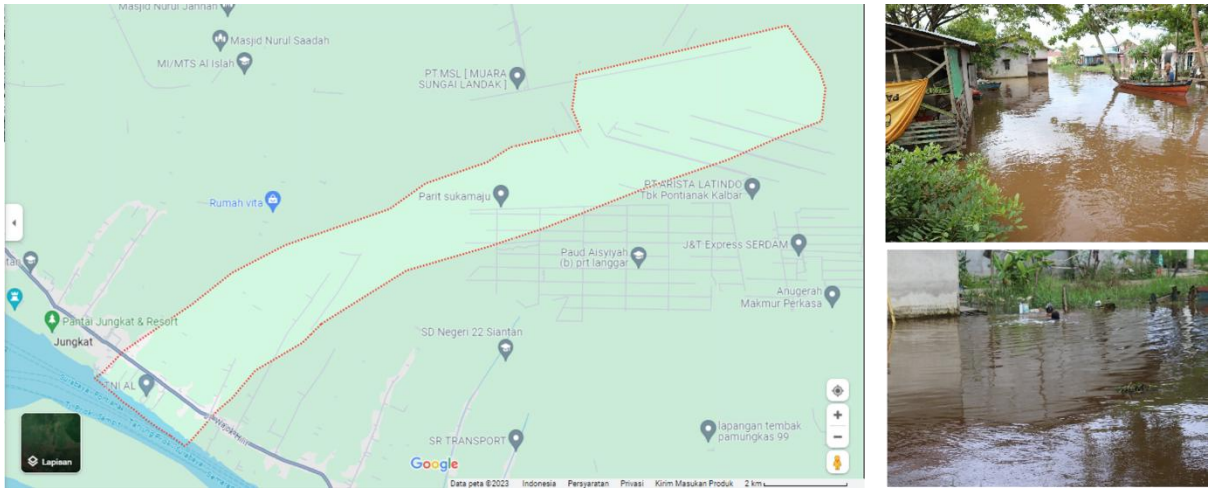

Figure 1. An image of Jungkat Village in Google Maps showing the position bordering the sea and small rivers or ditches that cross the village (left); a view in one of the areas of Jungkat Village when the sea tide is high and the water level around the settlement is raised (right, personal documentation).

The subjects for this study consist of school-aged children aged 6 to 12 years. Sampling was conducted in four primary schools located in Jongkat District. The sampling technique used was participatory, where potential respondents voluntarily and without coercion participated in the research after being informed about the study's objectives, benefits, risks, and the expected form of participation. Since the sample consisted of individuals under 18 years of age, consent for participation was obtained from the parents or guardians. Information about the research objectives, benefits, risks, and the required form of participation was provided to the parents through an introductory letter accompanied by a consent form. The signed consent form indicates that the parents or guardians authorized the researchers to perform anthropometric measurements and administer questionnaires to their children.

The research procedures include collecting date of birth information, conducting anthropometric measurements (height and weight), completing a worm infection questionnaire, and assessing intellectual ability using Raven's Progressive Matrices (RPM) test (19,20). Height was measured using a Kenko stadiometer, and weight was measured with a digital scale (Omron HBF214). Height and weight measurements followed the standard anthropometric measurement guidelines provided by the Indonesian Ministry of Health (21). The Body Mass Index (BMI) was calculated using the formula: weight (in kg) divided by the square of height (in m). The worm infection questionnaire, which was validated by two validators, includes 10 questions indicating potential worm infections and 10 questions

indicating the absence of worm infections. The RPM test consists of 60 questions divided into 5 types (A, B, C, D, and E), with each type containing 12 questions.

Data analysis began with determining the nutritional status categories of the children using standard deviations from height-for-age and BMI-for-age values. Nutritional status categories followed the growth standards for ages 5-19 years as per WHO (2017) (Table 1) (22). Worm infection categories were determined based on the respondents' answer scores, while the RPM test results were categorized into five levels according to Raven et al. (1983) and further explained by Vass (1992) (19,20). The intellectual categories were classified as intellectually superior, definitely above average in intellectual capacity, intellectually average, definitely below average in intellectual capacity, and intellectually defective. The RPM test assesses subjects' intellectual abilities through visual reasoning. Subsequently, the relationship between the children's nutritional status and worm infections was analyzed using multinomial logistic regression on RPM test scores. The multinomial logistic regression was performed in R version 4.2.2 using the "nnet" package (23). In interpreting the results of this type of regression, one level of the dependent variable was chosen as the reference category, typically selected from the most common or frequent category.

