

A Student Evaluation of an Assigned Randomized Controlled Trial Study

Course Name: Epidemiology II

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Study Information

Study Name: Impact of Mobile Health-based Nutritional Education on Hemoglobin Levels in Anemic Adolescent Girls in Rural Bangladesh: A Randomized Controlled Trial

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Introduction

- Anemia remains a major global public health concern, particularly among adolescents.
- In Bangladesh, anemia prevalence among adolescent girls ranges from **23% to 51.6%**.
- Mobile health (*mHealth*) interventions—such as phone calls and SMS—show strong potential for improving anemia awareness and promoting iron-rich diets, especially in low-literacy settings.
- Nutrition education has been shown to enhance adolescents' knowledge, attitudes, hygiene, and dietary practices, leading to improved hemoglobin levels.
- However, no specific studies in rural Bangladesh have examined the effectiveness of *mHealth*-based nutrition education on anemia outcomes.

Aim: To evaluate the impact of *mHealth*-based nutrition education on hemoglobin levels among school-going adolescent girls with anemia in rural Bangladesh.

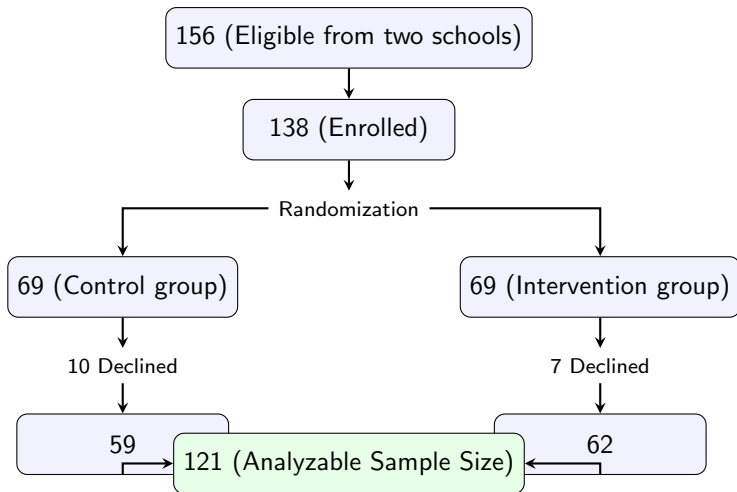
Inclusion Criteria

- Adolescent girls aged **10–19 years** enrolled in selected schools.
- Diagnosed with **mild or moderate anemia** in the prior prevalence study.
- Participants or families possessing a **personal cell phone**.
- Provided **informed consent** along with their legal guardians.

Exclusion Criteria

- Hemoglobin level < 7.0 g/dl (**severe anemia**).
- Regular intake of **iron supplements** for treatment.
- Presence of **mental illness** or **physical disability**.
- **Pregnant** adolescent girls.
- **Refusal** to participate in the study.

Participant Flow Diagram



Note: Data represent participant counts at each stage.

Data Collection Process

- **Community Health Workers (CHWs):** Collected sociodemographic and KAP data using field-tested, validated questionnaires during school visits.
- **Anthropometric measurements:** Height, weight, MUAC, hip, and waist circumference.
- **Blood samples:** Collected by certified laboratory technologists and hemoglobin levels were analyzed using an auto hematology analyzer.
- **Randomization:** Schools were randomized by a statistician into intervention and control groups.
- **Blinding:** CHWs were blinded to baseline interviews but not to group allocation.
- **Follow-up:** Data collected at baseline, 4th month, and 8th month during school visits.

Data Analysis

- Per-protocol analysis was performed after excluding missing data ($n = 17$).
- Descriptive statistics summarized data as frequencies, percentages, means.
- Independent t -test, Mann–Whitney U-test, and Chi-square test to compare.
- Mixed-effects and GEE models to assess intervention effects over time.
- Significance level set at $p < 0.05$.

Ethical Approval

- Approved by the Institutional Review Board/Ethics Review Committee (IRB/ERC) of North South University, Bangladesh.

Results

- The *mHealth* education intervention showed a small effect size ($d = 0.32$) in improving hemoglobin levels ($p > 0.05$).

Table 1: Mixed-effects model to estimate the effect between control and intervention groups over time

Variable	Unadjusted Coef. (95% CI)	p-value	Adjusted Coef. (95% CI)	p-value
BMI (kg/m ²)	1.40 (0.74–2.07)	<0.001	1.10 (0.44–1.76)	0.001
MUAC (cm)	0.98 (0.47–1.50)	<0.001	0.77 (0.27–1.26)	0.002
Hip circumference (cm)	3.18 (1.50–4.86)	<0.001	2.24 (0.62–3.87)	0.007
Waist circumference (cm)	2.81 (1.33–4.28)	<0.001	2.20 (0.74–3.66)	0.003

Mixed-effects model adjusted for age, grade, and parental education & occupation. Intra-class correlation accounted for clustering at the school level.

