バングラデシュの子どもたちに栄養を。
ユーグレナGENKIプログラム

# Euglena GENKI Program
# - Nutritional Support to Foster the Future
# Impact Assessment Report

December 2025


**Euglena Co., Ltd.**
**euglena GG Ltd**

Grameen euglena　ユーグレナ

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# 1. Introduction

## ■ The Founder, Mitsuru Izumo's Vision and GENKI Program

The People's Republic of Bangladesh is a low-to-middle-income country located in South Asia (east of India) with a population of approximately 170 million. One of the challenges Bangladesh is facing is that child malnutrition. In Bangladesh, one in every 2.5 children under five suffers from anemia, and micronutrient deficiencies (such as vitamin A, iodine, iron, and zinc) are common, leading to stunted growth in one in every four children under five[1-3].

To address this challenge, Euglena Co., Ltd. launched "GENKI Program" in 2014. It delivers highly nutritious cookies made with the microalgae *Euglena* to local children free of charge. Each serving is designed to supplement vitamins, iron, and other nutrients often lacking in their diets. Purchasing products or making donations in Japan directly contributes to the children's "genki" (health and vitality in Japanese).

The origin of this initiative lies in the experiences of founder, Mitsuru Izumo, during his student days in Bangladesh. Witnessing children suffering from malnutrition, he resolved, "I want to find a nutritional source that would allow them to live healthy lives." After returning to Japan, he encountered *Euglena*, a microalgae rich in nutrients. Through extensive research and challenges, he succeeded in the world's first large-scale outdoor cultivation for a food grade *Euglena* in 2005 and founded Euglena Co., Ltd. GENKI Program is an activity that embodies this vision.

Figure 1-1. Mitsuru Izumo and children in Bangladesh during his student days

## ■ Purpose of this Report

This report, "Nutritional Support to Foster the Future — Euglena GENKI Program Impact Assessment Report" was created to reveal the impact generated by the program that delivered a total of 20 million biscuits to children in Bangladesh.

We conducted quantitative and qualitative measurements—including height, weight, grip strength, urine tests, and symptom questionnaires—on 200 children participating in the program and 200 non-participants. These measurements were taken three times over a one-year period from February 2024 to March 2025, at six-month intervals.

Based on these findings, this report aims to present the social impact of GENKI Program. In addition to reporting to our supporters, we also introduce the future direction of our initiatives.

# 2. GENKI Program's Journey (2014–2025)

Launched in Bangladesh in 2014, GENKI program began by distributing Euglena biscuits to approximately 2,000 children across five schools. Since then, the program has expanded its scale through strengthening partnerships with local NGOs and businesses. In addition to improving children's health, the program also promotes nutrition education and hygiene awareness.

In 2024, the program celebrated its 10th anniversary and introduced a corporate donation scheme, "GENKI-Yell," marking the start of full-scale collaboration with corporate CSR initiatives. By March 2025, total distributions surpassed 20 million biscuits. Today, the program has grown to deliver Euglena biscuits to approximately 9,000 children up to five days a week.

We express our heartfelt gratitude to our customers and partner organizations who have supported our journey, and we remain committed to providing nutritional support that nurtures the future of children.

Table 2-1. Program Trajectory

| Month/Year | Event |
|---|---|
| April 2014 | **Launched GENKI Program.** Began free distribution of Euglena biscuits to approximately 2,000 children at five schools in Dhaka slums. |
| September 2017 | **Expanded local partnerships.** Introduced an operational model where NGOs and schools provide support of 4 yen per packet of cookies. |
| December 2017 | **Support for Rohingya refugees.** Distributed 200,000 servings of specially made Euglena biscuits to refugee camps. Also began expanding the program to the outskirts of Dhaka. |
| April 2019 | **Expanded product range program.** Marking our 5th anniversary, we expanded eligible products to include all Euglena Group products. |
| December 2022 | **Exceeded 15 million servings.** The program expanded beyond Dhaka to 12 rural districts, increasing partner schools to 106 and reaching approximately 10,000 children daily. |
| April-July 2024 | **Program's 10th Anniversary.** Held a 10th anniversary event in Bangladesh and launched "GENKI-Yell," a new corporate donation system. |
| March 2025 | **Reached 20 million servings.** Completion of one-year GENKI Program impact measurement (Reported in this document). |

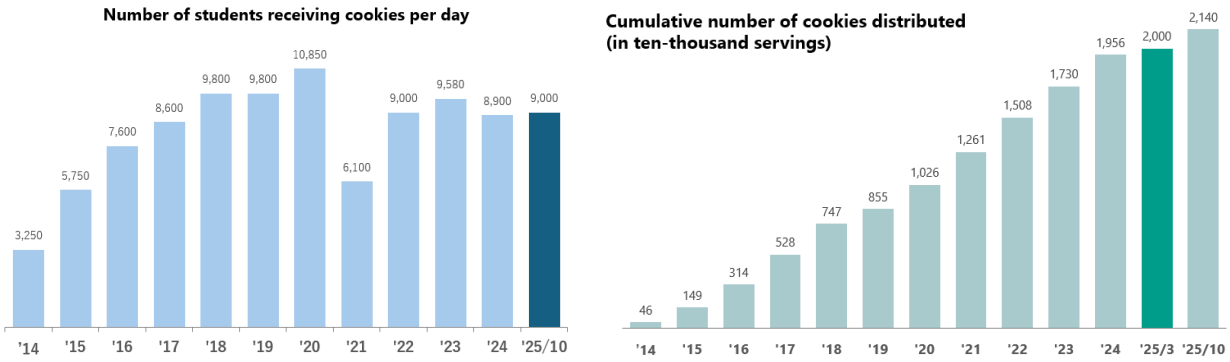



Figure 2-1. Daily Distribution of Euglena biscuits to Students and Total Distribution

# 3. Nutritional challenges faced by children in slums of Bangladesh

Before launching GENKI program, we first investigated the health challenges faced by children in Bangladesh. We found that issues like anemia, micronutrient deficiencies, and growth impairment were severely impacting their learning and daily lives. To address these challenges, GENKI program has promoted nutritional support utilizing *Euglena*, along with nutrition and hygiene education.

The purpose of this impact assessment is to determine the program's effect on these challenges. However, the environment surrounding Bangladeshi children has changed since the program's inception in 2014. Therefore, this chapter outlines the nutritional challenges then and now, providing context for interpreting the current survey results.

*The content presented in this chapter does not demonstrate the effectiveness of GENKI Program. It is an analysis based on public data and literature concerning children living in Bangladesh. It is positioned as comparative context and background for interpreting the program results.

### (1) Malnutrition due to lack of dietary diversity

The challenge with food in Bangladesh lies more in "food quality" than "food quantity." A 2013 survey reported that monotonous and variety-poor dietary patterns, formed against a backdrop of insufficient nutrition knowledge and low literacy rates, were a major factor in malnutrition[4].

The Food Consumption Score (FCS) is used to evaluate dietary diversity and nutritional balance. The FCS calculates the frequency of consumption for each food group over the past seven days, applies a "weight" based on the nutritional value of that food group, and sums these weights to produce a score. This score classifies household dietary status into three levels: "Poor" (severe food insufficiency), "Borderline" (barely adequate), and "Acceptable" (sufficient).

In the 2024 survey, as shown in Figure 3-1, only 21% of households in slum areas achieved an acceptable level of balanced meals, while 31% were classified as poor, indicating extremely low dietary diversity[6]. These results show that dietary diversity has not significantly improved compared to more than a decade ago, and meals remain predominantly staple-based with limited variety.

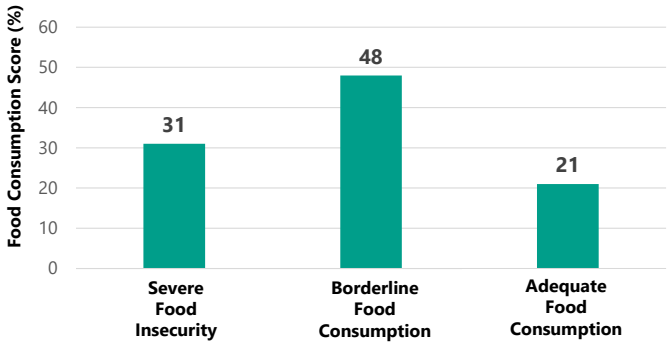



Figure 3-1. FCS score in Slums of Bangladesh[6]

### (2) Micronutrient Deficiencies

Against the backdrop of limited dietary diversity, severe micronutrient deficiencies have also emerged. Since the number of surveys of school-age children are limited, we present findings based on data for children under five years old.

#### ■ Current Status and Challenges for Children Under Five

The National Micronutrient Survey (NMS) 2019–2020, conducted under the leadership of the Ministry of Health of the Government of Bangladesh, reported a comparison of micronutrient deficiencies among children under five years old based on survey results from 2019–2020 and 2011–2012[3].

