Nutritional Status and Health Risk Assessment: A Study among the Angami Tribal Adults of Kohima, Nagaland

Tepuhoto Khieya[1], J.W. Dkhar[2]

[1]Post Graduate, [2]Assistant Professor, Department of Anthropology, NEHU, Shillong, Meghalaya

Abstract

Background: Recent developmental activities with increasing urbanization has brought about immense changes in the lifestyles of tribal populations in India. But their impact on the health and nutritional status remained poorly explored.

Objectives: This study explored the nutritional and health status of the Angami tribal adults, and the influence of income, alcohol and tobacco use.

Method: Cross-sectional data of 565 individuals from the age of 21–60 years were collected for this study. Nutritional and health status was assessed using BMI, WHR and WHtR.

Results: Underweight was more prevalent in the females (12.7%),whereas, overweight (19.7%) and obese (23.1%) were more prevalent in the males. Risk for cardiovascular disease and metabolic abnormalities based on WHR and WHtR are higher in the females. Chi-square analysis showed significant difference in the nutritional and health status between sex and age groups.

Conclusion: Nutritional status according to BMI showed that males have a better status of nutrition. There is an increasing prevalence of overweight and obesity along with increased risk of for cardiovascular disease and metabolic abnormalities with increasing age. Income, alcohol and tobacco use did not correlate with significantly with nutritional status and health risk in females.

Keywords: *Nutritional status, undernutrition, overweight, obese, cardio-metabolic abnormalities.*

Introduction

There is a consensus that the health status of the tribal populations is very poor owing to their remoteness and alienation from developmental processes.[1]The tribal populations in India form a heterogeneous group and remain at the lowest stratum of the society due to geographical and cultural isolation, low literacy and poverty. As such, their health status also remains unsatisfactory.[2] However, modern developmental activities in the recent past have influenced changes in various aspects of the tribal populations. Nonetheless, the impacts of such changes on the nutritional status and health remains an area of research which is poorly explored. Furthermore, much of the studies carried out in India especially in the North-East region are focused on the growth and nutritional status of children and adolescents, with very limited studies reported among the adult population.[3][4][5][6][7][8] In order to improve the health status of tribal populations, it is imperative to carry out relevant research in these areas to identify the problems and work towards the development of appropriate solutions. However, till date, no studies have been carried out on the adult Angami population of Nagaland. Thus, we carried out this study with the aim to fulfill the following objectives:

i. To assess the nutritional status and the status of health risk based on BMI, WHR and WHtR.

ii. To assess the differences in the distribution of BMI, WHR and WHtR with respect to age groups and their correlation with income, alcohol and tobacco use.

Materials and Method

This research was based on anthropometric data which were collected randomly by cross-sectional

method from among the Angami tribe inhabiting the southern part of Kohima district in Nagaland during June 2017 to May 2018. A total of 565 individuals (320 males and 245 females) from the age of 21 to 60 years were considered for the purpose of this research. All individuals participated voluntarily, and written consent was also obtained.

The anthropometric measurements such as height, weight, hip circumference and waist circumference were obtained using relevant method and guidelines. With minimal clothing and without footwear the measurements were recorded using the Harpenden anthropometer, standard weighing machine and a measuring tape respectively. Height, hip circumference and waist circumference were recorded to the nearest 0.1 cm, and weight was recorded to the nearest 0.1 kg. BMI was derived using the formula 'weight (in kg) ÷ height^2 (in m)', WHR was derived as 'waist circumference ÷ hip circumference', while WHtR was derived as 'waist circumference ÷ height'. Nutritional status was assessed using BMI, and according to the cut-off points of Asia-Pacific guidelines.[9] WHR (≥0.94 cm in males and ≥0.88 cm in females) was used to assess the risk for CVD.[10] WHtR (≥0.50 in both the males and females) was used to assess the risk for metabolic abnormalities.[11]

Socioeconomic data such as household income-per-month and total family members were also obtained. The household income was divided among the total family members to acquire the income-per-head. The frequency of the use of alcohol and tobacco (chewing and smoking) per-week were also recorded.

Data entry and analysis were done using SPSS (Statistical Package for Social Sciences) software (Version 25.0; IBM Corporation). Chi-square analysis was performed to determine the statistical significance between groups (at $p<0.05$). A level $p<0.01$ and $p<0.05$ were considered to determine the statistical significance in the Pearson correlation analysis between the derived variables (BMI, WHR and WHtR) with income, alcohol and tobacco use.

