Anaemia and body mass index (BMI) of fisherwomen inhabiting in Karang island of Loktak Lake, Manipur (India)

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Abstract

The paper examines the status of anaemia and body mass index (BMI) among fisherwomen of Karang Island Village, Manipur, India. Altogether 180 Meitei fisherwomen of age group 15 to 49 years were chosen for the study. Two anthropometric measurements viz., stature and body weight were taken on each subject. For estimation of haemoglobin level two standard methods namely, haemoglobin colour scale (HCS) and Sahli's haemoglobinometer were employed. About 70% of the fisherwomen of Karang village are in normal BMI category, while 16 % of them are underweight, 11 % overweight and 3 % obese. The prevalence of anaemia is notably high among the fisherwomen of this village with a frequency of 68.89%. Women with normal BMI and non-anaemic constitute 24.44%. The mean values of haemoglobin concentration measured by HCS and Sahli's method is 10.82gm/dl and 10.94gm/dl respectively. The two mean values were tested for t-test of significance and found statistically insignificant (t=0.852). The two adopted methods for haemoglobin estimation viz., HCS and Sahli's method are found reliable. The correlation value of BMI and haemoglobin level shows negative in association (r = –0.060) and the value is found insignificant (t=0.566). The insignificance of this relationship means there is no correlation.

Keywords: Haemoglobin level, body mass index (BMI), Sahli's method, haemoglobin colour scale (HCS) method

Introduction

Status of human health can be assessed by using various parameters such as biochemical, anthropometric measurements, etc. Haemoglobin concentration, body weight, stature and body mass index (BMI) are some of the most popularly use parameters for the evaluation of human health. Anaemia is a global public health problem affecting both developing and developed countries with major consequences for human health as well as social and economic development (WHO, 2002). Body mass index (BMI: weight in kg/ height in m^2) has been widely adopted for assessing obesity and chronic energy deficiency (CED) of an adult individual, or a population.

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The paper aims to investigate the status of anaemia and BMI among fisherwomen inhabiting in Karang Island of Loktak Lake, Manipur. It also intends to study the reliability of two haemoglobin estimation methods namely, haemoglobin colour scale (HCS) and Sahli's haemoglobinometer methods for diagnosing anaemia. The present study also examines the association between BMI and haemoglobin level of fisherwomen inhabiting in that small, isolated Island village.

Karang

Karang, a *Loi* (Scheduled Caste) village of Loktak lake, Manipur, is an irregular hillock island village, 55 kms away to the South of Imphal, the capital of Manipur. This village is under the jurisdiction of Bishnupur district of Manipur, and lies between 24032'40.55" and 24033'07.67" N latitude and 93049'46.59" and 93050'09.61" E longitude. The average elevation of the village is about 780 metres above mean sea level. *Karang* is being used as ethnonyme as well as toponyme as the two are connoted by the same term. Five of the main seven clans of the Meitei society are found in this village. There is no road connectivity to Karang village except by waterways through the nearby villages namely, Phoubakchao village in the East, Ningthoukhong village in the West, Liklai Karong (Hao Saban) village in the North, and Thanga village in the South. As the village is surrounded by Loktak Lake, boat/canoe is the only means of transportation and the villagers mainly depend on fishing and water resources for their livelihood. The nearest town to the village is Moirang that lies at a distance of 15 kms from the former. The village had a total population of 1447 persons in 1971 census, but the population decrease to 1022 heads in 1981. The population increases to 1322 in 1991 and further increase to 1673 souls (i.e. 815 males and 858 females) in 2001 (Statistical Abstract Manipur 2005 and 2007).

The Karang population simply denotes the Meiteis of Karang Island village of Loktak lake, Manipur. They show predominantly mongoloid features and speak *Manipuri* (*Meitei lon*), a language of Tibeto-Burman linguistic family. The villagers believed that they are the descendants of powerful and brave ancestors who worked as King's aid once upon a time. Due to political reason, they were forced to reside in this small island to keep away from the King's men. Later on, as they were disconnected for a long time with the mainstream society, they were outcasted and became to belong to *Lois* section. Although they belonged to *Lois* section, their culture and tradition vary from the *Lois* of *Sekmai, Phayeng, Khurkhul, Andro,* etc. The *Lois* of *Karang* follows almost a similar culture and tradition with the core Meitei. Some intellectuals opined that the Kings of those days exiled them in order to avoid disturbances in their administration. It is also believed that *Lois* of Loktak originated from the ones which the State exiled to the islands of Loktak as a punishment. They were chiefly engaged in fishing in the Loktak Lake, who did not perform *lallup* (military and other royal duties) but paid tribute to the King in the form of fish. This was probably because there was plenty of fish available as it was the staple food of the people. It is said that this section of *Loi* was known as the *Sel Loi.*

Material and methods

The study was conducted during April, 2012 at Karang Island village of Loktak lake, Manipur. The studied population comprises 180 fisherwomen, age ranges from 15 years to 49 years, residing in the study area. The blood haemoglobin concentrations of the subjects were assessed in the field using two standard methods namely, haemoglobin colour scale (HCS) and Sahli's haemoglobinometer. The measured haemoglobin concentrations were used to classify individuals as non-anaemic, or

mildly, moderately or severely anaemic. This classification was based upon the criteria developed by the WHO (2008). Two anthropometric measurements namely, stature and body weight were taken on each subject by standard techniques given by Weiner and Lourie (1969) and the corresponding BMI was calculated.

