

# **Comparative Study of Degree of Relationship between Age, Height, Weight and Haemoglobin Level Versus Health Status under 5 years Children**

**Shah Md. Keramat Ali, Md. Moksed Ali Pramanik and M.A. Samad Miah**

Institute of Nutrition and Food Science, University of Dhaka, Bangladesh.

## **Introduction**

It is well-known that age, height, weight of children are interacted (1,2,3). Undesirable relationship between age and weight under five years children was considered malnourished in the earlier report (4) of the current study. But in Bangladesh, it is unknown about the degree of relationship between age, height, weight and haemoglobin level of under five years children by health status. The present study was therefore designed to find out the degree of relationship between age, height, weight, and haemoglobin level by health status as well as selection of the best subject (5).

## **Materials and Methods**

Two hundred and ninety seven households out of 622 having children under 5 years of age were purposively selected from Bashaboo Wohab Colony, a slum of Dhaka city. Based on the earlier study(4) a questionnaire with four different components were designed. These included socio-economic, education and

occupational profile of the family, the anthropometry, clinical and biochemical examinations. The questionnaire were pretested and appropriate modifications were made.

Household demographic and socio-economic information were noted by interviewing the household head. Socio-economic and anthropometric data were collected by the two trained volunteers under the supervision of the investigators. The clinical examination and haemoglobin estimation were done by a clinician. The laboratory test for haemoglobin estimation was done by cyanmethemoglobin method. Less than 11 gms haemoglobin per dl of blood was considered as anaemic (6). Malnutrition was diagnosed as loss of weight for age (2). The survey was carried out in 1989.

## **Results**

Table 1 shows the demographic and socio-economic characteristics of the population. Of the total study population (N=297) 60%

\* Bangladesh Journal of Nutrition Vol. 4, No. 2, June 1991. Printed in Bangladesh Institute of Nutrition and Food Science, University of Dhaka, Dhaka, Bangladesh.

were male and 40% were female. Only 13% of the children were normal. The remaining children (87%) were suffering from various diseases. Forty eight percent of the subjects were below 3 years of age. The majority (70%) of the household heads had no formal education. Only 25% of the household heads had primary and secondary education . Only 24% of the households heads were low paid service holders, 47% were small traders, 29% were day labourer. All the households had pipe water supply but only 60% had access to sanitary latrines. The mean family size was  $6.02 \pm 2.38$  and the mean per capita monthly income was Tk.  $391 \pm 183$ .

Table 2 presents the prevalence of morbidity among the study children. The highest mode 246(82.82%) of the children presented with anaemia, 81.14% with malnutrition, 34.01% with fever, 28.62% with cough, 7.41% with diarrhoea, 6.73% with scabies, 4.04% with abdominal pain, 3.37% with night blindness, 2.36% dysentery, 2.02% with measles, 2.02% with asthma. Only 12.79% of the children were disease free during the study period.

Table 3 shows the degree of relationship between height (1),

weight (2) and haemoglobin level (3) ( $r_{12}$ ,  $r_{13}$  and  $r_{23}$ ) in cyclic order and  $r^2$  value by health status. Degree of relationship between height and weight of disease free children by 0-2 years children ( $r_{12}=0.93$ ) and by 3-5 years old children ( $r_{12}=0.81$ ) were found highly significant ( $p<0.001$ ). Relationship between height and haemoglobin level of two groups (0.46, 0.48) and between weight and hemoglobin level (0.45, 0.57) were found statistically significant ( $p<0.05$ ). Significant correlation between height and weight (0.45,0.32), by fever and anaemia of 0-2 years old children were found. Relationship between height and weight (0.40, 0.31, 0.53) by fever, anaemia and cough of 2-3 years old children were also found statistically significant ( $P<0.05$ ). In the case of 0-5 years children, relationship between height and weight by abdominal pain was found to be significantly higher proportion ( $P<0.05$ ). The rest were found to be insignificantly lower portion ( $p>0.05$ ).

