The Role of Adequate Nutrition on Academic Performance of College Students in North Tripura

Santanu Ghosh [1], Haradhan Saha [2]

[1] Dr., Santanu Ghosh, Department of Human Physiology Government Degree College, Dharmanagar, North Tripura. Phone no: 9862729696. sgrintuk11@gmail.com.

[2] Dr., Haradhan Saha Assistant Professor, Department of Education, Government Degree College, Santirbazar, Tripura (South).

ABSTRACT

The development of a nation is closely interlinked with the education level of its population. Various studies have provided enough evidence of the importance of proper nutrition to the cognitive development of an individual which also affects their education achievements. Bur till date, the pathway as to how nutrition develops or hinders academic achievement is still not very clear. It has been established that poor health and malnutrition in early childhood may affect cognitive abilities. This study looks into the effect of nutritional on college students in North Tripura district which has hitherto not been documented earlier. The study shows that, the tribal students have lower BMI values than their nontribal counterparts which may be due to the tribal students having less access to convenience foods. Their poor nutritional status reflects in their academic achievements which are lower than their nontribal counterparts.

Keywords: *Nutrition, College students, Tripura, Academic status.*

INTRODUCTION

Since national or community development depends largely on the quality of education, an understanding of the nature of the relationship between health and education is important for policy planners as well as the masses. It is generally believed that the basis for any true development must commence with the development of human resources [1]. It has been argued that health is an important factor for academic achievement at school [2,3] and in higher education [4]. Consequently, in the context of universities or colleges, promoting the health and well-being of all members means promoting effective learning [5]. A systematic literature review to examine whether school health programmes improved academic success provided positive evidence for at least some programmes [6]. Chronic malnutrition experienced during early life inhibits growth, retards mental development, and reduces motivation and energy level, causing a reduction of educational attainments and delay in school entry [2]. This study hopes to find out the relationship between the nutritional status of college students and its effect on their academic status in a sample of college students in Dharmanagar district in North Tripura, India, which has not been documented by any workers earlier.

Review Of Literature

The potential for health to improve cognitive function, learning and academic achievement in children has received attention by researchers and policy makers [34]. It is widely accepted that

health and well-being are essential elements for effective learning [2]. It is also seen that education is a strong predictor of lifelong health and quality of life in different populations, settings, and time [35]. But as to how education leads to better health and longer life expectancy are still not clearly understood. It is widely held, however, that education, health, and social outcomes are very closely interdependent [36].

Malnutrition is a major problem across the world, both in developed and developing countries and deficiencies in some nutrients have been reported to cause diseases which could lead to impaired cognitive development [5]. Many other studies have related lifestyle of students, particularly breakfast consumption, to their cognitive abilities as reflected in their academic performance [6-8]. But sadly, most of these studies have failed to include young adults or even adolescents studying in the tertiary institution. Undernourished children have been shown to have decreased attendance, attention, and academic performance as well as experience more health problems compared to well-nourished children [15,18]. More recently, studies have examined the impact of breakfast on cognition, behavior, and academic performance of school-age children [15,19-21]. Most studies of health-promoting profiles of students, such as the European Health and Behavior Survey conducted in 20 countries, did not explore the associations]between health and academic achievement [23).Conversely, most studies of the factors associated with students' educational attainment were mainly concerned with educational and/or demographic variables and did not concurrently explore the students' health-related parameters [25]. Geographically, the majority of research conducted assessed the associations between health/health programmes and academic achievement and were undertaken in the USA [26-28], with fewer studies from the UK or elsewhere [25]. Also the associations between health/health programmes and academic attainment were mostly examined in elementary, middle or high school children [29-33], rather than university/college students [25].

Low anthropometric measurements (height-for-age, weight-for height and head circumference) have been frequently associated with poor school outcomes.[2,3–6,34-36]. In fact, in several of the studies, the relationship remained significant, even after controlling for socioeconomic variables.[3-5,9]. Iron-deficiency anemia, missing breakfast and helminthic infections have also been reported to affect school performance [3–6,34-36]. Eating disorders create a variety of medical conditions that occur more frequently in the college-age population. [50]. According to Gardner and Grantham-McGregor the mechanisms which link undernutrition and poor development in children are not well understood, although children who were moderately to severely malnourished during their early childhood show delayed development [37].

Studies of nutrition and academic performance have typically focused on hunger, malnutrition, and micronutrient deficiency [38-40]. The predominant approach to studying diet has focused on the role of individual nutrients or foods [41].However; individuals do not consume single nutrients but combinations of foods [42]. In recognition of the multidimensional nature of diet, studies of the interrelations of nutrition and health have examined the effects of overall diet quality using summary measures of food and nutrient intake [42,43].Academic performance influences future educational attainment and income, which, in turn, affect health and quality of life [44]. Moreover, as increased levels of educational attainment and income facilitate increased understanding of nutrition messages and access to healthy food, [45,47] This relationship has been observed as steady across different levels of socioeconomic status [49].

METHODOLOGY

The study was conducted on undergraduate students of Government Degree College, Dharmanagar, North Tripura. Subjects were randomly selected from across the all faculties in the

campus. All the subjects were day scholars.Hostel dwellers were excluded from the ambit of the study to retain parity in subject selection as well as their diet. Subjects who had taken ill in the last 4 weeks and those currently on medication will be exempted from the study. The age group of the subjects was 19-22 years and the same was verified from their date of birth as recorded in their School leaving examination admit card. A total of one hundred students (58 girls and 42 boys) completed the survey from one hundred fifteen students selected for the survey. All the subjects were explained the modalities and objectives of the study and informed oral consent were taken both from the subjects as well as the principal of the college for undertaking the study.

