

Correlates of Overweight among Adult Women in Kerala: A Study Based on National Family Health Survey (NFHS-3)

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ABSTRACT The aim of this paper is to study the extent of overweight and obesity among adult women in Kerala and to examine the association between overweight and background characteristics. The analysis is based on 3370 ever married women of age group (15-49) in Kerala, whose Body Mass Index (BMI) is available in NFHS-3 data. BMI was used to define overweight ($24.9 < \text{BMI} < 30.0 \text{ Kg/m}^2$) and obese ($\text{BMI} > 30.0 \text{ Kg/m}^2$). Covariates included in the study are working status, occupation, wealth index, diet variables, behavioral variables and disease prevalence. Logistic regression method was used to estimate the effects of these variables on overweight. Findings shows that wealth index, occupation, consumption of milk or curd, fruits, fish, chicken or meat and alcohol are significantly related with BMI. Diseases, namely, Diabetes, Asthma, Goitre or Thyroid also have a significant relation with BMI. Among behavioral characteristics, frequency of reading newspaper and frequency of watching television were found to have a significant association with BMI. Study evidenced that consumption of heavy food may lead to an increase in the number of overweighted persons in Kerala and so there is an urgent need to implement programs to ensure food security for the poor and to understand the components of a healthy life style.

INTRODUCTION

Nutrition research in India has focused primarily on the problem of under-nutrition, particularly among vulnerable women and children. There is convincing evidence that total energy intake is related to body weight. Most of the studies proved that people with normal weight had healthier nutrition habits than obese or overweight persons. The World Health Organization has declared that obesity is the biggest unrecognized public health problem with very substantial impacts on both morbidity and mortality of populations throughout the world (WHO 1998). The risk of death from all lifestyle diseases increases throughout the range of moderate and severe overweight for both men and women in all age groups (Calle 1999).

The nutritional transition and the lifestyle changes are also becoming relevant among the adult women. It has been proved that obesity and overweight was less prevalent among daily smokers and physically active persons (Villus Gra Bauskas et al. 2003). Changing standard of living, popularity of fast foods, fizzy drinks, sedentary life styles, increased pocket money, lack of sports, increased TV and computer watching have led to a change in the way

of life, the effects of which have to be studied. There is some evidence of an emerging nutritional transition in India. NFHS-2 data for India show that more than one-third of the women aged 15-49 years have a BMI (Body Mass Index) $< 18.5 \text{ kg/m}^2$, whereas nearly a quarter of urban women, who account for 27% of the sample population, are overweight or obese.

Though India is a country still combating communicable diseases, Kerala, on the other hand, has an admirable health status comparable to the west and is now going through an epidemiological transition where non-communicable diseases are more prevalent. Kerala has a unique position in the demographic transition as well as health transition in the country. In the area of overweight and obesity also, we can see a peculiarity in the Kerala situation within the Indian context. Based on National Family Health Survey, 1998-99 (NFHS-2) data, the prevalence of overweight was high in Kerala (17.0). Keeping in view of these facts, the present paper attempts to find (1) The extent of overweight and obesity with respect to some economic, diet, health and behavioral characteristics among Kerala women and, (2) The factors which contribute to overweight among Kerala women.

DATA AND METHOD

Using NFHS-3 data, this paper examines economic, diet, behavioral and health determinants of overweight among women in the adult age group (15-49) in Kerala State. Logistic regression was used to identify the determinants of overweight. This method helped to evaluate the effects of the selected group of predictor variables on the probability of being overweight. This analysis was used because it provides an interpretable linear model for a categorical dependant variable. Here, the logistic regression analysis was applied because the dependant variable-overweight- is dichotomous, where BMI is less than 25.0 equal 0 or 1 otherwise. The theoretically low risk group for each variable was treated as a reference category.

Primary outcome variables in the analysis were created from BMI measurements collected in the survey. The sample women were categorized based on the BMI variable into four groups using the WHO (1995) recommendations for preliminary analysis. The four groups that identify the sample women are obese, BMI > 30 kg/m², overweight, BMI 25.0 to 29.9 kg/m², normal weight, BMI 18.5 to 24.9 kg/m², and underweight, BMI < 18.5 kg/m².