Table 4a-4c shows the homogeneity test of a set of correlation coefficients  $H_0: r_1 = r_2; \dots = r_k$

In the case of 0-2 and 3-5 years old children, degree of

relationship between height and weight were found to be not homogeneous (( $P < 0.001$ ). No significant difference in the rest were noted.

Table 5 shows the regression co-efficient (b) between height (1), weight (2) and haemoglobin level (3) by health status. Regression co-efficient between weight (2) as dependent variable and height (1) as independent variable, regression co-efficient between

haemoglobin level (3) as dependent variable and height (1) as independent variable, regression co-efficient between haemoglobin level (3) as dependent variable and weight (2) as independent variable are denoted by  $b_{21}$ ,  $b_{31}$  and  $b_{32}$  where b represent the expected change in dependent variable for a unit change in independent variable.

**Table 1 :** Socio-demographic information of the study population.

Variable	No.	%
Total No. of children	297	100
Boys	178	60
Girls	119	40
<b>Health status of the children:</b>		
Not diseased	38	13
Diseased	259	87
<b>Age structure of the study children:</b>		
Less than 3 years	143	48
3-5 years	154	52
<b>Education of household head:</b>		
Illiterate	208	70
Class I to x & Above	89	30
<b>Occupational status of house hold head:</b>		
Service	71	24
Business	140	47
Day labourer	86	29
<b>Housing:</b>		
Kancha house	193	65
Piped water use	297	100
Sanitary Latrin use	178	60
	$\bar{X}$	SD
Family Size	6.02	2.38
Per head monthly income (Tk.)	391	183

**Table 2** : Health status among the study children (N=297)

Health Status	No	%	95% confidence limit
No disease	38	12.79	2.17 to 23.41
Anaemia	246	82.82	78.12 to 87.53
Malnutrition	241	81.14	76.20 to 88.08
Fever	101	34.01	24.77 to 43.25
Cough	85	28.62	19.01 to 38.23
Diarrhoea	22	7.41	3.53 to 18.36
Scabies	20	6.73	4.25 to 17.71
Abdominal pain	12	4.04	7.10 to 15.18
Dysentery	7	2.36	8.89 to 13.61
Measles	6	2.02	9.24 to 13.28
Otitis	5	1.68	9.59 to 12.95
Asthma	6	2.02	9.24 to 13.28
Dental caries	1	0.34	11.07 to 11.75
Jaundice	3	1.01	10.34 to 12.32
Night blindness	10	3.37	7.81 to 14.55
Dumb	1	0.34	11.07 to 11.75

- \* 95% confidence limits implies that there is only a 5% chance that the ranges of above mentioned factors excluded the percentage of the population.
- \* Total percentages are not mutually exclusive.

**Table 3** : Degrees of relationship between height (1), weight (2) and haemoglobin level (3) by health status in 0-5 years children.

Health status	Subject	0 - 2 years old children			'3 - 5 years old children			
		r <sub>12</sub>	r <sub>13</sub>	r <sub>23</sub>	Subject	r <sub>12</sub>	r <sub>13</sub>	r <sub>23</sub>
No disease	20	0.93** (0.86)	0.46* (0.19)	0.45* (0.20)	18	0.81** (0.66)	0.48* (0.23)	0.47* (0.22)
Fever	42	0.45* (0.20)	-0.20 (0.04)	-0.20 (0.04)	59	0.40* (0.16)	-0.08 (0.0)	-0.07 (0.0)
Anaemia	111	0.32* (0.10)	0.03 (0.0)	-0.08 (0.0)	135	0.31* (0.10)	-0.15 (0.02)	-0.05 (0.0)
Scabies	8	0.30 (0.09)	-0.57 (0.32)	-0.22 (0.05)	12	0.45 (0.20)	-0.10 (0.01)	0.09 (0.0)
Diarrhoea	8	0.22 (0.05)	-0.13 (0.02)	-0.12 (0.01)	14	0.15 (0.02)	-0.39 (0.15)	-0.01 (0.0)
Cough	43	0.14 (0.02)	-0.07 (0.0)	-0.04 (0.0)	42	0.53* (0.28)	-0.10 (0.01)	0.09 (0.0)
Malnourished	114	0.06 (0.0)	-0.02 (0.0)	-0.02 (0.0)	127	0.05 (0.0)	-0.16 (0.0)	0.01 (0.0)