Recording of height and weight of the subjects were carried out with the help of an anthrop meter and a weighing machine respectively which was calibrated every day before the start of work. All the anthropometric measurements were taken following the standard techniques recommended by Lohman *etal*. [53]. BMI was calculated as per WHO norms. It is calculated as the weight in kilograms divided by the square of the height in meters (kg/m2). BMI is age-independent and the same for both sexes [54]:

$$\text{Body Mass Index : } = \frac{\text{Body weigh t in kg}}{\text{Body height in m}^2}$$

There has been a large number of divergent views as to how many days of dietary survey is required to exactly represent the intake of an individual. These range from one day recall method to seven days weighment method But it has been agreed that the number of days of survey is dependent on the type of work to be done with the data. Thus for example, epidemiological survey like National Sample Survey relies on 24 hour recall method while surveys of small population can be done over a period of seven days. So for this study , dietary survey was conducted on each individual for a period of seven days. From this data, the nutritional status of each individual was calculated with the help of food composition table [57]. Standard Diet survey questionnaire as used by National Institute of Nutrition and ICMR modified as per local requirement was used in the collection of food consumption data.

Academic performance of the students was assessed by the marks scored by the students in the test exam conducted by the college prior to them being sent up for their university final exam. Since the students had a combination of subjects, so to bring in parity in assessment, the percentage of the total marks scored by the students were taken into consideration to rule out bias.

Statistical analysis was done using SPSS version 10 to find out the means and also to test for relationship between various dietary nutrients on academic achievement. Correlation between various nutrients and academic achievement were calculated .Regression equations of detailing the effects of certain major nutrients on academic achievement of the students were also developed

RESULTS

TABLE:1- Age And Sex Distribution Of The Studied Population:

Age Range	Tribal Males	Tribal Female	Total Tribal Subjects	Non Tribal Males	Non Tribal Females	Total Non Tribal Subjects	Grand Total
Adolescent (19-23 yrs)	**27**	**15**	**42**	**31**	**27**	**58**	**100**

A total of 58 nontribal and 42 tribal students took part in the survey. Of the 100 students 58 were male and 42 were female.(Table 1 and Fig 1).

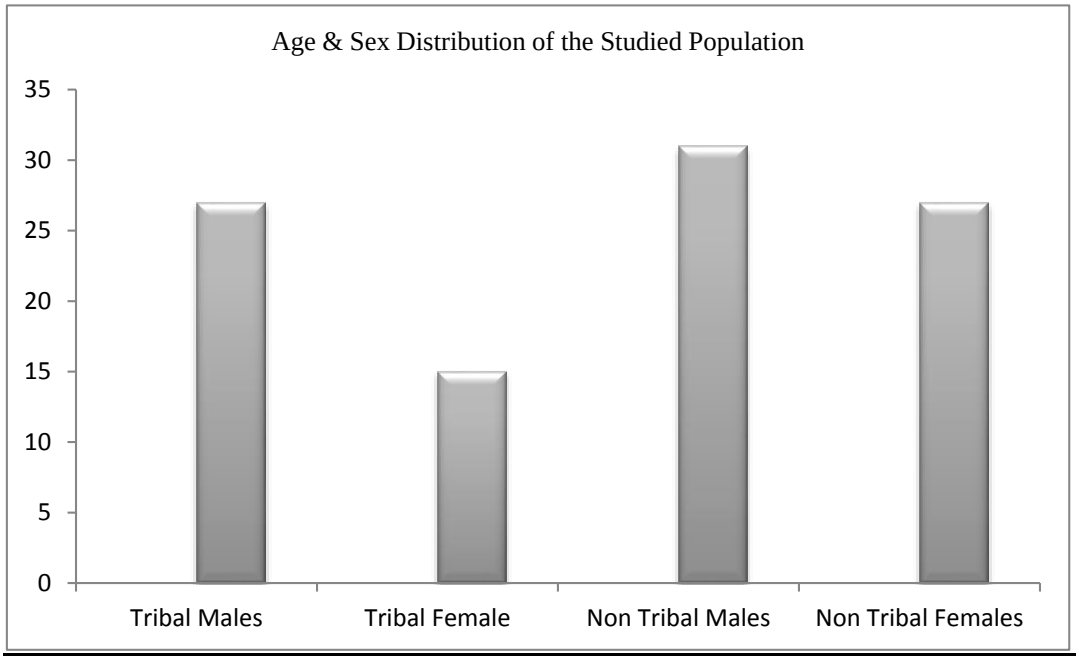

Fig 1 - Age and Sex Distribution of the Studied Population:

Table: 2 BMI Values Of The Surveyed Population (Mean Value)

CATEGORY	BMI VALUES
Tribal Males	18.9
Tribal Females	18.6
Non tribal Male	19.2
Non tribal Female	19.4

