

## **Impact of Mid-Day Meal Program on Cognitive Ability of School Going Children: with Reference to Kabirdham District of Chhattisgarh**

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### **Abstract**

The relation between nutritional status and cognition is a long established fact. The mid-day meal scheme is a step towards improving the nutritional status of children in India. Hence to find out the impact of mid-day meal program on cognitive ability of school going girls between age ranges of 6-11 years, the present study was planned. The study was conducted on 80 school-going girls from Kabirdham District of Chhattisgarh, receiving the benefits of mid-day meal program. Only those subjects with haemoglobin level below 10 mg/dl were selected for the study. To measure cognitive development of subjects Draw a Man test was used. The pre-post research design was employed to find out the efficacy of mid-day meal program on cognitive development of selected subjects after a period of 1 year's study period. The pre-post statistics shows that after receiving the benefits of mid-day meal program for 1 year, the cognitive ability of the selected subjects showed significant improvement. Similarly significant improvement was also observed in haemoglobin levels of selected subjects. Hence, the present study again highlights the role of nutritional health in cognitive development of school children.

**KEYWORDS:** children, mid day meal, nutritional status, intelligence

### **INTRODUCTION**

The concept of supplementary nutritional support through educational institutions took its root in India when Madras Corporation developed a school lunch program in 1925. In the post-independence era, it was only in 1995 that the National Program of Nutritional Support to Primary Education was launched at the national level [GOI, 1995].

It envisages provision of cooked, nutritious mid-day meal to primary and secondary school children. Importantly, it mentions setting-up of an appropriate mechanism for quality checks. The basic idea is to improve their nutritional status.

Nutrition is a fundamental pillar of human life, health and development across the entire life span. From the earliest stages of foetal development, at birth, through infancy, childhood, adolescence, and into adulthood and old age, proper food and good nutrition are essential for survival, physical growth, mental development, performance and productivity, health and well-being (FAO/WHO, 1992; WHO, 2000).

Evidence has shown that physical growth and cognitive development in children are faster during early years of life, and that by the age of four years, 50% of the adult intellectual capacity has been attained and before thirteen years, 92% of adult intellectual capacity is attained (Vernon, 1976).

Keeping the importance of nutritional status in cognitive development of children, the researcher decided to find out the effect of mid-day meal on cognitive ability of school girls of Kabirdham District of Chhattisgarh State.

Quite a few studies have been conducted in the past to see the impact of mid-day meal on nutritional, physiological and other allied aspects. In this context, Pratchi Research Team (2005) reported positive intervention of Mid-Day Meal in universalization of primary education by increasing enrolment and attendance while Nangia and Poonam (2011) in her study reported that results that enrolment at primary level and upper primary level are increasing every year after the initiation of Mid-Day Meal Scheme. Alim *et al.* (2012) reported that the nutritional status and academic achievement of MDM school children was poorer than Non MDM public school of Aligarh.

Scanning through the research literature it was observed that impact of mid-day meal was not observed upon cognitive ability of school children. Hence the present study was planned.

## **METHODOLOGY**

### **Selection of sample**

160 school going girls in the age group of 7 - 10 years from six Governments Primary schools located in the urban areas of Kabeerdham District of Chhattisgarh , availing the benefits of mid-day meal programme were targeted for the study. The criteria for selection of subjects were haemoglobin status. As per WHO (2000) and Demayer (1989) criteria samples with Haemoglobin (<11mg/dl) were selected as experimental group and samples with haemoglobin (= or >11mg/dl) were selected as control group for the present study.

### **Ethical issue**

Consent note was given to every participant who explained the procedure of blood collection and their option to volunteer the study. Participation in the blood collection was voluntary. Consent from each child was collected and written acceptance by head of the institute was also taken before starting the study.

### **Tools:**

#### **Haemoglobin Estimation**

Haemoglobin estimation was done by Cyan-met-haemoglobin method by finger prick (Dacie and Lewis, 2002).

#### **Draw a Man test**

To measure intellectual development of subject Draw a Man test was used. This test was contrived by Dr. Pramila Pathak (2006). This is the simplest test in this test subject has drawn a human figure, before drawing a picture following instruction were given to the subjects. IQ was calculated by following formula (1):

$$IQ = \frac{\text{Psychological age}}{\text{Physical age}} \times 100 \quad (1), \text{ where}$$

### **Procedure:**

- Prior permission was obtained from school authorities to conduct the study.

- Haemoglobin level of 500 subjects was assessed. From these subjects 80 girls with haemoglobin <11 mg/dl were selected as experimental group and 80 girls with haemoglobin (= $\geq$ 11mg/dl) were selected as control group for the study.
- Haemoglobin levels were again determined after the completion of study period.
- IQ of each subject was assessed before and after the study period with the help of draw a man test.
- The obtained data is tabulated according to their respective groups and put to statistical analysis.

