

A Study on Relationship of Body Mass Index (BMI) with Recurrent Aphthous Ulcer

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ABSTRACT

Background: Obesity has emerged as a major problem in India due to negative lifestyle choices. BMI used as tool of Nutritional assessment. The importance of BMI and Oral health conditions were analysed to determine if any strong correlations existed with oral lesions like RAU, Angular Cheilitis and Bald Tongue.

Aims & Objectives: To evaluate relationship between Body Mass Index (BMI) and oral lesions in Gujarat, India.

Materials & Methods: Total 936 patients were selected and their BMI (Body Mass Index) were calculated in Kg/m² units and their oral cavity examined for lesions like Angular Cheilitis, Recurrent Aphthous Ulcer, Bald Tongue. Patients were divided in different groups according to their age, education level, life-style, socioeconomic status and living area.

Results: The range of the patients was 17- 83 years, 41% were females and 59% were males. In the series 12% had RAU, 24% showed bald tongue and 14% exhibited Angular Cheilitis. Life style, Educational level and socioeconomic status, resident area did not significantly affect the BMI. The RAU was seen at highest frequency in the younger age range and individual with habit had significantly less level of RAU. Bald tongue was seen more in females and in middle aged patients. Angular Cheilitis was seen more in elderly males and people with habit.

Conclusion: BMI is an easily measured nutritional index, however for Nutrition measure need to utilize other indices like Skin Fold Test, MUAC(Mid Upper Arm Circumference) and ratio of waist circumference to height to do a more complete and efficient analysis.

Keywords: Angular Cheilitis, Bald Tongue, BMI, Nutritional Assessment, Oral Lesions, RAU, Recurrent Aphthous Ulcer.

INTRODUCTION

The Body Mass Index (BMI) has always been considered a simple method for analysis of the nutritional status. It gives the value that better correlates with body fat.^[1] Body Mass Index (BMI) also known as the Quetlet Index is a simple index of weight-for-height that is commonly used to classify

underweight, overweight and obesity in adults. It is defined as the weight in kilograms divided by the square of the height in meters ($BMI = Kg/m^2$) BMI provided a simple numeric measure of a person's "fatness" or "thinness", allowing health professionals to discuss over- and under-weight

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problems more objectively with their patients. It is meant to be used as a simple means of classifying sedentary (physically inactive) individuals with an average body composition.^[2]

A frequent use of the BMI is to assess how much an individual's body weight departs from what is normal or desirable for a person of his or her height. The weight excess or deficiency may, in part, be accounted for by body fat (adipose tissue) although other factors such as muscularity also affect BMI significantly. The WHO regards a BMI of less than 18.5 as underweight and may indicate malnutrition, an eating disorder, or other health problems, while a BMI greater than 25 is considered overweight and above 30 is considered obese. These ranges of BMI values are valid only as statistical categories. **[Table 1]**

Nutrition (Nourishment) is the provision to cells and organisms of the materials necessary (in the form of food) to support life. Many common health problems can be prevented or alleviated with a healthy diet. Malnutrition refers to insufficient, excessive, or imbalanced consumption of nutrients by an organism. Malnutrition can be classified as either primary or secondary. Primary malnutrition is caused by inadequate calorie and nutrient intake.^[3] Secondary malnutrition can be caused by reduced intake of food, malabsorption, impaired nutrient utilization and nutrient losses associated with chronic infection etc. In both primary and secondary malnutrition, understanding of the relevant genetic mechanisms can be helpful in approaching the clinical manifestations.^[4]

The prevalence of obesity has been increasing dramatically in developed countries.^[5] Overweight or obese children have been shown to have lower levels of vitamin B12, an increased prevalence of iron deficiency anemia.^[6,7] The most common nutritional deficiency is iron deficiency anemia. It may manifest as atrophic glossitis, mucosal pallor and angular cheilitis. Atrophic glossitis "flattening of the tongue papillae" resulting in a smooth and erythematous tongue may mimic migratory glossitis.^[8] Angular cheilitis or perleche is an inflammatory reaction at the corner of mouth which is usually begins at the mucocutaneous junction and extends into skin. It is characterized by diffuse redness, a fissured, eroded, ulcerated or encrusted surface and is accompanied by subjective symptoms

of soreness, tenderness, burning or pain.^[9] Recurrent aphthous stomatitis (RAS), commonly referred to as canker sores, is recurrent, self-limiting ulcers that mainly affect nonkeratinized oral mucosa. A prodromal burning sensation with a small, shallow, painful, well-circumscribed and round-shaped ulceration that is covered by a yellow-grayish pseudomembrane and surrounded by an erythematous halo which heals without scarring after 10 to 14 days.^[10-14]

BMI has been accepted as an index for measuring nutritional status in patients.^[15] In India, very few studies have been done associating the oral lesions like bald tongue, RAU and angular cheilitis with BMI.