Anemia and Iron Deficiency

The prevalence of anemia decreased from 33% in 2011-2012 to 21% in 2019-2020, yet it still falls within the range of WHO's definition of moderate public health problems (20-40%). The iron deficiency rate increased from 11% to 15%, indicating no improvement in iron sufficiency. Eliminating iron deficiency is considered essential for further reducing anemia.

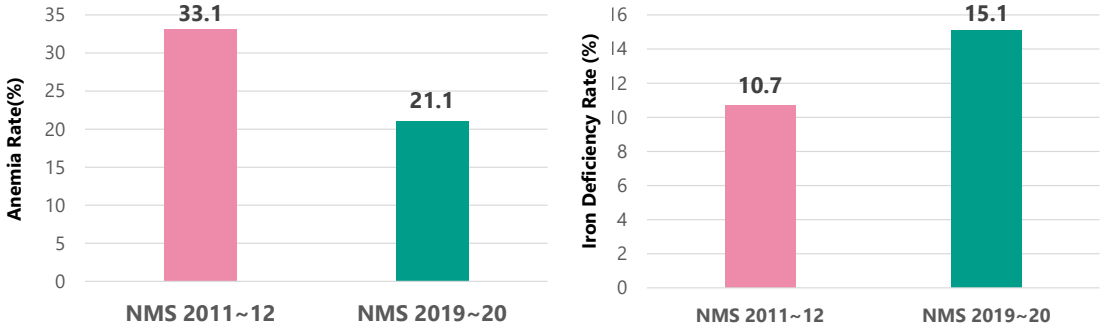



Figure 3-2 Changes in Anemia and Iron Deficiency Rate

Zinc Deficiency

The zinc deficiency rate in 2019-2020 also improved from 45% in 2011-2012 to 31%. However, reports[5] define areas with a zinc deficiency rate of 25% or higher as high-risk areas, indicating that zinc deficiency remains a significant issue in Bangladesh.

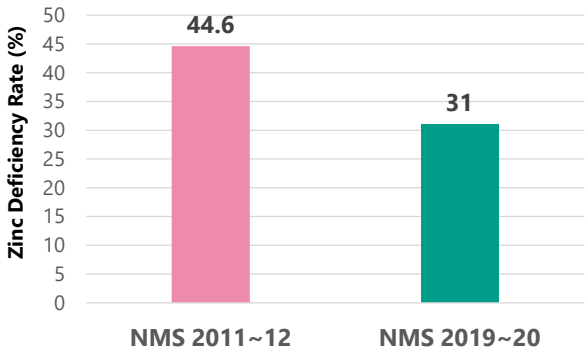



Figure 3-3 Changes in Zinc Deficiency Rates

Vitamin D Deficiency

Vitamin D deficiency rates in 2019-2020 also decreased from 40% in 2022-2012 to 22%; however, since regions with a deficiency rate exceeding 20% are considered to require intervention[6], this remains a public health concern.

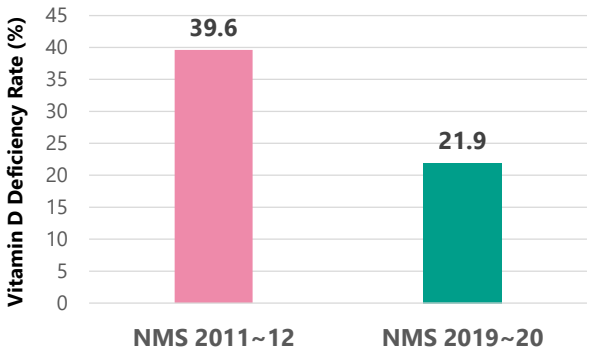



Figure 3-4 Changes in Vitamin D Deficiency Rates

Vitamin A Deficiency

On the other hand, the vitamin A deficiency rate in 2019-2020 (moderate and above) improved from 21% in 2011-2012 to 7%, reaching a level classified as a mild problem according to WHO indicators. This improvement is suggested to be due to the effectiveness of the Vitamin A Plus Campaign implemented by the Government of Bangladesh with support from UNICEF.

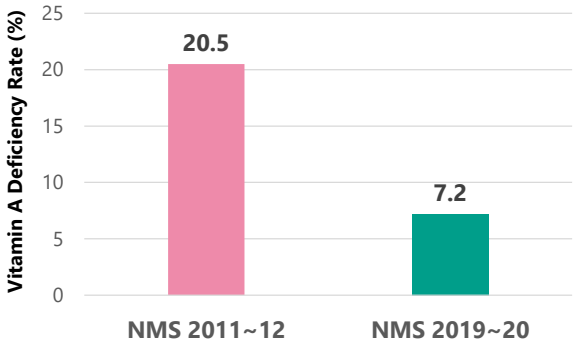



Figure 3-5: Change in Vitamin A Deficiency Rate (Moderate to Severe)

Thus, while improvements are seen in nutrients like vitamin A among children under five, deficiencies in iron, zinc, and vitamin D remain significant challenges.

## ■ Health Effects of Deficiency in Each Nutrient

Iron

Iron is not only essential for producing hemoglobin, which carries oxygen in the blood, but also plays a critical role in brain and nervous system function. The school-age period (approximately 6–12 years) is a time of simultaneous physical and cognitive development. When iron intake is insufficient during this stage, iron-deficiency anemia can lead to oxygen shortage, causing symptoms such as fatigue, lethargy, and decreased vitality.

Moreover, iron is involved in neurotransmitter synthesis and brain energy metabolism, meaning that even before anemia develops, psychological changes such as reduced attention, loss of motivation, and depressed mood may occur.

These effects are suggested to broadly impact on learning motivation, academic performance, and overall quality of daily life[7-8].

Zinc

Zinc is an essential trace mineral involved in a wide range of life-sustaining processes, including cell division, growth, immune function, and neural development. When children enter their growth phase, zinc deficiency has been shown not only to hinder height and weight gain but also to potentially cause reduced activity levels and attention span, affecting cognitive functions like learning and memory[9]. Furthermore, since zinc is essential for normal immune system function, deficiency has been reported to increase the risk of infections such as diarrhea and pneumonia, as well as slow recovery[10-11].

Thus, zinc deficiency is not merely a matter of "insufficient nutrition"; it has the potential to impact multiple areas including learning motivation, school life, health, and overall development. Therefore, early nutritional management is particularly important for children during their growth period.

Vitamin D

Vitamin D is a fat-soluble vitamin that promotes calcium absorption in the intestines, enables normal bone mineralization by maintaining blood calcium and phosphorus levels, and plays a role in muscle development and function. Reports indicate that vitamin D deficiency in school-aged children can lead to inadequate development of muscle strength and function. Prolonged and severe deficiency may cause rickets due to impaired bone tissue mineralization, potentially resulting in bone pain, skeletal deformities, and growth retardation[12-13].

**(3) Growth Impairment Caused by Chronic Malnutrition**

The prevalence of stunting among children under five decreased from 60% in 1996 to 24% in 2022, and wasting also declined from 21% to 11%[1]. However, these figures still fall within the ranges defined by WHO as a severe public health concern—stunting: 20–30%, wasting: 10–15%—and thus remain critical issues[14]. Furthermore, the 2022 survey revealed that children of mothers with no formal education had significantly higher rates of stunting and wasting (39% and 22%, respectively) compared to children of mothers with at least secondary education (16% and 10%)[1].

Among school-age children, a 2016 survey (covering the poorest slum population aged 6–12) reported a stunting rate of 60%[15], which falls within the category of a "serious problem" (30% or higher). However, a 2023 survey in rural areas (ages 6–13) showed an improved rate of 18%[16], placing it in the "moderate problem" range (10–20%). On the other hand, since the results for school-age children vary by target region, further research will be necessary going forward.

**(4) Effects on Gut Health and Bowel Movements**

The decline in dietary diversity has also affected intestinal health. A 2022 survey of school-age children in Bangladesh reported that approximately 14% suffer from

constipation, identifying it as a hidden health issue[17]. The main contributing factors include insufficient intake of dietary fiber from fruits and vegetables, inadequate hydration, and habits of withholding bowel movements. In particular, among children in urban and slum areas, poor toilet facilities at schools and reluctance to use them are also considered contributing factors.

**(5) The Vicious Cycle of Infection and Hygiene Issues**

According to a 2013 report, inadequate sanitation infrastructure was recognized as a serious challenge in Bangladesh, particularly in urban slums where water supply and sewage systems were underdeveloped and access to safe drinking water was limited[4]. Many households relied on untreated water and used temporary or shared toilets, resulting in extremely poor hygiene conditions. Children were repeatedly exposed to infections caused by bacteria and parasites. These infections hindered nutrient absorption, weakened immunity, and triggered further infections, creating a vicious cycle. Low maternal education levels, which limited knowledge about hygiene and nutrition, were also contributing factors. Diarrheal diseases were among the leading health problems affecting children[18].

