ANTHROPOMETRY AND HAEMOGLOBIN RANGE AMONG RURAL WOMEN IN DAVANAGER DISTRICT OF KARNATAKA

Abstract:

The rural women play a vital role in agricultural economic development since recent past, so they perform so many activities in their daily work, to accomplish those activities consumes lot of energy in terms of calories, for that women's need good health. The health can be assessed by their Anthropometry and haemoglobin levels. The present study on socio-economic characteristics, food habits and dietary intake of rural women was conducted in selected villages of Davanager district in Karnataka state. The selected villages were Nittur of Harihar taluk and Kulambi of Honnalli taluk during the year 2020-21. Sixty each women from Nittur and Kulambi villages were selected randomly for the study, thus making a total sample of 120 respondents.This paper focussed on Anthropometry and haemoglobin range among rural women. The prime objectives of the present study were to examine the associations between the haemoglobin level and various anthropometric indices and to predict low and normal haemoglobin levels using combined indices. Furthermore, we examined differences in the haemoglobin level and anthropometric indices between rural women. Since the rural women belong to low socio-economic group in general, the reasons for prevalence of under nutrition could be due to the fact that women are over exhausted by the combination of reproductive demands and long term intake of lower amounts of food. Among respondents 84 per cent of them were normal and 16 per cent of them were overweight.

Key words: Anthropometry, Haemoglobin, rural women and Body Mass Index (BMI).

Introduction

Women share abundant responsibility and perform a wide spectrum of duties in running the family. They have to do jobs that are time and labour intensive and are involved in various aspects of agriculture. They are gainfully employed in Agri-based allied activities like dairying, animal husbandry, poultry, goatery, rabbit rearing, floriculture, horticulture, fruit preservation, post-harvest technology, and production of value added food products and further they take-up small ventures to generate additional family income. The existence of women in a state of economical, political, social and knowledge dis-empowerment is known to be a major hindrance to economic development. Without the power to work and earn good income, their voices are silenced.

Empowering rural women needs a holistic approach to participate in decision making in the household, community and local domestic sector and prepare women to take up leadership position in agricultural activities. SHGs in rural India are causing a silent revolution not only in terms of providing access to micro credit to communities but also in contributing towards a greater sustainability in agriculture in various ways, including

through a better use of marginalized local agro biodiversity. Life style changes in society, new advances in food technology and packaging, increased interest in healthy eating of more nutritious foods. They perform so many activities in their daily work; to accomplish those activities consumes lot of energy in terms of calories, for that women's need good health. The health can be assessed by their Anthropometry and haemoglobin levels. The objectives of the present study were to capture the socio-economic characteristics; food habits and dietary intake of rural women and examine the associations between the haemoglobin level and various anthropometric indices and to predict low and normal haemoglobin levels using combined indices. Furthermore, we examined differences in the haemoglobin level and anthropometric indices between rural women. "The red blood cells (RBCs) have significant role in the gaseous interchange of the external environment and the living tissue. Haemoglobin is the protein in RBCs that works as a carrier of oxygen. Usually haemoglobin A dominates throughout the life after six weeks of age. It contains two alphas and two beta chains. Sickle cell disease (SCD) is found when a person receives two abnormal copies of haemoglobin genes, one from each parent. That means healthy haemoglobin (HbA) is replaced by sickle haemoglobin (HbS) if he/she contains single abnormal genes, which means HbS replaces half of the HbA" (Das et.al.,2019). We say a person has sickle cell traits Anthropometric measurement studies have been widely conducted internationally (especially BMI) and show a significant Journal Farmasi Sainsdan Komunitas, 2017, 14(2), 112-119 114 Dita Maria Virginia and Fenty correlation between anthropometric measurements and risk of anemia (Chang et al., 2014; Hausman et al., 2011; Saxena et al., 2011).

Methodology

The present study on socio-economic characteristics, food habits and dietary intake of rural women was conducted in selected villages of Davanager district in Karnataka state. The selected villages were Nittur of Harihar taluk and Kulambi of Honnalli taluk during the year 2020-21. Sixty women from Heggadehalli village and sixty rural women from Venkatahalli village were selected randomly for the study, thus making a total sample of 120 respondents.

