

Original Research Article

Nutritional assessment of women in the reproductive age group (15-49 years) from a rural area, Kolar, Kerala, India

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Received: 09 October 2016

Revised: 04 January 2017

Accepted: 07 January 2017

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ABSTRACT

Background: Adults in India are affected by dual burden of malnutrition such as over nutrition and under nutrition. Literature suggests that only 52% of women and 57% of men are at a normal weight for their height. Objectives: To estimate the nutritional status of women in the reproductive age group in rural Kolar and to estimate various socio-demographic factors associated with the nutritional status of women.

Methods: Community based Cross-sectional study was conducted in rural field practice areas of Medical College for 6 months. 180 women in the reproductive age group of 15-49 years residing at Devarayasamudra village were included. Statistical methods: Chi-square test and multiple logistic regression were used as test of significance.

Results: It was observed that out of 180 women, 49 (27.2%) of the women were overweight and 26 (14.4%) women were underweight. 36.67% women had a waist hip ratio of more than 0.85. Multivariate logistic regression showed that Age and educational status were independent risk factors for increased Waist Hip Ratio among women in reproductive age group.

Conclusions: Higher prevalence of overweight and abdominal obesity was observed among women of reproductive age group in rural area. Hence measures to improve the nutritional status of women in rural areas need to be addressed.

Keywords: Rural, Nutrition, Reproductive, Waist hip ratio

INTRODUCTION

The World Health Report identifies the top ten risks, globally and regionally, in terms of the burden of disease they cause. The ten leading risk factors globally are: underweight; unsafe sex; high blood pressure; tobacco consumption; alcohol consumption; unsafe water, sanitation and hygiene; iron deficiency; indoor smoke

from solid fuels; high cholesterol; and obesity. Together, these account for more than one-third of all deaths worldwide.¹

In India, only 52% of adult women and 57% of adult men are at a normal weight for their height. 36% of women and 34% of men are undernourished with a BMI less than 18.5, indicating a high prevalence of nutritional

deficiency.² Overweight and obesity are emerging problems in India. 13% of women and 9% of men are overweight or obese. Nutritional status is an indication of the overall well being of a population. Adequate nutritional status of women especially in reproductive age group is important for good health and increased work capacity of women themselves as well as for the health of their offspring. Poor nutrition is indicative of greater health risk to both mother and children born to them. The simultaneous occurrence of over nutrition and under nutrition indicates that women in India are suffering from a dual burden of malnutrition.²

Body mass index has also been recommended by WHO as a simple, practical and epidemiological measure for identifying over weight and obese patients. It is nevertheless a crude index and does not take into account the distribution of body fat.³ Waist circumference and waist/hip ratio have been used as measures of central obesity (where visceral adipose tissue is stored), and body mass index (kg/m^2) has been used as a measure of general obesity.⁴ Studies on nutritional assessment of women in reproductive age are limited, and so far under nutrition were addressed and over nutrition among rural women remain a neglected health problem.

This study was carried out with the primary objective to determine the nutritional status of the women in the reproductive age group in rural Kolar. The secondary objective was to find the association between socio-demographic factors and nutritional status of women.

METHODS

A community based cross sectional study was carried out in the rural field practice areas of Medical College at Rural area in Kolar district, Karnataka State. Considering the prevalence of over nutrition among women in reproductive age group of 15-49 years as 13%², a sample size of 174 was obtained at 5% absolute precision and 95% Confidence level. Women in the reproductive age group of 15-49 years were included and pregnant, lactating mothers were excluded from the study. Informed consent was taken prior to the start of the study.

Sampling: The study was conducted in the rural field practice area of medical college. There were 20 villages under the rural health training center. Total population catered by RHTC was 12000; of them 5200 were women. Out of the 20 villages under Rural Health Training Centre, one village was selected by simple random sampling and women in reproductive age group of 15-49 years residing in that village and fulfilling the inclusion criteria were included in the study by simple random sampling (random table number method was used) after obtaining the sampling frame from local governing body. Every selected woman was interviewed at their households with the help of ANM's and ASHA workers after obtaining informed consent. Prior Institutional ethical clearance was taken to conduct the study.