Subsequent surveys conducted in 2017–2018 indicated some improvement[17]. Increased access to safe drinking water and improved toilets led to a decline in diarrhea prevalence among children under five to around 5%, demonstrating that better sanitation contributes to child health.

However, progress remains uneven across regions and socioeconomic groups. In slums and among the poor, many households still use mud floors and unsafe water sources, and combined with insufficient hygiene knowledge, these conditions continue to foster infectious diseases. Moreover, children with poor nutritional status are reported to be more prone to recurrent infections[18], indicating that the complex interplay between hygiene, infection, and nutrition has not been fully resolved. Although diarrheal disease incidence has decreased, it remains an indicator of fragile sanitation conditions, underscoring the need for continued hygiene education and improvements in living environments.

**(6) Widening Nutritional Inequality Driven by Educational and Socioeconomic Disparities**

Recent reports indicate that overall nutritional status in Bangladesh has steadily improved, largely due to rising education levels and living standards. The National Micronutrient Survey (NMS) 2019–2020 revealed that households with higher maternal education levels had lower rates of iron, zinc, and vitamin D deficiencies, demonstrating that disparities in education and income directly affect nutritional status.[3] In urban areas, families with higher education levels showed fewer cases of anemia and micronutrient deficiencies, suggesting that expanded educational opportunities contribute to improved nutrition and health conditions.

Conversely, severe malnutrition persists in socially vulnerable areas such as urban slums. The 2022 Urban SMART Survey found that stunting and underweight rates in slum communities significantly exceeded national averages, with limited maternal education and poor dietary diversity identified as major barriers[19]. As noted earlier, the 2024 urban slum survey confirmed that households with lower maternal education and income had

markedly lower Food Consumption Scores (FCS)[20] reinforcing that educational and economic disparities are driving nutritional inequality.

Thus, while improvements in education and income have enhanced nutritional status nationwide, these benefits have not sufficiently reached socially disadvantaged regions. In fact, relative nutritional disparities are widening in urban slums. Ensuring access to education and economic stability is highlighted as a key strategy for eliminating nutritional inequality in the future.

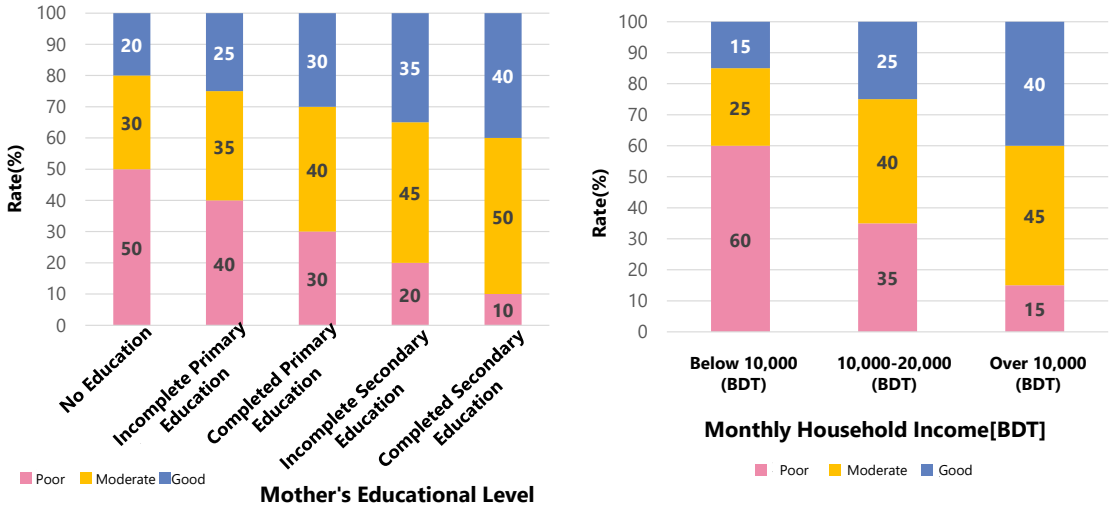


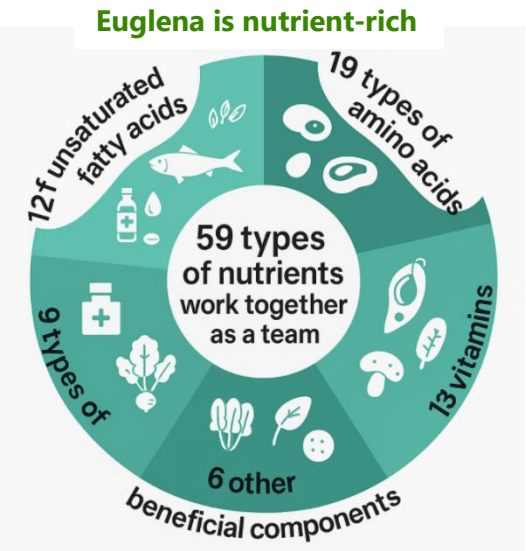

Figure 3-6. Correlation Between Household Income or Maternal Education and Food Consumption Score

### (7) Summary

Based on the above, children living in the slums of Bangladesh face severe impacts on learning motivation and quality of daily life due to micronutrient deficiencies—such as iron and zinc—caused by a lack of dietary diversity. These deficiencies manifest as reduced concentration, depressed mood, fatigue, and weakened immunity. In addition, constipation due to insufficient dietary fiber, recurrent infections linked to poor sanitation, and growth impairment caused by chronic undernutrition remain interconnected challenges. In response to these health issues, GENKI program has contributed to creating an environment for healthy growth and learning through nutritional support, nutrition education, and hygiene education. This report examines, through impact measurement, how GENKI program has influenced these challenges.

# 4. The Functionality of *Euglena* as a Food Ingredient

### (1) A Wide Range of Nutrients




*Euglena* (*Euglena gracilis*) is a microalgae that possesses characteristics of both plants and animals, making it a unique food source that provides wide range of different nutrients in a single intake, including vitamins, minerals, amino acids, unsaturated fatty acids, and dietary fiber. It comprehensively covers nutrients typically found in vegetables, fish, and meat, offering exceptional diversity in nutritional composition.

In particular, its content of essential micronutrients such as iron, zinc, vitamin D, and calcium—critical for growing children—makes it highly valuable for addressing nutritional challenges. Moreover, Euglena has a structure without a cell wall, which enhances its digestibility efficiency, allowing nutrients to be readily utilized by the body.

Additionally, *Euglena* contains a unique component called paramylon (a type of β-glucan), which functions as dietary fiber and has been studied for its potential benefits on gut health and immune function. Thus, beyond nutrient supplementation, it also serves as a functional ingredient contributing to overall health.

### (2) Improving Immune Balance

Euglena contains components involved in maintaining and regulating immune function, and research on its functionality has advanced in recent years. In particular, paramylon, unique to *Euglena*, is suggested to contribute to immune balance by acting on immune cells in the intestinal tract.

Clinical trials in humans have confirmed that continuous intake of Euglena significantly reduces the number of days with cold-like symptoms and the severity of symptoms such as nasal congestion, sore throat, and fatigue[21]. Animal studies using influenza-infected mice have reported that pre-infection intake of Euglena or paramylon reduces viral load in the lungs and improves survival rates. These findings suggest that Euglena may help alleviate infectious disease symptoms through immune modulation[22].

Moreover, trials targeting both adults and children with atopic dermatitis, an allergic condition, showed improvement in skin symptoms in groups consuming Euglena[23].

Thus, *Euglena* is believed to help maintain immune homeostasis by activating necessary immune responses while suppressing excessive inflammation.

### (3) Improving the intestinal environment

In Japan, the most common initial feedback from customers consuming Euglena relates to improved bowel movements, indicating its impact on gut health. Research on gut microbiota balance is also progressing.

Clinical trials in humans have confirmed that continuous intake of Euglena improves

bowel movements[24-25] and increases the proportion of butyrate-producing bacteria in the gut microbiota[24]. Studies using fecal culture systems have similarly reported increased butyrate-producing bacteria and higher butyrate production[25], suggesting improved intestinal function via short-chain fatty acids.

These effects may involve not only *paramylon's* role as insoluble dietary fiber but also enhanced peristalsis through autonomic nervous system balance[27].

Thus, *Euglena* is considered to contribute to gut health through multiple mechanisms, including microbiota balance, short-chain fatty acid production, and intestinal motility regulation.

**(4) Effects on Sleep and Stress**

Clinical trials in humans have reported that continuous intake of Euglena improves sleep satisfaction and reduces fatigue upon waking[26]. Additionally, Euglena intake has been shown to help regulate autonomic nervous system balance under work-related stress, reducing feelings of irritability and tension[26].

These findings suggest that Euglena may support mental and physical health by improving sleep and alleviating stress.