Results

Assessment of the nutritional status and health risk are shown in Table 1 to Table 3. The results show that underweight was more prevalent in the females (12.7%),whereas, overweight (19.7%) and obese (23.1%) were more prevalent in the males. In both the sex, individuals from the age group 21 – 30 years have a better status of nutrition. Health risk assessment according to WHR and WHtR show thatthe prevalence of high risk wasmore in the females, and it also increases with increasing age groups. In the males, high WHR and WHtR risk was most prevalent in the age group 51 – 60 years, whereas in the females, high WHR and WHtR risk were most prevalent in the age group 51 – 60 years and 41 – 50 years respectively. Chi-square analysis shows that nutritional status, WHR and WHtR risks were significantly different betweenthe sex and age groups. However, BMI was not significantly different between the age groupsin the males.

Table 1: Nutritional status and health risk assessment

Parameters	Males (n=320) (n) %	Females (n=245) (n) %	Chi-square
Nutritional Status			
Underweight	(15) 4.7	(31) 12.7	$\chi^2 = 13.27$, df = 3, p = 0.004
Normal	(168) 52.5	(124) 50.6	
Overweight	(63) 19.7	(35) 14.3	
Obese	(74) 23.1	(55) 22.4	
WHR			
Low risk	(222) 69.4	(89) 36.3	$\chi^2 = 61.25$, df = 1, p = 0.000
High risk	(98) 30.6	(156) 63.7	
WHtR			
Low risk	(208) 65	(120) 49	$\chi^2 = 14.62$, df = 1, p = 0.000
High risk	(112) 35	(125) 51	

Table 2: Distribution of nutritional status in different age groups

Age groups	Underweight (n) %	Normal (n) %	Overweight (n) %	Obese (n) %	Chi-square
Males (n=320)					
21 – 30	(9) 5.1	(101) 57.4	(35) 19.9	(31) 17.6	$\chi^2 = 10.98$ df = 9 p = 0.277
31 – 40	(4) 5.1	(35) 44.9	(15) 19.2	(24) 30.8	
41 – 50	-	(19) 51.4	(9) 24.3	(9) 24.3	
51 – 60	(2) 6.9	(13) 44.8	(4) 13.8	(10) 34.5	
Females (n=245)					
21 – 30	(26) 21.7	(77) 64.2	(8) 6.7	(9) 7.5	$\chi^2 = 65.64$ df = 9 p = 0.000
31 – 40	(3) 4.8	(29) 46.8	(12) 19.4	(18) 29	
41 – 50	(2) 4.1	(12) 24.5	(11) 22.4	(24) 49	
51 – 60	-	(6) 42.9	(4) 28.6	(4) 28.6	

Table 3: Distribution of WHR and WHtR risk in different age groups

Age groups	WHR		WHtR	
	Low risk (n) %	High risk (n) %	Low risk (n) %	High risk (n) %
Males (n=320)				
21 – 30	(154) 87.5	(22) 12.5	(136) 77.3	(40) 22.7
31 – 40	(39) 50	(39) 50	(43) 55.1	(35) 44.9
41 – 50	(19) 51.4	(18) 48.6	(18) 48.6	(19) 51.4
51 – 60	(10) 34.5	(19) 65.5	(11) 37.9	(18) 62.1
Chi-square	$\chi^2 = 63.27$, df = 3, p = 0.000		$\chi^2 = 28.68$, df = 3, p = 0.000	
Females (n=245)				
21 – 30	(64) 53.3	(56) 46.7	(81) 67.5	(39) 32.5
31 – 40	(14) 22.6	(48) 77.4	(26) 41.9	(36) 58.1
41 – 50	(10) 20.4	(39) 79.6	(10) 20.4	(39) 79.6
51 – 60	(1) 7.1	(13) 92.9	(3) 21.4	(11) 78.6
Chi-square	$\chi^2 = 30.59$, df = 3, p = 0.005		$\chi^2 = 37.96$, df = 3, p = 0.000	

Correlation analysis of BMI, WHR and WHtR with income, alcohol and tobacco use are presented in Table 4. In the males BMI was positively correlated with income and inversely correlated with tobacco use. WHR was positively correlated with alcohol, and these results were statistically significant. WHtR did not show any significant correlation with income, alcohol and tobacco use. In the females, no statistical significance was observed in any of the correlation.

Table 4: Correlation of BMI, WHR and WHtR with income, alcohol and tobacco use

Variables	Males (n=320)		Females (n=245)	
	r	p	r	p
Income				
BMI	0.2**	0.000	-0.011	0.868
WHR	-0.059	0.292	-0.065	0.314
WHtR	0.075	0.181	-0.041	0.527

Variables	Males (n=320)		Females (n=245)	
	r	p	r	p
Alcohol use				
BMI	0.009	0.869	0.012	0.847
WHR	0.139*	0.013	0.025	0.703
WHtR	0.096	0.088	-0.003	0.969
Tobacco use				
BMI	-0.117*	0.036	0.015	0.815
WHR	0.064	0.252	0.123	0.055
WHtR	-0.05	0.373	0.037	0.564

**p<0.001, *p<0.05

Discussion

Our study has demonstrated that the males have a better nutritional status than the females,which is similar to the findings reported among the Meiteis of Assam.[7] But, the higher prevalence of overweight and obesity in the Angami population is in contrast to the findings of other tribal populations.[4],[8],[7] The increasing prevalence of overweight and obesity with increasing age groups may well suggest that with ageing the physical activity level and metabolic rate reduces but the caloric intake is not much affected which results in fat deposition and is mainly the reason for increase in body weight and fatness.[12] Perhaps, the higher prevalence of overweight and obesity among the Angami adults could be due to a number of complex but positive socioeconomic factors and increasing sedentary lifestyles affecting the population.