Data collection: Structured questionnaire was used to collect the data by House to house survey in the selected area. General physical examination was done and anthropometry measurements of the women were taken. Weight was taken on bathroom scale without footwear measuring to an accuracy of 0.5kg. Height was taken in standing position without footwear with measuring tape measuring to an accuracy of 0.1cm. Waist circumference was measured at the midpoint between the lower margin of the least palpable rib and the top of the iliac crest, using a fibre glass tape. Hip circumference was measured around the widest portion of the buttocks, with the tape parallel to the floor⁵. Body mass index (BMI) was calculated by using the formula $\text{weight}/\text{height}^2$. BMI was classified according to WHO classification as: normal range (18.50-24.99 kg/m^2); underweight ($<18.50 \text{ kg}/\text{m}^2$); overweight ($\geq 25.00 \text{ kg}/\text{m}^2$) and obese ($\geq 30.00 \text{ kg}/\text{m}^2$).⁶ Waist circumference of $>102 \text{ cm}$ for men and $> 88 \text{ cm}$ in women is associated with a substantially creased risk of metabolic complications. Abdominal obesity is further defined as waist-hip ratio ≥ 0.90 for males and ≥ 0.85 for females⁵. Parity of the women was classified as Nulliparous, primipara and multipara.⁷

Statistical analysis

Data collected was entered in Microsoft Excel Spread Sheet after coded. SPSS 22 software was used for data analysis. Chi-square test was done to find the association between independent and dependent variables. The level of significance used was $p < 0.05$. Univariate analysis and logistic regression analysis were used to calculate the unadjusted and adjusted odds ratios.

RESULTS

A total of 180 women were surveyed and majority of the women i.e. 51 (28.3%) belonged to 15-19 years of age followed by 31 (17.2%) each in the 20-24 year and 35-39 year age groups. 142 (78.9%) women were married and 153 (85.0%) women belonged to nuclear type of family. 71 (39.4%) women were illiterate, 38 (21.1%) had primary education and 31 (17.2%) had middle school education. 23 (12.8%) women had high school education followed by 17 (9.4%) with an education of graduate level and above. About 71 (39.4%) women had parity status of three.

Majority of the women i.e. 105 (58.3%) had normal BMI between 18.50 and 24.99, 49 (27.2%) women were overweight, 11 (6.1%) were obese and 26 (14.4%) women were undernourished. The mean height of the women was $150.78 \pm 5.90 \text{ cm}$ and mean weight was 51.69 ± 9.75 . The mean waist circumference was $71.41 \pm 9.48 \text{ cm}$ and mean hip circumference was $85.35 \pm 10.9 \text{ cm}$. 66 (36.67%) women had a waist-hip ratio of more than 0.85 and mean waist-hip ratio was 0.83 ± 0.05 .

Out of 26 malnourished women, 9 (34.6%) belonged to 20-24 year age group followed by 8 (30.8%) in 15-19

year age group. Among overweight women, majority ie.13 (26.5%) belonged to 35-39 year age group followed by 9 (18.4%) in 15-19 year age group. Significant association was observed between BMI and age of women ($p < 0.05^*$).

15 (21.1%) illiterate women, 7 (18.4%) of women with primary education, 3(9.7%) of women with middle school and 3 (7.5%) of them with high school education and above had BMI $< 18.5\text{kg/m}^2$ (Undernourishment). 21(29.6%) of illiterate women, 12 (31.6%) with primary education, 8 (25.8%) with middle school and 12 (30.0%) of women with high school education and above had BMI $\geq 25\text{kg/m}^2$ (Over nourishment). 17 (17.7%) homemakers and 11 (16.4%) women working as laborers had BMI $< 18.5\text{kg/m}^2$. 6 (35.3%) women employed as professionals or managing business, 25 (26.04%) homemakers and 22 (32.8%) women working as laborers had BMI $\geq 25\text{kg/m}^2$.

