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Effect of Government Nutritional Intervention Programme on Hemoglobin level among Early Adolescent Girls

Vishakha Nagar* **Dr. Lakshmi Agnihotri****

*Research Scholar (Home Science) Barkatullah University, Bhopal (M.P.) INDIA
** Associate Professor (Home Science) Sarojini Naidu Govt. Girls PG (Autonomous) College, Bhopal (M.P.) INDIA

Abstract: The early stage of adolescence spanning 11–14 years requires proper nutrition for optimal growth. The government of India has launched multiple nutritional programs to fight iron deficiency and anemia among adolescent girls but these conditions persist as major public health issues. The research project "Effect of Government Nutritional Intervention Programme on Hemoglobin Level among Early Adolescent Girls" evaluates how the Mid-Day Meal Scheme and Weekly Iron and Folic Acid Supplementation (WIFS) program affect hemoglobin levels in schoolgirls. The research employed a symbolic imperial design to measure hemoglobin levels through finger-prick tests at the beginning and after three months of government nutritional intervention exposure. The research included a complete sample of early adolescent girls from Obedullaganj block government schools for comparative evaluation purposes. The researchers documented observations about how nutritional schemes were put into practice and used by the participants. The study demonstrates that government nutritional intervention programs lead to significant improvements in hemoglobin levels of early adolescent girls. The substantial rise in pre-observation to post-observation mean values demonstrates that these initiatives successfully combat anemia and enhance health results for this susceptible demographic. The programs need to be strengthened and maintained to guarantee long-term nutritional well-being for these individuals. The research demonstrates the actual effects of government-run nutritional programs while establishing proof to boost their performance in treating anemia among early adolescent girls.
Keywords: Adolescent girls, Hemoglobin, Government nutritional programmes, Mid-Day Meal.

Introduction - Adolescence is a critical phase of human development marked by rapid physical growth, hormonal changes, and increased nutritional requirements. Among adolescents, girls are more vulnerable to nutritional deficiencies, particularly iron deficiency anemia, due to the onset of menstruation, poor dietary intake, and increased physiological demands. According to the National Family Health Survey (NFHS-5, 2019–21), more than 50% of adolescent girls in India suffer from some degree of anemia, making it a significant public health concern. Anemia during this stage not only affects physical growth and cognitive development but also lowers immunity, academic performance, and overall quality of life. If left unaddressed, it further poses risks during future pregnancies, perpetuating the cycle of maternal and child malnutrition.

Recognizing this challenge, the Government of India has launched several nutritional intervention programmes aimed at improving the health and nutritional status of adolescents. Prominent among these are the Mid-Day Meal Scheme (MDMS), the Weekly Iron and Folic Acid Supplementation (WIFS) programme, and the Poshan Abhiyaan (National Nutrition Mission). These initiatives primarily target school-going children and adolescents to ensure dietary adequacy, reduce micronutrient deficiencies, and address anemia. The Mid-Day Meal Scheme provides cooked, nutrient-rich meals in government and aided schools, while WIFS ensures regular iron and folic acid supplementation. Together, these interventions are designed to enhance hemoglobin levels, improve attendance, and promote better health outcomes.

Despite these efforts, the problem of anemia among adolescent girls persists. Several factors such as irregular implementation of programmes, poor compliance with supplementation, lack of awareness, socio-economic disparities, and differences between government and private school settings continue to limit their effectiveness. Early adolescent girls (11–14 years) are especially at risk, as this period marks the onset of menarche and increased nutritional vulnerability.

The present study titled "Effect of Government Nutritional Intervention Programme on Hemoglobin Level among Early Adolescent Girls" seeks to evaluate the

effectiveness of these interventions in improving hemoglobin level. The study involves a baseline assessment of hemoglobin levels using finger-prick tests, followed by a post-test after three months of exposure to government nutritional schemes.

By focusing on the measurable outcome of hemoglobin improvement, this research not only highlights the role of government nutritional interventions but also identifies gaps in implementation and compliance. The findings are expected to provide evidence-based insights for strengthening policies and strategies to combat adolescent anemia more effectively, thereby contributing to national health goals such as the Anemia Mukt Bharat initiative and the Sustainable Development Goals (SDGs) on health and nutrition.

