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Nutrition and Economic Status in Relation to Changes in Adult Growth among the Assamese Muslims of Kamrup District, Assam

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ABSTRACT The present study delves into the effects of dissimilar economic conditions providing insight into the population response to environmental circumstances operating at the microlevel during adulthood on the body build and nutritional status. A sample of 136 adult males and 187 adult females of indigenous segment of the Assamese Muslims of Kamrup district, Assam forms the material for study. The decennial changes in the growth pattern of some somatometric characters has also been looked into.

INTRODUCTION

Physical development is best envisaged as a series of many successive processes, overlapping one another in time and linked loosely or tightly as the case may be (Tanner, 1978). There is an overall order in which visible changes follow one another with the regularity of a serially changing mosaic with speeds varying from time to time. Of this order, is a transition from adolescence to adulthood which as per Bogin (1991) is marked by the cessation of height growth, reproductive maturity and other physical any psychological events. So the attainment of adult stature is used as a hallmark to mark the transition from adolescence to adulthood. Growth in other somatometric characters does not entirely ceases at the end of adolescent period. Tanner (1978) says that height increases by a small amount till about age 30 as the vertebral column continues to grow till then. From about 30 to 45 years height remains stationary and then it begins to decline.

The present study is an attempt to look into the decennial changes during adulthood in some somatometric characters among the Assamese Muslims of Kamrup district, Assam. Choudhury (1981) found that the Rabhas of the same district have an increasing trend of growth from 20 to 35 years in their linear measures taken at 5 years interval but the skinfolds showing a decrease among the males.

The course of growth and development during adulthood is not easily described (Bogin, 1981). Apart from the genetic factors (for the most part shape had been considered to be genetically determined), there are many intervening variables between the macroenvironmental factors including cultural attitudes which acts as a determinant of the outcome of the growth process of mature adult. Nutrition does play a most important part in growth, however, not all differences among populations are the result of poor nutrition.

Nutritional anthropometry reflecting growth and development of infants, toddlers and school age children were found different between socio economic groups (Rao and Sathya narayana, 1976; Vijayaragnavan, 1976; Rao, 1980; Banik, 1982; Begum and Choudhury, 1996 and many more). Variations in growth differentials observed in infants, preschool and school age children continued to persist in the adults also (Gopalan and Srikantia, 1973; Rao, 1974; Satyanarayana et al, 1980;). Longitudinal studies also indicated that growth retardation observed in preschool age could not be made up later (Satyanarayana et al., 1980).

Very few nutritional anthropometric studies have been done in the state of Assam. Of them, in Kamrup district, 60% Kalita children were found to be suffering from various forms of malnutrition (Choudhury and Bhuyan, 1994). In Guwahati among the Assamese, Bengali and Hindi speakers, the Assamese children were found to be least sufferers (Choudhury et al., 1995; Begum, 1996 a). The Assamese Muslims of the same district have 42.07% preschool boys and 45.39% of girls suffering malnutrition (Begum and Choudhury, 1996), when they enjoy a medium body build (Begum, 1996b). No study on the adult population has yet been done.

With this intention, the present study will also try to peep into the impact of micro socio-environmental differences associated with economic status on the nutritional conditions of the adult

Assamese Muslims of Kamrup district. The economic status has clearly carved out a difference in the patterns of growth among the children of this group of people (Begum, 1994).

MATERIALS AND METHOD

The present study was carried out on the indigenous segment of the Assamese Muslims of Kamrup district. The data was collected from two densely populated villages-Garigaon, located on the outer fringes of Guwahati city, on the southern bank of river Brahmaputra and From Aggiathori, on the other side of the river. The Muslims of this district are scattered in the rural areas and make a concentration of 28.93% of the total population of the district (Siddiqui, 1976).

The practise of consanguineous marriage is totally absent among these people but villages endogamy is prevalent. These people are basically agriculturists but at present are on the verge of pursuing this occupation at primary level. The level of education not being very high has resulted in pursuing fourth grade jobs in various establishments by most of the villagers.

Data for the present study has been collected on 136 adult males and 187 adult females above 20 years of age for their total body height, sitting height, lower extremity length, horizontal head circumference, girth of bicep, chest circumference, girth of calf and body weight. The change in growth pattern of these anthropometric parameters would be seen at decennial interval.

