The Medical Journal of Tikrit University (2025) 31 (2): 36-46
DOI: http://dx.doi.org/10.25130/mjotu.31.2.5

IRAQI Academic Scientific Journals

ISSN: 1813-1638

The Medical Journal of Tikrit University

Available online at:www.mjotu.com

MJTU

The Medical Journal of Tikrit University

Association between *Helicobacter Pylori* Infection and Malnutrition in Children Under Five Years

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Keywords: *H. pylori, Helicobacter pylori, malnutrition, children under five, infection prevalence, nutritional status, pediatric infection, early detection, bacterial infection, growth impairment*

ARTICLE INFO

Article history:

Received 01 Jul 2025
Accepted 01 Sep 2025
Available online 31 Dec 2025

Citation

ABSTRACT

Background: *Helicobacter pylori* are particularly common in childhood and infects more than half the world's population. It's a gram-negative, spiralshaped bacterium that colonizes the stomach of humans. Although many infections are asymptomatic, it can cause gastritis, ulcers and gastric cancer. *Helicobacter pylori,* is strongly associated with malnutrition. Thissets up a cycle: Malnutrition reduces immunity, increasing vulnerability to infection, while infection exacerbates malnutrition. This association is critical to improving child health in at-risk communities.

Objective: this study aimed to investigate the association between *Helicobacter pylori* infection and the severity of malnutrition in children under five years old.

Methods: The utility of *Helicobacter pylori* antibodies were detected by using ELISA kits

Results: This study involved 100 kids with malnutrition below the age of 5. The results revealed a 45% occurrence of infection with *Helicobacter pylori* among children. The data also revealed a substantial link between the prevalence of *Helicobacter pylori* and the level of malnutrition, resulting in kids with severe malnutrition becoming more at risk of infection. There were no significant variations in infection rates across genders or ages in the study group. Additionally, laboratory analyses revealed that infected children had lower nutritional indicators, such as weight and height, compared to non-infected children

Conclusion: This study found a significant frequency of infection with *Helicobacter pylori* in malnourished kids below the age of five, particularly among males aged 13 to 24 months. Marasmus was the most frequent kind of malnutrition, with severe instances prevailing. The findings emphasize the need of early of *Helicobacter pylori* in children.

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Introduction:

Helicobacter pylori, a well-known human stomach illness, affect more than half of the world's population. Infection with these bacteria can cause a variety of gastrointestinal issues, including chronic gastritis, peptic ulcers, and cancer. *Helicobacter pylori* is a spiral-shaped gram-negative human pathogen found in the stomach's antrum and corpus. Over the last decade, various virulence factors have been identified. These components allow bacteria to live in the highly acidic environment of the gastrointestinal tract, move to the more neutral mucous layer, and withstand the human immune response, resulting in persistence. The majority of infections happen throughout infancy, with just a small proportion progressing to severe disorders [1].

Helicobacter pylori is a gram-negative bacteria that is thought to infect over half of the global population. It colonizes the human host's gastrointestinal mucosa, causing symptoms such as recurrent ulcers and chronic gastritis, and has also been linked to gastric cancer and malnutrition [8]. *Helicobacter pylori* is prevalent in low-income countries, and it has recently been reported to colonies 46% of children aged 1 to 3 years [5]. This study identified mild, moderate, and severe malnutrition in children under the age of five by measuring weight, height, and mid-upper arm circumference. Cases were then divided based on demographic data such as age, gender, socioeconomic status, eating habits, and domicile. Detect *Helicobacter pylori* infection in malnourished children under the age of five.

2. Materials and Methods

2.1 Study population

The study was carried out on patients under 5 years old (children <5yrs), that were clinically suspected to have gastrointestinal disorder and malnourished

2.2 Sampling method

100 individuals submitted blood specimens. The identical individuals responded to 100 enquiries. One hundred volunteers contributed 5 mL of blood, which underwent centrifugation for 5 minutes to isolate serum for the *Helicobacter pylori* assay. Utilise donor plasma or serum specimens (including citrate and heparin). Maintain the specimens at 2-8°C if the *Helicobacter pylori* bacteria assay is conducted within 5 days of sample collection.

Alternatively, they should be aliquoted and stored at -70 to -20 °C. If samples have been frozen, thoroughly mix the thawed samples just before testing. Refrain from recurrent cycles of freezing and thawing. Heat processing of samples is inadvisable. Each specimen was labeled with the individual's identity, age, gender, and collection date.