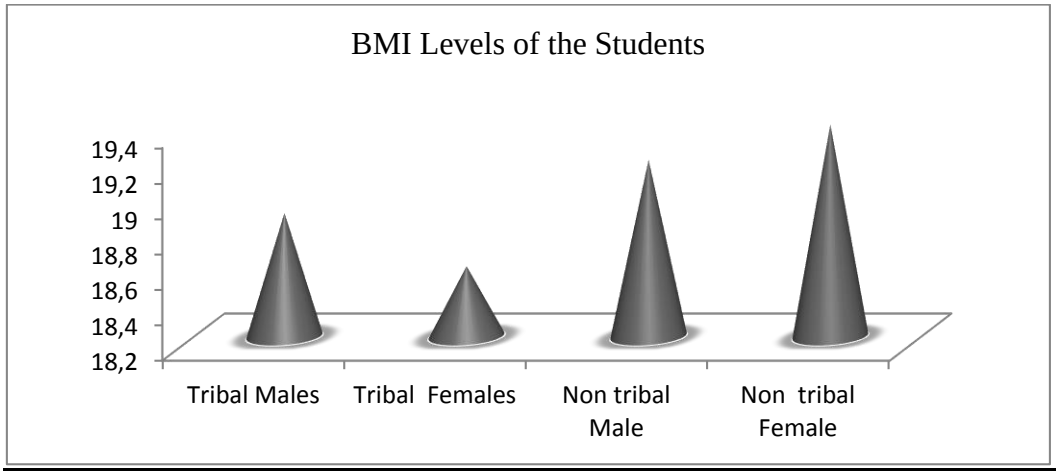

Fig 2 – BMI Levels of the Students

A study of the BMI values of the surveyed population shows that nontribal students have a higher BMI value than their tribal counterparts(Table 2), but from the BMI values we can interpret that chronic undernutrition is not present in any of the study groups(Fig 2). The higher BMI levels in the nontribal students may be due to their food habit which is completely different from their tribal counterparts. While the tribal students partake of home cooked meals where they use very little of spices and mostly use boiled foods, the nontribal students seem to have an affinity for fast foods available in outlets across the town. Their food also is mostly fried or cooked for a long period of time with a whole lot of spices so as to make it more palatable.

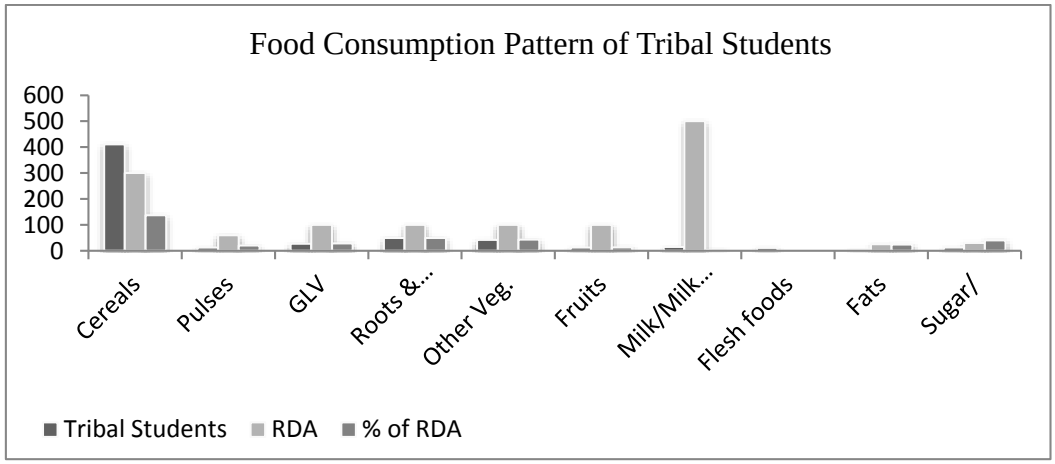

Fig 3 – Food Consumption Pattern of Tribal Female Students

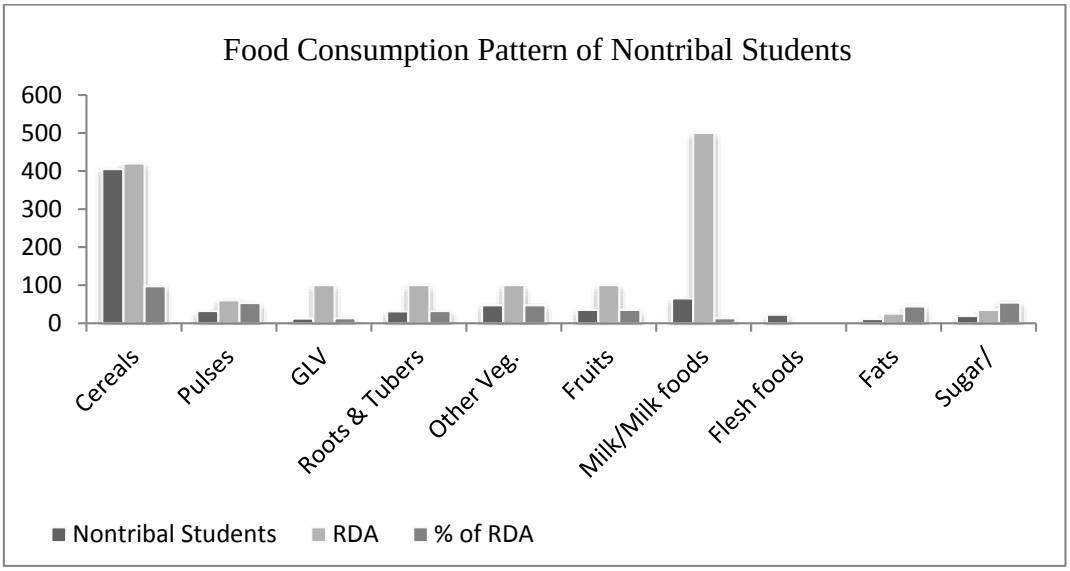

Fig 4 – Food Consumption Pattern of Nontribal Male Students

An analysis of the dietary survey data brings forth the fact that the tribal students take in more of cereals, green leafy vegetables, roots and tubers. Their consumption of fats, flesh foods and fruits are minimum(Fig.3) .This may be due to the higher cost associated with these food groups which they can ill afford. On the other hand the non tribal students take in fewer amounts of vegetables, but compensate this with a higher consumption of fruits(Fig.4). The consumption of milk is also quiet high in this population. They also take in a lot of flesh foods along with higher amounts of fats and sugar. This may also be the causative factor for the higher BMI levels seen in this group. The later sections help to reveal the nutrient consumption of the surveyed population which were calculated by transposing these dietary survey food consumption data on to the food consumption table