In our study, increase in the prevalence of overweight and obesity corresponds to the increase in the prevalence of high WHR and WHtR risk from the age group 41 – 50 years and 51 – 60 years. There is a clear significant sex difference, and in which the females have a higher prevalence for high risk across all age groups. Our study gives a similar result to that of Dobbelsteynet al. in terms of the increasing prevalence of high risk with increasing age, and to that of De Koning et al. in terms of the higher prevalence of risk in the females.[13],[14] Li et al. reported that the risk of CVD in the females increased with increasing WHR irrespective of BMI category, and in the males it was associated with increased incidence of CVD in those with normal weight.[15] This could be because females have increased waist circumference with increasing age which could suggest the increased abdominal adiposity, resulting in an increase in high risk for CVD.[16] Groups with healthy BMI and WHtR equal or greater than 0.5 are also found to have some significantly higher cardio-metabolic risk compared to the groups with healthy BMI but WHtR below 0.5.[17] Even among children, individuals with healthy BMI exhibited raised cardio-metabolic risk factors if their WHtR was above 0.5.[18] Some studies have shown that, even after adjustment was made for age and BMI, WHR and WHtR still have a strong association with CVD and metabolic abnormalities independently, indicating their independence in predicting risks.[17],[19],[20]

Education, income and occupation are the three generally accepted parameter which are used terms to define the socioeconomic status of a population. Higher BMI among the high income groups has been reported by Pelin et al., however, their results indicated that parental education was significantly stronger than the effects of income.[21] Similar studies points to education showing stronger association with BMI and health risk factors.[7],[22] These findings on education may well point to its interaction with income, because higher income means access to higher and/or better education. In this regard, our study also shows a positive interaction of income with BMI and WHtR in the males, though it was significant only for BMI. In the females there was an inverse relationship but no significance in any of the correlation. In regard to alcohol consumption, our study gives a similar inverse relationship similar to that of Kleiner et al. particularly for the females, though it was not significant.[23] The frequency of alcohol consumption is known to have a very small positive and marginally statistically significant effect on BMI in the males, and with no effect on the females.[24] Studies have often showed inconsistencies in the relationship between

alcohol usage and health risk, and although many factors can explain the conflicting findings, nevertheless, it is reasonable to say that alcohol intake may be a risk factor for obesity.[25] In terms of tobacco use, our study is consistent with findings of Li et al. who reported an inverse relationship between BMI and tobacco in the males.[15] All forms of tobacco use are found to be independent risk factor for low BMI and independent of age or education.[26] However, because smoking is a major CVD risk factor that is more prevalent in subjects with normal weight, this tends to reduce the relationships between obesity and CVD.[15]

Conclusion

The results of our study indicated a significant sex and age differences in the nutritional status and health risks. Higher prevalence of overweight and obesity is observed among the males, while higher prevalence of underweight and high risk for cardio-metabolic abnormalities is observed among the females. There is an increasing prevalence of overweight and obesity, and high risk for cardio-metabolic disease with increase in age. While the magnitude of the correlation differed between the sexes, with the females showing no significance in any of the correlation, chi-square analysis has shown that age was significantly associated with BMI, WHR and WHtR. The changing lifestyles and decreasing level of physical activity may be a risk factor to increasing incidence of non-communicable diseases such as obesity and other cardio-metabolic diseases in the Angami population. However, the influence of physical study is a topic of further research.

Acknowledgement: The authors thank all the individuals who have participated willingly and have contributed to this study.