2.3 Bacteriological methods

The quantitative immunoenzymatic evaluation of particular antibodies relies on the an Enzyme-Linked (ELISA). Microtiter plates are coated with particular antigens that adhere to corresponding antibodies in the sample. Subsequent to cleansing the wells to eliminate any unbound sample constituents, a horseradish peroxidase (HRP) conjugate is introduced. The conjugate attaches to the immobilized antibodies. The subsequent washing procedure eliminates any unbound conjugate. The immunological complex created by the bound conjugate is

visualized using the Tetramethylbenzidine (TMB) substrate, producing a blue reaction outcome. The potency of this product correlates with the quantity of particular antibodies in the sample. Sulfuric acid is employed to halt the process. This results in a golden concluding hue. The absorbance at 450/620 nm is quantified using an ELISA Microtiter plate reader.

2.4 Data collection

The primary data were acquired using a questionnaire to gather information pertinent to the investigation. The questionnaire includes variables such as age and rural residency. Weight, height, mid-upper arm circumference, feeding method, presence of additional conditions such as asthma or chronic illnesses, family economic status, water quality, and administration of intravenous fluids or antibiotics.

2.5 Data analysis

The findings were analysed using the Statistical Package for the Social Sciences (SPSS version 26) using frequency, mean, and chi-square tests. Subsequently, the data were shown in figures and tables.

3. Results and Discussions

3.1. Descriptive features of the study cohort

Table.1 shows malnourished children under-five's demographics. The age distribution showed that 56% of the children were under one year old and 44% were older ($p = 0.024$). Significant weight differences were seen between children under one year and those over one year, with a mean of 6.21 ± 1.33 kg for the former and 12.04 ± 1.28 kg for the latter ($p = 0.030$). Height differed considerably between age groups, with children under one year averaging 53.11 ± 0.95 cm and those over one year 85.47 ± 1.03 cm ($p = 0.046$). The difference in breastfeeding status was statistically significant ($p = 0.012$), with 21% of children nursed and 79% not. These findings indicate that age, weight, height, and nursing practices are linked to childhood malnutrition.

Nutrition is crucial to early childhood growth, explaining Table.1's statistical significance. The increased incidence of malnourished children under one year old (56%) implies that suboptimal nursing and weaning habits make this age group vulnerable. Malnutrition delays or stunts physical growth in children under one year old, as shown by their weight and height inequalities [12]. These data show chronic under nutrition in this community. Only 21% of children were nursed, highlighting the importance of breastfeeding in reducing malnutrition. Breast milk offers critical nutrients and immunological protection, especially in the first year, therefore its absence may cause nutritional deficiencies [12]. Thus, suboptimal feeding behaviours, especially not breastfeeding, and insufficient nutrition in the first years of life contribute to malnutrition and growth retardation in children under five.

Malnutrition is more common and severe in younger children, especially those under one year old, due to their increased nutritional needs and greater vulnerability to feeding deficits and infections. Infants eat mostly breast milk or formula in the early months [13]. Malnutrition can occur from inadequate breastfeeding or poor-quality supplemental foods supplied too early or late [14]. Younger children have underdeveloped immune systems, leaving them more

susceptible to infections like diarrhoea and respiratory ailments, which deplete nutrients and stunt growth [15]. Figure 1.

Children over one year old eat more variety. Malnutrition can cause chronic diseases like stunting if it continues after infancy. Age is both a risk factor and a factor in malnutrition type and severity [15]. If early nutritional needs are not satisfied, older children may develop chronic malnutrition, whereas younger infants are more likely to develop acute malnutrition. Weight, height, and malnutrition are crucial in measuring children's nutritional condition, especially under-fives. Acute and chronic malnutrition influence weight and height differently [16]. Underweight suggests general malnutrition, which can be caused by sudden weight loss or chronic development failure. Low weight for height (wasting) indicates acute malnutrition, often caused by illness or famine. Stunting, on the other hand, implies persistent malnutrition that has slowed a child's linear growth [17].

Malnourished children usually have a combination of these disorders, and growth indicators like weight and height help diagnose severity and duration [18]. This study's significant weight and height differences between age groups suggest that malnutrition is affecting growth patterns, with younger children likely showing signs of acute malnutrition (wasting) and older children possibly stunting due to prolonged deficiencies. Therefore, weight and height monitoring is essential for early detection, intervention, and prevention of malnutrition's long-term effects.

Breastfeeding and malnutrition are strongly linked, especially in children under five. Breastfeeding prevents malnutrition, especially in the first six months when breast milk is the only source of nutrition. It contains all the nutrients, antibodies, and enzymes needed for good growth, immunological development, and protection against diarrhea and pneumonia, which cause malnutrition [19].

