

Prevalence of Overweight and Obesity Among the Rural Populations of Andhra Pradesh

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INTRODUCTION

Overweight refers to increased body weight in relation to weight, when compared to the same standard of acceptable or desirable weight. Obesity is defined as an excessively high amount of fat or adipose tissue in relation to lean body mass (Stunkard and Wadden, 1993). Obesity is increasing at an alarming rate throughout the world. Today, it is estimated that there are more than 250 million obese people world-wide, equivalent to 7% of the adult population (WHO, 1998). The prevalence of obesity is increasing in most of the populations of world, affecting men, women and children. Furthermore, obesity is no longer just a concern for developed countries, but it is becoming a serious problem in many developing countries. A number of factors have been linked to obesity, including age, gender and socio-economic status. In developed countries levels of obesity are higher in the lower socio-economic groups, but in developing countries this relationship is reversed (Sobol and Stunkard, 1989; Randrianjohany et al., 1993). However, it may be noted that this phenomenon is more profound among the urban populations in comparison to the rural ones (Venkatramana and Chengal Reddy, 2002a). The increased levels of obesity is associated with the transition from rural to urban lifestyle. The urban lifestyle has been linked with dramatic changes leading to increased consumption of high energy dense foods and decrease in physical activity. Though, under nutrition continuous to be a problem in most of the tribal and rural communities (Venkatramana and Chengal Reddy, 2002; Nirmala Reddy, 1998), the prevalence of overweight and obesity have been showing an increasing trend for the last few years among the Indian populations (Gopalan, 1988). The division of non-communicable diseases (NCD) at WHO (1997) has warned that the overweight and obesity pose a major public health issue which demands urgent attention. Further, obesity has got positive association with many CHD risk factors like cholesterol, HDL cholesterol and blood pressure (Venkatramana and Chengal Reddy, 2002a). Because of the significance of overweight and obesity, documenting the

patterns and trends of overweight and obesity in different populations of the world is essential. Hence, we have undertaken the anthropometric status of adults among the three populations, *Kammas*, *Kaikalas* and *Malas* of Andhra Pradesh. The anthropometric status includes height, weight, waist circumference, hip circumference, body mass index (BMI) and waist-to-hip ratio (WHR). The BMI is an indicator of overall obesity and WHR refers to abdominal obesity.

MATERIAL AND METHODS

Study Area and Populations: Three different populations, Kammas, Kaikalas and Malas were chosen for the present study. The sample for the three populations were drawn from Chittoor district (12.37-14.08N and 78.03-79.50E) of Andhra Pradesh. A total of 784 subjects (390 males and 394 females) aged 20 and above were included. The distribution of the sample is presented in table 1. According to Hindu caste system the two populations namely the Kammas and the Kaikalas come under Sudra varna whereas the Malas belong to the Panchama Varna. Among several castes among the Sudra varna, Kammas occupy the higher stratum along with the Reddy community. The Kaikalas belong to a category somewhere in the middle of the hierarchy in the Sudra varna. The Malas form one of the dominant groups in the Panchama varna. As far as the social and economic status is concerned, the Kammas are socially and economically sound whereas the Kaikalas are poor both socially and economically. The Malas also belong to low socio economic group.

Table 1: Classification of adults according to BMI

Sex	Kamma	Kaikala	Mala	Total
Male	150	101	139	390
Female	146	101	147	394
Total	296	202	286	784

Anthropometry: Height, weight, waist circumference and hip circumference were recorded according to Lohman et al. (1988). Height was measured with anthropometric rod to the nearest 0.1cm while the weight was recorded nearest to

Table 2: Classification of adults according to BMI

Classification	BMI (kg/m ²)
Underweight (CED)	< 18.5
Normal range	18.5-24.9
Overweight	
Pre-obese	25.0-29.9
Obese class I	30.0-34.9
Obese class II	35.0-39.9
Obese class III	≥ 40.0

CED=chronic energy deficiency

the 0.1 kg using portable weighing machine with light clothes and no shoes. A standard non-elastic tape was used to measure the waist and hip circumferences and measured nearest to the 0.1cm. Waist circumference was taken at the minimum circumference between umbilicus and xiphisternum while the hip circumference was measured at the maximum width of the greater trochanter. Body mass index (BMI) was calculated as body weight in kilograms divided by height in metres, squared. Waist-hip-ratio, was calculated as waist circumference divided by hip circumference. The classification of overweight and obesity in adults according to BMI is shown in table 2 (WHO, 1998).