MATERIALS AND METHOD

A cross sectional study done and total 936 patients were included out of 1003 examined. Patients were divided in 3 groups according to their age in 17-34, 35-50 and 51-67 years. Their BMI (Body Mass Index) were calculated in Kg/m² units and their oral cavity was examined for lesions like Angular Cheilitis, Bald Tongue, Recurrent Aphthous Ulcer.

The inventory measured the Urban, Rural distribution; Male, Female distribution; Level of Education; Level of Socioeconomic status as Sociological stratification parameters.

We divided Level of Education into four categories i.e. (1) <10 standard, (2) 10-12 standard, (3) Graduate, (4) Professional and compared average BMI between these groups to know impact of education level on nutritional status. Socioeconomic status was grouped into four types i.e. (1) Indigent, (2) Labour, (3) Middleclass, (4) Rich and tried to know whether SE status can make difference in BMI or nutrition status.

We also considered type of work done by individual and divided into two groups; Sedentary and Physical because it is believed that sedentary lifestyle make people overweight or obese but individuals who do physical work, their BMI also can be above average. So to check whether BMI alone can be good indicator for this or not, we noted their daily lifestyle and activities.

The three lesions specifically analysed were RAU, Angular Cheilitis and Bald Tongue. Occurrence of

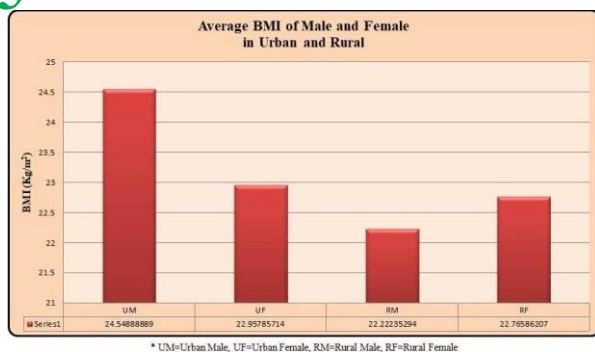


Figure 1: Mean BMI of male & female in urban & rural.