Results

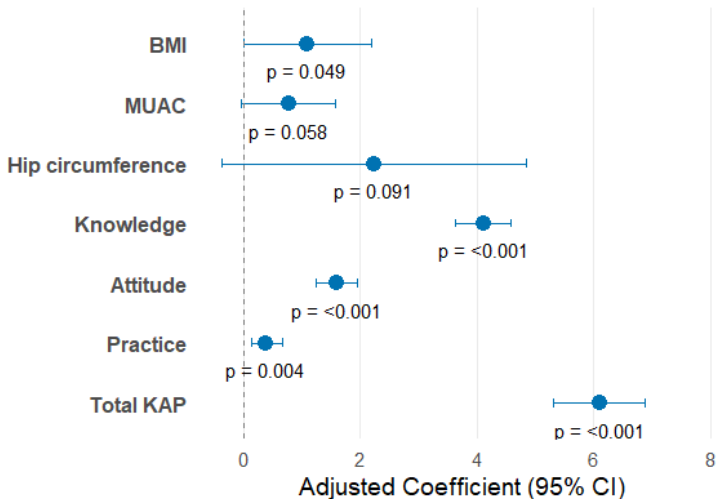
Table 2: GEE model to estimate the effects of health education between control and intervention groups over time

Variable	Unadjusted Coef. (95% CI)	p-value	Adjusted Coef. (95% CI)	p-value
BMI (kg/m ²)	1.41 (0.30–2.52)	0.013	1.10 (0.01–2.20)	0.049
MUAC (cm)	0.99 (0.14–1.83)	0.022	0.77 (–0.03–1.57)	0.058
Hip circumference (cm)	3.19 (0.43–5.94)	0.024	2.25 (–0.36–4.85)	0.091
Knowledge (Score)	4.11 (3.62–4.59)	<0.001	4.11 (3.63–4.58)	<0.001
Attitude (Score)	1.64 (1.33–1.98)	<0.001	1.59 (1.24–1.96)	<0.001
Practice (Score)	0.40 (0.15–0.65)	0.001	0.39 (0.13–0.66)	0.004
Total KAP (Score)	6.15 (5.38–6.93)	<0.001	6.10 (5.31–6.89)	<0.001

GEE adjusted for age, grade, parental education & occupation, and income. Model accounts for clustering at the individual level to estimate population-averaged effects.

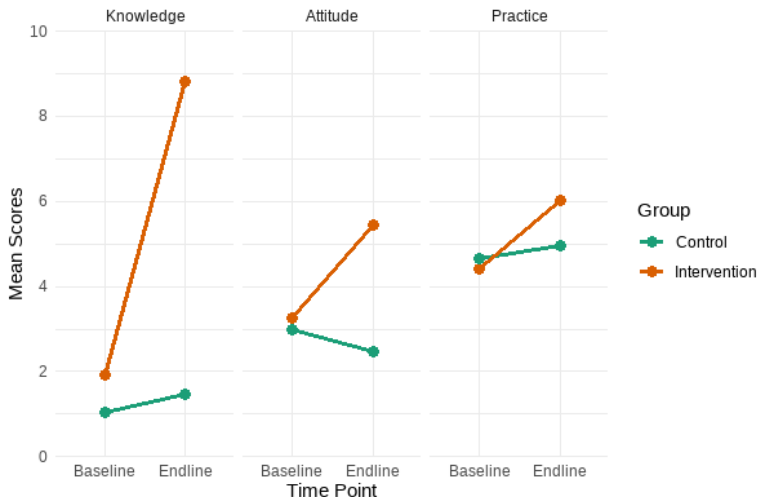
Results

Figure 1: The effects of health education between control and intervention groups over time (GEE model)



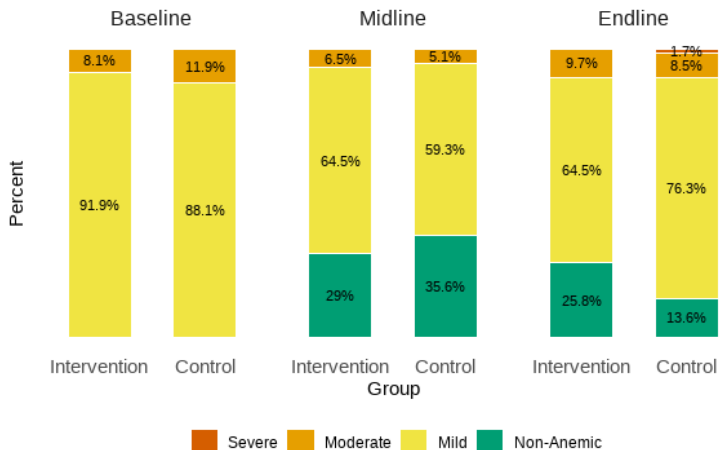
Results

Figure 2: Changes in KAP scores from baseline to endline



Results

Figure 3: Changes in anemia categories levels over the intervention period



Strengths and Limitations

Strengths:

- Novel use of mHealth education (first school-based trial in rural Bangladesh)
- Positive impact on learning experience, self-esteem, and anemia prevention
- Well written, methodologically rigorous and a role model for future studies on mHealth education

Limitations:

- Intra-cluster correlation was not appropriately estimated
- Limitation on generalization
- Lack of blindness among participants and CHWs

Conclusions

- mHealth-based nutritional education improved knowledge, attitude, and practice (KAP) among adolescent girls.
- The intervention showed positive trends in BMI, MUAC, and anthropometric indicators, including hemoglobin and anemia recovery.
- Outcomes were influenced by nutritional knowledge, healthy lifestyle, behavioral change, anemia prevention awareness, and engagement levels.

Recommendations

- **mHealth education** demonstrated strong potential to improve knowledge, attitude, and practice regarding anemia among adolescent girls in low-resource settings.
- The intervention can be **scaled up nationally** through integration with **school health programs**.
- Collaboration with **government health programs** and **NGOs** is essential for sustainable implementation.
- The program's **cost-effectiveness, adaptability**, and reliance on minimal infrastructure make it suitable for replication in **similar low-resource settings** globally.

Thank You!

Questions or Comments?

I appreciate your attention.