Definition of Variables

Obesity is an excess of body fat frequently resulting in a significant impairment of health. The expert committee on the treatment and prevention of obesity and the International Task Force on obesity suggest "BMI is an accurate and easily available method to screen for obesity". The proposed reference stand for obesity is

$$\text{BMI} = \frac{\text{Weight in kilogram}}{\text{Height in metre square}}$$

Classification of BMI

Level of BMI	Level of nutrition
<18.5	Underweight
18.5-24.9	Normal
25.0-29.9	Overweight
30+	Obesity

RESULTS

Data of 3370 women in the age group 15-49 whose BMI is available in NFHS-3 were taken

for analysis. Among them 27.8% were overweight.

Economic Characteristics and Overweight

Economic factors taken here for analyzing nutritional status are current working status, occupation of women and wealth index. Percentage of women observed in each of the BMI groups by selected economic characteristics is presented in Table 1. Based on current working status, an expected result is obtained that non-working women have a higher chance of getting overweight and obese than working women. On the other hand, women who are currently working have a high chance of being under weight.

Agricultural laborers seem to be less overweight and obese than the other groups. Women working in professional, managerial and technical field have more chances to be overweight and obese than the other groups. Respondents belonging to the richest level based on wealth index were found to be more overweight and obese than the remaining group. Moreover, the level of overweight and obesity was found to increase with the increase in the level of wealth index. Among the poorest women, 55% are under weight.

Diet Variables and Overweight

Proportion of women in different BMI category with respect to diet characteristics are given in Table 2. Overweight is very common among daily consumers of milk or curd, pulses or beans, dark green vegetables, fruits, fish and chicken or meat and weekly users of eggs. Obesity also prevails mostly among the non-consumers of fruits, eggs milk or curd, pulses or beans, dark green vegetables and daily users of fish and chicken or meat. On the other hand, underweight is a common character of non-users of milk or curd, pulses or beans, dark green vegetables, and chicken or meat, and occasional users of fruits and fish. It is interesting to note that underweight is seen among daily users of eggs also.

Behavioral Characteristics and Overweight

Overweight and obesity among women with respect to their behavioral characteristics is pre

Table 1: Percentage of women in different BMI levels classified on the basis of economic characteristics, 2005-06, Kerala

Women's characteristics	Under-weight	Nor-mal	Over-weight	Obe-sity	N
<i>Economic variables</i>					
<i>Current Work Status</i>					
Working	20.2	54.8	22.1	2.9	961
Not working	17.1	53.6	23.5	5.8	2404
<i>Occupation of Respondent</i>					
Professional, technical, managerial	13.9	55.0	27.8	3.3	209
Clerical	18.9	56.7	24.4	0.0	90
Sales	30.4	38.2	28.4	2.9	102
Agriculture	21.2	60.9	15.4	2.6	156
Services	16.1	54.2	24.6	5.1	118
Skilled, manual	21.8	56.4	18.7	3.1	353
<i>Wealth Index</i>					
Poorest	55.6	40.7	3.7	0.0	27
Poorer	27.1	58.6	12.8	1.5	133
Middle	27.1	56.3	14.0	2.6	387
Richer	21.2	54.9	20.4	3.5	1276
Richest	11.6	52.9	28.9	7.2	1546

sented in Table 3. Users of any form of tobacco seem to have less probability of getting overweight and obese than the non-users. About 45% of women who are users of alcohol are also overweight. Overweight and obesity is most common among the daily readers of newspaper and those who watch television every day. On the other hand, women who daily listen to radio seem to have less chances of getting overweight than the others.

Disease Prevalence and Overweight

The percentage distribution of underweight, normal, overweight, and obese women classified on the basis of certain disease prevalence showed that overweight is very common among diabetic women. About 47% of diabetic women are overweight and 12.2% of them are obese. Asthma patients are also more likely to be overweight and obese than the others. Women who had goiter or thyroid complaints also seem to be overweight and obese (Table 4).