The nutritional status and the body build has been assessed with the help of some anthropometric indices, weight/height, weight/height^2, weight/height^3, pellidisi index, ponderal index and korperfulle index. The present study was therefore conducted on the three economic subgroups to detect any pattern of relationship between microeconomic condition and nutritional status along with the body build during adulthood. The economic subgroups have been made on the basis of monthly family income as follows:

(a) Low Economic Subgroups (LES): income of Rs. 1000/- & less.
(b) Middle Economic Subgroups (MES): income ranging between Rs.1001/- to Rs. 1800/-
(c) High Economic Subgroups (HES): income of Rs. 1801/- or more.

RESULT AND DISCUSSION

The mean values of the somatometric variables under consideration with their standard error for both the sexes are shown in table 1 and 2. The decennial change in the linear measures of height vertex, sitting height and lower extremity length is in decreasing trend for both the sexes till 50 years of age except among the females when a slight increase of 0.06 cms. could be noticed in their lower extremity length during 41 to 50 years.

The net decrease in stature among the males is 3.22 cms. which is statistically insignificant but females have a significant decrease of 2.73 cms. during the whole age period under consideration. As per Caster (1976), the process of aging is a consistent pattern of degenerative changes which starts slowly around age 30 and progressing at a more rapid rate beyond the age of 60 or so.

The difference between adult height of males and females among the Assamese Muslims is 13.93 cms. On average adult men are taller and heavier than women. This difference was found to be 12.6 cms in Switzerland (Largo et al., 1978). Surveying 93 societies, including western and non-western cultures, Alexander et al. (1978) found the stature of women averages between 88 and 95 percent of the stature of men.

Unlike the linear measurements where decrease has already been initiated from 20 years onwards, the circumferential and ponderal parameters show an increase in the mean values till 40 years (except girth of calf) among the males whereas this increase continues upto 50 years among the females (except increase of girth of calf). So the decrease in circumferential mass starts early among the males. When the males are showing a net decrease in all the circumferential and ponderal measures between the age groups under consideration, the females have a net increase in their body weight and all the girth measures.

So whatever increase in the body weight has taken place among the females between all the ages could be accorded to be due to the increase in the circumferential mass, as there is a decreasing trend in all the linear measures. Any variation in bodyweight is considered to be the sum total of variations in its constituent parts.

Table 1: Distance and velocity statistics for eight variables among the adult males

Age Groups (Years) decennial	*No. of males*	*Height vertex (cm)*	*Sitting height (cm)*	*Lower extremity length (cm)*	*Horizontal head circumference (cm)*	*Girth of bicep (cm)*	*Chest girth (cm)*	*Girth of calf (cm)*	*Body weight (kg)*
		$\overline{X}$ ±S.E.	$\overline{X}$ ±S.E.	$\overline{X}$ ±S.E.	$\overline{X}$ ±S.E.	$\overline{X}$ ±S.E.	$\overline{X}$ ±S.E.	$\overline{X}$ ±S.E.	$\overline{X}$ ±S.E.
21-30	47	165.12±1.42	85.53±1.22	79.76±0.87	55.52±0.29	26.29±0.52	85.19±0.96	32.91±0.52	54.64±1.70
		d.c. - 2.07	d.c. - 1.05	d.c. - 1.15	d.c. + 0.2	d.c. + -.7	d.c. + 4.54	d.c. - 0.01	d.c. + 4.24
31-40	33	163.05±1.20	84.48±0.76	78.61±0.82	55.72±0.40	26.99±0.62	89.73±1.42	32.90±0.49	58.88±2.03
		-1.07	-0.34	-0.7	-0.83	-1.0	-3.06	-1.06	-4.31
41-50	34	161.98±1.36	84.14±0.70	77.91±0.91	54.89±0.37	25.99±0.54	86.67±1.31	31.84±0.62	54.57±2.01
		-0.08	-1.06	+1.0	+0.10	-0.59	-2.25	-0.98	-2.98
51 & above	22	161.90±1.36	83.08±0.63	78.91±0.93	54.99±0.25	25.40±0.41	84.42±0.69	30.86±0.39	51.59±1.25
		165.12-161.90	85.53-83.08	79.76-78.91	55.52-54.99	26.29-25.40	85.19-84.42	32.91-30.86	54.64-51.59
Net decrease		= 3.22	= 2.45	= 0.85	= 0.53	= 0.89	= 0.77	= 2.05*	= 3.05
Pooled	136	163.31±1.34	84.53±0.76	78.88±0.88	55.32±0.33	26.24±0.53	86.54±1.11	32.31±0.52	55.16±1.78

d.c. = decennial change
* Significant net decrease at 5% level of significance

Table 2: Distance and velocity statistics for eight variables among the adult females