**(5) Cognitive Function**

As noted above, Euglena intake helps regulate autonomic nervous system balance under stress and improves psychological stress and sleep quality[26]. Since sleep deprivation and chronic stress increase cortisol secretion, leading to cognitive decline, stress management and sleep improvement may indirectly support normal brain function. Clinical trials in adults have reported improvements in indicators such as cognitive processing speed, motor speed, and mental health with continuous Euglena intake[29]. Animal studies have confirmed that Euglena intake in aged mice suppresses declines in spatial cognition and spontaneous activity[28].

These findings suggest that Euglena may help prevent cognitive decline and support brain health related to learning and concentration.

# 5. Quantitative Impact Assessment Methodology and Results (2024–2025)

**(1) Survey Overview**

This survey was conducted from February 2024 to March 2025 to evaluate the effectiveness of GENKI program in Bangladesh. We compared children participating in GENKI program (intake group) with those not participating (non-intake group) and assessed the program's impact on nutritional status and health through body measurements, urine tests, and questionnaires on lifestyle habits and physical condition.

■ **Survey Schedule**

1. Overall Period: February 2024 - March 2025
2. Measurement Schedule:
   - 1st Measurement: January–February 2024
   - 2nd Measurement: September–October 2024
   - 3rd Measurement: February–March 2025

   **Due to political unrest in Bangladesh, there were periods when children could not attend school, resulting in delays in the second measurement and up to three weeks of suspension in cookie distribution.*

■ **Target Children**

- Group Design:
  - Intake group: 200 children participating in GENKI program and consuming Euglena cookies
  - Non-intake group: 200 children not participating in the program

  **Children in the intake group had already been participating (consuming cookies) before the 1st measurement, though the start time varied. Some children dropped out of the evaluation due to relocation or other reasons, so the participants changed slightly at each measurement. The number of children common to all three measurements was 161 in the intake group and 141 in the non-intake group.*
- Age: 8–10 years old at the start of the study
- Participating Schools: A madrasa is a religious school where students learn Islamic teachings along with general education. Most are boarding schools where students live communally on campus, following strict daily routines for prayer, study, and meals. Meals are simple, mainly rice, lentil soup, and stir-fried vegetables, and vary depending on region and donations.
- Gender Ratio:
  - 1st Measurement: Boys 293, Girls 107
  - 2nd Measurement: Boys 288, Girls 112
  - 3rd Measurement: Boys 282, Girls 118

■ **Measurement Items**

- Attendance Rate: Recorded by teachers for one month during the measurement period
- Symptom Questionnaire: Children self-reported frequency of various symptoms
- Symptom Checklist: Teachers recorded symptoms of children feeling unwell
- Urine Test: Measured using a nutritional condition checker
- Physical measurements: Height, weight, grip strength

Please also note that this study has several limitations.

- Although the GENKI program places cookie distribution at the core of its activities, it is necessary to consider the overall impact of the program beyond this single component.
- In this trial, comparisons were made between the intake group and the non-intake group at each time point; however, children in the intake group had already been participating in the program (consuming the test food) before the initial measurement. Therefore, baseline comparisons prior to intervention were not possible, and caution is needed when interpreting causal relationships regarding intervention effects.
- During the survey period, a political upheaval occurred*, resulting in changes to measurement timing and temporary suspension of cookie distribution. The potential impact of these disruptions must also be considered.
- Regarding blood tests, strong cultural resistance to blood sampling and insufficient infrastructure for specimen handling made implementation difficult. Consequently, detailed nutritional assessment using blood markers was not conducted; instead, nutritional evaluation was performed using urine samples, which can be collected non-invasively.

*Reuters (6 August 2024): https://jp.reuters.com/pictures/pictures-bangladesh-pm-resigns-amid-protests-crowds-swarm-her-private-residence-2024-08-05/

**(2) School Attendance Evaluation**

Ensuring that children can attend school consistently is an important indicator of overall well-being, encompassing not only physical health but also social and psychological aspects, and is one of the objectives of GENKI program. In this survey, teachers recorded attendance for one month during each measurement period, and absence rates were calculated.

For the 302 children who participated in all three measurements, the average absence rate (±SD) over three months was compared: the intake group showed 3.6 ± 3.2%, while the non-intake group showed 11.8 ± 6.3%, confirming that program participants had a significantly lower absence rate. This difference is considered to be mainly due to two factors:

First, a reduction in health-related absences. It is assumed that consuming Euglena biscuits, along with improvements in lifestyle habits through nutrition and hygiene education, made children less likely to fall ill (see details in the quantitative and qualitative evaluation results described later).

Second, increased motivation to attend school. The benefit of being able to eat Euglena biscuits encouraged parents for their children to attend schools, reducing absences due to family circumstances unrelated to health.

Thus, the reduction in absenteeism through GENKI program is expected not only to secure learning opportunities but also to maximize program effectiveness, creating a positive cycle.

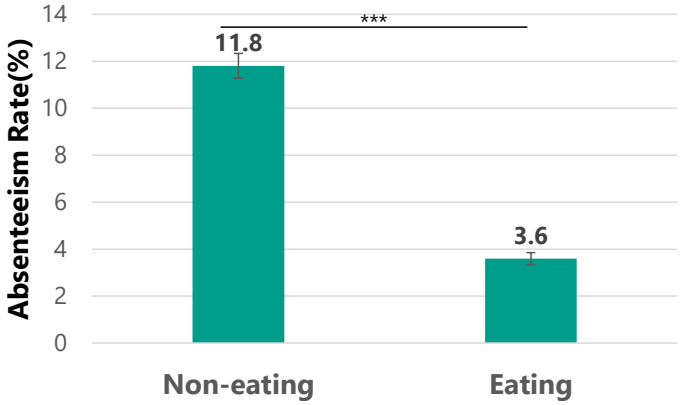



Figure 5-1. Average Absenteeism Rate Across Three Measurements

***p < 0.001 (Welch's t-test)

**(3) Symptom Questionnaire Survey**

In this survey, multiple items related to physical condition were evaluated based on children's self-reported responses. These items included: sleep quality, ease of waking up, decreased concentration, dizziness, headache, palpitations/shortness of breath, feeling of heaviness in the body, depressed mood, bowel movement frequency, and stool condition (Bristol scale).

■ **Overall Trends**

For all items except sleep quality, the intake group showed significantly better conditions compared to the non-intake group. The lack of improvement in sleep quality is likely because many children in both groups already reported "good" sleep, indicating that poor sleep quality was not widely recognized as an issue.

■ **Bowel Movement-Related Items (Frequency and Stool Condition)**

In the non-intake group, 25% of children had bowel movements three times or less per week and based on visual assessment using the Bristol Stool Scale, 32% of children were found to be prone to constipation. As noted in Chapter 3 (2), this supports the existence of hidden issues such as constipation among school-age children due to reduced dietary diversity.

In contrast, the intake group showed a markedly higher proportion of children with frequent bowel movements and stool conditions within the normal range. Notably, responses indicating constipation tendencies decreased, suggesting that GENKI program may have contributed to improving bowel habits. As discussed in Chapter 4, *Euglena* has been reported to help balance gut microbiota and promote short-chain fatty acid production. Additionally, other dietary fibers contained in the cookies may have acted synergistically to improve the intestinal environment.

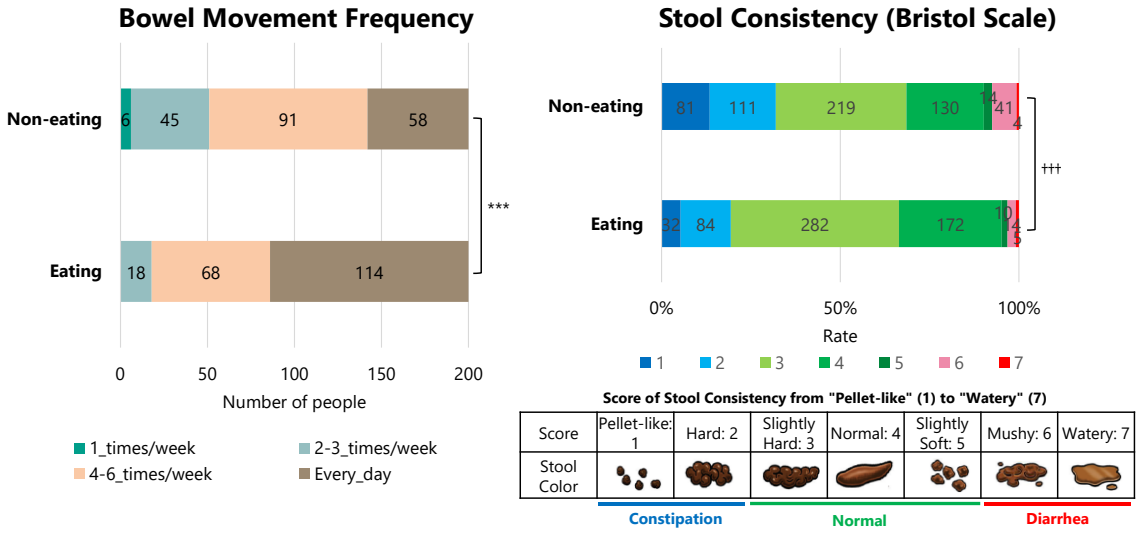



Figure 5-2. Questionnaire Survey (Bowel Movement-Related) at the 3rd Measurement

*** p<0.001 (Ordinal logistic regression)

$^{\dagger\dagger\dagger}$p<0.001 (Chi-square test, standardized residual |Z|>2)

## ■ Effects on Subjective Symptoms (Dizziness, Headache, Palpitations, Shortness of Breath)

Dizziness, headaches, and palpitations/shortness of breath are closely related to anemia, chronic undernutrition, and micronutrient deficiencies among children living in slums, as described in Chapter 3. In the non-intake group, 29–38% of children reported experiencing these symptoms at least once every one to two weeks, highlighting significant nutritional challenges.