Regression Analysis of Selected Variables with Overweight

Chi-square test shows that wealth index, occupation, consumption of milk or curd, fruits,

Table 2: Percentage of women in different BMI level classified on the basis of diet variables, 2005-06, Kerala

Women's characteristics	Under-weight	Nor-mal	Over-weight	Obe-sity	N
<i>Diet variables</i>					
<i>Consumed Milk or Curd</i>					
Never	19.4	51.0	24.1	5.5	382
Daily	16.9	52.1	25.9	5.2	1442
Weekly	18.0	57.4	20.8	3.8	601
Occasionally	19.0	55.7	20.1	5.2	945
<i>Consumed Pulses or Beans</i>					
Never	20.8	52.8	20.8	5.7	53
Daily	15.8	52.8	26.3	5.2	792
Weekly	16.9	54.5	23.3	5.3	1664
Occasionally	21.8	53.9	20.2	4.1	861
<i>Consumed Dark Green Vegetables</i>					
Never	29.5	47.7	15.9	6.8	88
Daily	10.3	52.5	23.9	5.3	394
Weekly	16.5	54.2	23.9	5.4	1524
Occasionally	18.7	54.4	22.5	4.3	1363
<i>Consumed Fruits</i>					
Never	9.3	63.0	22.2	5.6	54
Daily	15.8	50.6	28.4	5.2	708
Weekly	18.1	53.6	23.6	4.7	1478
Occasionally	19.6	56.0	19.3	5.1	1128
<i>Consumed Eggs</i>					
Never	15.7	54.4	22.7	7.2	498
Daily	20.4	56.1	21.8	1.7	358
Weekly	16.9	53.6	24.4	5.1	1101
Occasionally	18.9	53.5	22.6	5.0	1411
<i>Consumed Fish</i>					
Never	21.6	56.8	19.1	2.5	162
Daily	17.1	52.0	25.0	5.8	2206
Weekly	16.8	58.7	20.6	3.8	683
Occasionally	24.1	55.9	17.1	2.9	315
<i>Consumed Chicken or Meat</i>					
Never	19.0	55.6	21.5	3.9	284
Daily	18.5	44.4	29.6	7.4	27
Weekly	15.6	50.5	27.5	6.4	921
Occasionally	18.7	55.3	21.5	4.5	2134

fish, chicken or meat, and use of alcohol are significantly associated with overweight. Diseases namely, diabetes, asthma, goitre or thyroid also have a significant and strong association with overweight. The other factors found to have a major role in causing overweight from this study are frequency of reading newspaper and frequency of watching television.

Statistically significant variables with BMI in the bivariate analysis are taken for the regression analysis. The independent variables are categorical in nature and for each variable one category was selected as the reference category. Results of the logistic regression analysis which compares overweighed and obese women with normal and underweight ones are presented in Table 5.

Table 3: Percentage of women in different BMI levels classified on the basis of behavioral characteristics, 2005-06, Kerala

Women's characteristics	Under-weight	Nor-mal	Over-weight	Obe-sity	N
<i>Economic variables</i>					
<i>Use of Any form of Tobacco</i>					
Non-users	17.7	54.1	23.2	5.0	3307
Users	32.3	46.8	17.7	3.2	62
<i>Alcohol Consumption</i>					
No	18.0	54.0	23.0	5.0	3346
Yes	16.7	37.5	41.7	4.2	24
<i>Frequency of Reading Newspaper</i>					
Not at all	19.8	56.3	19.1	4.7	632
<once in week	19.6	56.1	20.2	4.1	729
At least once in week	20.4	54.2	23.0	2.4	452
Every day	15.8	51.8	26.2	6.2	1552
<i>Frequency of Listening Radio</i>					
Not at all	17.1	53.8	23.6	5.5	1315
<once in week	16.0	55.2	24.3	4.5	645
At least once in week	19.3	54.3	23.1	3.3	363
Every day	19.8	53.1	21.9	5.3	1047
<i>Frequency of Watching Television</i>					
Not at all	21.9	57.1	17.4	3.5	539
<once in week	17.3	57.4	22.3	3.0	364
At least once in week	19.8	57.0	18.9	4.3	323
Every day	16.8	52.1	25.3	5.8	2143

Table 4: Percentage of women in different BMI levels classified on the basis of disease prevalence, 2005-06, Kerala

Women's characteristics	Under-weight	Nor-mal	Over-weight	Obe-sity	N
<i>Diseases</i>					
<i>Asthma</i>					
No	18.1	54.4	22.6	4.8	3219
Yes	16.1	40.9	35.0	8.0	137
<i>Diabetic</i>					
No	18.4	54.3	22.5	4.8	3258
Yes	3.3	37.8	46.7	12.2	90
<i>Goiter or Thyroid</i>					
No	18.2	54.2	22.8	4.9	3158
Yes	15.7	48.7	28.9	6.6	197
<i>Tuberculosis</i>					
No	18.1	54.0	22.9	5.0	3194
Yes	30.0	70.0	0.0	0.0	10