## RESULTS AND DISCUSSION

**Table 1.** Pre- and post-test mean haemoglobin levels of experimental group (N=80)

Variable	(a) Before supplementation Mean $\pm$ SD	(b) After 6 months Mean $\pm$ SD	(c) Post-test (After 1 year) Mean $\pm$ SD	't'
Haemoglobin	9.11 $\pm$ 0.92	9.55 $\pm$ 0.76	10.43 $\pm$ 0.85	t (ab) 5.04** t (bc) 9.69** t (ac) 11.07**

\*\* Significant at  $\alpha = 0.01$  level

From the analysis of Table 1, it is clear that mean haemoglobin of the selected school girls have increased significantly during study period i.e. 1 year, while they were taking the benefits of mid-day meal program. The results confirms the fact that post mean haemoglobin of girls from experimental group shows significant increase as compared to pre test scores.

**Table 2.** Pre- and post-test mean haemoglobin levels of control group (N=80)

Variable	(a) Before supplementation Mean $\pm$ SD	(b) After 6 months Mean $\pm$ SD	(c) Post-test (After 1 year) Mean $\pm$ SD	't'
Haemoglobin	9.26 $\pm$ 1.20	9.31 $\pm$ 1.09	9.66 $\pm$ 1.45	t (ab) 0.44 (ns) t (bc) 2.39* t (ac) 2.33*

\* Significant at  $\alpha = 0.05$ ; ns - not significant

From the analysis of Table 2, it is clear that mean haemoglobin of the girls belonging to control group have increased significantly during study period i.e. 1 year, after additional nutritional supplementation besides mid-day meal.

The reported  $t = 2.33$  and mean difference between pre-test mean Hb ( $M=9.26$ ) and post-test mean Hb ( $M = 9.66$ ), which is statistically significant at  $\alpha = 0.05$ , confirms the above finding.

The pre- and post-test means Hb of selected girls from control group who did not receive iron and calcium supplementation, were also compared in the light of their respective age groups.

**Table 3.** Comparison of gain in haemoglobin during study period among girls belonging to experimental and control group

Groups	Mean	SD	't'
Experimental Group (N=80)	1.32	1.06	4.43**
Control Group (N=80)	0.39	1.52	

\*\* Significant at  $\alpha = 0.01$

To find out whether mid-day meal alone can boost the haemoglobin status of the selected girls or some other additional supplementation is required, gain score (post-test – pre-test scores on height) for both the groups were calculated and compared.

The resultant  $t = 4.43$ , which is statistically significant at .01 level, clear indicating that mean haemoglobin of girls belonging to experimental group have increased significantly ( $M = 1.32$ ) as compared to that of girls of control group ( $M = 0.39$ ).

It shows the importance of iron and calcium supplementation along with mid-day meals program in boosting the haemoglobin status.

**Table 4.** Pre- and post-test mean IQ of experimental group (N = 80)

Variable	(a) Before supplementation Mean $\pm$ SD	(b) After 6 months Mean $\pm$ SD	(c) Post-test (After 1 year) Mean $\pm$ SD	't'
Intelligence Quotient	<b>68.26 <math>\pm</math> 5.68</b>	70.71 $\pm$ 5.58	72.53 $\pm$ 4.11	t (ab) 12.27** t (bc) 2.47** t (ac) <b>5.78**</b>

\*\* Significant at  $\alpha = 0.01$

From the analysis of Table 4, it is clear that intelligence quotient of the girls belonging to experimental group have increased significantly during study period, i.e. 1 year, after additional nutritional supplementation besides mid-day meal.

The reported  $t = 5.78$ , which is statistically significant at  $\alpha = 0.01$ , confirms the above finding. The results can be interpreted in a way that nutritional health is an important factor influencing IQ of the selected subjects.

The pre- and post-test means IQ of selected girls from experimental group, who received iron and calcium supplementation, were also compared in the light of their respective age groups (Table 5).

**Table 5.** Pre-test and post-test mean IQ of control group (N=80)

Variable	(a) Before supplementation Mean ± SD	(b) After 6 months Mean ± SD	(c) Post-test (After 1 year) Mean ± SD	't'
Intelligence Quotient	67.68 ± 5.57	69.46 ± 5.70	69.61 ± 5.54	t (ab) 11.76** t (bc) 0.39 (ns) t (ac) 4.95**

\*\* Significant at  $\alpha = 0.01$ ; ns - not significant

The pre-post statistics of girls from control group reveal same finding as in case of experimental group, i.e. after 1 year period of supplementation the intelligence quotient of selected girls from control group have increased significantly.

The reported  $t = 4.95$ , which is statistically significant at .01 level, confirms the above finding. The results can be interpreted in a way that nutritional health is an important factor influencing IQ of the selected subjects.

