ORIGINAL ARTICLE

Association between standard of living and underweight & overweight among likely to conceive women in rural North Karnataka-baseline result of DBW cohort

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Abstract

Background: In 2014, approximately 462 million adults worldwide were underweight; while 1.9 billion were either overweight or obese. Hence, a study was carried out first time using the NFHS Standard of Living Index to assess the association between socioeconomic status and underweight & overweight among likely to conceive women.**Material & Methods**: In Determinants of Birth Weight (DBW): a community based prospective cohort study; household characteristic information was collected from 1293 likely to conceive women. Nutritional status of women was graded based on WHO international BMI categories. Chi-square test and multinomial logistic regression were applied to assess the association between standard of living and underweight & overweight with the 95% confidence level and p values less than 0.05.**Results**: The prevalence of underweight, normal weight, overweight and obesity was found 35.1%, 52.4%, 9.7% and 2.7%, respectively, with mean±SD BMI 20.4 kg/m2±3.876 kg/m^2. The low standard of living was significantly associated with underweight whereas high standard of living was associated with overweight among likely to conceive women in a rural North Karnataka with a p value less than 0.05.**Conclusion:** Among likely to conceive women, there is an inverse association between standard of living and underweight whereas positive association with overweight in a rural North Karnataka.

Keywords

NFHS Standard of Living Index; Likely to conceive women; Underweight; Overweight; Rural North Karnataka

Introduction

Today, nearly one in three persons globally suffers from at least one form of malnutrition: wasting, stunting, vitamin and mineral deficiency, overweight or obesity and diet-related NCDs. In 2014, approximately 462 million adults worldwide were

underweight; while 1.9 billion were either overweight or obese. (1) The World Health Organization (WHO) defines obesity as a 'global epidemic. Overweight and obesity are an important public health issues worldwide. (2) Developed countries are suffering from overweight or obesity, whereas developing countries are facing the dual burden of malnutrition. NFHS-4 data says 22.9% women are underweight (BMI<18.5 kg/m^2) whereas similar percentage 20.7% women are overweight (≥25 kg/m^2) in India. (3) In Karnataka 18.6% population is underweight whereas 22.7% are overweight. (4)

The problem relating to malnutrition for both men and women should receive equal attention. However, concerns relating to women in developing countries deserve extra attention because of cultural and economic backdrops among women. Secondly, maternal malnutrition directly affects the pregnancy outcome and overall poor maternal and child health status. (2) An augmented number of literature assert that an increased BMI of women is independently associated with increased risk of adverse obstetric and neonatal outcome. (5)

Women with a low BMI is often associated with low nutritional status and adverse pregnancy outcomes, such as low birth weight, preterm birth, mental health impairment, increased risk of early mortality, and a higher risk of infant mortality. (5,6,7,8) Early and late stillbirths are also associated with underweight mothers compared to their normal-weight counterparts. In developing countries; maternal underweight is a leading risk factor for preventable death and diseases.(5)

Besides, overweight is a greater risk of gestational diabetes and larger birth weights in their offspring, putting their infants at higher risk of overweight and obesity later in life. (9) However, it also leads to increased risk for hypertension, and pre-eclampsia in pregnancy, caesarean and instrumental deliveries, haemorrhage, infection and maternal mortality during labour. Overweight/ obesity among women has been shown to increase the risk of adverse neonatal outcome such as preterm delivery, low/high birth weight, congenital anomalies, neonatal asphyxia, neonatal death, hypoglycaemia, and hyperbilirubinemia. (9)

Anthropometric measurements are used as measures of health and nutritional status. An individual's nutrition is closely associated with different important factors like age, diet, exercise, co-morbidity, education, lifestyle, substance abuse and socioeconomic status. Though the socioeconomic status (SES) is an important determinant of nutritional status, there is no established relationship because of lack of sufficient evidence. (10) SES can be measured by directly or using the proxy measure. Direct measures, such as income, expenditure, or consumption are expensive and difficult to collect. (11) Hence, researchers prefer a proxy measure, making the best use of available data (11) like B G Prasad classification & Pareek classification in rural areas, whereas Modified Kuppuswamy in the urban area. The Government of India in the National Family Health Survey (NFHS- II) had used the Standard of Living Index (SLI) scale. (10)

Aims & Objectives

To explore the association between SES and nutrition status of Likely To Conceive (LTC) women by using SLI in rural North Karnataka.