8 (18.6%) Nulliparous women, 14 (13.3%) Multiparous women, and 4 (12.5%) Primipara women had BMI $< 18.5\text{kg/m}^2$. 33 (31.4%) multiparous women, 7 (21.9%) primipara and 9 (20.9%) Nulliparous women had BMI $\geq 25\text{kg/m}^2$. 20 (14.1%) of married women and 6 (16.2%) of unmarried women had BMI $< 18.5\text{kg/m}^2$. 40 (28.2%) of married women and 8 (21.6%) of unmarried women had BMI $\geq 25\text{kg/m}^2$. 66 (36.67%) women had a waist: hip ratio more than 0.85. Among them 30 (45.45%) were in the age group 15-19 years, followed by 14 (21.21%) women in the 35-39 year age group. The relation between age of the women and waist hip ratio was found to be highly significant (Table 1).

Out of the 66 (36.67%) women with waist hip ratio more than 0.85, majority of them 20 (30.3%) had primary education, followed by 17 (25.76%) women were illiterate and 15 (22.72%) were educated up to middle school. The relation between education of the women and waist hip ratio was found to be significant.

Among the 66 (36.67%) women with waist hip ratio more than 0.85, 30 (45.45%) were Multiparous, 19 (28.79%) were Nulliparous and 17 (25.76%) were Primiparous women. There was a statistically significant association between parity and waist hip ratio. In univariate analysis it was observed that age had significant influence on BMI, those in the age group 35-39 years had higher BMI compared to other age group (OR 3.370; 95% CI 1.223-9.286).

Table 1: Relation between age of the women and waist hip ratio.

Age of the women (years)	Waist hip ratio		Total
	≤ 0.85	> 0.85	
15-19	21	30	51
20-24	24	7	31
25-29	19	5	24
30-34	11	6	17
35-39	17	14	31
40-44	20	4	24
45-49	2	0	2
Total	114	66	180

$\chi^2=22.29$; $df=6$; $p<0.001$.

Table 2: Crude and Adjusted odds ratio for waist hip ratio using model for significant risk factors.

Factor	Waist hip ratio Crude Odds ratio (95%CI)	Waist hip ratio Adjusted Odds ratio (95%CI)	'p' value
Age			
15-19 ^R	1.00	1.00	
20-24	1.204 (1.074 -1.560)	1.120 (1.030-1.487)	0.002*
25-29	1.184 (1.059-1.571)	1.096 (1.021-1.449)	0.003*
30-34	1.382 (0.122-1.194)	1.263 (0.054-1.273)	0.098
35-39	1.576 (0.834-1.719)	1.278 (0.736 -1.357)	0.231
40-44	1.140 (1.042-1.469)	1.104 (1.022-1.496)	0.001*
Education			
Illiterate ^R	1.00	1.00	
Primary school	3.529 (1.526-8.161)	3.939 (1.537-10.097)	0.003*
Middle school	2.978 (1.222-7.257)	2.194 (0.773-6.226)	0.016*
High school	2.443 (0.909-6.565)	1.593 (0.450-5.645)	0.076
Graduate and above	0.977 (0.281-3.398)	1.018 (0.239-4.337)	0.971
Parity			
Nulliparous ^R	1.00	1.00	
Primiparous	1.432 (0.571-3.588)	3.679 (0.965-14.025)	0.444
Multiparous	0.505 (0.242-1.055)	2.402 (0.567-10.169)	0.069

*significant OR.

In multivariate logistic regression of factors influencing waist hip ratio (age, education and parity entered into the model simultaneously) those in the age group 20-24 years, 25-29 years and 40-44 years were significantly more likely to have a higher waist hip ratio. Those with primary and middle school education were also 4 times and 2 times respectively more likely to have a higher waist hip ratio than those who were illiterate. Parity had no statistical significance on Waist hip ratio (Table 2).

DISCUSSION

Nutritional status of women especially in reproductive age group is an important factor to determine the outcomes of pregnancy and overall health of the women. Although studies have shown that under nutrition was higher in rural population, there is change in the trend of nutritional aspect of women in rural India. 180 subjects were finally recruited in to the study and nutritional status was assessed among them.