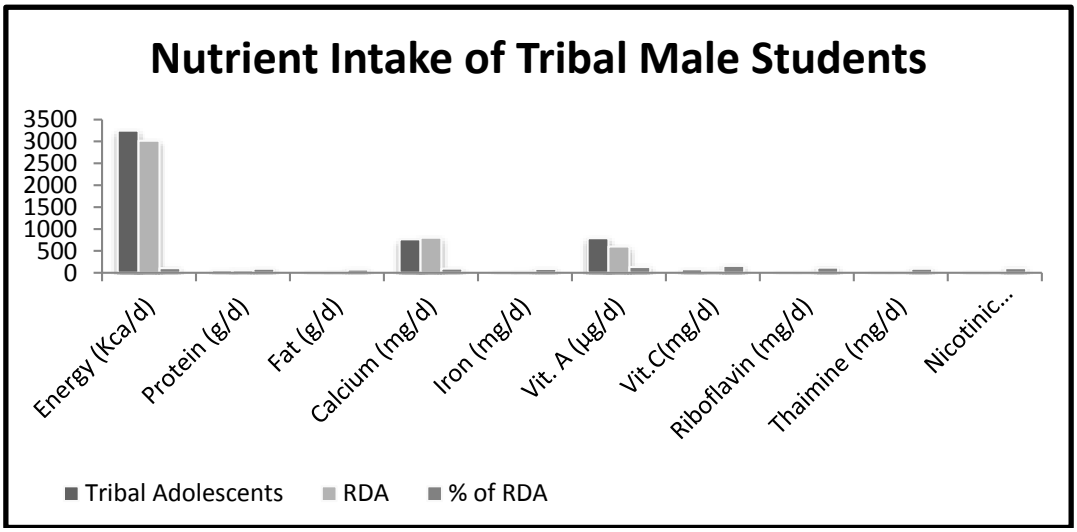

Fig 5 – Nutrient Intake of Tribal Male Students

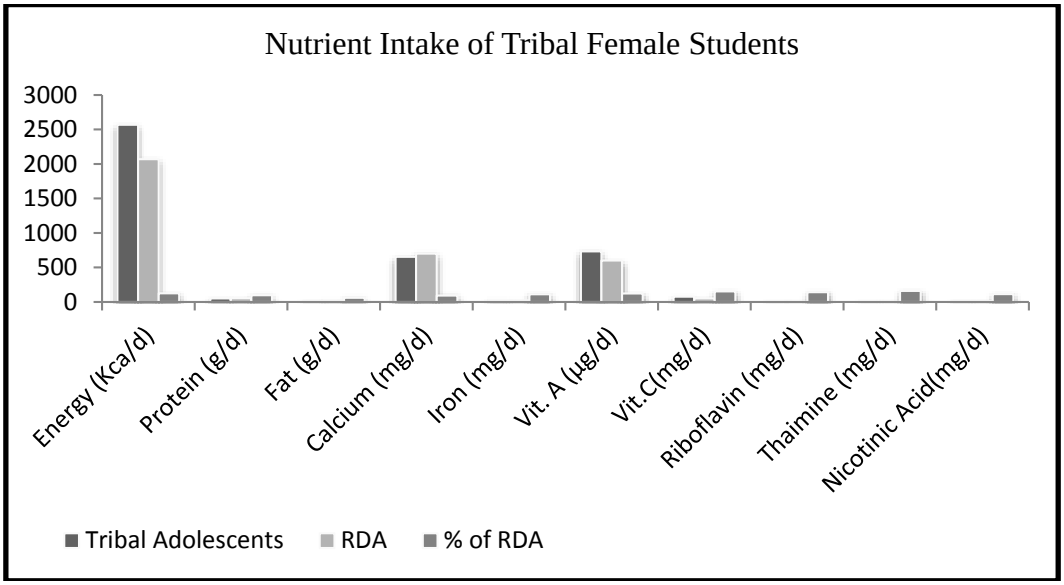

Fig 6 – Nutrient Intake of Tribal Female Students

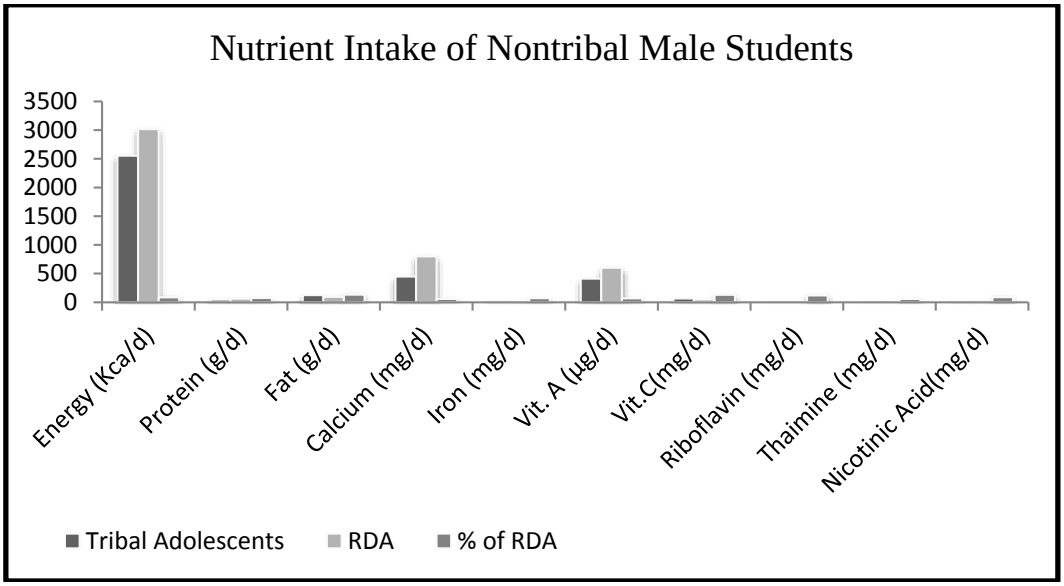

Fig 7– Nutrient Intake of Nontribal Male Students

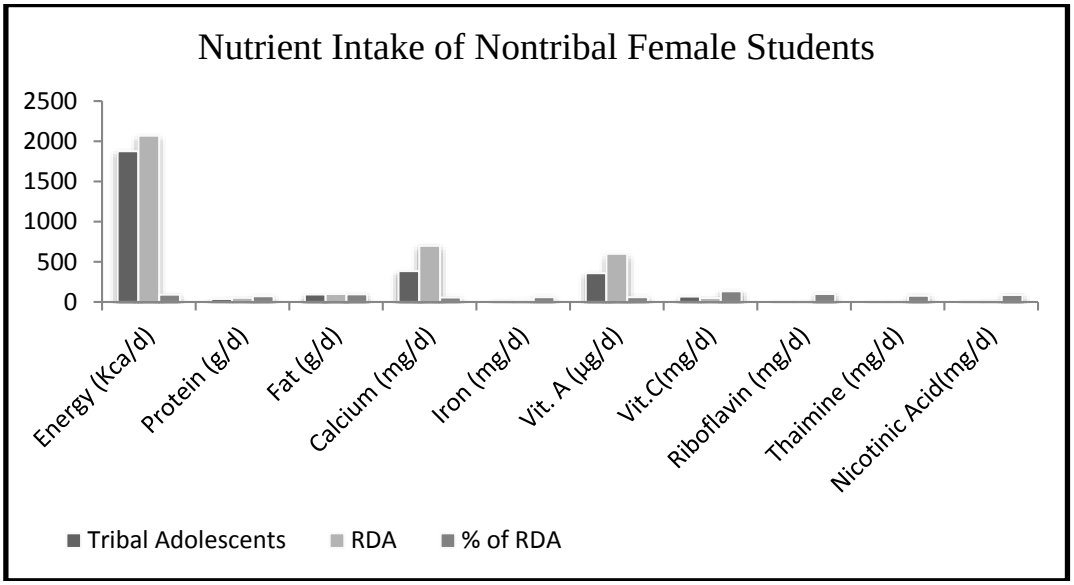

Fig 8 – Nutrient Intake of Nontribal Female Students

Thus the nutrient consumption table shows that the energy consumption of tribal students is slightly higher, but a major difference exists in the energy availability in the female students(Fig.6). While tribal female students have adequate energy consumption, the nontribal populace suffers from deficient energy consumption(Fig.5). This may due to food fads in females and also the influence of television or peer pressure to remain thin. The protein consumption levels are almost similar but fat intake is very less in the nontribal group(Fig.7). But then the levels of consumption of other minerals like calcium, iron and those of various vitamins are quiet high in the tribal group than in the nontribal population. This may be due to the intake of more of vegetables in the tribal group than the nontribal students(Fig.8).

TABLE: 5- Category wise Percentage Achievement

Category	<20	21-30	31-40	41-50	51-60	>60
Tribal Male	2	6	11	4	2	2
Tribal Female	3	4	4	3	1	Nil
Nontribal Male	10	11	7	1	2	Nil
Nontribal Female	4	10	6	3	3	1