Wealth index seems to be an important determinant of the prevalence of overweight. Overweight is 363% more prevalent among the poorer group than the poorest. The chances to be overweight increase with increase in the level is about 1219 % more than that of the poorest

Table 5: Results of logistic regression analysis for selected variables with BMI in Kerala

Independent variables	Odds ratio	Confidence interval
<i>Occupation of Respondent</i>		
Prof., Technical, managerial	1.00	0.47-1.47
Clerical	0.83	0.74-2.05
Sales	1.22	0.59-1.61
Agriculture	0.98	0.87-2.31
Services	1.41	
Skilled, manual (Ref)		
<i>Wealth Index</i>		
Poorest (Ref)	1.00	
Poorer	4.63	0.59-36.96
Middle	5.48*	0.73-42.06
Richer	8.04*	1.09-61.38
Richest	13.19**	1.78-101.18
<i>Consumed Milk or Curd</i>		
Never (Ref)	1.00	
Daily	0.88	0.68-1.15
Weekly	0.69**	0.51-0.93
Occasionally	0.77*	0.58-1.02
<i>Consumed Fruits</i>		
Never (Ref)	1.00	
Daily	0.96	0.48-1.92
Weekly	0.90	0.46-1.79
Occasionally	0.87	0.44-1.73
<i>Consumed Fish</i>		
Never (Ref)	1.00	
Daily	1.78*	1.12-2.82
Weekly	1.34	0.83-2.18
Occasionally	1.11	0.65-1.90
<i>Consumed Chicken or Meat</i>		
Never (Ref)	1.00	
Daily	1.38	0.58-3.29
Weekly	1.10	0.77-1.58
Occasionally	0.87	0.62-1.23
<i>Alcohol Consumption</i>		
No (Ref)	1.00	
Yes	1.64	0.69-3.87
<i>Frequency of Reading Newspaper</i>		
Not at all (Ref)	1.00	
<once in week	0.94	0.73-1.24
At least once in week	0.97	0.72-1.31
Every day	1.08	0.85-1.39
<i>Frequency of Watching Television</i>		
Not at all (Ref)	1.00	
<once in week	1.20	0.86-1.66
At least once in week	1.10	0.72-1.44
Every day	1.17	0.91-1.50
<i>Asthma</i>		
No (Ref)	1.00	
Yes	2.00**	1.38-2.89
<i>Diabetic</i>		
No (Ref)	1.00	
Yes	3.61**	2.29-5.68
<i>Goiter or Thyroid</i>		
No (Ref)	1.00	
Yes	1.32*	0.96-1.81

*Significant at 0.05 level

** Significant at 0.01 level.

of wealth index and among the richest group of women, the probability of being overweight

group. Women working in professional, technical, managerial, clerical or sales position were much more likely to be overweight than women working in the skilled, unskilled and manual sectors. But this relation is not significant.

A significant negative relation between women's consumption of milk or curd and overweight was obtained. Daily users of milk or curd had 88% less chance to be overweight than those who never consume. Consumption of fish was significantly associated with overweight in the sample women. Those women who daily use fish had 78% more chance for being overweight compared to the never users of fish, whereas daily users of chicken or meat had 38% more chance than the non-users, but the relation is not significant.

Chance of being overweight is 61% more among women who consumed alcohol than those who did not. But the relation is not significant. Patients who suffered from diabetes, asthma and goitre or thyroid were more likely to be overweighted than the others and the relation is highly significant. A diabetic woman had 161%, an asthma patient had 100% and women with goiter or thyroid complaint had 32% more chance to be overweighted when compared to their counterparts.

DISCUSSION

Based on the sample, 27.8% women are overweight and 18 % women are underweight in Kerala. Based on NFHS-2 data, women who lived in households with a high standard of living index had a significantly higher probability of being overweighted and obese. In the present sample also, women who are in the richest level on wealth index are more likely to be overweight. As per the study by Paula (2001), respondents living in poorer households were much more likely to be underweight than those living in households with higher socio-economic status. In the present study also, nearly half of the poor women are underweight. Similar results are obtained in several studies conducted in developing countries (Monteiro et al. 2000; Martorwill et al. 1993; Singh et al. 1999; Dhurandhar and Kulkarni 1992) which are at the early stages of nutrition transition.