It was observed that, majority of the women ie.105 (58.3%) had normal BMI between 18.50 and 24.99. Nearly 49 (27.2%) of the women were overweight, 11(6.1%) were obese and 26(14.4%) women had BMI less than 18.5kg/m².

In a similar study conducted in Mysore, the authors found that 18.7% of women were suffering with chronic energy deficiency, 42.3% were normal, 27% were overweight and 12% were obese. The study indicated that over nutrition is becoming a problem even in rural population of developing countries.⁸

According to the World Health Organization (WHO), there will be about 2.3 billion overweight people aged 15 years and above and over 700 million obese people worldwide in 2015. Overweight and obesity are the fifth leading risk of deaths, resulting in around 2.8 million deaths of adults globally every year.⁹ Even in countries like India, which are typically known for high prevalence of under nutrition, significant proportions of overweight and obese now coexist with the undernourished.¹⁰ Study in India observed that about 20% of adults who were not overweight or obese as per the BMI definition still had abdominal obesity.¹¹

According to NFHS III data, more than a third (36%) of women has a BMI below 18.5.² The prevalence of chronic energy deficiency (CED) in Karnataka has been reported as 35.5%.¹² The prevalence of malnutrition in this study is lesser probably due to better education status and living standards of this population.

In the present study, among overweight women, majority ie.13 (26.5%) belonged to the 35-39 year age group followed by 9 (18.4%) in the 15-19 year age group. The problem of overweight in the adolescent age group in our study can be an emerging problem.

The findings of this study is similar to the study conducted in Mysore where it was seen that BMI increased in women with increasing age and obese women were found in the age range of 35+ years.⁸ Gouda J and Prusty R in their article on data obtained from NFHS survey (2005-2006) observed that women at later age (35+ years) are more overweight or obese than the reference group in 15-24 years.¹³

In the present study, the prevalence of overweight was seen among educated women. Nearly 30.0% of women with high school education and above had BMI \geq 25kg/m². Agarwal P and Mishra V found that woman's education is strongly positively correlated with the levels of overweight and obese. In their article, the proportion of obese increases from less than 5% among illiterate women to more than 15% among those with high school or more education.¹⁴

Higher education opens better employment opportunities for women and leads to be self-dependent and for further improvement in socioeconomic status.¹³ This possibly helps women live a life which involves less physical activity and helps access energy-dense food which is considered to cause overweight or obesity.^{14,15}

In the present study, 35.3% of women employed as professionals or managing business had a BMI \geq 25kg/m². A similar observation is seen in the article by Agarwal P and Mishra V. The authors in this article state that the type of work is strongly correlated with overweight and obesity. Among working women, those in professional or technical jobs are much more likely to be overweight or obese than other types of workers. Household workers are least likely to be overweight or obese.¹⁴ With change in working pattern in rural areas this observations hold good to a rural community as well.

In the study 66 (36.67%) women had a waist: hip ratio of more than 0.85. A higher percentage of waist hip ratio was observed in women compared to men (25.4% vs. 7.1%) in a study conducted among affluent Indian adults. Abdominal obesity based on waist circumference was higher among women than men (35.9% vs. 32.4%).¹⁶

In the present study, a highly significant association was found between age of the women and waist hip ratio. Significant association between education of the women and waist hip ratio was also observed. After adjusting for confounders, those in the age group 20-24 years, 25-29 years and 40-44 years were significantly more likely to have a higher waist hip ratio. Those with primary and middle school education were also 4 times and 2 times respectively more likely to have a higher waist hip ratio than those who were illiterate.

The prevalence of increased waist hip ratio was more among Multiparous women. There was a statistically significant association between parity and waist hip ratio.

However, after controlling for age and education, it was found that parity did not significantly influence waist hip ratio. Parity and risk of being overweight or obese among women is positively related.¹³

Cross-sectional analysis of data from NHANES III illustrated how parity is associated with changes in body shape. Data from 16,325 women showed that women who had given birth had less lower body fat and greater waist circumference. After controlling for age and BMI, increasing parity was associated with lower hip and thigh circumferences, and higher waist circumference.¹⁷

Our study found a higher prevalence of overweight and abdominal obesity among rural women in reproductive age group. Although malnutrition is also present to a certain extent, the prevalence of overweight and abdominal obesity is an emerging problem even in rural areas which needs to be addressed.