Material & Methods

Study design and participants: In this article, baseline data of Determinants of Birth Weight (DBW) were analyzed. DBW is a community based prospective cohort study in a rural North Karnataka. The detailed description of the methodology and sample size calculation has been mentioned somewhere else. (12) Briefly, LTC women were invited to participate in the screening based on the eligibility criteria: 15-45 years of married women residing since last one year in the study area; not using any family planning method; and the last delivery was before 6 months at the time of screening. In the DBW cohort study, a sample size of 1293 (n=z2SD2/d2) LTC woman was selected using a cluster sampling technique from 35 villages, having around 65,000 population. Using a proportional allocation technique, 35 villages were selected from 61 villages under the jurisdiction of 3 PHC areas in rural North Karnataka. Data were collected on pretested interview schedule about household characteristic and anthropometry by a PhD. Scholar with the help of ASHA/Anganwadi/ANM in 2014-15. The currently pregnant women and women suffering from sterility problem were excluded from the study.

Outcome measure: Women's nutrition status, indicated by their BMI category, was used as the outcome variable in the analyses. BMI was calculated as weight in kg divided by height in square meter. This measurement of BMI is generally considered an

appropriate method for epidemiological studies. Weight was measured using an electronic scale with a precision of 0.1 kg, and height was measured with a wall mounted height measuring scale/ stature meter designed for use in survey settings, which can provide accurate measurements to the nearest 0.1 cm. The WHO International BMI cutoff point was used to grade the nutrition status of women as underweight, normal weight, overweight and obesity which allow international comparison.

Exposure variable: Socioeconomic status of women was considered as an exposure variable in the present study. A standard of living index created by the NFHS weighting for different items as a summary household measure was used as a proxy measure of socioeconomic status. It is composed of 30 items, including consumer durables, agricultural machinery, housing conditions and access to basic services (water, light, fuel, etc.) which is shown in table 1. The total score ranges from 0 to 67.

Analysis: Data was entered in a MS. Excel sheet and transferred to Statistical Package for the Social Sciences (SPSS) 20 version for analysis. LTC women were categorized based on World Health Organization International cut off points as <18.5 kg/m2 as underweight, 18.5 to 24.99 kg/m2 as normal weight, 25 to 29.9 kg/m2 as overweight and ≥30 kg/m2 as obesity. Whereas, the standard of living was categorized as low, medium and high for SLI score of 0-14, SLI score 15-24 and SLI score 25-67 respectively. (13) Chi-square and multinomial logistic regression analysis were applied and 95% conference interval (CI) & p value less than 0.05 were considered significant.

Ethical Consideration: Ethical approval was taken from institutional review board of KLE University before conducting the study. Written informed consent was taken from all participants before the interview and measurement of body height and weight.

Results

Characteristic of Participants

Out of 1293 participants, almost half (49.7%) LTC women were 20-24 years of age whereas 26.3% were from 25-29 years of age group, 13.5% from 15-19 years of age group and only 10.6% women were ≥30 years of age, with mean±SD ages of 23.7±4.3 years. The distribution of LTC women across categories of BMI showed that, 35.1% women were underweight, 52.4% were normal weight, 9.7% were overweight and 2.7% were obese. The mean±SD BMI observed in the study was 20.4 kg/m2±3.876 kg/m2. Similarly, 3.9% women belonged to low standard of living, 18.5% belonged to medium and 77.6% belonged to a high standard of living category.