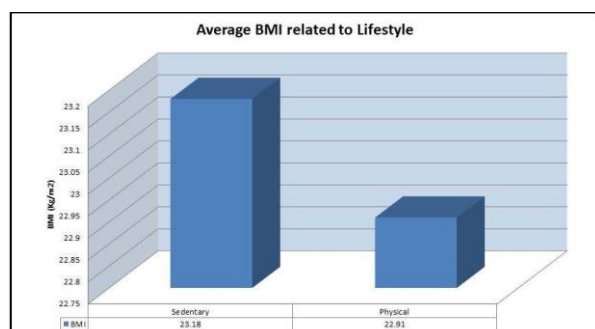


Figure 2: Average BMI according to work type

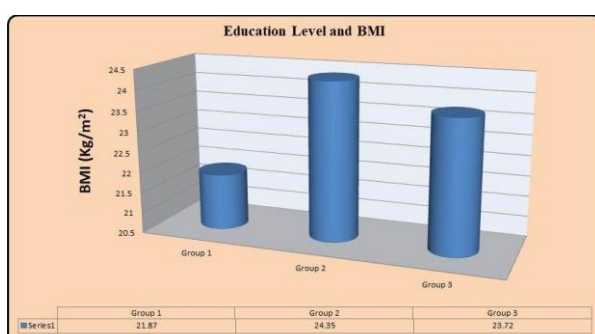


Figure 3: Average BMI according to education level

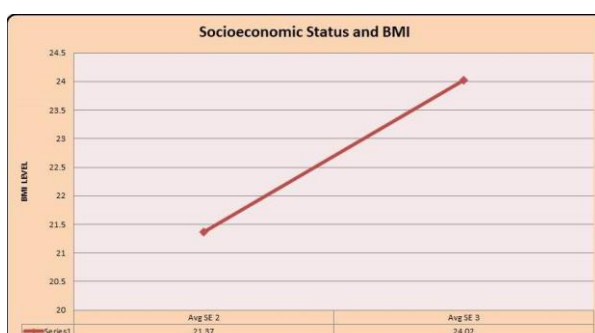


Figure 4: Average BMI according to socioeconomic status

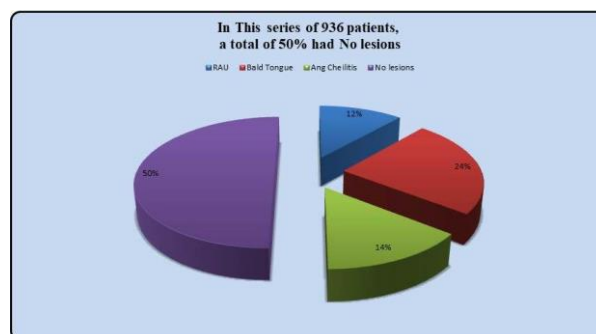


Figure 5: Total percentage of patients with different oral lesions

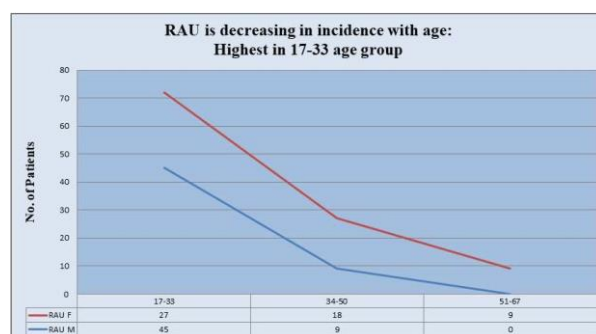


Figure 6: Incidence of RAU in different age groups

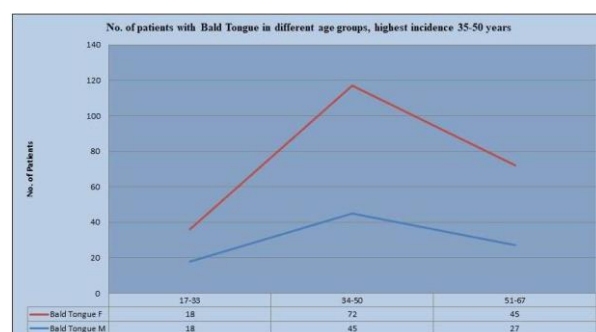


Figure 7: Incidence of bald tongue in different age groups

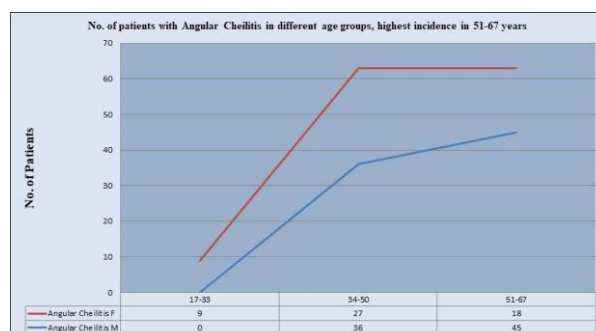


Figure 8: Incidence of angular cheilitis in different age groups.

Table 1: Classification of BMI category.

Classification	BMI(kg/m ²)	
	Principal cut-off points	Additional cut-off points
Underweight	<18.50	<18.50
Severe thinness	<16.00	<16.00
Moderate thinness	16.00 - 16.99	16.00 - 16.99
Mild thinness	17.00 - 18.49	17.00 - 18.49
Normal range	18.50 - 24.99	18.50 - 22.99
		23.00 - 24.99
Overweight	≥25.00	≥25.00
Pre-obese	25.00 - 29.99	25.00 - 27.49
		27.50 - 29.99
Obese	≥30.00	≥30.00
Obese class I	30.00 - 34.99	30.00 - 32.49
		32.50 - 34.99
Obese class II	35.00 - 39.99	35.00 - 37.49
		37.50 - 39.99
Obese class III	≥40.00	≥40.00

Source: Adapted from WHO, 1995, WHO, 2000 and WHO 2004.

Table 2: Total Number of Male and Female according to their BMI category.

	Male	Female
Underweight	54	63
Normal	306	234
Overweight	162	72
Obese	27	18

Table 3: No. of patients with RAU, AC and Bald Tongue in different age groups.

	RAU		Angular Cheilitis		Bald Tongue	
	M	F	M	F	M	F
Age Group						
17-33	45	27	00	09	18	18
34-50	09	18	36	27	45	72
51-67	00	09	45	18	27	45
TOTAL	54	54	81	54	90	135

Table 4: Correlation of BMI with habit and without habit in RAU.