In contrast, the intake group showed a markedly lower frequency of these symptoms compared to the non-intake group. These improvements may be attributed not only to the overall enhancement of nutritional status through cookies containing *Euglena* but also to lifestyle improvements promoted by GENKI program as a whole.

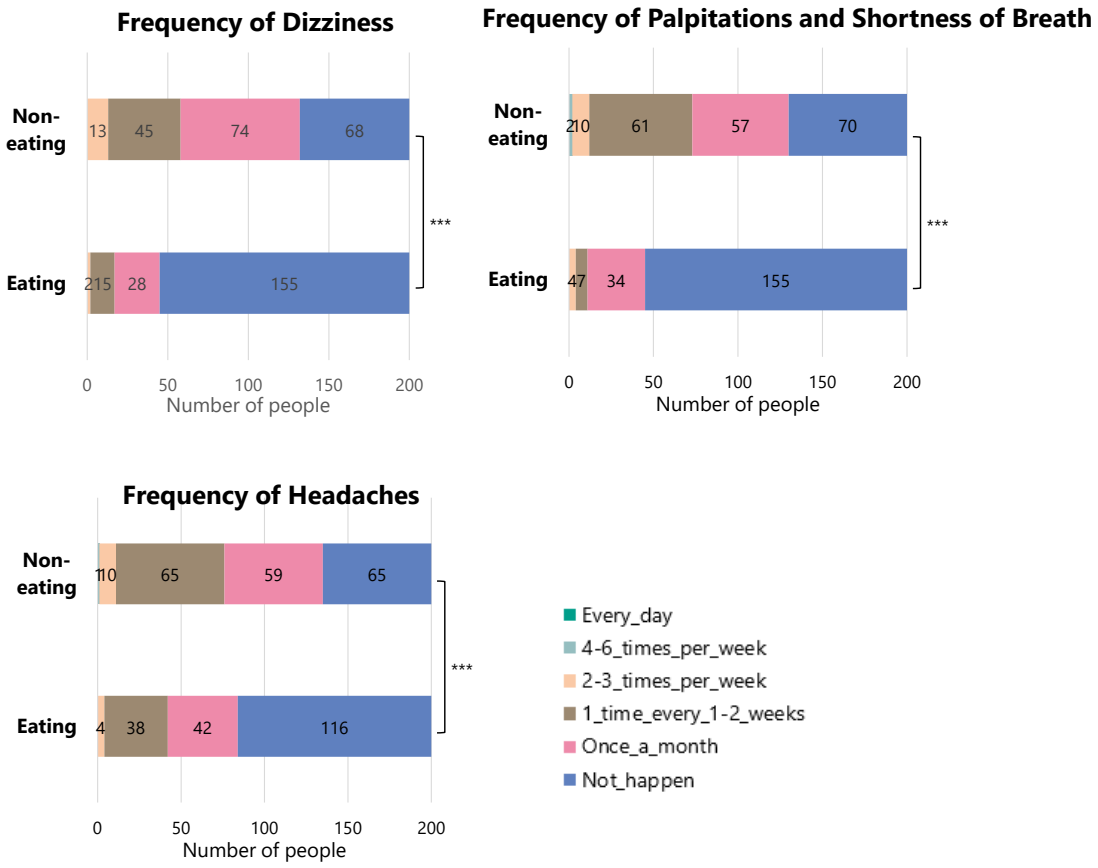



Figure 5-3. Questionnaire Survey (Physical Discomfort Symptoms) at the 3rd Measurement

*** p<0.001 (ordinal logistic regression)

■ **Effects on Subjective Symptoms such as Fatigue and Decreased Vitality (Feeling Heavy, Difficulty Waking Up, Reduced Concentration, Depressed Mood)**

Chronic undernutrition and micronutrient deficiencies can lead to fatigue and reduced concentration. In addition, psychosocial factors such as unstable living conditions in slum environments and feelings of isolation when parents are away for work are also important contributors.

In the intake group, the frequency of symptoms related to fatigue and decreased vitality such as feeling heavy, difficulty waking up, inability to concentrate, and depressed mood, was clearly lower compared to the non-intake group. These improvements may be due not only to better nutritional status and effect of *Euglena's* functionality but also to the reassurance children felt from daily encouragement and support provided through GENKI program, which helped them feel cared for by adults. This suggests a combined effect of nutritional improvement and psychological support within GENKI program.

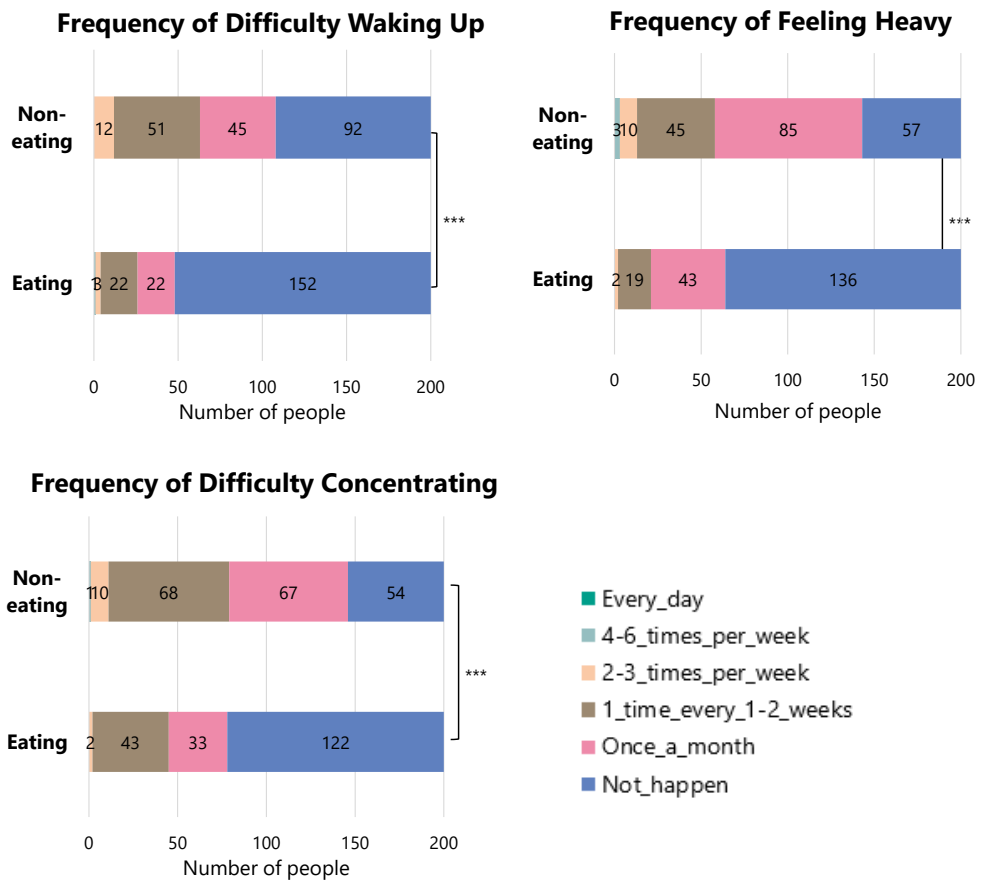



Figure 5-4. Questionnaire Survey
at the 3rd Measurement (Fatigue and Decreased Vitality)

*** p<0.001 (Ordinal Logistic Regression)

**(4) Symptom Checklist**

In this survey, for children who were absent and those who reported feeling unwell while attending school, teachers conducted interviews about symptoms and recorded them using a checklist. Compared to the symptom questionnaire completed by the children themselves, these teacher-recorded observations provide greater objectivity.

The evaluation was based on cumulative data collected over a 10-day period during the survey. We aggregated the total number of children who exhibited at least one symptom and the cumulative number for each symptom category. Taking into account the impact of political unrest, the results were summarized using sufficient data obtained at the end of the evaluation period (third measurement).

The symptom categories included: cold/cough symptoms, fever, seasonal illnesses, skin diseases, stomatitis, jaundice, diarrhea, constipation, fatigue, depressed mood, and other symptoms. Among these, detailed analysis focused on the most frequently reported symptoms: cold/cough symptoms, fever, skin diseases, fatigue, and depressed mood.