The limitations such as information on socio-economic status, physical activity and diet of the women could have given more parameters influencing waist hip ratio.

CONCLUSION

The study concludes that higher prevalence of overweight and abdominal obesity was detected among women of reproductive age group in rural areas and there is change in trend of nutritional status of women. Overweight and obesity are emerging problems in India. The simultaneous occurrence of over nutrition and under nutrition indicates that adults in India are suffering from a dual burden of malnutrition. Although various factors influence on nutritional status, measures have to be taken to educate about the healthy nutrition and importance of physical activity among rural women.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. The World Health Report 2002.Reducing risks, promoting healthy life. Geneva: World Health Organization; 2002.
2. Arnold F, Parasuraman S, Arokiasamy P, Kothari M. Nutrition in India. National Family Health Survey (NFHS-3), India, 2005-06. Mumbai: International Institute for Population Sciences; Calverton, Maryland, USA; 2009 Aug. 44p.
3. Goodman-Gruen D, Barrett-Connor E. Sex differences in measures of body fat and body distribution in the elderly. *Am J Epidemiol*. 1996;143:898-906.
4. Folsom AR, Kushi LH, Anderson KE, Mink PJ, Olson JE, Hong CP, et al. Associations of general

- and abdominal obesity with multiple health outcomes in older women: the Iowa Women's Health Study. *Arch Intern Med*. 2000;160:2117-28.
5. WHO. Waist Circumference and Waist-Hip Ratio. Report of WHO Expert Consultation. Geneva: World Health Organization (WHO); 2008 Dec.
6. Park K. Park's Textbook of Preventive and Social Medicine. 22th ed. Jabalpur: M/s Bhanarsidas Bhanot Publishers; 2013.
7. Gopalan S, Jain V. Mudaliar and Menon's Clinical Obstetrics. 10th ed. Chennai: Orient Longman; 2005.
8. Prakruthi BS, Prakash J. Nutritional status and dietary pattern of Indian rural women with reference to energy intake and expenditure. *J Community Nutrition & Health*. 2013;2(1):44-51.
9. World Health Organization. Fact sheet N°311 [internet]. Washington DC: World Health Organization; 2013. Obesity and overweight. (Available from <http://www.who.int/mediacentre/factsheets/fs311/en>, accessed on 3 October 2016).
10. Popkin BM. The shift in stages of the nutritional transition in the developing world differs from past experiences! *Public Health Nutrition*. 2002;5(1A):205-14.
11. Gopalan C. Obesity in the Indian urban 'middle class'. *Bulletin of the Nutrition Foundation of India*. 1998;19(1):1-5.
12. Mandal S, Sinha NK, Samantha P, Das S, Bose K. Anthropometric assessment of nutritional status among college women of Midnapore, West Bengal, India. *Int J Life Science and Pharma Research*. 2011:L81-7.
13. Gouda J, Prusty RK. Overweight and Obesity among Women by Economic Stratum in Urban India. *J Health Popul Nutr*. 2014;32(1):79-88.
14. Agrawal P, Mishra V. Covariates of Overweight and Obesity among Women in North India. [Internet]. Honolulu: East-West Centre; 2004.
15. Kain J, Vio F, Albala C. Obesity trends and determinant factors in Latin America. *Cad Saude Publica*. 2003;19(Suppl 1):S77-86.
16. Rao S, Parab-Waingankar P. Performance of waist circumference relative to BMI in predicting risk of obesity and hypertension among affluent Indian adults. *Health*. 2013;5(8A3):16-22.
17. Lassek WD, Gaulin SJ. Changes in body fat distribution in relation to parity in American women: covert form of maternal depletion. *Am J Physical Anthropology*. 2006;131(2):295-302.

Cite this article as: Manjunath TL, Zachariah SM, Venkatesha M, Muninarayana C, Lakshmi A. Nutritional assessment of women in the reproductive age group (15-49 years) from a rural area, Kolar, Kerala, India. *Int J Community Med Public Health* 2017;4:542-6.