A pilot study was conducted to determine the feasibility of the study and validity of the questionnaire. The pilot study was conducted on 10 per cent of the sample Size. The study used both qualitative and quantitative assessment measures. The data was collected from the respondent rural women using semi structured interview schedule developed for the

study. The identified socio-economic independent variables were age, education, family size, family type, land holding and income etc,. And also taken the waist/Hip ratio/Waist circumference, WHR, BMI, RLPP, BFP, etc,. The collected data was tabulated and analysed using appropriate statistical tools like frequency, parentage, mean, standard deviation, correlation etc., to draw valid conclusions. "The automatic segmentation of blood cells for detecting haematological disorders is a crucial job. It has a vital role in diagnosis, treatment planning, and output evaluation. The existing methods suffer from the issues like noise, improper seed-point detection, and over segmentation problems, which are solved here using a Laplacian-of-Gaussian (LoG)-based modified high boosting operation, bounded opening followed by fast radial symmetry (BOFRS)-based seed-point detection, and hybrid ellipse fitting (EF), respectively" by Das etal., (2019).

Results and discussion

Anthropometry

Table 1 depicts the body mass index and waist hip ratio of rural women. According to body mass index women were categorized into normal, under weight and overweight. Sixty four per cent of respondents were normal and 25.00 per cent of them were under weight and 15.83 per cent respondents were overweight. Similar findings has been observed by Venkatalakshmi and Peramma (2000) who reported that "body mass index of agricultural farm women showed lower weight normal grade (18.5-20.0) and concluded that agriculture workers are main pillars of the country's economy and lower body weight decreases the productivity. Since the rural women belong to low socio-economic group in general, the reasons for prevalence of under nutrition could be due to the fact that women are over exhausted by the combination of reproductive demands and long term intake of lower amounts of food".

The waist/hip ratio of the rural women is depicted in the same Tale 2. Among respondents 63.33 per cent of them were normal and 15.83 per cent of them were overweight. Estimates of waist/hip ratio provide a useful indication of nutritional status in undeveloped countries, where population is often malnourished with little fat reserves, a change in this measurement reflects the total body stress. It is observed that measurement of waist/hip ratio has been used as a measure of total body subcutaneous fat. This observation was in concurrence with the findings of Menon *et al.* (2011) who reported that "body weight was highest in older individuals, where as no marked difference was observed in other variables like height. The possible factors of variation in waist/hip ratio, height and

significant linear correlation with weight. Approximately more than 50 per cent of the women were under nourished due to low intake of food during early childhood and socio-economic status".

Correlation co-efficient of selected socio-economic factors on anthropometric measurements are shown in Table 3. Age had a positive relationship with weight (r= 0.01) BMI (r= 0.01) waist (r= 0.05) hip (r= 0.01) and negative relation with waist/hip ratio. In rural women, family type had a negative relationship with weight (r= 0.03), height (r= 0.03) and BMI (r= 0.02) and positive relationship with remaining anthropometric measurement. Family size had a negative relationship with height (r= 0.12) and BMI (r= 0.01).Remaining anthropometric measurements had a positive relation with family size. It clearly indicates that education, land holding and income of the independent variables had a positive relationship with all the anthropometric measurements. Income was found to have significant relationship at one per cent level with all the anthropometric measurements.

From the present study it was observed that socio-economic factors viz. age and family income had a positive influence on anthropometric measurements. These observations are in line with the findings of Shwetha *et al*. (2011).

Haemoglobin status of rural women

Table 4 shows the classification of rural women by haemoglobin range. The deficient level of haemoglobin existed in 54.17 per cent of women, low in 20.00 per cent and 27.00 per cent of women had acceptable level. This may be due to inadequacy of iron through dietary intake, which in turn affects the women as undernourished. Poor nutrition also affects their activity level and overall physical performance which reduce work capacity, increases fatigue and causes nutritional anaemia. These findings are in line with the findings of Shweta and Kumar (2001) and Shobha *et al. (*2011) who reported that "mean haemoglobin levels of women was 10.44 g/dl. Majority of women (59.21%) were mild anaemic, 23.3 per cent were moderately anemic and only 14.5 per cent were found to have normal haemoglobin level".