The pre- and post-test means IQ of selected girls from control group who did not receive iron and calcium supplementation, were also compared in the light of their respective age groups.

**Table 6.** Comparison of gain in Intelligence Quotient (IQ) during study period among girls belonging to experimental and control group

Groups	Mean	SD	't'
Experimental Group (N = 80)	4.27	6.62	2.81**
Control Group (N = 80)	1.92	3.47	

\*\* Significant at  $\alpha = 0.01$

To find out the efficacy of Mid-day Meal programme and Mid-day Meal program along with additional nutritional supplementation on intelligence quotient of selected subjects, gain score (Post-test – Pre-test scores on IQ) for both the groups were calculated and compared. The resultant  $t = 2.81$ , which is statistically significant at .01 level, clear indicating that mean IQ of girls belonging to experimental group have increased significantly ( $M = 4.27$ ) as compared to that of girls of control group ( $M = 1.92$ ). Correlation between haemoglobin concentration and IQ was found to be significant at .01 level in both test conditions i.e. pre and post. It therefore indicates that as haemoglobin level of subjects improves, their IQ also increases (Table 7).

**Table 7.** Correlation Matrix: Haemoglobin and IQ (N=160)

Variable	Pre-Test IQ	Post-test IQ
Hb	0.3245*	0.3924**

\*\* Significant at  $\alpha = 0.01$

In the present study mid-day meal program was found to be positively associated with intelligence quotient of the selected subjects. The results of the present study were consistent with the findings of Agaoglu *et al.* (2007). Hence, the present study once again highlights the importance of mid-day meal program in enhancing the nutritional status of children which in turn reflects upon their cognitive ability.

## CONCLUSION

On the basis of result and discussion, it may be concluded that mid-day meal program is an effective measure to enhance the cognitive ability of children through improved nutritional status.

The intelligence quotient of girls as measured by Draw a Man Test was found to have increased significantly after 1 year of Mid-Day Meal Program as compared to their IQ scores prior to commencement of the study period

The haemoglobin level of girls have increased significantly during 1 year of mid-day meal program, but it was still below <10 mg/dl mark.

A positive correlation was found between haemoglobin values and intelligence quotient scores in a group of selected girls enrolled in various schools of Kabirdham District Chhattisgarh.

## References

- Agaoglu, L., Torun, O., Unuvar, E., Sefil, Y., Demir, D. (2007) Effects of iron deficiency anemia on cognitive function in children. *Arzneimittelforschung*. 57 (6A): pp. 426-430.
- Alim, A., Khalil, S., Mirz, I., Khan, Z. (2012) Impact of mid-day meal scheme on the nutritional status and academic achievement of school children in Aligarh city. *Indian J. Sci. Res.* 3 (2): pp. 5-90.
- Dacie, J. V., Lewis, S. M. (2002) *Practical haematology* 7<sup>th</sup> Edition. Churchill Livingstone Edinburgh London, Melbourne and New York, pp. 38-40, 48-50, 87, 93.
- Demayer, E. M. (1989) *Preventing and Controlling Iron Deficiency Anemia Through Primary Health Care - A Guide for Health Administrators and Program Managers*. Geneva, World Health Organization: p. 26.
- FAO/WHO. (1992) *Nutrition and Development: A Global Assessment*. International Conference on Nutrition, Rome: pp 25.
- GOI. (1995) 'Guidelines of National Program of Nutritional Support to Primary Education [Mid-Day Meal Scheme],' <http://education.nic.in/>, accessed in 2007.
- Nangia, N., Poonam, R. (2011) Impact of Mid-Day Meal Scheme on Enrolment of Elementary School Students. *International Referred Research Journal*, ISSN-0975-3486, RNI : RAJBIL 2009/30097, Vol. III, Issue 27: pp. 123-128.
- Praitichi Research Team. (2005) *Cooked Mid-day Meal Program in West Bengal "A Study In Birbhum District"*, available at [http://www.rightfoodindia.org/data/mdm\\_praitichi.birbhumstufy.doc](http://www.rightfoodindia.org/data/mdm_praitichi.birbhumstufy.doc). University of Rajasthan and UNICEF (2005.) [planningCommission.nic.in/plans/mta/11th\\_mta/.../chap6\\_edu.pdf](http://planningCommission.nic.in/plans/mta/11th_mta/.../chap6_edu.pdf)
- Pramila, P. (2006) *Draw a Man Test for Indian Children (Extension and Revision)*. M. S. University, Baroda.

- Vernon, P. E. (1976) The development of cognitive process. In: V. Hamilton & P. Vernon (Eds.). Development of Intelligence. London Academic Press Inc: pp. 507-541.
- WHO. (2000) Nutrition for Health and Development. World Health Organization, Geneva.