BMI and Standard of Living Index (SLI)

Chi-square analysis suggested significant difference ($p<0.001$) in three categories of BMI by standard of living index (SLI). Underweight was more common among LTC women belonged to lower SLI whereas overweight including, obesity were common with higher SLI, which is statistically significant ($\chi^2=31.04$, DF=4, $p<0.001$) (Table 2).

Determinants of Underweight and Overweight

Table 3 shows the Odds Ratio for underweight and overweight including obesity relative to the normal weight for the Standard of Living from multinomial logistic regression. Compared to a high standard of living, LTC women from lower standard of living were more likely to be underweight. As compared to a high standard of living, medium standard of living has 69% lower chance of having overweight, including obesity, whereas association between overweight and a low standard of living was statistically not significant.

Discussion

The present study assessed the association between standard of living and underweight & overweight among LTC women in a rural North Karnataka. The mean±SD age of women was 23.7±4.3 years with minimum and maximum age range 15 to 44 respectively. Nutritional status was measured using WHO BMI international cut off point. Socioeconomic status was measured using a proxy measure called as Standard of Living Index (SLI) created by the NFHS weighting for different items as a summary household measure. SLI is a good proxy measure of SES with acceptable, reliable score, i.e Alpha Coefficient – 0.79. (14) Some studies were carried out in India to identify best proxy measure for SES and recommended to use a NFHS SLI scale which gives a more accurate and realistic picture of the SES of the family in both urban and rural setting.(10)

In our study, we found that, the prevalence of underweight, normal weight and overweight were 35.1%, 52.4% and 12.4% (overweight 9.7% and obesity 2.7%) respectively. In rural North Karnataka 3.9% LTC women belonged to low standard of living, 18.5% belonged to the medium, whereas 77.6%

were from a high standard of living which is consistent with a study conducted in 2010.(10)

In developed countries, obesity is widely considered a condition that more affects on people of lower SES than those of higher SES. In developing countries, however, the debate continues as to whether obesity primarily affects the poor or the rich. (15) Our study found that as compared to a high standard of living, medium standard of living has 69% lower chance of being overweight including obesity which is consistent with previous study though those studies used wealth index instead of SLI.(16,17)Similarly, LTC women with low standard of living has almost 13% lesser chance of having overweight as compared with high standard of living but statistically not significant. Whereas women belonged to low standard of living have almost 2 times higher chance of being underweight compared to a high standard of living. Similarly, LTC women belonging to medium standard of living have 52% more chance of being underweight as compared to a high standard of living. However, lower SLI is statistically not associated with overweight in our study. To our knowledge, this is the first study using the NFHS SLI that assessed the association between socioeconomic status and nutritional status among LTC women.

Conclusion

Our study revealed that, compared to a high standard of living, medium standard of living has 69% lower chance of being overweight, including obesity, whereas women belonged to low standard of living has almost 2 times higher chance of being underweight compared to a high standard of living. Similarly, LTC women belonged to medium standard of living has 52% more chance of being underweight as compared to a high standard of living.

Recommendation

Hence, thought our study result justifies that, there is a need to focus on women with low standard of living and high standard of living to improve underweight and overweight respectively, a good number of higher level of study are recommended to carry out for better understanding the relationship between Standard of Living and overweight among likely to conceive the women.

Limitation of the study

It was conducted only in rural area of North Karnataka. Cross Sectional data were used to assess the association between Standard of Living and Overweight & underweight

Relevance of the study

This study used first time standard of living index to assess the association between SES and overweight & underweight among LTC women, which enlighten standard of living is a factor associated with malnutrition.

Authors Contribution

TRG: Concept, Literature Review,Data Collection, Analysis, Manuscript; BSK: Concept designing, manuscript finalization; SM: Manuscript drafting; VSN: Manuscript drafting.

