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Variations in Biochemical Parameters among Adults Based on BMI

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Abstract: ***Biochemical parameters and nutritional status are intricately related. The present study proves the relationship between biochemical parameters and nutritional status among adults. The study was conducted in the urban and coastal areas of Ernakulam district of Kerala. A total of 236 adults constituting 116 in the coastal and 120 in the urban area were selected for the biochemical assessment. Blood samples were collected and biochemical profiles, fasting blood glucose, lipid profile and blood pressure were assessed. Slightly higher number of adults from the coastal area had moderately high cholesterol values than urban adults.***

Keywords: fast blood glucose, lipid profile, blood pressure, nutritional status, biochemical profile

I. INTRODUCTION

Optimum nutrition is the level of intake that should promote the highest level of health. Although excess caloric intake will lead to obesity, a deficit in nutrition may result in a tissue depletion of essential nutrients that can lead to biochemical changes and eventually to clinical signs and symptoms. Nutrition requirements may differ according to sex, age, activity, or physiological state and can be influenced by drugs, smoking, alcohol, and other factors. With ever-increasing sedentary life styles and less physically demanding jobs, the resulting reduced caloric requirements have made it more difficult to make nutritionally sound food choices. Nutrition is the single most important component of preventive health care. Diet has been associated with cancer, heart disease, diabetes, stroke and hypertension, arteriosclerosis, and cirrhosis of the liver. The ability of the human to respond to stresses, such as altitude, heat, trauma, surgery, and infection can be influenced by nutritional status. Nutritional status is reflected in a variety of metabolic processes that provide the basis for a number of methods for its assessment [1].

The biochemical evaluation of nutritional status includes quantitative determinations of nutrients or related metabolites usually in blood and urine. Low blood levels of a nutrient may reflect a low dietary intake, defective absorption, increased utilization, destruction or excretion.

Biochemical data either helps to confirm findings of clinical observations and dietary studies or to identify sub-clinical deficiencies before clinical symptoms are evident [2]. For some nutrients they can be used to assess the range from frank deficiency levels through adequate, optimal and excessive levels of nutritive intake.

For each kg of weight gain, it has been calculated that the risk for diabetes increases by about 4.5 per cent [3]. In men, BMI was positively correlated with triglyceride and negatively correlated with HDL-cholesterol. Correlations between anthropometric parameters and lipid levels or blood pressure have varied in different studies. Flodmark *et al* (1994) found that BMI was significantly correlated with serum triglycerides and diastolic blood pressure.

According to Wurmser *et al* (1998), normal cholesterol values are frequently seen with obesity, though a shift in the HDL and LDL concentrations to low HDL and high LDL can be seen. PROCAM study examined the relationship between weight and cardiovascular risk factors such as hypertension, hypercholesterolemia, hypertriglyceridemia, blood glucose and HDL cholesterol in 17,434 men. A significant increase in the appearance of all risk factors is found with weight gain. Total Body Fat (TBF) may affect serum lipid concentrations, but the contribution of TBF is evident only when the TBF is extremely increased (>37% in males or >56% in females).

II. MATERIAL AND METHODS

A. Selection of Area

Ernakulam district of Kerala State was selected as the locale for the study. In the absence of typical rural areas, the present study was conducted in the two major social demarcative areas of Ernakulam district - the urban (Kadavanthara, Edapally and Panampilly Nagar) and coastal (Vypin to Njarakkal) areas.

B. Selection of Sample

A total of 236 adults constituting 116 in the coastal and 120 in the urban area, comprising of 56 males (20 normal, 20 overweight and 16 obese) and 60 females (20 each of normal, overweight and obese) in coastal area were selected for the biochemical assessment. The subjects were selected based on their willingness to participate and co-operate in this invasive technique.

C. Methods for Biochemical Assessment

The subjects were selected based on their willingness to participate and co-operate in this invasive technique. Fasting blood glucose, lipid profile consisting of total cholesterol, triglycerides, HDL-cholesterol, LDL cholesterol and VLDL cholesterol were assessed.