Results

Table 1 shows the body mass index of fisherwomen of Karang Island village, Manipur. About 70% of the fisherwomen of Karang village are in normal BMI category, while 16 % of them are underweight, 11 % overweight and 3 % obese.

Haemoglobin status of fisherwomen of Karang Island village is displayed in Table 2. It is indicative from the table that the majority of women (68.89%) of Karang village were suffering from anaemia. However, about 31% of women are in normal haemoglobin level. Woman with severe anaemia constitute only 1.11% while 13.89% of women are moderately anaemic and remaining 53.89% are mildly anaemic. The prevalence of anaemia among the fisherwomen of this village (68.89%) is significantly in severe public health problem as per WHO classification (WHO 2001).

Table 3 compares the body mass index (BMI) and haemoglobin status among fisherwomen of Karang village. Women with normal BMI and non-anaemic constitute 24.44%. Majority of women (34.44%) of the village are with normal BMI and mildly anaemic. Severely anaemic women are not encountered among both obese and overweight BMI categories. However, mildly or moderately anaemic overweight or obese women are not uncommon in the village.

Table 1: Body mass index (BMI) of fisherwomen of Karang Village, Manipur

BMI Category	BMI Range	%
Underweight	<18.50	16.11
Normal	18.50 - 24.99	70.00
Overweight	≥25.00	11.11
Obese	≥30.00	2.78
Total		100.00

Table 2: Haemoglobin status of fisherwomen of Karang Village

	Karang fisherwomen	
Haemoglobin status	Range	p.c.
Not anaemic	(≥12.0 g/dl)	31.11
Mild	(10.0 – 11.9 g/dl)	53.89
Moderate	(7.0 – 9.9 g/dl)	13.89
Severe	(<7.0 g/dl)	1.11
Total		100.00
Anaemia (%)		68.89

Table 3: Body mass index (BMI) and haemoglobin status of fisherwomen of Karang Village

Haemoglobin level	Underweight	Normal	Overweight	Obese	Total
Not anaemic	5	24.44	0.56	1.11	31.11
Mild	9.44	34.44	8.33	1.67	53.89
Moderate	1.11	10.56	2.22	-	13.89
Severe	0.56	0.56	-	-	1.11
Total	16.11	70.00	11.11	2.78	100

Table 4 shows the comparison of two methods of haemoglobin estimation namely, haemoglobin colour scale (HCS) and Sahli's haemoglobinometer methods. The average haemoglobin concentration of fisherwomen as per Sahli's method is 10.94 g/dl whereas the value is slightly less in haemoglobin colour scale method i.e. 10.82 g/dl. The two adopted methods for haemoglobin estimation are reliable and the average values of haemoglobin concentration of fisher women shows statistically not significant. The haemoglobin colour scale (HCS) method is found to be more comfortable and handy while testing and diagnosing for anaemia in that small isolated island village.

Table 4: Comparison of haemoglobin colour scale (HCS) and Sahli's haemoglobinometer methods

Haemoglobin estimation methods				
Sahli's	SE of mean	HCS	SE of mean	Value of *t*-test
10.94	0.100	10.82	0.109	0.852*

*insignificant

Table 5: Association between BMI and haemoglobin level among fisherwomen of Karang Village

Pearson correlation	Haemoglobin status x BMI	*t*-value to test significance of a correlation coefficient	*P* value
r	− 0.060*	0.566*	0.6>P>0.5

*insignificant

Pearson's correlation coefficient were calculated by using statistical package SPSS 16.0 software to check the association between body mass index (BMI) and haemoglobin level among the fisher women of Karang village (Table 5). The correlation value (r = –0.060) of BMI and haemoglobin level shows negative in association. Further, the correlation value was tested for t-test of significance and found insignificant (t = 0.566). The insignificance of this relationship means there is no correlation.

Discussion

The mean BMI for women age 15-49 in Karang village is 21.6. This index excludes women who were pregnant at the time of the survey and women who gave birth during the two months preceding the survey. A cut-off point of 18.5 is used to define underweight or acute under-nutrition and a BMI of 25 or above indicates overweight or obesity. About 15% of women have a BMI below 18.5, indicating prevalence of nutritional deficiency. It is also well documented that mortality risk increases with the increase in BMI values (Garrow, 1981, 1988; Garrow and Webster, 1985; WHO, 1990), besides its positive relationship with economic conditions (Bharati, 1989; Naidu and Rao, 1994; Sichieri et al., 1994; Cornu et al., 1995; Nube et al., 1998; Reddy, 1998). About 11.1% women of Karang village are overweight and 2.8% obese. This is a growing phenomenon in Manipur as well as India.