■ **Effects on All Symptoms (Any Symptom Present)**

In the intake group, the total number of cases with at least one symptom over the 10-day period was 122, compared to 162 in the non-intake group, indicating that the intake group had fewer cases. This result suggests that GENKI program may contribute to overall health maintenance.

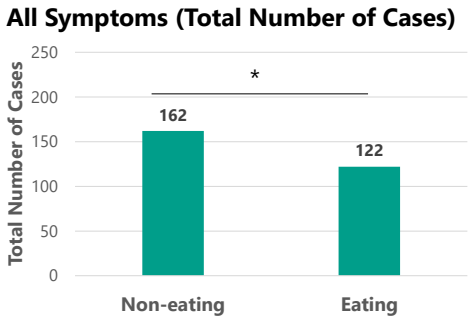



Figure 5-5. Total number of days with any symptom (at 3rd measurement)

* $p<0.05$ (Exact two-sample Poisson distribution test)

■ **Effects on Infections and Inflammation-Related Symptoms (Colds/Cough Symptoms, Fever, Skin Conditions)**

For cold/cough symptoms and fever, no significant differences were observed between the two groups in this survey. These symptoms are easily influenced by short-term outbreaks and incidental factors, making it difficult to clearly evaluate the program's effect within a 10-day observation period. Longer-term monitoring will be necessary in the future.

On the other hand, skin diseases were less frequent in the intake group, which may be attributed to improved nutritional status through GENKI program and better hygiene practices promoted during cookie distribution. Furthermore, as discussed in Chapter 4, previous research has suggested that *Euglena* intake may help alleviate atopic dermatitis in young children, indicating that the observed results could also be related to the effects of *Euglena* consumption.

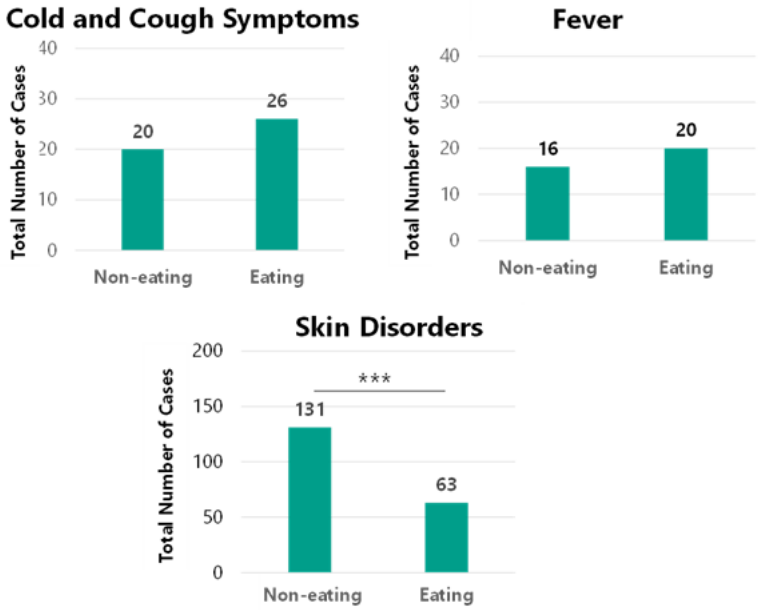



Figure 5-6. Total number of individuals with infection/inflammation-related symptoms on the symptom checklist (at the 3rd measurement)

*** p<0.001 (Exact two-sample Poisson distribution test)

■ **Effects on General Condition and Mental State (Fatigue, Depressed Mood)**

Fatigue tended to be lower in the intake group, and depressed mood was markedly less frequent compared to the non-intake group. These results are consistent with the questionnaire findings (ease of waking, concentration, and mood). This improvement may be attributed not only to better nutritional status and effects of *Euglena's* functionality but also to the psychological stability provided by daily encouragement and support within GENKI program.

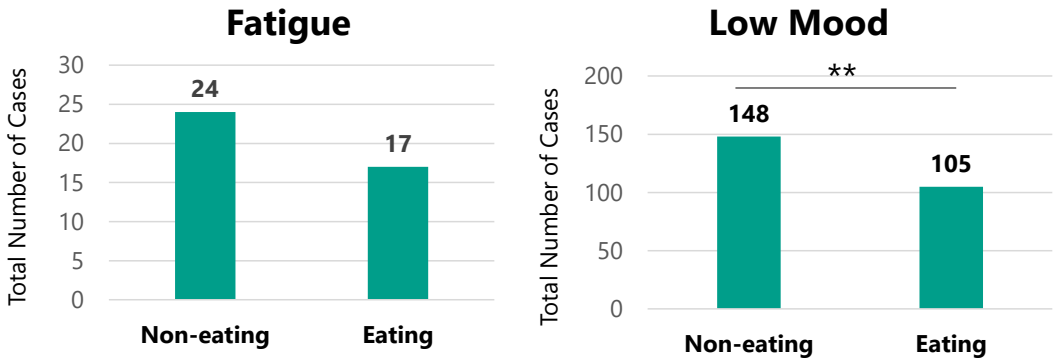



Figure 5-7. Total number of participants reporting fatigue and depressed mood on the symptom checklist (at the 3rd measurement)

** p<0.01 (Exact two-sample Poisson distribution test)

Children consuming Euglena biscuits at Madrasa

**(5) Urine Test for Nutritional and Health Indicators**

At the end of the evaluation period (3rd measurement), nutritional and health indicators were assessed using urine tests. The urine test was conducted with the Nutrition Condition Checker*. This device is a urine testing kit that allows rapid evaluation of nutrient sufficiency. The process involves applying urine to a test strip, allowing it to react for a specified time, then photographing the strip with a smartphone. The image is analyzed using a dedicated algorithm, enabling quick assessment of various nutrient levels.

*Nutrition Condition Checker: https://www.euglena.jp/eiyou/info/

**Nutrition Items**

The nutritional assessment included eight items: zinc, vitamin C, magnesium, calcium, vegetables, salt, oxidative stress, and hydration, each scored from 0 to 9 (a higher score indicates a more desirable state in terms of sufficiency levels), with higher scores indicating a more desirable condition. Additionally, the combined scores for zinc, vitamin C, magnesium, and calcium were converted to a 100-point scale to create a comprehensive micronutrient score, which was then categorized into five levels (A–E) in 20-point increments for graphical representation.

The comprehensive micronutrient score on sufficiency level was 34.7 ± 14.8 in the intake group and 33.7 ± 16.3 in the non-intake group, showing no major difference between the two groups. However, as shown in Figure 5-8 (left), the proportion of children classified in the lower categories (D and E) was slightly reduced in the intake group, suggesting a potential improvement among children with poorer nutritional status.

On the other hand, differences were observed in individual items, particularly zinc sufficiency scores: 3.7 ± 2.2 in the intake group versus 3.3 ± 2.3 in the non-intake group. This may reflect the zinc content in Euglena biscuits and the increased dietary diversity promoted.

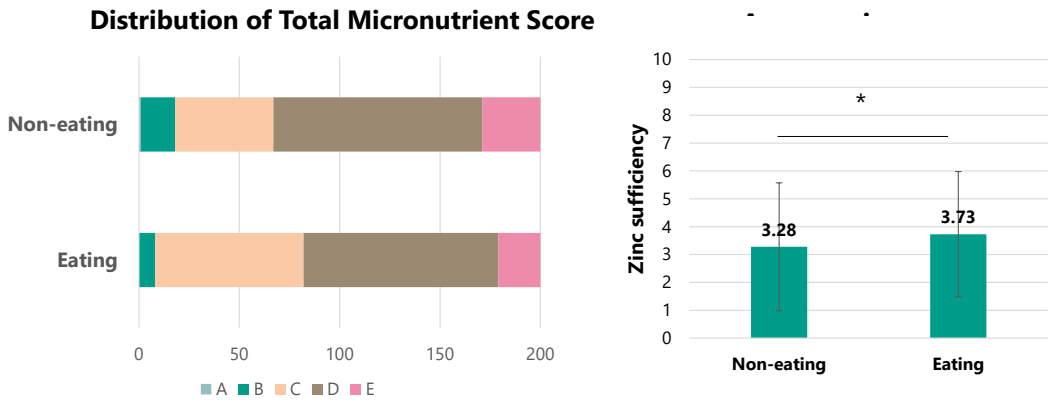



Figure 5-8. Urinalysis-based nutrition scores
(Left: Overall score distribution, Right: Zinc sufficiency)
*p < 0.05 (Welch's t-test, intake vs. non-intake)

Children reporting urine test results

**(6) Growth and Development Assessment (Height, Weight, Grip Strength)**

In this study, to assess whether GENKI program contributed to children's growth and development, height, weight, and grip strength were measured three times. Results showed that the intake group, which consumed Euglena biscuits, consistently exhibited higher average values across all measurement items compared to the non-intake group.