Table 1. Height-for-Age and BMI-for-Age Categories According to [NO_PRINTED_FORM] (22)

Nutritional Status Parameter	Threshold (Deviation Standard)	Nutritional Status Categories
Height-for-Age	– 2 SD and ≥ 3 SD	Normal
	-3SD and -2SD	Stunted (moderate chronic malnutrition)
	<-3 SD	Severely stunted (severe chronic malnutrition)
BMI-for-Age	<-3 SD	Severely Thinness
	-3 SD and <-2 SD	Thinnes
	-2 SD and 1 SD	Normal
	1 SD and 2 SD	Overweight
	>2 SD	Obese

RESULTS

This study involved 626 children aged 6–12 years, consisting of 296 girls and 330 boys, recruited from four primary schools in Jongkat District. Ethical approval was obtained from the Health Research Ethics Committee, Faculty of Medicine, Universitas Tanjungpura (Decree No. 3479/UN22.9/PG/2023). Written informed consent was obtained from all parents, who permitted their children to participate in all stages of the research.

Anthropometry and Nutritional Status Profile of Children Aged 6-12 Years in Jungkat Village

The results of the measurements for weight, height, and BMI of the subjects are presented in Table 2. The average values for each measurement of height and weight show a trend of increasing anthropometric measurements with age. In other words, children aged 6-12 years in Jungkat Village generally exhibit growth, as evidenced by increases in height and weight each year. The largest range

in weight is observed at age 12 for girls and age 11 for boys. Meanwhile, the largest range in height is seen at age 12 for both boys and girls. This indicates that the highest variation in height and weight occurs at age 12 for girls and at ages 12 and 11 for boys. For BMI, the largest range is noted at age 12 for girls and age 11 for boys. At age 12, the average weight and height of boys are greater than those of girls. However, from ages 6-11, the average BMI of boys is higher than that of girls, whereas at age 12, the average BMI of girls exceeds that of boys.

Table 2. Anthropometry for Children Aged 6-12 Years in Jungkat Village

Age Range (year)	Subject (individuals)		Body Weight (kg) ± SD		Body Height (cm) ± SD		Indeks Massa Tubuh (kg/m²) ± SD	
	Girl	Boy	Girl	Boy	Girl	Boy	Girl	Boy
6.0-6.9	43	42	18.81 ± 4.12	18.96 ± 3.72	110.56±5.00	110.84±5.50	15.29±2.42	15.33±2.06
7.0-7.9	56	60	20.82 ± 4.15	21.96 ± 6.29	116.04 ± 4.94	116.64 ± 6.27	15.37±2.18	15.78±2.92
8.0-8.9	36	48	23.86 ± 5.50	23.86 ± 7.40	121.25 ± 5.30	121.41 ± 6.78	16.21±2.86	16.11±3.30
9.0-9.9	59	48	25.53 ± 6.64	25.83 ± 6.26	125.85 ± 6.98	125.84 ± 5.97	15.89±2.58	16.07±2.72
10.0-10.9	55	59	27.01 ± 5.61	29.56 ± 7.83	131.75 ± 6.70	131.12 ± 6.46	15.50±2.52	16.99±3.14
11.0-11.9	41	61	32.47 ± 9.15	35.04 ± 9.66	137.97 ± 7.68	137.48 ± 7.69	16.69±3.06	18.42±4.00
12.0-12.9	6	12	34.34 ± 11.23	35.55 ± 8.94	141.28 ± 12.28	144.25 ± 8.35	17.04±2.19	16.59±3.23

The nutritional status categories of the children, based on height-for-age and BMI-for-age indices, are presented in Table 3. According to the WHO (2017) categories, only 79.23% of children in Jungkat Village fall within the normal height-for-age category, and 78.59% fall within the normal BMI-for-age category. The study found that 17.09% of the children in Jungkat Village are classified as stunted and 3.67% as severely stunted, indicating their height is too low for their age. Additionally, 1.28% of the children are classified as underweight and 4.79% as thin, while the rates of overweight and obesity are relatively higher at 7.67% each.