RAU	Mean BMI	No. of Patients	SD	POSD %	T Value
With Habit	22.60	36	3.77	59.58	0.865
Without habit	20.94	72	2.82		

*SD-Standard Deviation

Table 5: Incidence of Bald Tongue in patients with habit.

Sr. No.	Category	With Habit %	No. of patients	POSD %	Z Value
1	Non bald tongue	46%	37	80	1.281
2	Bald tongue	64%	17		

Table 6: High POSD between bald tongue and Non-bald tongue group and their Haemoglobin Level.

Group	No. of Respondent	BMI correlation Level	POSD %	Z value
Hb-Bald Tongue	225	52.47	100%	4.746
Hb-No Bald Tongue	711	34.79		

Table 7: Individuals with habit had higher incidence of AC.

Sr. No.	Category	With Habit %	No. of patients	POSD %	Z Value
1	AC	60	81	96.06	2.060
2	No AC	48	378		

Recurrent Aphthous Ulcer (RAU) was noted by its periodicity, frequency and duration. Also presence of Angular Cheilitis and Bald tongue were noted. Angular Cheilitis at both corner of mouth whether unilateral or bilateral occurrence and its severity both were noted. Complete or partial baldness of

tongue noted down by mild, moderate and severe scored according to involvement.

Patients who had minimum 3 previous outbreaks of RAU were included in study and any other ulcers except RAU were excluded from study. Angular Cheilitis due to loss of teeth or in denture wearer was not considered in this study. For bald tongue, baldness due to any physical or chemical injury to tongue was not included in study. Habits like tobacco or betel nut chewing or smoking was noted and its habit index (frequency per day X duration in years) and whether there was any impact of habit on prevalence of these lesions were noted.

We divided patients into three age groups: (1) 17 – 34, (2) 35 – 50 (3) 51 – 67 years. We noted highest incidence of which lesion seen in which age groups and also its distribution between Male and Female. We also checked haemoglobin level of each patient and correlated it with associated lesion in individual if present, and also mean haemoglobin and BMI difference between with habit and without habit group were calculated.

Statistical Analysis:

After collection data were tabulated for statistical analysis. Microsoft® EXCEL 2007 and Decision Analyst STATS™ 2.0. were used for mean, median and standard deviation and z exact test and correlation was applied. For all tests, P value <0.05 (5%) was considered statistically significant.

RESULT

Total of 936 patients of age from 17 to 83 years were evaluated, 549(59%) Male and 387(41%) Female. Out of these, 117 (54 Males, 63 Females) were underweight, 540 (306 Males, 234 Females) were in Normal group, 234 (162 Males, 72 Females) were Overweight and 45 (27 Males, 18 Females) were obese.[Table 2] Average Male BMI was 23.3 Kg/m² and Female BMI was 22.0 Kg/m². Mean BMI of Urban Male was 24.55 Kg/m² which was more than Urban Female mean BMI which was 22.96 Kg/m². On rural side, Mean BMI of Male 22.22 Kg/m² appeared to be lower than mean BMI of Female i.e. 22.77 Kg/m². [Figure 1]

Regarding Lifestyle, Average BMI of individuals who had sedentary work (23.18 Kg/m²) was higher than those who did Physical work (22.91 Kg/m²). [Figure

2] According to Education Level, average BMI was highest in 10-12th standards group i.e. 24.35Kg/m². [Figure 3] Regarding SE Status, most of patients are in labour and middleclass amongst which average BMI of middleclass was highest (24.35 Kg/m²) amongst all groups. [Figure 4]

Total 12% had RAU, 24% had Bald Tongue and 14% had Angular Cheilitis and 50% patients had no lesions. [Figure 5, Table 3] Male and Female distribution of RAU was equal. RAU was seen to be decreasing in incidence for descending age groups. [Figure 6] There was a Probability of Significant Difference between with habit and without habit individuals at Moderate Level. [Table 4] Bald Tongue was seen more in Female (60%) compared to Male (40%), highest incidence was seen in 35-50 years age group [Figure 7] and more in patients with habit compared to without habit group. [Table 5] Even correlation between haemoglobin level with BMI in Bald tongue and Non-bald tongue patients shows very high probability of significant difference of 100%. [Table 6] Angular Cheilitis was seen more in Male (60%) than the Female (40%) and highest incidence was seen in 51-67 years age group [Figure 8] and more in those who had habit than without habit. [Table 7]