Table 5 shows that the BMI does not show significant difference between haemoglobin levels in BMI group 25 kg/m2 (p=0.153). In addition, Haemoglobin levels do not differ significantly between the normal anthropometric group and the obese group based on the WC parameter (p=0.491) and BFP (p=0.847). "The WHR (waist to hip ratio) parameter is the only anthropometric parameter showing a significant proportion of difference between HB levels in the normal WHR group with the WHR group that show

obesity with p=0.002. Since it is inconclusive, this study will continue with Spearman test to determine the direction of the correlation between WHR and HB level. Results from median values show that the obese group based on BMI, WHR, and BFP has higher HB levels than the normal group. The results of the study show no correlation between BMI and BFP on the haemoglobin level (p>0.05). The absence of correlation between BMI and haemoglobin levels is consistent with previous studies suggesting that obesity with BMI parameters did not show differences between the obese and the normal groups towards the HB levels, but the study was specific to anaemia in chronic disease" (Ausk and Ioannou, 2008). A study in Nigeria by Ugwuja et al. (2015) also showed similar results "in the absence of correlation between BMI and anaemia. However, there are studies showing that there is a negative correlation of BMI to anaemia in female students categorized in the overweight and obesity status" (Saxena et al., 2011). "The absence of a correlation between BFP and HB levels is similar to a study on adolescent subjects where anaemia was not correlated with BMI and BFP. However, in general, obesity remained correlated with low levels of HB" (Bagni et al., 2013).

Table 6 shows that WC and WHR are correlated with haemoglobin levels. WC (r=0.238, p=0.017) and WHR (r=0.483, p=0.000) correlated weakly to the haemoglobin level with positive correlation direction. "It canbe concluded that the larger the WC and WHR, the higher the HB level will be. The WC correlates weakly to the haemoglobin level with positive correlation. It can be concluded that the larger the WC, the higher the HB level. The results of this study do not match with the study on the females in India that concluded that the central obesity group based on the WC is more at risk of anaemia" (Hemamalini, 2013).

The results of this study show a difference in HB levels between the obese respondents and the normal respondents based on the WHR measurements. The hip waist circumference ratio (WHR) reflects abdominal obesity and is more often associated with cardiovascular risk. There are only few studies that discuss the WHR relationship to anaemia in detail. Several studies have reported that females with central obesity who are reflected by WHR have an increased risk of anaemia. This study shows that the WHR has a moderate positive correlation to HB levels. This means that the higher the WHR (the risk of abdominal obesity), the higher the HB levels are. Therefore, the results of the study are not in accordance with the studies that have been done previously (Qin et al., 2013; Gartner et al., 2013).

This study measures the correlation so that perhaps at a certain point, the high number of WC and / or WHR will reach a saturation point against the HB level considering

the weak correlation. Therefore, obesity subjects will not necessarily reduce the risk of anaemia. Table 3 also shows that the median of the obese group has lower HB levels than the normal group. This may mean that the higher the waist circumference and RLPP to the optimum limit, the higher the HB levels. Further studies to see the optimal value are needed. Sinha and Haldar's study (2015) suggests that "increased waist circumference and WHR are assumed to have a good nutritional intake so as to increase the HB levels. However, the cardiovascular risk should also be noted".

A study in China by Qin et al. (2013) concluded that "in China, females with obesity/overweight or central obesity are more likely to have anaemia than the female subjects with normal anthropometry. This especially increased in older patients. The results of the study on female students show a significant difference between the BMI, BFP, and WHR values in the anaemia group and non-anaemia group. Supporting data suggest that low physical activity of female students increases the risk of obesity and low oxygen absorption, thus lowering serum oxygen levels resulting in decreased haemoglobin levels" (Mohamed and Alhessain, 2012). "So far, the studies that have been done about the correlation of anaemia to obesity are actually anaemia with Fe levels measurement. Obesity which is an excess of nutrient and calorie intake will affect homeostasis in adipose tissue, liver, and iron homeostasis; obesity also reduces the absorption of Fe in the small intestine" (Zimmermaann et al., 2008; Aigner and Datz, 2014). "Anaemia is more affected by eating style, age, and gender. The economic status also affects the anaemia condition because the economic status will also affect nutrient intake" (Gartner et al., 2013). "Other factors that can affect anaemia are eating style, food type, and location of residence, education level, and economic status. This study was conducted in Cangkringan which is a plateau so it enables the risk of bias. People who live on a plateau have lower oxygen need than people who live in lowlands so that the HB levels may decrease according to the serum oxygen levels" (Ugwuja et al., 2015; Mohamed and Alhessain, 2012).