Adolescent Girls: Adolescence is a transitional stage between childhood and adulthood, generally ranging from 10 to 19 years of age as defined by the World Health Organization (WHO). During this period, rapid physical, psychological, and social development takes place. Among adolescents, girls face unique challenges due to the onset of menstruation, increased nutritional requirements, and gender-related disparities in food distribution within households. Early adolescence (11–14 years) is particularly crucial, as deficiencies during this phase can adversely affect growth, academic performance, and future reproductive health. Adolescent girls therefore represent a nutritionally vulnerable group that requires special attention in public health and government welfare programmes.

Hemoglobin: Hemoglobin is a vital protein molecule found in red blood cells that carries oxygen from the lungs to the body tissues and returns carbon dioxide from the tissues to the lungs. Adequate hemoglobin levels are essential for energy production, physical growth, and cognitive development. Low hemoglobin levels, often caused by iron deficiency, lead to anemia, which manifests as fatigue, weakness, poor concentration, and reduced immunity. Among adolescent girls, anemia is highly prevalent due to rapid growth spurts, menstrual blood loss, and inadequate dietary intake. Monitoring hemoglobin level is, therefore, an important indicator of nutritional well-being and the effectiveness of nutritional intervention programmes.

Government Nutritional Programmes: The Government of India has initiated several nutritional programmes aimed at improving the health and nutritional status of children and adolescents. These include the Mid-Day Meal Scheme (MDMS), the Weekly Iron and Folic Acid Supplementation (WIFS) programme, and the PoshanAbhiyaan (National Nutrition Mission). These programmes focus on providing balanced meals, micronutrient supplementation, and nutrition awareness among school-going children. Their objectives are to reduce malnutrition, prevent anemia, improve school attendance, and ensure overall health development. Such programmes form the backbone of India's efforts toward achieving better adolescent health and reducing the burden of anemia in the population.

Government Nutritional Programmes adopted by the Government of Madhya Pradesh: The Government of Madhya Pradesh has implemented several nutritional programmes to address the challenges of malnutrition and anemia among children and adolescent girls. Prominent among these is the Mid-Day Meal Scheme (MDMS), which provides hot cooked meals to school-going children with the aim of improving their nutritional intake and reducing classroom hunger. In addition, the state actively participates in the PoshanAbhiyaan and Anemia Mukt Bharat Programme, focusing on dietary supplementation, awareness campaigns, and regular health check-ups to combat anemia, especially in adolescent girls. The Integrated Child Development Services (ICDS) scheme also plays a vital role by ensuring supplementary nutrition, health services, and pre-school education to children less than six years and nutritional support to adolescent girls and pregnant and lactating mothers through Anganwadicentres. Moreover, initiatives like Weekly Iron and Folic Acid Supplementation (WIFS) and School Health and Wellness Programme are being executed to prevent micronutrient deficiencies and enhance overall health. Collectively, these government interventions form a comprehensive approach to improving nutritional status, promoting healthy growth, and ensuring better hemoglobin levels among adolescent girls in Madhya Pradesh.

Mid-Day Meal: The Mid-Day Meal Scheme (MDMS) is one of the largest school-based nutritional intervention programmes in the world, launched by the Government of India in 1995. Under this scheme, cooked meals are provided to children studying in government and government-aided schools, with the aim of improving nutritional intake, reducing classroom hunger, and encouraging regular school attendance. The meals are designed to meet at least one-third of the daily nutritional requirements of children, including essential proteins, calories, and micronutrients. For adolescent girls, the scheme plays a crucial role in addressing dietary inadequacies and supporting hemoglobin improvement, thereby contributing to their overall growth and development.

Review of Literature

Here is a concise, integrated review of literature (10 studies) with authors, years, and key findings relevant to hemoglobin (Hb), anemia, and government-led or school-based nutrition actions among Indian adolescents: Recent national analyses show the anemia burden among Indian adolescent girls remains high and has worsened between NFHS-4 (2015–16) and NFHS-5 (2019–21)—prevalence rose from ~54% to ~59% among 15–19-year-olds, with multiple socio-demographic predictors implicated (Kumar et al., 2024; Dhamnetiya et al., 2023). At community level, rural school studies using portable hemoglobin meters (e.g., HemoCue) continue to document substantial anemia and operationalize