Table 3. Classification of Nutritional Status of Children Aged 6-12 Years in Jungkat Village Based on Height-for-Age and BMI-for-Age referring to [NO_PRINTED_FORM] (22)

Index	Nutritional Status Category	Total Number of Subjects (%)		
		Boy	Girl	Total
Height-for Age	Severely Stunted	5	4.1	3.67
	Stunted	17.9	16.2	17.09
	Normal	78.8	79.7	79.23
	Tall	0	0	0
BMI-for-Age	Severely Thinness	0.6	2.0	1.28
	Thinness	3.6	6.1	4.79
	Normal	78.5	78.7	78.59
	Overweight	6.7	8.8	7.67
	Obese	10.6	4.4	7.67

Indication of Worm Infection Profile of Children Aged 6-12 Years in Jungkat Village

The findings from the investigation into the prevalence of worm infection among children aged 6 to 12 years in Jungkat Village are detailed in Table 4. Of the children surveyed, 70.29% showed no signs of worm infection, while 29.71% were identified as potentially affected. This percentage of suspected

cases is subsequently used to estimate the number of children at risk of worm infection in Jungkat Village.

Table 4. Indication of Worm Infection in Children Aged 6-12 Years in Jungkat Village based on Questionnaire Score

Worm Infection Indications	Number of Subjects (%)
Potentially infected	29.71
Not potentially infected	70.29

Intellectual Profile of Children Aged 6-12 Years in Jungkat Village

The results of the intelligence tests reveal a range of criteria among children aged 6 to 12 years in Jungkat Village (see Table 5). No children were found to be classified as intellectually superior, while only 5.11% fell into the category of definitely above average. The percentage of children with average intelligence is 34.03%, whereas those classified as definitely below average and intellectually defective constitute 38.02% and 22.84%, respectively. The RPM test reflects the subjects' ability to process information and utilize their intellectual capacity to draw inferences. These results indicate that approximately 60% of primary school children in Jungkat Village are not yet capable of effectively processing information and utilizing their intellectual potential.

Table 5. Intellectual Test Results of Children (6–12 Years) in Jungkat Village (%)

Intellectuality Criterion	Number of Subjects (%)
Grade 1: Intellectually superior	0
Grade 2: Definitely above the average in intellectual capacity	5.11
Grade 3: Intellectually average	34.03
Grade 4: Definitely below the average in intellectual capacity	38.02
Grade 5: Intellectually defective	22.84

The Relationship between Nutritional Status and Indications of Worm Infection on the Intellectual Abilities of Children Aged 6-12 Years in Jungkat Village

The results of the multinomial logistic regression analysis examining the relationship between worm infection, nutritional status, and the intellectual abilities of children aged 6-12 years in Jungkat Village are presented in Table 6. Compared to the reference category of normal BMI, obesity is associated with a 0.010 unit increase in the likelihood of having average intellectual ability and a 0.428 unit increase in the likelihood of being below average, but a 0.329 unit decrease in the likelihood of being classified as intellectually defective. On the other hand, severe thinness is linked to an 11.228 unit increase in the likelihood of having average intellectual ability and a 9.556 unit increase in being below average, but an 11.325 unit decrease in the likelihood of being intellectually defective. Thinness, however, is associated with a 0.232 unit decrease in the likelihood of having average intellectual ability, a 0.873 unit decrease in being below average, and a 0.631 unit decrease in being classified as defective.

Regarding height-for-age, severe stunting not only increases the likelihood of having average intellectual ability by 17.533 units, but also increases the likelihood of being below average by 18.427

units and defective by 18.604 units. Conversely, stunting decreases the likelihood of having average intellectual ability by 0.198 units but increases the likelihood of being below average by 0.683 units and defective by 0.815 units. Additionally, when compared to the condition of no worm infection, the presence of worm infection is associated with a 1.257 unit decrease in the likelihood of having average intellectual ability, a 1.679 unit decrease in being below average, and a 1.524 unit decrease in being classified as defective. Overall, while the results show a relatively high AIC value, they also present low standard errors, indicating that the relationships identified may not perfectly explain the conditions but are still considered acceptable.