1) *Blood Sample Collection:* Totally 5ml of blood was collected in fluoride tube (1ml) and serum plain tube (4ml). The supernatant was separated by using the centrifuge at 3000 rpm for 10 minutes and the supernatant was transferred into vial tubes and stored at -200C until analysis. The vial tubes were screw capped tightly The methods used for assessing the biochemical profile are given below.
2) *Fasting blood glucose:* The American Diabetes Association (ADA) uses fasting blood glucose level for screening, because it is faster, more acceptable to patients and less expensive than other screening tests. The fasting plasma glucose level is also more reproducible than the oral Glucose Tolerance Test (GTT) and varies less between patients [6]. Fasting blood glucose was measured by GOD-PAP method.
3) *Lipid Profile:* Lipid profile namely Total Cholesterol, Low Density Lipoprotein (LDL), High Density Lipoprotein (HDL), Very Low Density Lipoprotein (VLDL) and Triglyceride were measured by GPO - POD method.
4) *Blood Pressure:* Blood pressure of the subjects was determined using the sphygmomanometer. Variations in the above biochemical indices with BMI, gender, age, area and religion among the selected subjects were noted.

III. RESULTS AND DISCUSSION

A. Mean Biochemical Profile of the Subjects

The mean biochemical profiles of the subjects area and gender wise is presented in Figure 1 (a), 1(b)

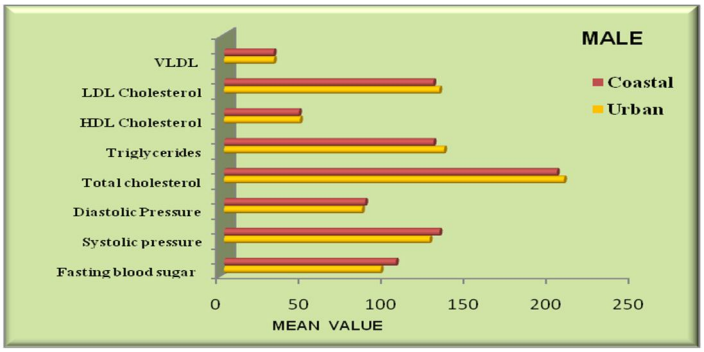

Fig. 1(a)

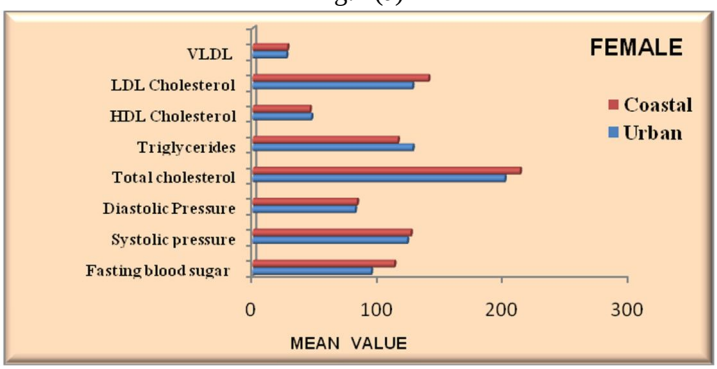

Fig. 1(b)

Biochemical profile of the adults indicated that unlike as expected, subjects in the coastal area showed higher mean values than their urban counter parts for majority of the parameters. Mean fasting blood glucose, HDL cholesterol, TC/HDL and LDL/HDL ratios were found to be higher among women particularly in the coastal area. Mean systolic and diastolic pressure were higher among males generally and particularly coastal males. Mean total cholesterol values were higher among urban males (201.5±25.6 and 205.8±33 coastal and urban males) and coastal females (213±37.4 and 200.7±28 coastal and urban females) with coastal females showing the highest mean. Mean of serum triglycerides, LDL cholesterol were higher among urban males whereas mean VLDL was similar among males in both areas, but higher among coastal females.

