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Malnutrition Analysis of Anganwadis

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ABSTRACT

Malnutrition is one of the prominent health hazard and a grave problem in developing countries like India. To tackle this problem, Government of India introduced ICDS (Integrated child development scheme) which operates primarily through Anganwadis. With this backdrop, this paper aims at examining whether there is statistical difference in the actual BMI (Body mass index) level of children across 4 Anganwadi centers.BMI levels are calculated of the sample taken from Anganwadi centers. Analysis has been done using one-way ANOVA, a statistical technique. Results depict that BMI levels of children differ significantly across Anganwadi centers indicating that nutrients provided to the children vary significantly amongst Anganwadi centers. Further we suggest ways to visualize these results in perspective and propose solutions to counter menace of malnutrition.

Keywords: Anganwadi, ANOVA, BMI, ICDS scheme, Malnutrition

INTRODUCTION

Malnutrition is one of the prominent health hazard and a grave problem in developing countries. Malnutrition may be defined as a state of the body when it does not get the correct amount of minerals, vitamins and other nutrients required to maintain health issues. Growing children are most vulnerable to its adverse consequences if malnutrition is not curbed at the right age. India also witnesses malnutrition among under-five children as a major public health problem. This is reflected by the fact that in India, under-weight children are among highest in the world, and is almost double to that of Sub-Saharan Africa (1). A study, conducted in 130 districts in 53 developing countries among children in the age group of 3 months to 3 years pointed out that the mild under-weight deserves larger attention which shows a positive signal among preschool children of their changing health conditions (2). According to Global Hunger Index Report 2015 of World Bank (3), India is ranked 20th amongst leading countries with a serious hunger situation.

It is need of the hour to develop various mechanisms and take policy initiatives and some serious implementation to overcome the problem of malnutrition which not only is a deterrent to the individual growth of a child but acts as a suppressant to the overall national economic development as well. As an answer to this problem, Integrated Child Development Services (ICDS) scheme has been introduced by Government of India for early childhood care and development. ICDS scheme is an ambition multidimensional program targeted on malnutrition children as well as their economically deprived mothers in the lower socio-economic strata of society. It also aims at reaching all the needy children in the age group of 0-6 years expectant and nursing mothers and women in the age group 15-44 years with basic child welfare services. At an operational level, ICDS scheme is implemented through Anganwadi workers and Anganwadi helpers. Therefore, the functioning of Anganwadis has a major bearing on the success of ICDS scheme. Consequently, in order to study the malnutrition level of children, approaching Anganwadis and making an analysis of malnutrition level children enrolled therein would be the logical step.

In this paper, a brief insight into the dynamics of different levels of malnutrition, which is more prevalent in slum children has been made on the basis of comparison of BMI (Body mass index) level of children enrolled in Anganwadi centers. BMI is a person's weight divided by the square of his or her height, measured in kilogram/ meter square (kg/m^2).

Review of Literature

Although functioning of Anganwadi comes under the ICDS scheme of Government of India, but the current literature review, however, is being restricted to selected items relevant to the present research study, which is Anganwadi workers and helpers. Ameya (4) assessed the functioning of the ICDS Anganwadi by surveying children of 0-6 years of the age group in Thiruvananthapuram district during 2003-2005 on the system of grades of malnutrition. It indicated that 60% of the children were in normal grade of nutrition, 32% of the children were in Grade I, 8% of the children were in Grade II, and 0.06% children were found in Grade III and IV of severe level of malnutrition category. Dash (5) found that 92% mothers of beneficiary children were satisfied with the quality of food, 60% mothers of non-beneficiary children were satisfied with supplementary feeding to be used for the better health and nutritional status of children. Polit(6) conducted a study on the children in the age group of 0-6 years covered for growth monitoring revealing a significant relationship between functionary knowledge and maternal knowledge of the growth chart. It also indicated that about half of the children were never monitored for growth. It also analysed that the covariance of the effect of growth monitoring had no impact on the nutritional status of children.

It can be observed that existing literature is more of descriptive in nature rather than analytical. Thus, current paper attempts to augment the existing literature by doing a statistical analysis based on the data collected in the field.

Rationale of the study

With ICDS scheme, Government of India has already taken an initiative to tackle the issue of malnutrition. But the question arises as to whether with this scheme, actually at the ground level, malnutrition is curbed. With this curiosity, following research issues emerges:

1. How Anganwadi workers collect information for measuring malnutrition?
2. What measures do they take to prevent malnutrition?

The current paper realizing an importance of identification of malnutrition level aims at developing a BMI level of children in Anganwadis and then to analyse whether this level is different amongst Anganwadis. It has been conducted with the objectives of identifying the actual BMI level of children enrolled in different Anganwadis after real life data collection and finding out whether there is any statistical difference between BMI level of children enrolled in different Anganwadis and suggestions have been made to rectify the difference.