## 0 - 5 years children

Health Status	Subject	$r_{12}$	$r_{13}$	$r_{23}$
Dysentery	7	-0.12 (0.12)	-0.35 (0.12)	0.09 (0.0)
Measles	6	-0.18 (0.03)	0.22 (0.05)	0.24 (0.06)
Abdominal pain	12	0.52* (0.27)	-0.40 (0.16)	-0.51 (0.26)

**Note :**  $r$ =Correlation coefficient -  $-1 \leq r \leq 1$   
 $r$  measure the degree of relationship between two or more set of variables.  
 Figures within parentheses indicates  $r^2$  value.  
 $r^2$  measures the dependence of one variable on the other.  
 It is often expressed as a percentage multiplying by 100.  
 \*Significant ( $P < 0.05$ ) \*\* Highly significant ( $P < 0.001$ ) .

**Table 4a :** Homogeneity test of the correlation co-efficients  $r_{12}$ 

In the case of 0-2 years old children

$r_{12}$	0.93	0.45	0.32	0.30	0.22	0.14	0.06
n	20	42	111	8	8	43	114

Chi-Square = 67.43;  $P < 0.001$  (Significant)

In the case of 3 - 5 years old childran

$r_{12}$	0.81	0.40	0.31	0.45	0.15	0.53	0.05
n	18	59	135	12	14	42	127

Chi-Square = 22.75;  $P < 0.001$  (Significant)

In the case of 0 - 5 years old children

$r_{12}$	-0.13	0.18	0.52
n	7	6	12

Chi-Square = 0.76;  $P > 0.05$  (Insignificant) $r_{12}$  = Correlation co-efficient between height and weight**Table 4 b :** Homogeneity test of the correlation co-efficients  $r_{13}$ 

$r_{13}$	0.44	-0.20	0.03	-0.57	-0.13	-0.07	-0.02
n	20	42	111	8	8	43	114

Chi-Square = 10.81;  $P > 0.05$  (Insignificant)

In the case of 3 - 5 years old children

$r_{13}$	0.48	-0.08	-0.15	-0.10	-0.37	-0.10	-0.16
n	18	59	135	12	14	42	127

Chi-Square = 3.18;  $P > 0.05$  (insignificant)

In the case of 0 - 5 years old children

$r_{13}$	-0.35	0.22	0.40
n	7	6	12

Chi-Square = 0.57;  $P > 0.05$  (insignificant) $r_{13}$  = Correlation co-efficient between height and haemoglobin level.

**Table 4 c** : Homogeneity test of the correlation co-efficients  $r_{23}$ .

In the case of 0 - 2 years old children

$r_{23}$	0.45	-0.20	-0.08	-0.22	-0.12	-0.04	-0.02
n	20	42	111	8	8	43	114

Chi-Square = 3.74;  $P > 0.05$  (Insignificant)

In the case of 3 - 5 years old children

$r_{23}$	0.47	0.07	-0.05	0.09	-0.01	0.01	-0.01
n	18	59	135	12	14	42	127

Chi-Square = 1.67;  $P > 0.05$  (insignificant)

In the case of 0 - 5 years old children

$r_{23}$	0.09	0.24	-0.51
n	7	6	12

Chi-Square = 0.03;  $P > 0.05$  (Insignificant)

$r_{23}$  = Correlation co-efficient between weight and haemoglobin level.

**Table 5** : Regression co-efficient (b) between height (1), weight (2), and haemoglobin level (3) by Health Status in 0-5 years children.