Table 6. Multinomial Logistic Regression of Worm Infections, Nutritional Status, and Intellectual Abilities in Children (6–12 Years), Jungkat Village

Coefficient								
			BMI-for-Age Category			Height-for-Age Category		Worm Infection Category
	(Intercept)	Obese	Overweight	Severely thinness	Thinness	Severely stunted	Stunted	None worm infection
Average	2.937	0.010	-0.122	11.228	-0.232	17.533	-0.198	-1.257
Below Average	3.239	0.428	-0.620	9.556	-0.873	18.427	0.683	-1.679
Defective	2.604	-0.329	-0.188	-11.325	-0.631	18.604	0.815	-1.524
Std. Errors:								
Average	0.615	0.793	0.663	4.368	0.800	0.374	0.586	0.628
Below Average	0.611	0.779	0.683	4.368	0.833	0.317	0.565	0.624
Defective	0.621	0.855	0.689	8.497	0.855	0.353	0.576	0.636
Residual Deviance: 1478.016								
AIC: 1526.016								

DISCUSSION

Despite the potentially hazardous environmental conditions, children aged 6–12 years in Jungkat Village continue to show age-related increases in both height and weight. Based on the [NO_PRINTED_FORM] (22) nutritional status standards, more than 70% of children in this age group have normal height-for-age and BMI-for-age. Nevertheless, deviations in nutritional status are evident, particularly stunting (23.1% among boys and 20.3% among girls), as well as overweight and obesity (17.3% among boys and 13.2% among girls). The proportion of underweight children is also relatively high at 12.3%. The prevalence of short stature in Jungkat Village is categorized as moderate (20–29%). The coexistence of stunting with relatively high rates of overweight, obesity, and underweight suggests a dual burden of malnutrition (24–26). This phenomenon, identified as a growing trend in various

regions, has also been highlighted by UNICEF, WHO, and the World Bank in their 2023 Joint Child Malnutrition Estimates, and is evident in Jungkat Village (27).

The predicted impact of malnutrition is evident in the intellectual abilities of primary school-aged children in Jungkat Village. Despite over 70% of children having normal nutritional status, the intellectual performance of children aged 6-12 years in Jungkat Village reveals a concerning trend. Approximately 60% of these children fall into the categories of "definitely below average" and "intellectually defective." The percentage of children with average intellectual ability is relatively small at 34.04%, and even lower at the "above average" level, which stands at just 5.11%. Low levels of intellectual ability can restrict an individual's capacity to learn and function at the expected levels (28). For example, reading acquisition in children from second to eighth grade with borderline intellectual functioning (BIF) and mild intellectual functioning (MIF) were lower than normative values. Moreover, these abilities declined further as the children aged (29). Malnutrition during critical periods of brain development disrupts neuronal growth, myelination, and synaptic formation, leading to long-term deficits in memory, attention, and learning capacity (30). Stunting, in particular, has been linked to delayed school readiness and reduced intellectual performance (31). These mechanisms explain why undernourished children are more likely to exhibit lower cognitive function and learning outcomes.

In addition to the intellectual profile, the relatively high incidence of worm infection among primary school-aged children in Jungkat Village warrants attention. The prevalence of worm infection among children aged 6-12 years across the four primary schools in Jungkat Village is found in both boys and girls, with a relatively balanced number of cases. This figure is higher than what was found by [NO_PRINTED_FORM] (32) involving 60 elementary school students in North Pontianak, which was only 16.7%. Preventive measures to reduce prevalence and treatment for worm infection are necessary) for both genders, as each may have different influencing factors (33,34). Worm infections can affect individuals across all age groups and genders, though they are most common among children. One contributing factor is the high level of direct interaction children have with their play environment, where they frequently play outdoors and come into direct contact with soil, a common practice among children in Jungkat Village (35).