Children who are not nursed or inadequately breastfed are more likely to become malnourished [20]. During rapid growth and high nutritional demand, not nursing deprives newborns of important proteins, lipids, vitamins, and minerals. Improper replacement feeding (using filthy water or diluted formula) can cause infections and poor nutrient absorption, increasing malnutrition risk [21]. The data shows a statistically significant link between loss of breastfeeding and malnutrition ($p = 0.012$). Poor breastfeeding practices lead to malnutrition, as 79% of children are not breastfed. For optimal child development and to prevent malnutrition, exclusive breastfeeding for six months followed by proper complementary eating is essential (Figure 1).

3.2 Various infections and chronic conditions among malnutrition children under five years

Table 2 shows the prevalence and statistical significance of infections and chronic illnesses in malnourished children under five. Malnutrition was related with *Giardia lamblia*, a parasite infection that causes diarrhea and malabsorption, in 5% of 100 children ($p = 0.011$). A substantial link between malnutrition and asthma in 6% of children ($p = 0.029$) may be attributed to increased metabolic demands and low appetite during respiratory distress. Chronic diseases were observed in 13% of children, with a p-value of

0.034, demonstrating a relationship between inadequate nutrition and long-term health. These data show that infections and chronic illnesses are strongly linked to malnutrition in early children, emphasizing the need for combined medical and nutritional rehabilitation.

The data presented in Table .2 reflects the significant association between malnutrition and various infections and chronic health conditions among children under five years of age. The high prevalence of *Giardia lamblia* in 5% of the cases ($p = 0.011$) indicates that parasitic infections, often linked to poor hygiene and sanitation, contribute to malnutrition through chronic diarrhea and nutrient loss. Asthma, found in 6% of the children ($p = 0.029$), may lead to increased metabolic demands and reduced appetite, especially during flare-ups, further compromising nutritional intake. Additionally, 13% of the children were diagnosed with chronic diseases ($p = 0.034$), which are known to interfere with nutrient absorption, increase energy requirements, and reduce overall food intake. These statistically significant findings highlight the multifactorial nature of malnutrition, where infections and chronic health issues not only coexist with but actively contribute to poor nutritional outcomes. Addressing malnutrition in early childhood, therefore, requires an integrated healthcare approach that treats underlying infections and chronic conditions while providing appropriate nutritional support Figure (2).

It is bidirectional and synergistic that parasitological diseases and starvation can exacerbate each other [22]. Because malnourished children lack proteins, vitamins A and C, and minerals zinc and iron, their immune systems are weakened and more prone to parasitological infections [23]. Parasitological infections, such as *Giardia lamblia*, can decrease nutrient absorption, induce chronic inflammation, and cause diarrhea, vomiting, and lack of appetite [24]. These consequences deplete the body's nutrients, perpetuating infection and starvation.

Giardia lamblia, a protozoan, damages gut lining and nutrient absorption. Malnutrition and poor sanitation and hygiene increase exposure risks to these illnesses in low-income settings [25]. Parasitological illnesses cause and result in malnutrition, therefore proper intervention must involve nutritional rehabilitation and infection prevention and treatment [26].

Childhood asthma and hunger are complex and often reciprocal. Multiple ways asthma, a chronic inflammatory airway condition, can cause malnutrition [27]. In asthma flare-ups, children may have trouble breathing, exhaustion, and a diminished appetite, which can affect food intake [28]. Regular asthma attacks and chronic inflammation raise metabolic demands, so the youngster needs more energy and nutrients to stay healthy. Weight loss, poor growth, and under nutrition can arise from unmet demands, especially in food-insecure contexts [29]. Long-term corticosteroid medication can also impair food metabolism, appetite, and gastrointestinal function in children with moderate to severe asthma. However, malnourished children have compromised immune systems, making them more prone to respiratory infections and asthma symptoms. They may also have less muscular mass, including respiratory muscles, affecting lung function [30].

Thus, asthma and starvation may exacerbate one another, creating a mutually aggravating cycle. In malnourished children, asthma management must include respiratory care and nutritional support to disrupt this interdependent relationship [28]. In children, chronic diseases and malnutrition are intimately linked and often reinforce each other [31]. Chronic ailments such congenital heart defects, kidney disease, cystic fibrosis, neurological disorders, and gastrointestinal conditions can impact appetite, digestion, absorption, and metabolism, causing malnutrition [32]. Due to weariness, pain, or frequent hospitalizations, children with chronic illnesses may have feeding difficulties or dietary restrictions that limit their food intake [33].