Furthermore, when calculating the prevalence of stunting based on height in the non-intake group, the rate was 21–22%, which falls within the range classified by WHO as a "serious public health problem" (20–30%). This indicates that stunting remains a challenge among school-age children in urban slums. In contrast, the intake group showed a rate of 14–16%, remaining within the "moderate problem" range (10–20%).

| | Intake Group (1st → 3rd) | Non-intake Group (1st → 3rd) |
|---|---|---|
| Height | 128.2±9.9cm → 132.6±9.1cm | 124.3±8.6cm → 129.1±8.3cm |
| Weight | 25.8±6.9 kg → 28.9±8.3 kg | 23.5±5.2 kg → 27.0±6.8 kg |
| Grip Strength | 11.0±4.1 kg → 13.4±4.7 kg | 9.0±3.6 kg → 10.7±3.8 kg |
| Stunting Rate | 16% → 14% | 21% → 22% |

On the other hand, when comparing the changes from the first to the third measurement, no substantial differences were observed between groups for height and weight. Since the intake group had been participating in the program prior to the first measurement, variations in the start time should also be considered. Longer-term follow-up studies are recommended.

For grip strength, the increase from the second to the third measurement was slightly greater in the intake group. Although limited, this suggests that GENKI program may have contributed to improvements in healthy growth and development (improved muscle strength and nervous system etc.).

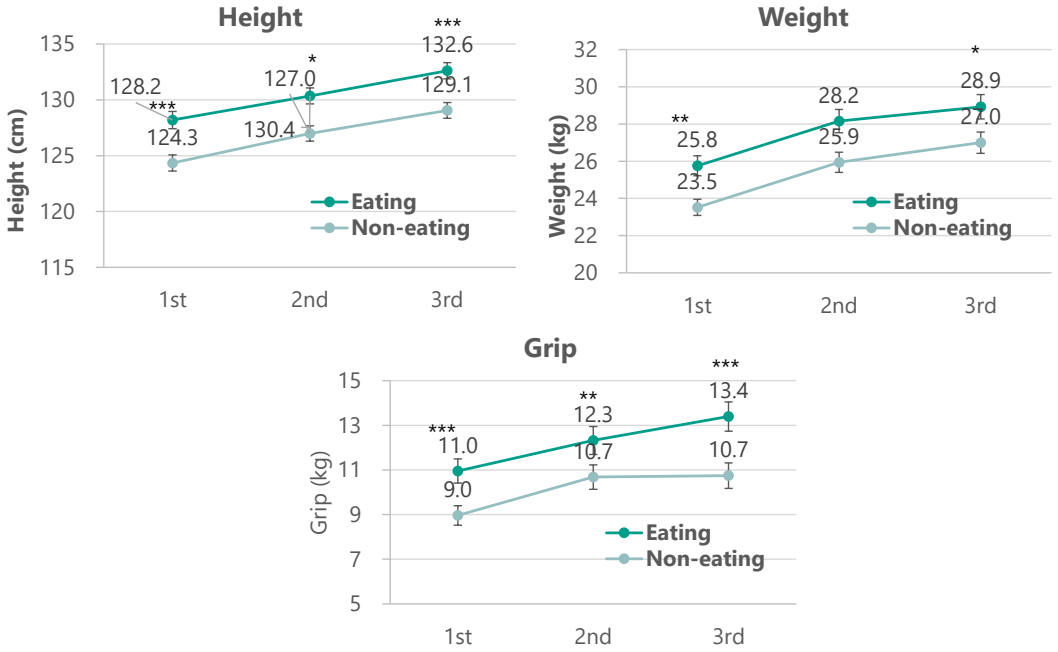



Figure 5-10. Changes over time in height, weight, and grip strength

*p < 0.05, **p < 0.01, ***p < 0.001 (Welch's t-test)

### (7) Summary of Quantitative Impact Assessment

In this study, we quantitatively evaluated the impact of GENKI program on children's nutritional status and health. From a physical health perspective, the intake group showed a lower frequency of symptoms such as dizziness, headaches, palpitations, and shortness of breath, as well as a lower incidence of constipation. Urinalysis indicated better zinc sufficiency, and overall nutritional status appeared relatively favorable. Additionally, the intake group exhibited fewer skin disorders and greater grip strength.

From lifestyle and mental health perspectives, the intake group demonstrated higher attendance rates and better conditions regarding fatigue, vitality, and mental health (including heaviness of the body, difficulty waking up, and declines in concentration and mood).

Based on these results, it is suggested that the intake of Euglena biscuits and the improvement of dietary diversity through food education may contribute to the enhancement of comprehensive health indicators, including nutritional status, physical function, and overall vitality. Furthermore, the combined effects of GENKI program, including lifestyle interventions and psychological support, should also be considered.

However, variations in the timing of intake initiation and age-specific characteristics must be taken into account, and long-term follow-up studies are needed. Regarding immune function, evaluating changes in symptoms such as colds requires extended observation, and additional research is necessary due to the lack of baseline data on incidence rates among children in Bangladesh. Similarly, improvements in micronutrient status require continued investigation, as baseline data for school-age children remains limited. Nutrients not assessed in this study should also be examined to confirm the program's effects.

Addressing stunting requires focusing on early childhood, where the impact is greatest; therefore, studies targeting younger age groups are essential. Clarifying the effects of nutritional interventions during growth periods will provide valuable insights for improving the program. The discussion of results presented here takes these considerations into account.

# 6. Insights from On-Site Interviews (Qualitative Assessment)

In addition to the quantitative impact results presented in Chapter 5, interviews were conducted in February 2025 with local program stakeholders to supplement the overall effects of continued implementation of GENKI program. Interview participants included school principals in slum areas where Euglena biscuits are distributed, partner NGOs, parents and mothers' groups of children consuming Euglena biscuits, and households living in the slums.

The interview findings were organized into three categories:

(1) Changes in health status and living environment among children consuming Euglena biscuits
(2) Changes in attitudes toward school
(3) Secondary effects on parents, teachers, and other stakeholders

**(1) Changes in Health Status and Living Environment**

- All the children know that Euglena biscuits contain 59 types of nutrients, so they have stopped eating junk food outside school and started eating more nutritious vegetables. (School teacher)
- Eating habits have changed. For example, my children used to skip breakfast and disliked meals, but after starting to eat cookies, they began to enjoy eating. (Parent)
- Awareness of nutrition has improved, and it has become a topic of conversation within the family. It also contributes to nutritional education. (Parent)

**(2) Motivation for School and Attendance**

- Physically, the children have become more energetic and focused. Growth changes are also noticeable. Previously, many were of a 'monotonous type,' quiet and passive, but after eating cookies, they became lively and active. Considering that outside school they rarely eat meat or fish, which are energy sources, these changes are likely due to Euglena biscuits. (School teacher)
- They became energetic and started playing more. Before eating cookies, they didn't enjoy playing much. Their concentration also improved. (Parent)
- Attendance rates have exceeded 95%, and children look forward to going to school. (School teacher)

**(3) Secondary Effects on Parents, Teachers, and Others**

- Teachers also gain nutritional knowledge by following the cookie distribution rules, so the program has secondary benefits. (NGO representative)
- Economically, since children eat cookies at school, parents can save on their children's meal cost (e.g., 10 taka per day) and use that money for other purposes. (NGO representative)
- Learning from support programs like GENKI program shows us Japan's strong time management, systems, and program implementation methods. Adults also learn a lot. We hope such disciplined and behavioral support continues to help Bangladesh. (School teacher)
- If GENKI program expands more in this area, the whole community will become

more vibrant. It would be great to spread this program to other regions and eventually nationwide to improve nutrition awareness and education. (Parents, schoolteachers, NGO representatives)

Based on these interviews, qualitative evaluation also confirmed numerous positive effects of GENKI program, including improvements in health status, increased awareness of hygiene among parents and teachers, and favorable impacts on living environments. As noted in the previous chapter's quantitative results, attendance rates were significantly higher among program participants: comparing the average absence rates over three months for 302 children who participated in all three measurements, the intake group had an average absence rate of 3.6 ± 3.2%, while the non-intake group had 11.8 ± 6.3%. This clearly demonstrates that improved school attendance is one of the most notable overall effects of GENKI program.

**【N=1 Stories】**

**Mohammadpur School (GENKI program started in 2020) Mr. Takbir-Fulkuri**

Originally, local NGOs were conducting educational activities for children in this area, recognizing the urgent need for both nutrition and education in this impoverished community. This led to the establishment of school operations. Through an introduction from an acquaintance, we learned about GENKI program and found it highly appealing for children living in this region, especially during the COVID-19 pandemic, when social interactions were severely restricted. The program was essential as both a nutritional supplement and a communication tool, so we applied proactively.