Age Groups (Years) decennial	*No. of females*	*Height vertex (cm)*	*Sitting height (cm)*	*Lower extremity length (cm)*	*Horizontal head circumference (cm)*	*Girth of bicep (cm)*	*Chest girth (cm)*	*Girth of calf (cm)*	*Body weight (kg)*
		$\overline{X}$ ±S.E.	$\overline{X}$ ±S.E.	$\overline{X}$ ±S.E.	$\overline{X}$ ±S.E.	$\overline{X}$ ±S.E.	$\overline{X}$ ±S.E.	$\overline{X}$ ±S.E.	$\overline{X}$ ±S.E.
21-30	58	150.89±0.81	78.60±0.60	72.33±0.58	53.87±0.28	23.58±0.37	80.58±1.27	29.73±0.39	45.21±1.26
		d.c. - 1.76	d.c. - 0.54	d.c. - 1.34	d.c. + 0.11	d.c. + 1.57	d.c. + 4.01	d.c. + 0.95	d.c. + 3.28
31-40	73	149.13±0.72	78.06±0.57	70.99±0.54	53.98±0.19	25.15±0.42	84.59±1.26	30.68±0.46	48.49±1.45
		-1.01	-0.89	+0.06	+0.07	+0.18	+4.36	=0.36	+1.65
41-50	35	148.12±0.95	77.17±0.46	71.05±0.77	54.05±0.32	25.33±0.62	88.95±0.95	30.32±0.66	50.14±2.28
		+ 0.04	+ 0.10	- 0.50	+ 0.14	-1.26	-7.35	+0.13	-4.75
51 & above	21	148.16±1.07	77.27±0.54	70.55±0.76	54.19±0.25	24.07±0.50	81.60±1.30	30.45±0.34	45.39±1.42
		150.89-148.16	78.60-77.27	72.33-70.55	53.87-54.19	23.58-24.07	80.58-81.60	29.73-30.45	45.21-45.39
Net decrease		= 2.73*	= 1.33	= 1.78	= -0.32	= -0.49	= -1.02	= -0.72	= -0.18
Pooled	187	149.38±0.83	77.97±0.59	71.37±0.62	53.98±0.25	24.57±0.45	83.83±1.21	30.29±0.46	47.43±1.54

d.c = decennial change
* Significant net decrease at 5% level of significance

To have a look into nutritional status and body build of the Assamese Muslims six anthropometric indices are presented by sex and their economic status in table 3 to 7.

Tabel 3: Mean ±S.E. of anthropometric indices by sex and economic status

Anthropometric Index	*Males*			*Female*		
	A	*B*	*C*	*A*	*B*	*C*
Weight/Height	0.35±0.01	0.32±0.01	0.32±0.01	0.32±0.007	0.31±0.01	0.31±0.01
Weight/Height^2	2.13±0.03	1.99±0.04	1.98±0.06	2.15±0.04	2.13±0.05	2.11±0.05
Weight/Height^3	1.29±0.02	1.22±0.02	1.22±0.03	1.44±0.03	1.38±0.04	1.38±0.03
Pellidisi Index	97.81±0.50	95.82±0.56	94.77±0.88	100.03±0.56	99.42±1.15	99.61±0.78
Ponderal Index	23.41±0.14	23.01±0.15	22.89±0.20	24.26±0.16	23.99±0.19	24.09±0.18
Korperfulle Index	1.29±0.02	1.22±0.02	1.22±0.03	1.45±0.03	1.38±0.04	1.41±0.03
Number of subjects	58	42	36	81	39	54