Due to continual inflammation, repair, or altered metabolism, these disorders often increase nutritional needs. For growth and immunological function, children with persistent infections or inflammatory disorders may need more protein and energy. Failure to meet these demands causes growth failure, weight loss, or stunting [34]. Malnutrition weakens the immune system, reduces therapeutic efficacy, and slows recovery from chronic disorders. Malnourished children may have slower wound healing, higher infection risk, and lengthier sickness recovery. Chronic disease causes malnutrition, which worsens the disease and slows development [35]. Managing chronic diseases in children must be closely integrated with nutritional assessment and support because increasing nutritional status improves health outcomes and quality of life.

3.3 levels of malnutrition

Table.3 shows questionnaire-based malnutrition rates in children under five, highlighting a major public health issue. Only 6% of children had no malnutrition ($p = 0.013$), while 94% had varied degrees of nutritional insufficiency. In 15% of children ($p = 0.029$), weak malnutrition indicated early-stage under nutrition due to poor diet or inconsistent feeding. 4% of the sample had moderate malnutrition ($p = 0.012$), indicating greater nutritional stress. Most worrying is that 74% of children ($p = 0.044$) have severe malnutrition, indicating protracted and chronic nutritional deprivation. This extreme malnutrition is commonly linked to poverty, recurring illnesses, poor food, and insufficient healthcare. Statistically significant p-values across all categories demonstrate that these findings are important and not random. This data emphasises the urgent need for comprehensive nutritional interventions, including immediate therapeutic support and long-term strategies to address maternal education, food security, and public health infrastructure to prevent severe early childhood malnutrition.

The data in Table.3 reflects a critical and widespread malnutrition crisis among children under five, arising from a complex interplay of socioeconomic, environmental, and healthcare-related factors. The extremely high rate of severe malnutrition (74%) indicates prolonged nutritional deprivation, which is often rooted in poverty, food insecurity, and limited access to quality healthcare. Families facing economic hardship may be unable to provide adequate, nutrient-rich food, while poor sanitation and hygiene contribute to recurrent infections that further compromise nutrient absorption

and immune function [36]. The presence of weak (15%) and moderate (4%) malnutrition suggests that many children are experiencing ongoing but less visible nutritional deficits that can escalate if not addressed early. Additionally, low levels of maternal education and awareness about proper infant and young child feeding practices contribute to early weaning, unbalanced diets, and poor nutritional outcomes [37]. The statistically significant differences across all levels of malnutrition underscore that these patterns are not random but reflect deep rooted structural issues. This data highlights the urgent need for integrated and sustained interventions, including therapeutic nutrition programs, public health education, improved sanitation, and policies aimed at reducing poverty and enhancing maternal and child care services [38] Figure (3)

3.4 Types of supplementary materials used to treat malnutrition among children < 5 years

According to questionnaire responses, Table.4 shows the forms of extra medical therapies used to treat malnutrition in children under five. Malnourished children's impaired immune systems make them susceptible to infections, therefore 57% of them received antibiotics (p = 0.024). To treat or prevent parasitological infections that can affect nutritional status and postpone recovery, antibiotics are often used. Intravenous (I.V.) fluids were also given to 65% of the children (p = 0.028) to treat dehydration caused by diarrhea, vomiting, or poor oral intake, which is typical in severe malnutrition. The statistically substantial p-values in both scenarios show that these interventions are not random but crucial to malnutrition treatment. These findings emphasize the necessity for a complete malnutrition treatment that involves nutritional rehabilitation and important medical care like infection control and fluid replacement to stabilize the kid and enhance health outcomes.

The data in Table. 4 highlights the necessity of medical interventions in the treatment of malnutrition among children under five, revealing that malnutrition is frequently accompanied by serious health complications requiring more than just dietary support [39]. The high percentage of children receiving antibiotics (57%, p = 0.024) underscores their vulnerability to infections due to weakened immune systems, a common consequence of nutritional deficiencies. Antibiotics are essential for treating or preventing Parasitological infections that could otherwise worsen the child's condition or delay nutritional recovery [40]. Similarly, the administration of intravenous (I.V.) fluids to 65% of children (p = 0.028) reflects the widespread issue of dehydration caused by diarrhea, vomiting, or inadequate fluid intake common complications in severely malnourished children. The statistically significant association of both treatments with malnutrition management confirms their clinical importance. This data emphasizes that managing malnutrition effectively requires a comprehensive, integrated approach that combines nutritional rehabilitation with essential medical care, particularly infection control and fluid therapy, to stabilize and support the recovery of malnourished children [41] Figure (4).