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Tables

TABLE 1 WEIGHT OF ITEMS AND DISTRIBUTION OF HOUSEHOLD CHARACTERISTIC

Name of the items	Classification	Weight	Number	Percentage (%)
Ownership of House	Yes	2	1058	81.8
	No	0	235	18.2
Type of House	Pucca House	4	685	53.0
	Semi-Pucca House	2	386	29.9
	Kachha House	0	222	17.2
Source of House	Electricity/Solar System	3	1292	99.9
	Kerosene/Gas/Oil	1	1	0.1
	Others	0	0	0.0
Ownership of Agricultural Land	5 Acres or More	4	51	3.9
	2.0 - 4.9 acres	3	213	16.5
	< 2 Acres or Acres not Known	2	412	31.9
	No Agricultural Land	0	617	47.7
Ownership of Irrigated Land	Owns at Least Some Irrigated Land	2	151	11.7
	No Irrigated Land	0	1142	88.3
Ownership of Livestock	Owns Livestock	2	432	33.4
	Does not Own Livestock	0	861	66.6
Source of Drinking	Pipe, Hand Pump or Well in Residence/Yard/Plot	2	683	52.8
	Public Tap, Hand Pump or Well	1	610	47.2
Toilet Facility	Own Flush Toilet	4	925	71.5
	Public or Shared Flush Toilet or Own Pit Toilet	2	86	6.7
	Shared or Public Pit Toilet	1	0	0.0
	No Facility	0	282	21.8
Separate Room for Cooking	Yes	1	1183	91.5
	No	0	110	8.5
Main fuel for Cooking	Electricity, Liquid Petroleum Gas or Biogas	2	961	74.3
	Coal, Charcoal or Kerosene	1	332	25.7
	Other Fuel	0	0	0.0
Ownership of Durable Goods	Car	4	84	6.5
		0	1209	93.5
	Tractor	4	31	2.4
		0	1262	97.6
	Moped or Scooter	3	846	65.4
		0	447	34.6
	Telephone	3	1185	91.6

		0	108	8.4
	Refrigerator	3	250	19.3
		0	1043	80.7
	Colour TV	3	1111	85.9
		0	182	14.1
	Black and White TV	2	1	0.1
		0	1292	99.9
	Bicycle	2	484	37.4
		0	809	62.6
	Electric Fan	2	719	55.6
		0	574	44.4
	Radio	2	2	0.2
		0	1291	99.8
	Sewing Machine	2	328	25.4
		0	965	74.6
	Mattress	1	93	7.2
		0	1200	92.8
	Pressure Cooker	1	986	76.3
		0	307	23.7
	Chair	1	1172	90.6
		0	121	9.4
	Cot or Bed	1	960	74.2
		0	333	25.8
	Table	1	964	74.6
		0	329	25.4
	Clock or Watch	1	1077	83.3
		0	216	16.7
	Water Pump	2	178	13.8
		0	1115	86.2
	Bullock Cart	1	40	3.1
		0	1253	96.9
	Thresher	2	0	0
		0	1293	100

TABLE 2 DISTRIBUTION OF LTC WOMEN ACROSS CATEGORIES OF BMI BY SLI

Background Characteristic	BMI (kg/m^2) Category				χ^2	P Value
	<18.5	18.5-24.9	≥25	Total		
Standard of Living Index					31.04	0.000
Low	24 (48.0%)	21 (42.0%)	5 (10.0%)	50 (100%)		
Medium	109 (45.6%)	120 (50.2%)	10 (04.2%)	239 (100%)		
High	321 (32.0%)	537 (53.5%)	146 (14.5%)	1004 (100%)		
Total	454 (35.1%)	678 (52.4%)	161(12.5%)	1293 (100%)		

TABLE 3 ODDS RATIOS (95% CI) OF SLI AND UNDERWEIGHT AND OVERWEIGHT FROM MULTINOMIAL LOGISTIC

Background Characteristic	BMI (kg/m2) category	
	Underweight vs. Normal OR (CI)	Overweight vs. Normal OR (CI)
Standard of Living Index		
Low	1.91 (1.05-3.50)b	0.87 (0.33-2.36)
Medium	1.52 (1.13-2.04)a	0.31 (0.16-0.60)a
High	Reference	Reference
ap<0.01; bp<0.05		