The waist-hip-ratio (WHR), a measure of abdominal obesity is a good indicator of abdominal fat accumulation which, in turn, has been shown to reflect changes in risk factors for CHD and other forms of chronic diseases (Taylor et al., 1998). The cut-off point of the waist-hip-ratio for men was greater than 1.0 and for women it was greater than 0.85 (WHO, 1998).

RESULTS

The descriptive statistics for age and different anthropometric variables is presented in table 3. The table shows that the mean of all the variables is greater among the Kammas in both the genders. The hip circumference of the Kaikalas in both the genders, WHR in the Malas show greater mean values.

The prevalence of underweight (CED), overweight and obesity among the three populations is presented in table 4. The prevalence of chronic energy deficiency (<18.5kg/m²) is higher in the Malas (males, 29%; females, 35%) and Kaikalas (males, 26%; females, 34%) while it is low among the Kammas (males, 24%; females, 29%). Totally 50% of the sample in both the genders among the three populations have normal weight. Further the percentage prevalence of overweight (males vs females) among the three populations: Kammas (17 vs 12) Kaikalas (14 vs 9) and Malas (9 vs 8). The percentage prevalence of obesity (≥30.0kg/m²) is very low among all the three populations. It is 2% and 6%, respectively among males and females in the Kammas; no male subject was found obese in the Kaikalas whereas only one subject categorized under obesity. In the Malas, one subject each in both the gender are found under obese category.

The prevalence of abdominal obesity (WHR) is negligible among all the three populations (Table 5). Interestingly, the prevalence of abdominal obesity is comparatively higher in the Malas with 2% and 18% in the males and females, respectively. Only 3% of females are categorized

Table 3: Descriptive statistics for age and anthropometric variables

Variable	Kamma		Kaikala		Mala	
	Male	Female	Male	Female	Male	Female
Age	39.1 ± 13.1	38.3 ± 12.4	41.9 ± 12.0	34.1 ± 10.6	38.9 ± 12.8	40.6 ± 14.3
Height	169.2 ± 6.9	155.1 ± 6.1	160.4 ± 5.7	150.4 ± 5.2	164.2 ± 5.9	150.6 ± 5.9
Weight	62.6 ± 11.8	53.4 ± 10.3	54.2 ± 9.3	46.3 ± 8.9	55.8 ± 9.6	45.3 ± 8.1
Waist circumference	82.2 ± 7.8	72.6 ± 7.3	80.2 ± 8.8	72.2 ± 8.3	77.9 ± 7.4	72.9 ± 9.3
Hip circumference	92.8 ± 8.1	93.8 ± 7.1	94.1 ± 7.3	92.8 ± 8.9	88.2 ± 7.6	89.4 ± 9.3
Body mass index	22.6 ± 3.8	22.4 ± 4.4	21.0 ± 3.3	20.4 ± 3.6	20.7 ± 3.4	19.9 ± 3.3
Waist-hip ratio	0.87 ± 0.1	0.77 ± 0.03	0.85 ± 0.04	0.78 ± 0.04	0.88 ± 0.06	0.82 ± 0.04

Table 4: Prevalence of underweight, overweight and obesity among the three populations according to BMI