As per the reports of NFHS 3, (2004-06) the average BMI of Indian women is 20.5 kg/m². With regards to North-eastern states, the mean BMI of women ranges from 19.9 of Tripura to 22.1 of Sikkim, through Assam (20.0), Nagaland (20.8), Meghalaya (21.0), Arunachal Pradesh (21.1), Mizoram (21.2) and Manipur (21.5). The greatest frequency of normal BMI is found among the women of Meghalaya with a percentage of 80.1%, which is followed by Nagaland (76.2%), Mizoram (75%), Arunachal Pradesh (74.8%), Sikkim (73.5%), Manipur (72%), Tripura (55.9%), and

Assam (55.7%). The frequency of underweight (thin) women is found to be greatest in Tripura (36.9%) and Assam (36.5%). The percentage frequencies of underweight BMI of the remaining six states of the region is 11.2 % for Sikkim, 14.4% for Mizoram, Meghalaya (14.6%), Manipur (14.8%), Arunachal Pradesh (16.4%), and Nagaland (17.4%). The present Karang population shows agreement with the earlier findings of Manipur state in respect of BMI (Table 6).

About 31% of Karang fisherwomen are found to be in normal haemoglobin concentration while the majority (68.9%) of the women are mildly (53.9%), moderately (13.9%) and severely (1.1%) anaemic (Table 7). As per the reports of National Family Health Survey India, NFHS-3 (2005-2006), the prevalence of anaemia among women in Manipur is 35.7%. However, the prevalence of anaemia shows comparatively high in other neighbouring states namely, Assam (69.5%), Tripura (65.1%), Sikkim (60%), Arunachal Pradesh (50.6%), Meghalaya (47.2%), and Mizoram (38.6%).

Table 6: Comparison of specific BMI levels of North-eastern states and Karang women

National/ N.E. States	Body mass index (BMI) in kg/m²					Reference
	Mean BMI	Normal (%)	Thin (%)	Overweight (%)	Obese (%)	
India	20.5	51.8	35.6	9.8	2.8	NFHS-3, 2005–2006
Arunachal Pradesh	21.1	74.8	16.4	7.7	1.1	
Assam	20.0	55.7	36.5	6.9	0.9	
Manipur	21.5	72.0	14.8	11.4	1.9	
Meghalaya	21.0	80.1	14.6	4.5	0.8	
Mizoram	21.2	75.0	14.4	9.4	1.2	
Nagaland	20.8	76.2	17.4	5.7	0.7	
Sikkim	22.1	73.5	11.2	12.4	3.0	
Tripura	19.9	55.9	36.9	6.4	0.7	
Karang	**21.6**	**70.0**	**16.1**	**11.1**	**2.8**	**Present 2012**

Table 7: Percentage of women suffering from anaemia of North-eastern states along with Karang women

National/N.E. states	Mild Anaemia (%)	Moderate Anaemia (%)	Severe Anaemia (%)	Any Anaemia (%)	Reference
India	38.6	15.0	1.8	55.3	NFHS-3, 2005–2006
Arunachal Pradesh	36.6	12.5	1.6	50.6	
Assam	44.8	21.2	3.4	69.5	
Manipur	30.1	5.1	0.5	35.7	
Meghalaya	32.8	12.6	1.8	47.2	
Mizoram	29.1	8.8	0.7	38.6	
Nagaland	NA	NA	NA	NA	
Sikkim	42.1	16.2	1.7	60.0	
Tripura	49.0	14.8	1.3	65.1	
Karang	**53.9**	**13.9**	**1.1**	**68.9**	**Present 2012**

It is pertinent to mention here that majority of people of Karang village depend on fishing for their livelihood. They purchased their day-today items such as rice, vegetables, edible oil, etc. by selling fishes they caught by using different types of nets and traps. The main causes of anaemia (68.9%) among the fisherwomen of the village may be attributed to nutritional deficiencies, extra-corporal blood loss, haemoglobin-pathy, and inflammation as these are the causes of anaemia in the developing

countries. However, a thorough assessment of the dietary patterns, abnormal haemoglobin types, etc of the people is required to understand the causes of high prevalence of anaemia among them.

Eftekhari et al. (2009) observed increased prevalence of anaemia among overweight adolescent Iranian girls. Bagni et al. (2012) also found similar results of overweight girls showing significantly lower haemoglobin concentrations in comparison with those who were not overweight. The reason for the association between increase in BMI and decrease in haemoglobin level would be the increase of inflammatory activity in the adipose tissue of obese individuals, which would lead to a higher production of hepcidin, a key hormone for the regulation of intestinal absorption and iron homeostasis (Fleming 2008; Ganz and Nemeth, 2006; Mena et al., 2008). The present study examines the association between body mass index (BMI) and haemoglobin concentration among the fisherwomen of Karang village. The correlation value of BMI and haemoglobin level shows negative in association ($r = -0.060$) which means the level of haemoglobin concentration decreases with the increase of BMI. However, the correlation value is further tested for t-test of significance and found insignificant ($t = 0.566$). The insignificance of this relationship means there is no correlation.

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