In a study of overweight in Kerala by Ramesh and Jareena (2009), women who were reported daily consumers of fruits, chicken, meat or fish were more likely to be overweight or obese than

those who ate them occasionally or rarely. With the limited dietary information available in the present data set, a similar result was obtained that women who more frequently ate fish, chicken or meat were more likely to be overweight.

Present study also indicates that women who watch television and read newspapers everyday have more chances of being overweight than the others. This result shows that overweight is common among those who eat heavy food and those who are sedentary most of the time. Studies conducted in Delhi, Punjab and the whole of India (Paula et al. 2001; Agarwal 2004) also have supported this result.

Users of any form of tobacco seem to have less probability of getting overweight and obese. A study in Kerala (Thankappan et al. 2010) shows that overweight is highly associated with most of the non-communicable diseases. Here also it is observed that most of the women in the state who suffered from diabetes, asthma and goitre or thyroid are overweight, or in other words overweight is found to be a common character of women in Kerala who suffered from these diseases.

CONCLUSION

The analysis presented in this study provides evidences for the emerging nutrition transition and the large inequalities that differentiate women's health in Kerala. Among the 18% of sample women who experience under-nutrition, majority is poor, and may face serious associated health problems. Highest percentage of underweight is seen among the poorest group of sample women who usually may have a poor diet pattern. Another important conclusion obtained from the present analysis is that consumption of heavy food and spending more time in front of TV and for reading newspaper may lead to an increase in the number of overweight persons in Kerala. The above mentioned emerging nutritional transition and rapid change in overweight among high income groups lead to the high occurrence of non-communicable diseases which are reported to be the highest for Kerala.

RECOMMENDATIONS

Present level of overweight/obesity among adult women in Kerala point out a need for a change in their lifestyle and diet habits and

also an increase in the level of physical activity. Healthy life style promotion programs should be integrated with existing health care system in the state. Results of this study also point out the need for continued commitment from government to ensure food security for the poor and adequate access to health services. Information and programs are also needed to help the women to be aware of the components of a healthy diet and the importance of physical activity for a healthy life.

REFERENCES

- Agarwal Praveen, Mishra Vinod 2004. Covariates of overweight and obesity among women in North India. *East-west Centre Working Papers, Population and Health Series*, No. 116, Jan 2004.
- Calle C E, Thun MJ, Petrelli J M, Rodriguez C, Heath CW 1999. Body mass index and mortality in a prospective cohort of US adults. *New English Journal of Medicine*, 341.
- Dhuradhar NV, Kulkarni PR 1992. Prevalence of obesity in Bombay. *International Journal of Obesity*, 16: 367-375.
- Martorell R, Khan LK, Grummer- Strawn LM 2000. Obesity in women from developing countries. *European Journal of Clinical Nutrition*, 54: 247-252.
- Monteiro C A, Benicio MH, Conde WL, Popkin BM 2000. Shifting obesity trends in Brazil. *European Journal of Clinical Nutrition*, 54: 342-346.
- Paula LG, Margaret E, Bentley 2001. The nutrition transition is underway in India, *The Journal of Nutrition*, 131: 2692-2700
- Ramesh P, Jareena S 2009. Overweight exceeds underweight among women in Kerala: An analysis of trends and determinants. *Journal of Human Ecology*, 25(2): 93-103.
- Singh RB, Beegam R, Mehtra AS, Niaz MA, De AK, Mitra RK, Haque M, Verma SP, Dube GK, Siddiqui HM, Wanders GS, Janus ED, Postiglione A, Haque MS 1999. Social Class coronary risk factors and under-nutrition, a double burden of diseases in women during transition in five Indian states. *International Journal of Cardiology*, 69: 139-147.
- Thankappan KR, Bela Shah, Prasnat Mathur, Sarma PS, Srinivas G, Mini GK Daivadavem M, Soman B, Vasan R S 2010. Risk factor profile for non-communicable diseases: Results of a community –based study in Kerala, India, *Indian Journal of Medical Research*, 131: 53-63.
- Villus GB, Janina Petkeviciene, Jurate Klumbienis, Vytautas vaisvalavicius 2003. The prevalence of overweight and obesity in relation to social and behavioural factors. *Medicina*, 39(12).
- World Health Organisation 1995. *Physical Status, the Use and Interpretation of Anthropometry*. Geneva, Switzerland: WHO.
- World Health Organisation 1998. Obesity preventing and managing the global epidemic. *Report of a WHO Consultation on Obesity*, Geneva, Switzerland: WHO.