METHODOLOGY

The current study makes an attempt to identify whether there is any statistically significant difference in the BMI level of children enrolled in different Anganwadis for which necessary research design has been developed:

Sample size and sampling period

The study uses primary sources for data collection. For the purpose of calculating BMI, a personal visit was made to four Anganwadis of Kusumpur Pahari district, New Delhi. Data for actual height, weight and age have been obtained for 5 children in each Anganwadi, making a total sample of 20 children.

Model and statistical tool

The current study makes a comparative analysis on BMI level of children in Anganwadis. As there are four independent samples of Anganwadis, therefore one-way ANOVA (Analysis of Variance) has been used for analysis purposes.

Results on the basis of ANOVA are inferred with the following sequence of steps:

Checking of assumptions - Before doing ANOVA analysis, two assumptions are to be satisfied by the data. These are:

a. Normality Assumption - ANOVA analysis requires an assumption that data is following a normal distribution. In the current paper, K-S (Kolmogorov-Smirnov) test has been used to check normality of data.

b. Assumption of homogeneity of variances - Another assumption is that variances of data are homogeneous. Levene's test is used to check this assumption.

Analysis of data - After satisfying both the assumptions, analysis of ANOVA is carried out. Results are analyzed using p-valuewhich indicates thedifference between the mean BMI levels of the children in 4 Anganwadis.

If ANOVA analysis indicates a significant difference in mean levels, then detailed information is extracted with the help of following two further analyses:

a. Post - hoc analysis - ANOVA analysis simply reveals the presence of difference across Anganwadis but fails to give details as to which Anganwadi significantly differs from which with respect to BMI level. This is given by Post- hoc analysis.

b. Mean plot graph- This tells that which Anganwadi is significantly lower or higher than other Anganwadis viz a viz each individual BMI level.

Drawing of inference - To conclude, inferences are drawn and suggestions may be made.

All the analysis is carried out on statistical software - SPSS, version 20.0.

Hypothesis development

For addressing the objectives of the study, detailed in above section, the hypotheses are framed as under:

Hypothesis I: No statistical difference between BMI of children of Anganwadi 1 and of other Anganwadis.

Hypothesis II: No statistical difference between BMI of children of Anganwadi 2 and of other Anganwadis.

Hypothesis III: No statistical difference between BMI of children of Anganwadi 3 and of other Anganwadis.

Hypothesis IV: No statistical difference between BMI of children of Anganwadi 4 and of other Anganwadis.

ANALYSIS AND RESULTS

The current section of the studyfocuses on analysing datausing statistical technique viz. one - way ANOVA with an objective to find if there is any statistically significant difference between BMI level of children enrolled in different Anganwadis. For this purpose, actual BMI level is calculated. Analysis of results is based on p-values at 5% level of significance.

Results of ANOVA tests are presented below:

Checking of assumptions

Two assumptions are to be satisfied as a prerequisite for ANOVA analysis. These are checked below:

a. Assumption of normality - K-S test is used to test the normality of the distribution. Table 1 shows the results.

From Table I it can be observed that p- value is 0.831, which infersnon-rejection of null hypothesis at 5% level of significance. Therefore, the above distribution is proved to be a normal distribution because of being null. Hence, assumption one is satisfied.

Table-I Kolmogorov-Smirnov Test (K-S test)

		BMI
N		21
Normal Parameters	Mean	16.3790
	Standard Deviation	4.84645
Most Extreme Differences	Absolute	.255
	Positive	.255
	Negative	-.183
Kolmogorov-Smirnov Z		1.167
Asymp. Sig. (2-tailed)		.831

b. Homogeneity of variances: Levene's test is used to test this assumption. Results are presented in Table II:

Table-II Homogeneity of variances of data (Levene's test)

Levene Statistic	**df_1**	**df_2**	**Sig.**
1.950	3	17	.010

From Table II it can be inferred that p- value(0.01) indicating that null is accepted at 5% level of significance (0.01<0.05). Thus, the second assumption is also satisfied.

B. ANOVA analysis results

After satisfaction of two assumptions, ANOVA analysis is carried on SPSS 20.0 (statistical software). Results are presented in Table III.

Table-III ANOVA analysis for BMI level of children enrolled in Anganwadis

BMI					
	Sum of Squares	**DF**	**Mean Square**	**F**	**Sig.**
Between Groups	384.276	3	128.092	25.473	.000
Within Groups	85.486	17	5.029		
Total	469.762	20			

From table III, it can be observed that as p-value is 0.00, therefore, null is rejected at 5% level of significance. This indicates that there is a statistically significant difference in BMI level of children across Anganwadis.