A: Upper income group, B: Middle income group, C: Lower income group

Tabel 4: State of nutrition as per weight/height^2 by sex and economic status

Classification of	*Frequency of males*				*Frequency of females*			
Malnutrition	*A*	*B*	*C*	*Total*	*A*	*B*	*C*	*Total*
Obesity	–	–	–	–	3	1	2	6
	–	–	–	–	(3.70%)	(2.56%)	(3.70%)	(3.45%)
Over weight	3	2	2	7	15	4	8	27
	(5.17%)	(4.76%)	(5.56%)	(5.15%)	(18.52%)	(10.26%)	(14.81%)	(15.52%)
Normal	40	19	14	73	33	17	24	74
	(68.97%)	(45.24%)	(38.89%)	(53.68%)	(40.74%)	(43.59%)	(44.44%)	(42.53%)
Under weight Grade I	15	21	20	56	29	17	20	66
	(25.86%)	(50%)	(55.56%)	(41.18%)	(35.80%)	(43.59%)	(37.04%)	(37.93%)
Under weight Grade II	–	–	–	–	1	–		1
	–	–	–	–	(1.23%)	–	–	(0.57%)

A: Upper income group, B: Middle income group, C: Lower income group

Tabel 5: State of Nutrition as per Korperfulle index by sex and economic status

Class	*Frequency of males*				*Frequency of females*			
	A	*B*	*C*	*Total*	*A*	*B*	*C*	*Total*
Low state of malnutrition to very mild state of undernutrition	16 (27.59%)	21 (50%)	19 (52.78%)	56 (41.18%)	15 (18.52%)	8 (20.51%)	14 (25.93%)	37 (21.26%)
Normal or satisfactory state of nutrition	36 (62.07%)	19 (45.24%)	14 (38.89%)	69 (50.74%)	37 (45.68%)	18 (46.15%)	23 (42.59%)	78 (44.83%)
Mild or moderately overweight	6 (10.34%)	2 (4.76%)	3 (8.33%)	11 (8.09%)	29 (35.80%)	13 (35.33%)	17 (31.48%)	59 (33.91%)

A: Upper income group, B: Middle income group, C: Lower income group

Table 6: State of nutrition as per Pelidisi index by sex and economic status

Class	*Frequency of males*				*Frequency of females*			
	A	*B*	*C*	*Total*	*A*	*B*	*C*	*Total*
Distinctly low state of nutrition	2 (3.45%)	4 (9.52%)	8 (22.22%)	14 (10.29%)	2 (2.47%)	1 (2.56%)	2 (3.70%)	5 (2.87%)
State of mild under-nutrition	13 (22.41%)	14 (33.33%)	12 (33.33%)	39 (28.68%)	9 (11.11%)	8 (20.51%)	9 (16.67%)	26 (14.94%)
Normal state of nutrition	29 (50%)	19 (45.24%)	10 (27.78%)	58 (42.65%)	26 (32.10%)	9 (38.46%)	13 (37.04%)	51 (35.06%)
Mildly overweight	12 (20.69%)	5 (11.90%)	5 (13.89%)	22 (16.18%)	29 (35.80%)	9 (23.08%)	13 (24.07%)	51 (29.31%)
Distinctly over weight	2 (3.45%)		1 (2.78%)	3 (2.21%)	15 (18.52%)	6 (15.38%)	10 (18.52%)	31 (17.82%)

A: Upper income group, B: Middle income group, C: Lower income group

Table 7: State of body build as per ponderal index by sex and economic status

Class	Frequency of males				Frequency of females			
	A	B	C	Total	A	B	C	Total
Good	2	-	-	2	-	-	-	-
	(3.45%)	-	-	(1.47%)	-	-	-	-
Medium	55	42	35	132	71	37	50	158
	(94.83%)	(100%)	(97.22%)	(97.06%)	(87.65%)	(94.87%)	(92.59%)	(90.80%)
Weak	1		1	2	10	2	4	16
	(1.72%)	-	(2.78%)	(1.47%)	(12.35%)	(5.13%)	(7.41%)	(9.20%)

A: Upper income group, B: Middle income group, C: Lower income group

Table 3 shows the mean and standard error for six anthropometric indices indicating the nutritional status among the adult males and females as per their economic status. The mean values of all the indices decrease with the decrease the economic status based on their income. The females have a higher mean value of all the indices except weight/height than their male counterparts. Rao et al. (1991) have stated that the indices which are least correlated with stature and better correlated with measurements reflective of muscle and fat components of the body may serve as good indicators for the assessment of undernutrition and overnutrition. Weight/height and weight/height^3 was found by them providing different estimates of malnutrition because of their correlation with stature. Weight/height^2 was deduced to be the index of choice for use. The superiority of weight/height^2 was deduced to be the index of choice for use. The superiority of weight/height^2 ratio over other age independent parameters in the detection of malnutrition has also been proved by Gupta and Bhandari (1974); Sen et al. (1980); Sastry and Srikantia (1976); Mehrotra (1976); Prasad et al. (1971); Gupta S.D. et al. (1979); Gupta, K.B. (1981).