Summary and conclusions

Agriculture workers are main pillars of the country's economy and lower body weight decreases the productivity. Since the rural women belong to low socio-economic group in general, the reasons for prevalence of under nutrition could be due to the fact that women are over exhausted by the combination of reproductive demands and long term intake of lower amounts of food. Sixty four per cent of respondents were normal and 25.00 per cent of them were under weight and 15.83 per cent respondents were overweight. Estimates of waist/hip ratio provide a useful indication of nutritional status in undeveloped

countries, where population is often malnourished with little fat reserves, a change in this measurement reflects the total body stress. Increased WC and WHR will decrease the risk of anaemia if seen from HB levels, in which WHR correlation to HB levels is higher than the WC, and both have weak correlational strength. Further studies are needed to see the boundary of WC and WHR to HB levels, the influence of other factors on HB levels such as socioeconomic factors as well as eating style. Other parameters besides haemoglobin such as iron also need to be examined to predict the condition of anaemia. So it is need of the hour to provide the nutri foods to the rural women workers to increase their healthy lifestyle so can work for agriculture economic development.

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Tables:

Table 1. Mean Anthropometric measurements of the rural women

(n= 120)

Attributes	Women	
	Mean	**SD**
Height (cm)	153.8	4.9
Weight (kg)	46.8	5.0
BMI	22.49	10.19
Waist hip ratio	0.80	0.268

Table 2. Body mass index and waist hip ratio of rural women

(n=120)

Classification	Women	
	No.	**Per cent**
BMI		
Under weight (<18.5)	25	20.83
Normal (18.5 – 22.99)	76	63.33
Over weight (23 – 27)	19	15.83
Waist/hip ratio		
Normal (0.80)	100	83.33
Obese (>0.80)	20	16.67
Total	**200**	**100**

Table 3. Correlation Co-efficient of Independent variables on Anthropometric measurements

Independent variables	Correlation co-efficient (r)					
	Weight (kg)	**Height (cm)**	**BMI**	**Waist**	**Hip**	**Waist/hip ratio**
Age	0.01^{NS}	0.21*	0.01^{NS}	0.05^{NS}	0.01^{NS}	-0.01^{NS}
Family type	-0.03^{NS}	-0.03^{NS}	-0.11^{NS}	0.22*	0.22*	0.02^{NS}
Family size	0.02	-0.12^{NS}	-0.01^{NS}	0.31**	0.28**	0.05^{NS}
Education	0.02	0.23*	0.13^{NS}	0.12^{NS}	0.13^{NS}	0.11^{NS}
Land holding	0.20*	0.17^{NS}	0.18^{NS}	0.20*	0.21*	0.12^{NS}
Income	0.43*	0.40**	0.38**	0.39**	0.41**	0.36**

* Significant at 5%

** Significant at 1%

NS: Non significant

Table 4. Classifications of women by haemoglobin range

(n = 120)

Haemoglobin classification (WHO standard)	Respondents	Per cent	SD
Deficient (<10g/dl)	65	54.17	1.680
Low (10-11.9 g/dl)	26	20.00	1.560
Acceptable (>12 g/dl)	29	27.00	1.580
Total	**120**	**100.00**	

Table. 5 Differences in the Proportion of Haemoglobin levels to Anthropometric parameters

Sl. No	Anthropometric Parameters	Heamoglobin Level (mg/dL) Median (minimum-maximum)	p
1	**BMI**		
	<25 kg/m^2	14.60 (9.50-18.30)	0.153
	>_25 kg/m^2	15.50(10.80-18.70)	
2	**Waist Circumference**		
	Normal	15.10(9.50-18.70)	0.491
	Obese	14.60 (10.80-17.40)	
3	**RLPP**		
	Normal	14.35 (9.50-18.70)	0.002*
	Obese	15.75 (9.50-18.70)	
4.	**BFP**		
	Normal	14.90 (9.50-18.70)	0.847
	Obese	15.40 (12.70-17.40)	

Note: * statistically significant difference in proportion

Table. 6 Correlation between Anthropometric measurements and Haemoglobin level

Sl. No	Anthropometric Parameters	Heamoglobin Level	
		r	p
1	BMI	0.094	0.354
2	Waist Circumference	0.238	0.017*
3	RLPP	0.483	0.000*
4	BFP	-0.158	0.116

Note: * statistically significant correlation