feasible school screening workflows (Kashyap et al., 2022). Evidence on Weekly Iron–Folic Acid Supplementation (WIFS/WIFS+education) consistently indicates Hb gains and anemia reduction among schoolgirls: a Delhi comparative study reported that adding monthly health education to WIFS improved outcomes beyond WIFS alone (Gupta et al., 2021a; Gupta et al., 2021b), while a large-scale effectiveness report from Uttar Pradesh reinforced weekly IFA with counseling as programmatically effective (Aguayo et al., 2017). Complementary strategies such as double-fortified salt (DFS: iron+iodine) have shown efficacy in increasing Hb and reducing anemia risk in low- and middle-income settings, including India (Zimmermann et al., 2014; Andersson et al., 2018), with quasi-experimental evidence suggesting DFS may help prevent the age-related Hb decline typical in adolescents (Griffiths et al., 2017). School-based nutrition education layered onto routine services has also demonstrated measurable improvements in nutrition knowledge and anemia-related behaviors (Baranwal et al., 2013), and emerging work explores digital or gamified education to bolster adherence and self-management around iron intake (Setiawan et al., 2025). Regarding Mid-Day Meal (MDM), longitudinal evidence suggests MDM participation reduces underweight and supports nutritional status among schoolchildren (Kumar et al., 2024), and an economics evaluation linked exposure to fortified school meals with higher Hb albeit mixed academic outcomes (Berry, Mukherjee &Shastry, 2020). Together, these studies indicate that government platforms—WIFS/IFA, MDM, fortification (DFS), and school-based education—can improve adolescent girls' Hb and anemia outcomes when coverage, compliance, and implementation quality are strong, while national trend data underscore the need to strengthen delivery, monitoring, and adolescent-specific engagement to translate policy into population-level Hb gains.

Methodology

(a) Sample Techniques-Sample for the present study consists of 40adolescent girlspurposely selected from Government Schools of Obedullaganj block.

Area	Before	After
Obedullaganj block	40	40

(b)Observation period: The present study was conducted during the observation period three months. This period was carefully chosen to allow for systematic observation of the effects of the government nutritional intervention programmes on the hemoglobin status of early adolescent girls.During this time, the adolescent girls continued to receive the regular government-sponsored nutritional interventions, including the Mid-Day Meal Scheme (MDMS) and supplementation initiatives such as the Weekly Iron and Folic Acid Supplementation (WIFS) programme under the Anemia Mukt Bharat campaign. The three-month duration was sufficient to monitor dietary intake patterns through the Mid-Day Meal, while also ensuring a measurable Effect of iron supplementation on the hemoglobin levels of the participants. Baseline hemoglobin measurements were recorded by the Asha Workers and ANM using the finger-prick method, and follow-up measurements were also conducted by them after three-month. Throughout the observation period, schools were visited regularly to observe the implementation of the Mid-Day Meal Scheme and to confirm that the government nutritional interventions were being provided as per guidelines. Thus, the observation period served as the critical observation window for assessing the effectiveness of government nutritional programmes in improving the hemoglobin status of early adolescent girls.

(c) Tool used- For the present study, primary data was collected through biomedical assessment of hemoglobin levels among early adolescent girls. Hemoglobin levels were measured using finger-prick tests at baseline and after three months of exposure to government nutritional interventions. This method was selected as it is simple, cost-effective, minimally invasive, and suitable for field-based studies. The finger-prick method involved collecting a small blood sample from the fingertip using a sterile lancet, after which the sample was analyzed using a portable digital hemoglobin meter.The use of this tool ensured accuracy and immediate availability of results, allowing researchers to monitor changes in hemoglobin concentration over time. The baseline test was conducted at the time of enrollment in the study, followed by a post-test after three months, in order to evaluate the effect of government nutritional programs such as the Mid-Day Meal Scheme, Weekly Iron and Folic Acid Supplementation (WIFS), and PoshanAbhiyaan on the hemoglobin level of the participants.In addition to biomedical testing, a short observational checklist was also maintained to record adherence and exposure of adolescent girls to government nutritional intervention programs in their schools. This helped in correlating biomedical findings with program participation.

(d) Data Analysis- Data analyzed with the help of t test.

(e) Objective of the study

1. To assess the effect of government nutritional intervention programmes on the hemoglobin levels of early adolescent girls (11–14 years) before and after a three-month period.