4. Conclusion

The findings underscore a significant association between malnutrition and *Helicobacter pylori* infection among children under five years

old, with a prevalence rate of 12% and a statistically significant relationship (p = 0.017). This highlights the important role of *Helicobacter pylori,* which plays in the health of malnourished children, as the infection may contribute to impaired nutrient absorption and gastrointestinal disturbances, further exacerbating nutritional deficiencies. The bidirectional impact between *Helicobacter pylori* infection and malnutrition emphasizes the need for integrated health and nutrition interventions that include screening and management of underlying infections to break the cycle of poor health and under nutrition in this vulnerable population.

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TABLES:

Table 1: Demographic characteristic of study samples among children < 5 years of age suffering from malnutrition

Parameters		Frequency (%)	Mean +- SD	P value
age	<1 year	56(56%)		
	>1 year	44(44%)		0.024
weight(kg)	<1 year		6.21 +- 1.33	
	>1 year		12.04 +- 1.28	0.03
height(cm)	<1 year		53.11 +- 0.95	
	>1 year		85.47 +- 1.03	0.046
breast milk	Yes	21(21%)		
	No	79(79%)		0.012
	P < 0.05			

Table 2: Parasitological infections and other diseases among children < 5 years of age suffering from malnutrition

Parameters	Frequency (%)	P Value
***Helicobacter pylori* Positive Samples**	12(12%)	0.017
Asthma positive samples	6(6%)	0.029
Chronic disease positive samples	13(13%)	0.034
	P < 0.05	

Table .3: Levels of malnutrition among children < 5 years of age according to questionnaire

Malnutrition Stage	Frequency (%)	P Value
No Malnutrition	6(6%)	0.013
Weak Malnutrition	15(15%)	0.029
Moderate Malnutrition	5(4%)	0.012
Severe Malnutrition	74(74%)	0.044
	P <0.05	

Table 4: Types of supplementary materials used to treat malnutrition among children < 5 years of age suffering from malnutrition according to questionnaire

Supplementary Materials Types		Frequency(%)	P Value
Antibiotic	Yes	57(57%)	0.024
	No	43(43%)	
I.V. Fluid	Yes	65(65%)	0.028
	No	35(35%)	
	P<0.05		

FIGURE:

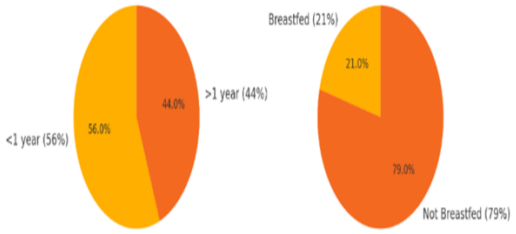

Figure 1: Demographic characteristic of study samples

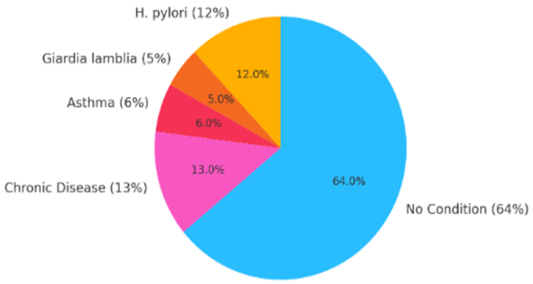

Figure 2: Parasitological infections and other diseases in children suffering from malnutrition

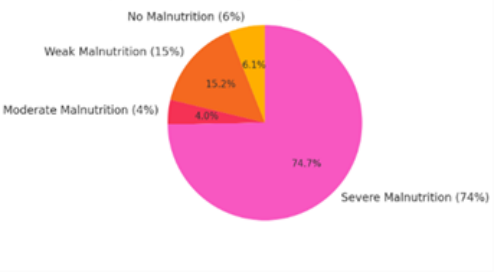

Figure (3): Levels of malnutrition

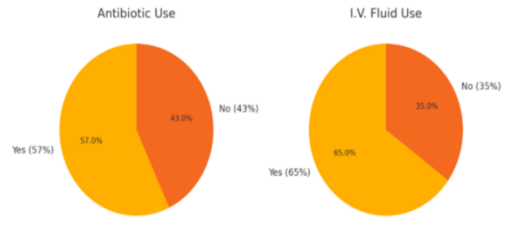

Figure (4): Types of supplementary materials used to treat malnutrition