As for the impact of GENKI program, cookies are usually distributed at 9:00 a.m. If the distribution is delayed by 20–30 minutes, children become anxious, asking if the cookies are coming. Seeing their joyful faces when the cookies are finally handed out makes me very happy. I sincerely hope that the program continues to support the community as a whole.

**Voices from children actually eating Euglena biscuits>**

- Euglena biscuits are essential for my school life. Even on days without breakfast, I can stay energetic all day. I am grateful to everyone who distributes the cookies.
  —Taslima (4th grade, Nayantara UCLC School)
- I don't have to have breakfast. Because at school, I can get the energy I need anytime. Euglena biscuits support us so we can stay active and energetic all day long.
  — Akhima (4th Grade, Nayan Tala UCLC School)

Top left: Taslima, Top right: Akhima, Bottom left: Shamiim, Bottom right: Mina

- Euglena biscuits packed with 59 nutrients are great because you can enjoy various flavors. They've always been my favorite.
  — Shamim (3rd year, Baitul Mamur Madrasah)
- At school, I have cookies that are my energy source. So, I never have to worry about feeling hungry.
  — Mina (4th year, DAM Shelter Home)

Through interviews with GENKI program participants and stakeholders, we obtained findings that support the quantitative impact evaluation discussed earlier. Physical effects included changes in body growth and vitality, improved motivation for school and concentration, enhanced hygiene knowledge through nutrition education, and economic savings within households. Additionally, there were positive secondary effects such as increased nutritional awareness among parents and teachers. Overall, the interviews revealed both physical and psychological benefits for the children themselves, as well as economic and nutritional advantages for those around them.

# 7. Summary of Impact Assessment and Future Outlook

GENKI program has been working to improve children's nutrition in Bangladesh through the distribution of Euglena biscuits. As of October 2025, the total number of cookies distributed exceeded 21.4 million, and the number of partner schools has reached 87. This achievement has been supported by a donation system linked to sales in Japan, enabling continued cookie distribution through customer purchases of Euglena products. Furthermore, the corporate donation scheme "GENKI-Yell," launched in 2024 to mark the program's 10th anniversary, has already attracted participation from 11 companies, establishing itself as a recognized CSR initiative. These complementary support models have enabled stable funding and sustained activities for over a decade. Strong partnerships with local schools, NGOs, and manufacturing partners have also been key to ensuring flexible operations that meet local needs.

From a quantitative evaluation perspective, GENKI program demonstrated positive impacts on children's nutritional status and health. From the physical perspective, he intake group showed lower frequencies of symptoms such as dizziness, headaches, palpitations, and shortness of breath, as well as reduced constipation. Urinalysis indicated better zinc sufficiency, and overall nutritional status appeared relatively favorable. Additionally, the intake group exhibited fewer skin disorders and greater grip strength. In terms of lifestyle and mental health perspectives, the intake group had higher school attendance rates and better conditions related to fatigue, vitality, and mental health (including heaviness of the body, difficulty waking up, and declines in concentration and mood).

These findings suggest that the intake of Euglena biscuits and the improvement of dietary diversity through food education may contribute to the enhancement of comprehensive health indicators, including nutritional status, physical function, and overall vitality. Furthermore, the combined effects of GENKI program, including lifestyle interventions and psychological support, should also be considered.

As resulted above, the program was confirmed to have multiple positive effects on children's health and daily life. Reductions in health issues caused by nutritional deficiencies and lower absence were observed, along with alleviation of breakfast-skipping problems, which contributed to improved learning motivation and concentration. Economic burdens on parents were also reduced, supporting household stability. Reports indicated improvements in children's self-esteem and well-being, as well as the establishment of hygiene practices and nutritional education in schools. In Japan, the program has gained recognition as a consumer-participation support initiative, contributing to the expansion of social impact (see Figure 7-1).

Based on these impact assessment results, GENKI program aims to further evolve and scale up its reach.

First, we will explore the possibility of expanding distribution to school meal programs, **targeting the provision of one million biscuits per day and reaching one million children.** In Bangladesh, school lunch programs are still underdeveloped as a nationwide system. Many public primary schools do not provide lunch, and children often attend classes hungry or resort to buying snacks from street vendors. This situation negatively affects learning motivation and concentration and leads to growth and health problems caused by nutritional deficiencies.

Second, we plan to strengthen collaboration with other enterprises towards commercializing Euglena cookies, leveraging GENKI program as part of CSR activities by multinational companies operating in Bangladesh. This model aims to combine employee health management with nutritional support through corporate social responsibility efforts.

In addition, we will conduct follow-up studies to address areas where data collection and analysis were insufficient in this impact assessment. By continuing regular evaluations and improvements, we will further develop the program and maintain accountability to stakeholders who support and collaborate with us. Furthermore, by applying insights gained from Euglena Co., Ltd. and Grameen Euglena's activities, we aim to expand knowledge of social problem-solving business models to other regions and sectors, contributing to the realization of a sustainable society.

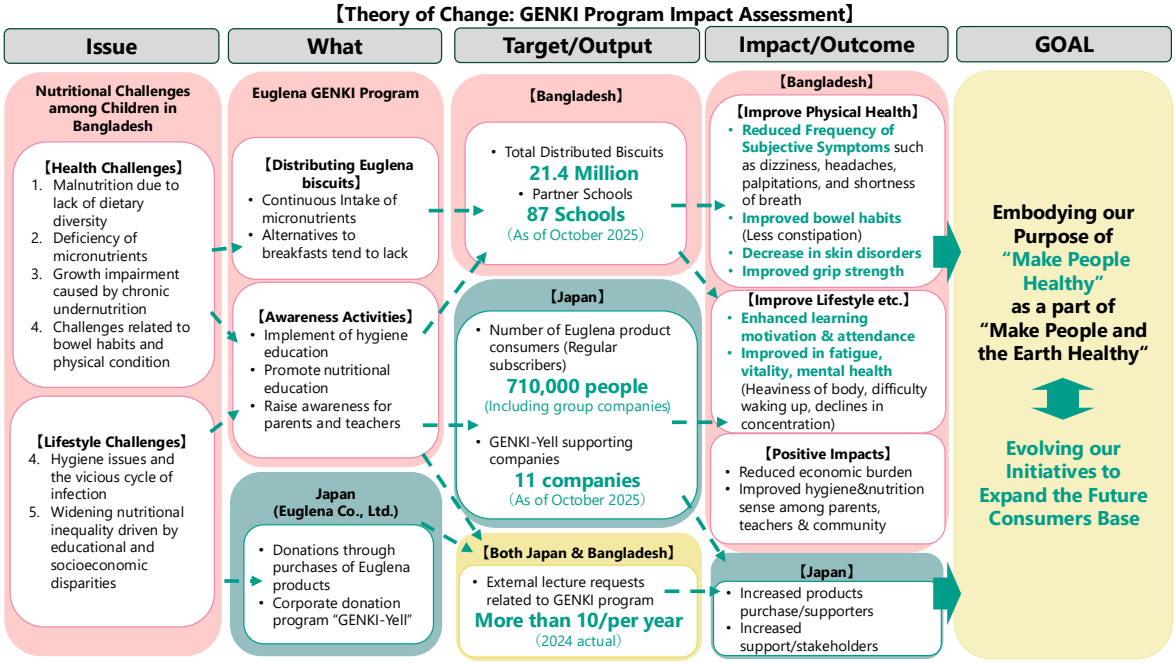



Figure 7-1 Theory of Change: GENKI Impact Assessment

# 8. In Closing

In closing this report, we would like to express our heartfelt gratitude to everyone who has supported the continuation and development of GENKI program. This initiative would not have been possible without the dedication of the staff working on site every day, the teachers at our partner schools, and the companies and individuals who have contributed through donations and purchases.

GENKI Program goes beyond simple nutritional support; it is an effort to build the future of local communities by fostering children's healthy growth and improving their learning environment. Guided by our purpose of "Make People and the Earth Healthy," we will continue to reaffirm its social significance and evolve into a more sustainable and impactful model.

Looking ahead, we will keep challenging ourselves to deliver smiles and hope to more children, including through enhancing various partnerships, which connects school meals with other companies in Bangladesh.

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27. Research results suggesting that continuous intake of the microalgae Euglena may suppress age-related memory decline have been announced | Euglena Co., Ltd.
28. Supporting healthy longevity with clarity, agility, and vitality! Human clinical trials confirm that continuous Euglena consumption effectively contributes to brain health | Euglena Co., Ltd.
29. Bringing smiles to children in Bangladesh! | Initiatives in Japan - JICA

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We would also like to express our deepest appreciation to all stakeholders who have supported the GENKI Program to date, including the children and families in the local communities, partner schools, NGOs, companies, customers who have purchased our products, and everyone who has contributed or offered encouragement.

We aim to realize a new business model in which business growth leads to social contribution. We hope that this report will deepen dialogue with all those involved with us—shareholders, investors, business partners, employees, and more—and contribute to the further development of our activities.

Going forward, we will continue to work together with our local partners and stakeholders toward the realization of a sustainable society.

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