DISCUSSION

Barker M et al did seminal work in 6 villages of Pune district in India and determined that the average BMI of Females was significantly lower than average BMI of Males and the BMI increased gradually as level of education increased.^[16] This was consistent with our findings in which BMI varies from 21.5 to 24.4 Kg/m² and gradually drops to 23.5 Kg/m² in highly educated persons. Maddah M et al found in their study on Iranian Men and Women and reported that after controlling for age and smoking, women with a higher level of education showed a significantly lower mean BMI than less educated women, while more educated men had a higher mean BMI than less educated men.^[17] In our study, we found that mean BMI of female and Male was in same range and BMI was increased as level of education increased.

Our study showed similar result with the study of Abdul-Rahim HF et al who found that mean BMI and prevalence of obesity was higher in Urban male and

female compared to Rural male and female in rural and an urban Palestinian West Bank population.^[18]

The work of Panjikaran ST et al from rural area of Kerala, India indicated that low BMI was correlated with chronic energy deficiency grade III and stated that alarming status of malnutrition as reflected by low levels of Haemoglobin percentage was seen in 88.7% of rural adolescent girls.^[19] In our study, the Bald Tongue was seen in 18 females (66%) in the adolescent group. Highest was seen in middle age group of female. This might be explained since many of these females had past medical history of multiple pregnancies and on oral history and high level of fasting for religious or other reasons. This point was not a part of our inventory but similar studies on other parts of rural India had stressed on this factor.

Result of our study is consistent with the study of Bohmer & Mowe in which there was definitive relationship between Atrophic tongue & BMI and Triceps skin fold test.^[20] However, we used only BMI as a nutritional indicator but we also got a definitive relationship. So tongue lesions and its symptoms are important indicators of nutritional compromise.

Gallo CB et al found in their study that Psychological stress may play important role in manifestation of RAU.^[21] We also noted that those who had more stressed life had more incidences of RAU and amongst them who had any habits like tobacco chewing or smoking etc. had comparatively lower incidence of RAU. Socioeconomic factor has very important role on nutritional impact. Our findings was similar to study of Warraich HJ et al who found that socioeconomic status is important factor related to BMI since obesity and overweight increase with SE Status.^[22]

Ogura M et al found in their study that average BMI of patients having RAU and control group was almost same.^[23] We also found that average BMI of patients having RAU or other soft tissue lesion was almost similar so it can be said that even though BMI is an indicator of nutrition, but deficiencies of vitamins like B-complex and C and also iron and calcium is important in development of any mucosal lesion of oral cavity. Field EA et al also found that glossitis, stomatitis and mucosal ulceration are oral manifestation of vitamin B₁₂ deficiency.^[24] Also

Blanck HM and colleague found that angular stomatitis was associated with riboflavin deficiency in their patients.^[25] In both studies, they measured BMI of all patients but did not correlate it but we correlated it and found that average BMI of patients who had RAU and patients had no lesion were similar. So these lesions reflected as deficiency of certain factors like vitamin B₁₂.

Koh ET et al also found in their study that angular cheilitis was associated with riboflavin deficiency and was seen in more in males than females and more in younger group than the older.^[26] Our study had similar result with this study and we also found that male had higher incidence of angular stomatitis than the female and highest prevalence was seen in middle age group between 35 to 50 years.

Rivera-Hidalgo F et al did study in adult US population and found that point prevalence of RAU was higher in cigarette non-smokers, males and individuals between 17-39 years of age.^[27] We also found in our study that those who did not have any habit had more prevalence of RAU than the those who had habits but we found that male and female had equal incidence and maximum in individuals between 17-33 age group.

CONCLUSION

Since early 18th century, Quetelet developed the idea of Body Mass Index (BMI) as an index to understand the body composition as reflected by nourishment. The oral physicians are regularly measuring BMI in the clinics in the pious hope that measurement will lead to accurate nutritional assessment. However, we have seen in this study that many patients with low or low normal BMI apparently have healthy constitution and those with high BMI are obese and suffering from Diabetes Mellitus &/or Hypertension. So BMI appears to be a nutritional indicator which has lost value as a predictor of good health. It is suggested that Waist Circumference to Height ratio is more sensitive and it needs to be complemented with Skin fold test, MUAC (Mid Upper Arm Circumference) & Bone densitometric studies to evaluate nutrition holistically.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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