	Kamma				Kaikala				Mala			
	Male		Female		Male		Female		Male		Female	
	n	%	n	%	n	%	n	%	n	%	n	%
Under weight <18.5	36	24.3	43	29.5	26	25.7	34	33.7	40	28.8	51	34.7
Normal weight 18.5-24.9	86	57.0	76	52.1	61	60.4	57	56.4	85	61.2	84	57.1
Over weight 25.0-29.9	25	16.8	18	12.3	14	13.7	9	8.9	13	9.4	11	7.5
Obese ≥30	3	1.8	9	6.2	-	-	1	0.9	1	0.7	1	0.6

Table 5: Prevalence of abdominal obesity among the three populations according to WHR

	<i>Kamma</i>				<i>Kaikala</i>				<i>Mala</i>			
	<i>Male</i>		<i>Female</i>		<i>Male</i>		<i>Female</i>		<i>Male</i>		<i>Female</i>	
	<i>n</i>	(%)	<i>n</i>	(%)	<i>n</i>	(%)	<i>n</i>	(%)	<i>n</i>	(%)	<i>n</i>	(%)
Normal	150	(100)	139	(95.2)	101	(100)	98	(97.03)	136	(97.84)	120	(81.63)
Obese	0	(0.00)	7	(4.8)	0	(0.00)	3	(2.97)	3	(2.16)	27	(18.37)

Note: For males 1.0 and for females 0.85 is normal

under obese and no individual was found with obesity in the Kaikalas. The prevalence is 5% in the males and no individual was found under obese category in the females of Kammass.

Table 6: Partial correlation coefficients between LBMI and WHR by sex among the three populations controlling for age

<i>Sex</i>	<i>Kamma</i>		<i>Kaikala</i>		<i>Mala</i>	
	<i>n</i>	<i>r</i>	<i>n</i>	<i>r</i>	<i>n</i>	<i>r</i>
Male	150	0.402**	101	0.568**	139	0.232**
Female	146	0.321**	101	0.230*	147	0.286**

Two-tailed significance * $p < 0.05$; ** $p < 0.01$

Body mass index (BMI) correlates significantly and positively with WHR among all the three populations (Table 6). Overall, the correlation coefficient in the males of Kammass, Kaikalas and Malas, respectively is 0.402, 0.568 and 0.232, whereas the correlation coefficient in females is 0.321, 0.230 and 0.286.

The mean value of WHR increases with the increase of BMI grades among all the three populations in both the genders (Table 7). It is a clear indication that the waist-hip-ratio is showing

an increasing trend among these populations.

DISCUSSION

Earlier, the WHO and other health related National /International organizations have focused on tackling the issues like infection and under nutrition. However, in recent years there has been a shift towards the management of chronic non-communicable diseases such as cardiovascular disease (CVD), cancer and diabetes mellitus. According to WHO estimates, 40% of deaths in developing countries and 75 % in the developed world are due to NCDs (WHO,1998). Of the several risk factors for the CHD, obesity particularly the abdominal obesity has been playing a major role (Paffenberger et al., 1993; Gopalan, 1988). The results of the present study conducted on the rural populations of Andhra Pradesh is showing an increasing trend of overall obesity among the three populations, viz., the Kammass, the Kaikalas and the Malas compared to the results of the earlier studies conducted on the populations of Andhra Pradesh (Nirmala Reddy, 1998). It is very interesting to note that the prevalence of abdominal obesity (WHR) is very low among all the three

Table 7: Mean and standard deviation values of BMI and WHR among the three populations by grades of BMI.