The difference in the mean nutritional indices between the economic subgroup A and B among the males is statistically significant except for ponderal index (Table 8). Between B and C the difference in all the indices is not significant statistically but A and C shows a significant difference in all except weight/height^3 and korperfulle index. This difference in the mean of nutritional indices between the economic subgroups among the females is insignificant for all the indices.

Body Mass Index (BMI) being detected by weight/height^2 as a measure of malnutrition (Table 4) shows that the percentage of overweight is more among the females (15.52%) than the males (5.15%). On the other hand the percentage of malnourished is more among the males (41.18%) than the females (38.51%). Females adults were also found overweight and obese by Rao et al. (1991) than the males in all income groups. But higher indices may not indicate excessive fatness (Malina et al., 1987). Lower percentage of malnourished among the females is may be due to the fact that females are less easily thrown off their growth curves (Tanner, 1978), less easily affected by adverse socio environmental conditions.

Tabel 8: Test of significance among the economic subgroups in their mean anthropometric indices

Nutritional indices	A × B Meales Females	B × C Males Females	A × C Males Females
Weigth/Height	3.85*	0	2.68*
	0.94	0	0.94
Weight/Height^2	2.80*	0.14	2.14*
	0.33	0.29	0.66
Weight/Height^3	2.33*	0	1.75
	1.20	0	1.50
Pellidisi index	2.65*	1.01	3.01*
	0.48	0.14	0.44
Ponderal index	1.90	0.48	2.17*
	1.08	0.38	0.71
Korperfulle index	2.30*	0	1.75
	1.40	0.60	1.0

*Statistically significant at the level of 5%

The state of nutrition as detected by korperfulle Index (Table 5) also shows more percentage of females (33.91%) as overweight than the male counterparts (8.09%) but percentage of undernutrition is more among the males (41.18%) than the females (21.26%). As per this index also the percentage of undernutrition increases with decrease in the economic status. But the percentage of over weight decreases with decrease in economic status except between middle and lower income groups among the males. A similar type of result has been deduced by Pelidisi index

(Table 6) with more percentage of females as overweight but more males suffering from low

Tabel 9: Test of significance between the economic subgroups in total number of malnourished

Nutritional indices	*A × B Meales Females*	*B × C Males Females*	*A × C Males Females*
Weigth/Height^2	3.94*	0.114	5.26*
	0.28	0.24	0
Korperfulle index	3.31	0.03	3.79
	0.06	0.28	0.83
Pellidisi index	2.13	0.64	5.27*
	1.42	0.07	0.92

*Statistically significant at the level of 5%

state of nutrition. The percentage of undernutrition increasing with decreasing income level but overweight adults decreasing with decreasing income level.

The difference in the total number of malnourished with changing economic status as detected by weight/height^2, korperfulle and Pellidisi index when seen statistically (Table 9) reveals that the difference in total malnourished between A & B is significant when detected by weight/height2 among the males. It is insignificant between B and C as detected by all the three indices but between A and C it is statistically significant when detected by weight/height^2 and Pellidisi index. The females show an insignificant difference in malnutrition between the economic subgroups detected by all the three indices.

In the present study almost all the Assamese Muslim adults fall in the medium category of body build as found out by Ponderal index (Table 7). It is 97.06% males and 90.80% females in this category. No female has a good build and the percentage of females with weak body build is more (9.20%) than the males (1.47%).

Therefore it could be seen that the economic factor based on the family income at the micro level has obviously got a role to play in determining the nutritional status and body build of the individual during adulthood. The response to this factor is also different for both the sexes. Therefore apart from the genetic composition at adulthood any environmental factor operating at the microlevel should not be overlooked in any growth study of a population. Similar results has also been found by Singh (1978); Verma et al. (1982); Siddhu et al. (1985); Rao et al. (1986), (1991); Bharati and Basu (1990).

More percentage of malnutrition among the males as detected by the indices may be one of the causes behind the early onset of degeneracy in the circumferential measures among them. Since various factors forming a part of the micro-environmental surrounding finally hinges upon the level of nutrition.

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