Health status	0 - 2 years old children				'3 - 5 years old children			
	Subject	$b_{21}$	$b_{31}$	$b_{32}$	Subject	$b_{21}$	$b_{31}$	$b_{32}$
No disease	20	0.21	0.02	0.04	18	0.22	0.07	0.35
Fever	42	0.09	-0.02	-0.15	59	0.10	-0.02	0.07
Anaemia	111	0.06	0.01	-0.01	135	0.07	-0.02	-0.05
Scabies	8	0.08	-0.20	-0.26	12	0.06	-0.01	0.09
Diarrhoea	8	0.05	-0.03	0.13	14	0.03	-0.03	-0.01
Cough	43	0.17	-0.01	-0.04	42	0.11	-0.01	0.09
Malnourished	114	0.01	-0.004	-0.01	127	0.01	-0.16	-0.06

0-5 years children

Health Status	Subject	$b_{21}$	$b_{31}$	$b_{32}$
Dysentery	17		-0.20	-0.02
Measles	6		0.03	0.02
Abdominal pain	12		0.11	-0.06

## Discussion

In this study we have considered stepwise procedure to find out the degree of relationship

between age, height, weight and haemoglobin level by health status as well as selection of the best subset.

It was observed that 87% of the children were suffering from one or more diseases.

The major morbidity were anaemia, malnutrition, fever, cough, diarrhoea, scabies, abdominal pain, dysentery, measles, otitis, asthma and dental caries. Kader Monzoor<sup>7</sup> found a similar morbidity in his study of slum dwellers.

Correlation Co-efficient  $r$  and regression coefficient  $b$  between height, weight and haemoglobin level in cyclic order are shown in the Table 2 and 4 respectively. In case of 0-2 years old children, degree of relationship between height and weight of disease free children was 0.93,  $P < 0.001$ . So the correlation Co-efficient may be regarded as highly significant.

The  $b$  Co-efficient in case of weight suggests that an increase of 1 percent in height resulted in an increase of about 0.21 percent in weight. The  $r^2$  value was 0.86. So we can say that 86% of the variation in weight is accounted for by the height of the child. The degree of relationship between height and weight of fever and anaemia were 0.45,  $P < 0.05$  and 0.32,  $P < 0.05$ , respectively. So the correlation Co-efficients may be regarded as significant. The regression Co-efficients  $b$  in case

of weight suggested that an increase of 1 percent in height resulted in an increase of about 0.09 and 0.06 percent in weight respectively. This  $r^2$  values were 0.20 and 0.10. So we may say that 20% and 10% of the variation in weight are accounted for the height of the child respectively. The rest of the degree of relationship between ht. and wt. 0.30, 0.22, 0.14 and 0.06;  $P > 0.05$  by scabies, diarrhoea, cough and malnutrition sloping downwards respectively. So the correlation co-efficients may be regarded as insignificant lower proportion. Their regression coefficients  $b$  and  $r^2$  values were 0.08, 0.05, 0.17, 0.01 and 0.09, 0.05, 0.02, 0.0 respectively. This implies that in case of weight suggested that an increase of 1 percent in height resulted in an increase of about 0.08, 0.05, 0.17 and 0.01 percent in weight. According to the  $r^2$  values 9%, 5%, 2% and nil of the variation in weight are accounted for the height of the child. The degree of relationship between height and haemoglobin level of children was 0.46,  $P < 0.05$ . So the correlation Co-efficient may be regarded as significant. The  $b$  Co-efficient and  $r^2$  value were 0.02 and 0.19 respectively. The degree of relationship between height and

Hb for fever, scabies, diarrhoea, cough, malnourished were found reverse ( -0.20, -0.57, -0.13, -0.07, -0.02,  $P > 0.05$  ). Their b Co-efficients and  $r^2$  values were -0.02, -0.20, -0.03, -0.01, -0.004 and 0.04, 0.32, 0.02, 0.0, 0.0 respectively. The reverse relationship implies that one variable (haemoglobin level) tends to decrease as the other (height) increase.