(f) Hypothesis of the study

Hypothesis 01: There is no significant difference in the hemoglobin levels of early adolescent girls (11–14 years) before and after exposure to government nutritional intervention programmes.

Interpretation

Hypothesis 01: There is no significant difference in the hemoglobin levels of early adolescent girls (11–14 years) before and after exposure to government nutritional intervention programmes.

Table No. 1: Comparative results of the hemoglobin

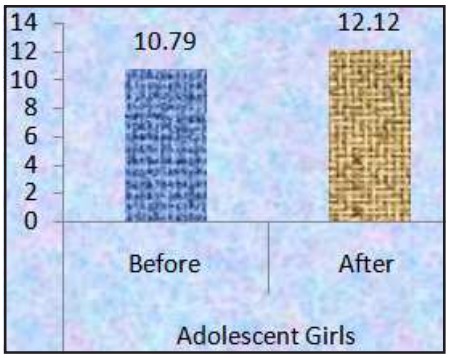
levels of early adolescent girls (11–14 years) before and after exposure to government nutritional intervention programmes

Adolescent Girls	HB level	N	Mean	S.D.	'CR' Value	'P' Value
	Before observation	40	10.79	1.09	5.6	Significant at 0.01
	After observation	40	12.12	1.02		

df –78Minimum values at 0.01 level of significance- 2.64

Result: Table No. 1 presents the comparative results of hemoglobin levels of early adolescent girls (11–14 years) before and after observationexposure to government nutritional intervention programmes. The mean hemoglobin level before the observation was 10.79 g/dL with a standard deviation of 1.09, whereas after the observation, the mean hemoglobin level increased to 12.12 g/dL with a standard deviation of 1.02.The calculated 'CR' value was found to be 5.6, which is greater than the table value (2.64) at the 0.01 level of significance with df = 78. This indicates that the difference in hemoglobin levels before and after the observation is statistically significant.

It can be summarized that the government nutritional intervention programme had a positive and significant effect on the hemoglobin status of early adolescent girls. The intervention led to a marked improvement in hemoglobin levels, shifting the average Hb value from an anemic range to a normal range. Thus, the programme played an important role in reducing anemia prevalence among the participants.



Verification of the Hypothesis: The null hypothesis of the study stated that:"There is no significant difference in the hemoglobin levels of early adolescent girls (11–14 years) before and after exposure to government nutritional intervention programmes." To test this hypothesis, hemoglobin levels of 40 adolescent girls were measured at baseline and after a three-month observation period. The obtained mean values were 10.79 g/dL (before) and 12.12 g/dL (after). The calculated 'CR' value was 5.6, which is greater than the critical value of 2.64 at the 0.01 level of significance (df = 78).Since the calculated value exceeds the table value, the null hypothesis is rejected. This indicates that there exists a statistically significant difference in the hemoglobin levels of adolescent girls before and after the observation. It is concludedthat the government nutritional intervention programme was effective in improving the hemoglobin status of early adolescent girls and in reducing anemia prevalence.

Conclusion: The present study titled "Effect of Government Nutritional Intervention Programme on Hemoglobin of 11–14 Years Adolescent Girls" was conducted to assess the effectiveness of government nutritional interventions in improving the hemoglobin levels of adolescent girls. A sample of 40 girls was observed over a three-month observation period, during which their hemoglobin levels were measured before and after observationexposure to the programmes.

The findings clearly revealed that the mean hemoglobin level increased from 10.79 g/dL to 12.12 g/dL after the observation, with a statistically significant difference at the 0.01 level of significance. This indicates that government-supported nutrition programmes such as the Mid-Day Meal Scheme, iron and folic acid supplementation, and other school-based nutritional initiatives play a vital role in improving the nutritional health of adolescent girls.

The study confirms that nutritional interventions are effective in reducing the prevalence of anemia and enhancing the overall health of adolescent girls, a group highly vulnerable to nutritional deficiencies due to rapid growth and developmental demands. By rejecting the null hypothesis, the research strongly supports the view that timely and structured nutritional support can positively Effect hemoglobin levels and reduce anemia among adolescent girls.

Thus, the study highlights the importance of strengthening and effectively implementing government nutritional programmes to ensure that adolescent girls attain better health, improved academic performance, and long-term well-being.

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