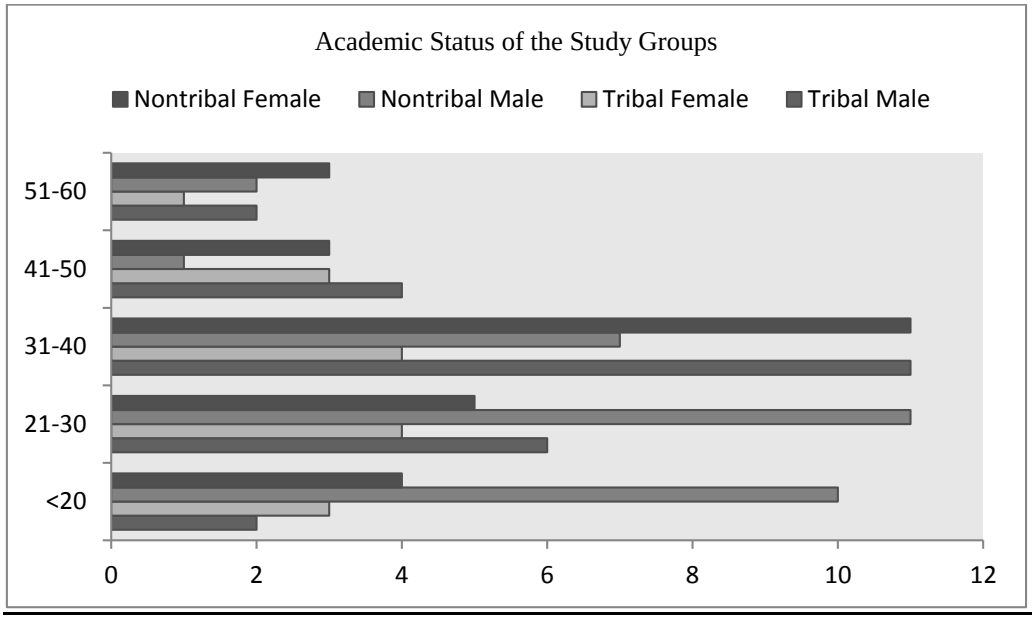

Fig 9 - Academic Status of the Study Groups

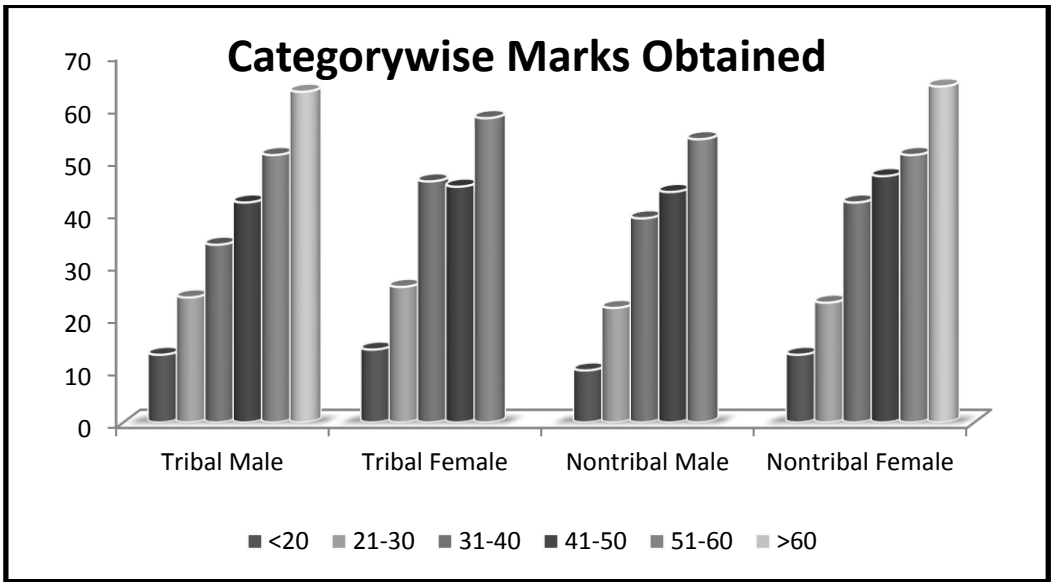

Fig 10 - Category wise Average Marks Obtained

The academic performance of the study group is detailed in Table.5,Fig.9 and Fig.10.A study of these table and figures show that there exists a difference in academic performance of the two groups. These were analyzed with later to find out the correlation between various dietary factors and academic performance.

The data from the study was analyzed with the help of SPSS (version-10) software to find out the correlation between academic status of the students of the study group and the various factors, and also to develop regression equations to understand the degree of association between the various variables that affect the academic status of these students. They are detailed below:

i) The correlation coefficient between BMI and academic status was found to be 0 .236 (R square value at 0.005 level of significance). Thus BMI levels are negatively correlated, albeit weakly with academic achievement.

The relationship can be better explained with the help of the following linear regression

equation :

E = 159.92 – 0.486 B

SE (162.893) (8.561),

Where, E = Academic Status of the study group, B = BMI of the study group and SE = standard error of estimate.

ii) The correlation coefficient between Fat intake and academic status was found to be 0 .725 (R square value at 0.005 level of significance).This denotes a strong negative correlation between Fat intake and academic status of the study group. The relationship can be better explained with the help of the following linear regression equation :

E = 36.607 - 0.852 F

SE (2.586) (0.033),

Where, E = Academic Status of the study group, F = Fat intake of the study group and SE = standard error of estimate.

iii) The correlation coefficient between Vitamin-C intake and academic status was found to be 0 .582 (R square value at 0.005 level of significance).This denotes a strong positive correlation between Vitamin-C intake and academic status of the study group. The relationship can be better explained with the help of the following linear regression equation :

E = 8.299 + 0.763 VC

SE (24.134) (0.335),

Where, E = Academic Status of the study group, VC = Vitamin-A intake of the study group and SE = standard error of estimate.

CONCLUSION

The above study shows that that the tribal students have lower BMI values than their nontribal counterparts which may be due to dietary differences – tribal students have less access to convenience foods and as such may have less consumption of these type of empty calorie containing foods. This dietary differences are reflected in the academic achievements of tribal students which are a little lower than their nontribal counterparts. This relationship becomes well established with the help of the regression equations developed whereby a negative correlation between BMI and academic achievement is observed.