<i>BMI Grade</i>	<i>Kamma</i>					
	<i>Male</i>			<i>Female</i>		
	<i>n</i>	<i>BMI</i>	<i>WHR</i>	<i>n</i>	<i>BMI</i>	<i>WHR</i>
<18.5	36	17.2 $\pm$ 0.9	0.83 $\pm$ 0.02	43	16.8 $\pm$ 1.0	0.74 $\pm$ 0.02
18.5-24.9	86	22.5 $\pm$ 1.8	0.86 $\pm$ 0.02	76	21.5 $\pm$ 1.9	0.78 $\pm$ 0.02
25.0-29.9	25	28.1 $\pm$ 1.5	0.91 $\pm$ 0.02	18	26.6 $\pm$ 0.7	0.78 $\pm$ 0.02
30.0 $\geq$	3	30.5 $\pm$ 0.6	0.90 $\pm$ 0.02	9	32.4 $\pm$ 2.7	0.80 $\pm$ 0.02
	<i>Kaikala</i>					
	<i>Male</i>			<i>Female</i>		
	<i>n</i>	<i>BMI</i>	<i>WHR</i>	<i>n</i>	<i>BMI</i>	<i>WHR</i>
<18.5	26	16.8 $\pm$ 1.3	0.81 $\pm$ 0.02	34	17.1 $\pm$ 1.1	0.76 $\pm$ 0.02
18.5-24.9	61	21.6 $\pm$ 1.7	0.86 $\pm$ 0.02	57	21.1 $\pm$ 1.7	0.78 $\pm$ 0.02
25.0-29.9	14	26.4 $\pm$ 1.2	0.88 $\pm$ 0.02	9	27.6 $\pm$ 1.3	0.79 $\pm$ 0.02
30.0 $\geq$	0	0	0	1	32.5 $\pm$ 0.0	0.81 $\pm$ 0.00
	<i>Mala</i>					
	<i>Male</i>			<i>Female</i>		
	<i>n</i>	<i>BMI</i>	<i>WHR</i>	<i>n</i>	<i>BMI</i>	<i>WHR</i>
<18.5	40	16.8 $\pm$ 1.2	0.86 $\pm$ 0.02	51	16.6 $\pm$ 1.5	0.79 $\pm$ 0.02
18.5-24.9	85	21.4 $\pm$ 1.6	0.88 $\pm$ 0.02	84	21.1 $\pm$ 1.7	0.82 $\pm$ 0.02
25.0-29.9	13	26.7 $\pm$ 1.3	0.90 $\pm$ 0.02	11	26.6 $\pm$ 0.8	0.82 $\pm$ 0.02
30.0 $\geq$	1	34.2 $\pm$ 0.0	0.97 $\pm$ 0.00	1	30.3 $\pm$ 0.0	0.77 $\pm$ 0.00

populations. But the mean of WHR increases with the increase of BMI. It is very clear from the table 4 that the prevalence of overall obesity has been showing an increasing trend compared to the earlier studies (Nirmala Reddy, 1998).

Despite the increasing prevalence of overweight and obesity among the Indian populations (Gopalan, 1988) the underweight continues to be a problem in most of the rural populations. The populations of the present study are no exception to this chronic energy deficiency. The research results show that the underweight is a major problem in the low socio-economic populations (Mala and Kaikala) compared to the high socio-economic populations (Kamma). The results of the present study supports the inference of Naidu and Rao (1994) and Nirmala Reddy (1998) that in the Indian rural populations CED is of primary significance rather than obesity or overweight unlike the western populations. However, further studies are needed to understand the prevalence of overweight and obesity among different Indian populations with contrasting socio-economic and ethnic backgrounds.

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ABSTRACT To understand the prevalence of overweight and obesity, a population based survey has been carried out among three populations. Among these Kammas (n=296) belong to high socio-economic group whereas the Kaikalas (n=202) and the Malas (n=286) are socio-economically poor. The body mass index (BMI) and waist hip ratio (WHR) were measured. BMI refers to overall obesity whereas WHR refers to abdominal obesity. The prevalence of overweight/obesity is higher in the Kammas (18%) compared to the low socio-economic populations viz., the Kaikala (12%) and the Mala (9%). The results of the present study indicate the increasing trend of overweight compared to the earlier studies conducted on the populations of Andhra Pradesh. The prevalence of WHR is low among all the three populations. Interestingly, with the increase of mean of BMI, the mean of WHR also increases. This shows that the WHR is showing an increasing trend. However more studies on the prevalence of overweight and obesity are recommended among the different Indian populations with contrasting socio-economic and ethnic backgrounds.

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