C. Post hoc analysis

Information revealed by ANOVA analysis is the just difference in the mean BMI levels of various groups. It does not detail out as where and among which groups this difference occurs. The post-hoc analysis gives this detailed information. *f*
Results of post-hoc analysis are presented in TableIV.

Table-IV Post hoc analysis

Multiple Comparisons

Dependent Variable: BMI

(I) type	(J) type	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Anganwadi 1	Anganwadi 2	9.44633*	1.35787	.000	5.5865	13.3062
	Anganwadi 3	9.85433*	1.35787	.000	5.9945	13.7142
	Anganwadi 4	9.04633*	1.35787	.000	5.1865	12.9062
Anganwadi 2	Anganwadi 1	-9.44633*	1.35787	.000	-13.3062	-5.5865
	Anganwadi 3	.40800	1.41825	.991	-3.6235	4.4395
	Anganwadi 4	-.40000	1.41825	.992	-4.4315	3.6315
Anganwadi 3	Anganwadi 1	-9.85433*	1.35787	.000	-13.7142	-5.9945
	Anganwadi 2	-.40800	1.41825	.991	-4.4395	3.6235
	Anganwadi 4	-.80800	1.41825	.940	-4.8395	3.2235
Anganwadi 4	Anganwadi 1	-9.04633*	1.35787	.000	-12.9062	-5.1865
	Anganwadi 2	.40000	1.41825	.992	-3.6315	4.4315
	Anganwadi 3	.80800	1.41825	.940	-3.2235	4.8395

*The mean difference is significant at the 0.05 level.

Post hoc analysis suggests that at a significance level of 5%, BMI level of children in Anganwadi 1 is significantly different from BMI level of all the other three Anganwadis.
However, BMI level of children in Anganwadi 2 is significantly different from BMI level of only Anganwadi 1. BMI level of children in Anganwadi 3 is significantly different from BMI level of only Anganwadi 1. Finally, BMI level of children in Anganwadi 4 is also significantly different from BMI level of only Anganwadi 1.

D Mean plot graph

The mean plot graph given below of different Anganwadis shows BMI level of children across four Anganwadis.

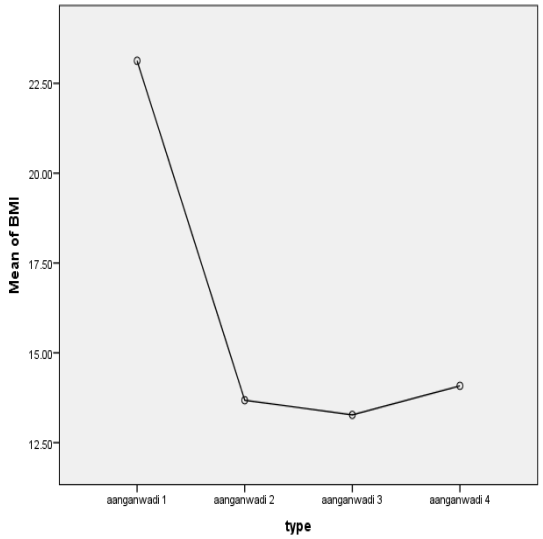

Figure-I Mean BMI of children across anganwadis.

The above mean plot graph indicates that the mean BMI level in Anganwadi 1 is significantly higher than mean BMI of other three Anganwadis. Although Anganwadi 2,3 and 4 have similar Mean BMI, Anganwadi 3 has the lowest BMI.

CONTRIBUTION OF THE STUDY

In the current study, an attempt has been made to identify whether there is any statistically significant difference in the BMI level of children enrolled in 4 different Anganwadis. The current paper makes contribution to the existing literature from the following perspectives:

1. Existing relevant literature does not reveal papers with statistical analysis, which the current paper does relate to BMI level of the children.
2. The results indicate that BMI level of children in different anganwadi is statistically different from each other. This observation of empirical analysis can be of great help in forming the basis for further policy formation and strategic decision making.
3. Finally, augmentation of the existing literature is done.

CONCLUSIONS

The current study primarily focuses on analyzing whether different Anganwadis differ in terms of BMI level of the children enrolled in these Anganwadis. Although, existing literature shows a paucity of analytical papers in this area, still certain uncovered areas provide an opportunity for further research. First, the current study focused on four anganwadis in Delhi, further research may expand the number of anganwadis. Second, the current analysis is carried out using actual BMI level of children enrolled in anganwadis. Future research may take other measures of malnutrition to do the analysis. Finally, the current study focused only on anganwadis operating in Delhi. Future research may include analysis of other states which would allow for comparison between states. We believe that a detailed statistical analysis of these programs will help bring effectiveness in these implementations and grow a base which will well feed and nicely developed children of

India. We also believe the nourishment programs are truly serving the national cause and would like thank the government and non-government sponsors.

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