Weight and haemoglobin level of disease free children was found significantly correlated (0.32,  $P < 0.05$ .) whereas regression coefficient b and  $r^2$  value were 0.04 and 0.20 respectively. The degree of relationship between weight and haemoglobin level for fever, anaemia, scabies, diarrhoea, cough and malnourished were found reverse (-0.20, -0.08, -0.22, -0.12, -0.04, -0.02,  $P > 0.05$ ). Their b Co-efficients and  $r^2$  values were -0.15, -0.01, -0.26, 0.13, -0.04, 0.01 and 0.04, 0.0, 0.05, 0.01, 0.0, 0.0 respectively. Reverse relationship implies that haemoglobin level dropped during these situation. In case of 3-5 years old children, it was observed that degree of relationship between height and weight by cough was 0.53,  $P < 0.05$  whereas in 0-2 years old children it was 0.14,  $P > 0.05$ . The others degree of relationship had

a similar trend within 0-2 years age group. In case of 0-5 years old children, the degree of relationship between height and weight by dysentery and measles were insignificantly lower proportion (-0.12, -0.18,  $P > 0.05$ ). Their b Co-efficient and  $r^2$  values were -0.20, 0.03, and 0.01, 0.03 respectively. The degree of relationship between height and weight by abdominal pain was found to be significantly higher proportion (0.52,  $P < 0.05$ ). The b co-efficient and  $r^2$  value were 0.11 and 0.27 respectively. In the cases of 0-2 years and 3-5 years children, it was observed from the homogeneity test of a set of  $r_{12}$  (relation between height and weight) by health status were found to be significantly higher proportion (Chi-Square = 67.43; and 22.75,  $P < 0.001$ ) respectively. The rest were found to be insignificantly lower proportion  $P > 0.05$ ). For this insignificant results we may furnish these degree of relationship according to ascending or descending order.

As a fall out of the present study it may be concluded that the situation of relationship between height, weight and haemoglobin level of disease-free children was better than the others. Overall situation, dysentery, malnutrition, measles, diarrhoea, scabies,



cough, anaemia, fever and abdominal pain were the next position according to the ascending order. Degree of relationship by dysentery, malnutrition, measles, diarrhoea indicated the serious condition.

### Summary

The paper reports the findings of a comparative study conducted to find out the degree of relationship between age, height, weight and haemoglobin level by health status among 297 children selected from a slum area of Dhaka city. The situation of relationship between height and weight ( $r_{12} = 0.93$ ) of disease-free by 0-2

years old children was found to be highly correlated. Relationship between height and haemoglobin level ( $r_{13} = 0.48$ ), weight and haemoglobin level ( $r_{23} = 0.47$ ) of disease-free by 3-5 years old children were found to be significantly higher proportion than other groups (Fever, Anaemia, Scabies, Diarrhoea, Cough, Malnutrition, Dysentery, Measles, Abdominal Pain). Undesirable degree of relationship between height and weight by dysentery ( $r_{12} = -0.12$ ), malnutrition ( $r_{12} = -0.06$ ), measles ( $r_{12} = 0.18$ ), diarrhoea ( $r_{12} = 0.22$ ) and scabies ( $r_{12} = 0.30$ ), were found.

### Reference

1. T.D.V. Swinscow; Statistics at square one, published by the British Medical Association, Tavistock Square, London, WC1H9JP.
2. Gomez, F., Rames-Galvan, R., and Gravioto, J.; Pediatrics 16; 513 (1952).
3. American Health Care Association. Growth Monitoring: Primary Health Care Issues, 1981.
4. Ali, S.M. Keramat, Pramanik, Md. Moksed Ali, Samad, M.A., Razzak, A., Mustafa, G., Hossain, M., Taher, R.A. Prevalence of morbidity among normal and malnourished children of a slum area of Dhaka city. Bangladesh Journal of Nutrition, 1989 - 1990, Volume 3, Numbers 1 & 2, Pare. 13.
5. N.R. Draper, H. Smith; Applied Regression Analysis.
6. Report of a WHO Group of Experts on Nutrition Anaemia; WHO Technical Report Series No. 503, 1972.
7. Monzoor, Kader, Epidemiological Study of Rheumatic Fever (RE) and Rheumatic Heart Disease (RHD) in Urban Slums of Bangladesh, (Dissertation) NIPSOM, Mohakhali, Dhaka University, 1984.