The findings highlight a complex interplay between nutritional status, worm infection, and intellectual ability. Severe stunting appears to exert the most profound negative influence, likely because chronic malnutrition during critical developmental stages disrupts neural growth, myelination, and synaptic connectivity, ultimately compromising memory, learning, and problem-solving skills (30,36). Severe thinness also emerges as a risk factor, particularly for children with average or below-average intellectual ability, suggesting that acute energy deficiency can further constrain cognitive performance (37). In contrast, obesity and mild thinness show more limited associations with intellectual function, indicating that their effects, while present, are less detrimental compared to the long-term consequences of severe stunting or severe thinness (38). These patterns emphasize the importance of addressing chronic malnutrition as a central determinant of children's cognitive development (31,39).

Interestingly, the absence of worm infections tends to decrease the likelihood of being at any intellectual level compared to having a worm infection, suggesting that in this context, worm infection may be associated with better intellectual outcomes. This unexpected finding may be influenced by several contextual and methodological factors. The apparent positive association between worm infection and intellectual outcomes could reflect confounding variables, such as socioeconomic status, access to education, or hygiene practices. For example, children from families with better educational support may still be exposed to worm infections due to environmental conditions (Jukes et al., 2008). In addition, reverse causality or misclassification bias may play a role—children who are more active and cognitively engaged might also spend more time in environments where worm transmission is likely, thereby increasing infection risk (40). Another explanation is that light or moderate infections often remain asymptomatic and may not substantially impair nutritional status or cognition, unlike chronic or heavy infections that are typically associated with growth and cognitive deficits (41,42). Indeed, studies have shown that the effects of helminth infections on cognition vary widely depending on infection intensity, nutritional status, and environmental conditions (43). Therefore, this finding should not be interpreted as evidence that worm infections enhance intellectual outcomes. Rather, it underscores the need to consider infection intensity, contextual influences, and potential confounders when analyzing the relationship between helminth infections and cognitive development (30).

Meanwhile, other studies found no correlation between worm infection, nutritional status, or academic performance (44,45). On the other hand, improved household sanitation reduces childhood stunting by 5 percentage points, and open defecation negatively impacts cognitive test scores (46) Worm infections can hinder primary school children from engaging in lessons, as it causes fatigue, reduced concentration, headaches, and leads to a lack of motivation and frequent absenteeism (47–49) In other words, worm infections negatively impact children's academic performance from a behavioral and readiness perspective. However, a different phenomenon has been observed among primary school children in Jungkat Village. It appears that children aged 6-12 in the village exhibit a certain adaptability to worm infections, such that these infections do not seem to impair their intellectual capacity. Damage from parasitic infections varies between hosts, which indicates genetic variation in the host that results in resistance or expression of the disease (50). More studies are needed to explain this phenomenon.

Broadly speaking, the relationship between the three variables in Jungkat Village shows conditions that allow the existence of other determinants that have a more significant influence on children's intellect. Although the majority of primary school-aged children in the village fall within the normal nutritional status category, the distribution of intellectual abilities—largely in the average, definitely below average, and even intellectually defective ranges—indicates that nutrition alone does not fully determine a child's intellectual potential. Additionally, the relatively high incidence of worm infections, along with the possibility of adaptive responses to such infections, presents an intriguing phenomenon that warrants further investigation. More specifically, future studies should explore family environmental factors, the quality of learning stimulation at home and school, socioeconomic

conditions, and parenting patterns, as these aspects may play a more central role in shaping children's intellectual development.

CONCLUSIONS AND RECOMMENDATIONS

The majority of school-aged children (6-12 years old) in Jungkat Village exhibit normal nutritional status based on BMI-for-age and height-for-age measurements. However, the dual burden of malnutrition, particularly in the form of stunting, overweight, and obesity, remains relatively high. Additionally, the predicted prevalence of worm infections among children in this age group is alarmingly significant. Intellectual assessments further reveal that a large proportion of these children fall within the below-average and intellectually defective categories. Overall, the interrelationship between nutrition, parasitic infections, and intellectual capacity is complex. While most children show normal nutritional status, their intellectual potential predominantly lags, indicating the presence of other contributing factors beyond nutrition and worm infections. Future research should specifically explore the role of family environment, learning stimulation, socioeconomic conditions, and parenting patterns in shaping children's intellectual development.

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