The dietary survey shows that tribal students take in more of cereals, green leafy vegetables, roots and tubers. Their consumption of fats, flesh foods and fruits are minimum .This may be due to the higher cost associated with these food groups which they can ill afford. When these dietary survey data are converted to energy and nutrient consumption with the help of food composition tables it is seen that the energy consumption of tribal students is slightly higher, but a major difference exists in the energy availability in the female students. While tribal female students have adequate energy consumption, the nontribal populace suffers from deficient energy consumption. Consumption of other minerals like calcium, iron and those of various vitamins are also quiet high in the tribal group.

Statistical analysis of these nutrients consumption data with that of their academic achievement provides valuable insight into the role of various nutrients in academic achievement

of these students. It was found that BMI and fat consumption levels are negatively correlated with academic achievement. Though the correlation of BMI with academic achievement is weak, fat consumption is strongly correlated with academic achievement. This may be due to the fact that fats form a crucial part of the neuronal circuitry. All other nutrients are positively correlated with academic excellence. Of the various vitamins, Vitamin C has the strongest correlation with academic status, followed by Vitamin A Riboflavin and Thiamine respectively. This correlation may be because, all these vitamins are particularly important for neuronal development as well as neuronal connectivity and signal processing and transmission.

Thus from the above study and analysis of the data generated, we can conclude that nutritional status of a college student has definite relationship with his/her academic achievement.

REFERENCE

1) Pollitt, E.; "Nutrition and Educational Achievement." Nutritional Education Series, 1984; Issue 9. ED-84/WS/66. UNESCO, Paris

2) Popkin BM, Lim-Ybanez M. 1982. Nutrition and school achievement.SocSci Med. 16: 53–61.

3) Jamison DT. Child malnutrition and school performance in China.J Dev Econ 1986; 20: 299–309.

4) Moock PR, Leslie J. 1986. Childhood malnutrition and schooling in the Terai region of Nepal. J Dev Econ.20: 33–52.

5) Johnston FE, Low SM, Baessa YD, MacVean RB. 1987. Interaction of nutritional and socioeconomic status as determinants of cognitive development in disadvantaged urban Guatemalan children.Am J PhyAnthropol. 73: 501–506.

6) Sigman M, Neumann C. 1989. Cognitive abilities of Kenyan children in relation to nutrition, family characteristics and education. Child Dev. 60: 1463–1474.

7) Pollit E, Watkins WE, Husaini MA. 1997. Three month nutritional supplementation in Indonesia infants and toddlers, benefit child memory function 8years later. Am. J. Clin. Nutr. 66: 1357-1363.

8) Lisa MS. 1998.The correlation between eating breakfast and school performance. Am .J. Clin Nutr. 65: 7795-9845.

9) World Health Organization, Young people's health. a challenge for society; report of a WHO Study Group on Young People and Health for All by the Year 2000. Geneva: World Health Organization. Technical Report, 1986; Series No. 731, 1-117.

10) Matsuhashi Y. 2000. Thinness: drives and results. J. Adolesc. Health. 27: 149-150.

11. Ryan YM, Gibney MJ, Flynn MA. 1998. The pursuit of thinness: a study of Dublin schoolgirls aged 15 y. Int. J. Obes. Relat. Metab. Disord..22:485-487.

12) Thompson AM, Chad KE. 2003. The relationship of social physique anxiety to risk for developing an eating disorder in young females. J. Adolesc. Health. 31: 183-189.;

13) Jones JM, Bennett S, Olmsted MP, Lawson ML, Rodin G. 2001. Disordered eating attitudes and behaviours in teenaged girls: a school-based study. Can. Med. Assoc. J. 165: 547-552.;

14) Weinshenker. 2002. Adolescence and body image. School Nurse News. 19:12-16.

15) Taras H. 2005. Nutrition and student performance at school. J Sch Health. 75:199-213.

16) Galal O, Hulett J. 2003. The relationship between nutrition and children's educational performance: a focus on the United Arab Emirates. Nutr Bull. 28:11-20.

17) Kretchmer N, Beard JL, Carlson S. 1996. The role of nutrition in the development of normal cognition. Am J Clin Nutr.63(suppl 1):997-1001.

18) Meyers AF, Sampson AE, Weitzman M. 1991. Nutrition and academic performance in school children. Clin Appl Nutr. 1:13-25.

19) Kleinman RE, Hall S, Green H, et al. 2002. Diet, breakfast and academic performance in children. Ann Nutr Metab. 46(suppl 1):24-30.

20) Rampersaud GC, Pereira MA, Girard BL, et al. 2005. Breakfast habits, nutritional status, body weight, and academic performance in children and adolescents. J Am Diet Assoc. 105:743-760.

21) Pollitt P, Matthews R. 1998. Breakfast and cognition: an integrative summary. Am J Clin Nutr.67(suppl 1):804-813.

22) Kim HY, Frongillo EA, Han SS, et al. 2003 Academic performance of Korean children is associated with dietary behaviours and physical status. Asia Pac J Clin Nutr. 12(2):186-192.

23) Wardle J, Steptoe A. 1991. The European Health and Behaviour Survey: Rationale, Methods and Initial Results for the United Kingdom. Soc. Sci. Med. 33:925–936.

24) Al-Kandari F, Vidal VL. 2007. Correlation of the Health-Promoting Lifestyle, Enrollment Level, and Academic Performance of College of Nursing Students in Kuwait. Nurs. Health Sciences. 9:112–119.

25) Hoskins SL, Newstead SE, Dennis I. 1997. Degree Performance as a Function of Age, Gender, Prior Qualifications and Discipline Studied. Assess. Eval. Higher Educ. 22:317–328.