Funding: None

Conflict of Interest: None

References

1. Chhotray GP. Health status of primitive tribes of Orissa. ICMR Bulletin. 2003;33(10):1-6.
2. Bala SM, Thiruselvakumar D. Overcoming problems in the practice of public health among tribals of India. Indian J Commun Med. 2009;34(4):283-287.
3. Khongsdier R, Basu D. Nutritional status of the Dimasa of North Cachar, Assam. Bhattacharya KK, Choudhury SSD, Tyagi D, editors. Nutritional status of Indian population: North East India. Kolkata: Anthropological Survey of India; 2004.p.45-58.
4. Bose K, Chakraborty F. Anthropometric characteristics and nutritional status based on body mass index of adult Bathudis: A tribal population of Keonjhar District, Orissa, India. Asia Pac J Clin Nutr. 2005;14(1):80-82.
5. Tungdim MG, Kapoor AK. Nutritional Status and Chronic Disease among the Adult Tribal Population of Northeast India. The Open Anthropol J. 2010;3:188-191.
6. Mungreiphy NK, Kapoor S, Sinha R. Association between BMI, blood pressure, and age: study among Tangkhul Naga tribal males of Northeast India. JAnthropol. 2011;1-6.
7. Barbhuiya AFGI, Das R. Gender differences in nutritional status among the adult Meiteis of Cachar district of Assam, India. Euras J Anthropol. 2014;4(2):36-44.
8. Sarmah C, Barbhuiya AFGI. Nutritional status of the adult Dimasa Kacharis of Cachar District, Assam. Baruah T, editor. People of contemporary North-East India. Guwahati: Pratisruti Publication; 2011.p.59-67.
9. World Health Organization. The Asia-Pacific perspective: Redefining obesity and its treatment. Sydney: Health Communications Australia; 2000.
10. Ledoux M, Lambert J, Reeder BA, Despres JP. Correlation between cardiovascular disease risk factors and simple anthropometric measures. Canadian Heart Health Surveys Research Group. Can Med Assoc J. 1997;157(1):S46-53.
11. Ashwell M, Hsieh SD. Six reasons why the waist-to-height ratio is a rapid and effective global indicator for health risks of obesity and how its use could simplify the international public health message on obesity. Int J Food Sci Nutr. 2005;56(5):303-307.
12. Mungreiphy NK, Sinha R, Kapoor S. Body composition, physiological functions and menopause among Rajput women of Uttaranchal. Indian Anthropologist. 2007;37(2):81-91.
13. Dobbelsteyn CJ, Joffres MR, MacLean DR, Flowerdew G. A comparative evaluation of waist circumference, waist-to-hip ratio and body mass index as indicators of cardiovascular risk factors. The Canadian Heart Health Surveys. Int J Obes Relat Metab Disord. 2001;25(5):652-661.

14. De Koning L, Merchant AT, Pogue J, Anand SS. Waist circumference and waist-to-hip ratio as predictors of cardiovascular events: meta-regression analysis of prospective studies. Eur Heart J. 2007;28(7):850-856.
15. Li C, Engström G, Hedblad B, Calling S, Berglund G, Janzon L. Sex differences in the relationships between BMI, WHR and incidence of cardiovascular disease: A population-based cohort study. Int J Obes (Lond).2006;30(12):1775-81.
16. Haffner SM, Katz MS, Dunn JF. Increased upper body and overall adiposity is associated with decreased sex hormone binding globulin in postmenopausal women. Int J Obes Relat Metab Disor. 1991;15(7):471-478.
17. Ashwell M, Gibson S. Waist-to-height ratio as an indicator of 'early health risk': simpler and more predictive than using a 'matrix' based on BMI and waist circumference. BMJ Open. 2016;6(3):e010159.
18. Khoury M, Manlhiot C, McCrindle BW. Role of the waist/height ratio in the cardiometabolic risk assessment of children classified by body mass index. J Am Coll Cardiol. 2013;62(8):742-751.
19. Hsieh SD, Yoshinaga H, Muto T. Waist-to-height ratio, a simple and practical index for assessing central fat distribution and metabolic risk in Japanese men and women. Int J Obes Relat Metab Disord. 2003;27(5):610-616.
20. Huxley R, Mendis S, Zheleznyakov E, Reddy S, Chan J. Body mass index, waist circumference and waist: hip ratio as predictors of cardiovascular risk – A review of the literature. Eur J Clin Nutr. 2010;64(1):16-22.
21. Pelin C, Ozener B, Kurkuoglu A, Zagyapan R. Effect of living conditions on somatotype components of young individuals belonging to different socioeconomic strata: a preliminary study. Euras J Anthropol. 2010;1(1):26-32.
22. Winkleby MA, Jatulis DE, Frank E, Fortmann SP. Socioeconomic status and health: How education, income, and occupation contribute to risk factors for cardiovascular disease. Am J Public Health. 1992;82(6):816-820.
23. Kleiner KD, Gold MS, Frostpineda K, Lenzbrunsman B, Perri MG, Jacobs WS. Body mass index and alcohol use. J Addict Dis. 2004; 23(3):105-118.
24. French MT, Norton EC, Fang HAI, Maclean JC. Alcohol consumption and body weight. Health Econ. 2010;19(7):814-832.
25. Traversy G, Chaput JP. Alcohol consumption and obesity: an update. CurrObes Rep 2015;4(1):122-130.
26. Pednekar MS, Gupta PC, Shukla HC, Hebert JR. Association between tobacco use and body mass index in urban Indian population: Implications for public health in India. BMC Public Health. 2006;6(1):70.