26) Elias MJ, Gara MA, Schuyler TF, Branden-Muller LR, Sayette MA. 1991. The Promotion of Social Competence: Longitudinal Study of a Preventive School-Based Program. Am. J. Orthopsychiatr. 61:409–417.

27) McCord MT, Klein JD, Foy JM, Fothergill K. 1993. School-Based Clinic Use and School Performance. J. Adolesc. Health. 14:91–98.

28) Eggert LL, Thompson EA, Herting JR, Nicholas LJ, Dicker BG. 1994. Preventing Adolescent Drug Abuse and High School Dropout through an Intensive School-Based Social Network Development Program. Am. J. Health Promot. 8:202–215.

29) Keeley TJH, Fox KR. 2009. The Impact of Physical Activity and Fitness on Academic Achievement and Cognitive Performance in Children. Int. Rev. Sport Exerc. Psychol. 2:198–214.

30) Felner RD, Jackson AW, Kasak D, Mulhall P, Brand S, Flowers N. 1997. The Impact of School Reform for the Middle Years. Phi Delta Kappan. 78:528–532.

31) Meyers AF, Sampson AE, Weitzman M, Rogers BL, Kayne H. 1989. School Breakfast Program and School Performance. Am. J. Dis. Child. 143:1234–1239.

32) Gall G, Pagano ME, Desmond MS, Perrin JM, Murphy JM. 2000. Utility of Psychosocial Screening at a School-Based Health Center. J. School Health. 70:292–298.

33) Flay B, Allred CG, Ordway C. 2001. Effects of the Positive Action Program on Achievement and Discipline: Two Matched-Control Comparisons. Prev. Sci. 2:71–89.

34) Ivanovic D, Marambio M. 1989. Nutrition and education. I. Educational achievement and anthropometric parameters of Chilean elementary and high school graduates. Nutr Rep Intl. 39: 983–993.

35) Keeley TJH, Fox KR. 2009. The Impact of Physical Activity and Fitness on Academic Achievement and Cognitive Performance in Children. Int. Rev. Sport Exerc. Psychol. 2:198–214.

36) Kolbe LJ. 2002. Education Reform and the Goals of Modern School Health Programs. Educ. Stand. 3:4–11.

37) Gardner JM, Grantham-McGregor S. 1998. Activity levels and maternalchild behavior in undernutrition: Studies in Jamaica. In: Pan American Health Organization Nutrition, Health and Child Development Scientific Publication. No 566. Washington, DC PAHO, 32–42.

38) Taras H. 2005. Nutrition and student performance at school. J Sch Health. 75:199-213.

39) Galal O, Hulett J. 2003. The relationship between nutrition and children's educational performance: a focus on the United Arab Emirates.Nutr Bull. 28:11-20.

40) Kretchmer N, Beard JL, Carlson S. 1996. The role of nutrition in the development of normal cognition.Am J ClinNutr. 63(suppl 1):997-1001.

41) Gerber M. 2001. The comprehensive approach to diet: a critical review. J Nutr. 131(suppl 11):3051-3055.

42) Kant AK. 1996. Indexes of overall diet quality: a review. J AmDiet Assoc. 96:785-791.

43) Patterson RE, Haines PS, Popkin BM. 1994. Diet quality index: capturing a multidimensional behaviour. J AmDiet Assoc. 94:57-64.

44) Ross CE, Wu C. 1995. The links between education and health. Am Sociol Rev. 60:719-745.

45) Veugelers PJ, Fitzgerald AL. 2005. Dietary intake and risk factors for poor diet quality among children in Nova Scotia. Can J Public Health. 96:212-216.

46) Kant AK. 2000; Consumption of energy-dense, nutrient-poor foods by adult Americans: nutritional and health implications: the third national health and nutrition examination survey, 1988-1994.Am J Clin Nutr. 72:929-936.

47) Turrell G, Hewitt B, Patterson C, et al. 2003. Measuring socio-economic position in dietary research: is choice of socio-economic indicator important? Public Health Nutr. 6:191-200.

48) Baranowski T, Mendlein J, Resnicow K, et al. 2000. Physical activity and nutrition in children and youth: an overview of obesity prevention. Prev Med. 31(suppl 1):1-10.

49) Considine G, Zappala G. 2002. The influence of social and economic disadvantage in the academic performance of school students in Australia.J Sociol. 38:129-148.

50) Grace, T.W., 1997. Health problems of college students.worsened after joining the university. J. Am. College Health, 45: 243-250.

51) Physical status: the use and interpretation of anthropometry. World Health Organ Tech Rep Series, 854, 1995. http://www.who.int/ bmi/index.jsp?introPage=intro_6.html as on 7th June, 2007.

52) Rao G, Yadav R, Dolla C K, Kumar S, Bhondeley M K,Ukey M. 2005. Undernutrition & childhood morbidities among tribal preschool children, Indian J Med Res. 122 -43.

53) Lohman, T G, Roche A F, Martorell R, Anthropometric Standardization Reference Manual, Human Kinetics Books, Chicago, 1998, 75.

54) World Health Organization. Measuring change in nutritional status. Geneva: World Health Organization, 1983, 64.

55) Hartman A. M, Block G. Dietary assessment methods for macronutrients. In: Micozzi MS, Moon TE, Eds. Macronutrients Investigating their Role in Cancer. New York Marcel Dekker, Inc. 1992; 87-124.

56) Block G. 1982. A review of validations of dietary assessment methods. Am J Epidemiol 115:492-505.

57) Gopalan C, B V Ramasastri, S C Balasubramaniam, Nutritive value of Indian Foods, Hyderabad, 2004.