According to Misra (2008), one in every three Indians has high triglyceride (bad cholesterol) levels and 30-70 per cent has low levels of HDL (good cholesterol). One in every three Indians has high blood pressure, which is expected to shoot by 60 per cent in the next 20 years. Important risk factors associated with the increase in obesity were lack of physical activity and increased upper body obesity.

According to NNMB survey, (2005- 2006), among men, the mean systolic blood pressure was 126mm and diastolic 79mm of Hg. In case of women, it was 125mm and 78mm of Hg respectively. The mean blood pressure levels tended to increase with age from 20 years in both men and women. Systematic analysis of health examination surveys and epidemiological studies with 786 country-years and 5·4 million participants to study National, regional, and global trends in systolic blood pressure since 1980, revealed that men had higher blood pressure than women in most world regions[8].

B. Area wise Comparison of Biochemical Profile

Comparison of the two areas revealed that excepting for triglycerides, HDL cholesterol and VLDL cholesterol, means of all other parameters were found to be higher among coastal adults (namely fasting blood glucose, total cholesterol, LDL cholesterol, TC/HDL and LDL/HDL, systolic and diastolic pressure). Mean of triglycerides and HDL cholesterol was found to be higher among urban adults (121±38.6 and 130.3±32.8 triglycerides and 45.4±6.6 and 46.3±6.6 HDL cholesterol among coastal and urban subjects respectively). Mean VLDL cholesterol was found to be the same among subjects in both areas.

C. Gender wise Comparison of Biochemical Profile

The mean fasting blood glucose, total cholesterol, HDL and LDL cholesterol were higher among females while systolic and diastolic pressure, triglycerides and VLDL were comparatively higher among males. Ratios of TC/HDL and LDL/HDL were more or less the same among males and females. The differences in the means were statistically significant only for VLDL at five per cent.

D. Classification of Subjects as per Biochemical Standards

Selected subjects were classified on the basis of cut offs for the various biochemical parameters to determine the number of subjects who fall within the normal category as against those with abnormal level.

TABLE I

Parameters	**Standards (mg/dl)**	**Area**		**Total (N=236)**	**X2**
Fasting blood sugar	<109	71	102	173	23.42 (p<0.01)
	110-126	23	16	39	
	>126.1	22	2	24	
Serum cholestrol	<200 (normal)	1	4	5	
	200-239 (moderately high)	51	47	98	2.08 (p=0.35)
	>239 (high)	64	69	133	
Serum triglycerides	<150(Normal)	94	92	186	

	150-199(borderline)	19	25	44	0.77 (p=0.68)
	200-499 (High)	3	3	6	
HDL Cholesterol	<40 (Poor)	19	17	36	
	40-60 (Moderate)	96	99	195	1.89 (p=0.39)
	>60 (Good)	1	4	5	
LDL Cholesterol	<100(Optimal	14	20	34	
	100-129 Near Optimal	41	41	82	
	Borderline 130-159	39	37	76	6.69 (p=0.15)
	High160-169	17	22	39	
	Very High>190	5	0	5	
VLDL Cholesterol	Normal <40	108	108	216	0.73 (p=0.39)
	High>40	8	12	20	
LDL/HDL	Normal 3-5	85	94	179	0.82 (p=0.36)
	High >5	31	26	57	
TC/HDL	Normal 3-5	79	84	163	
	High >5	37	36	73	0.1 (p=0.75)

It was generally seen that for all biochemical parameters except for fasting blood glucose, there was no significant difference in the number of subjects in the normal and abnormal category for the various parameters. In case of fasting blood sugar, there was a higher percent of subjects from the coastal area with above normal values while higher number of urban adults than coastal fell into the normal category. A slightly higher number of adults from the coastal area had moderately high cholesterol values than urban adults while for high cholesterol value urbanities were a slightly higher number.

According to Soman (2004), while about eight percent of adults are diabetic in Kerala, the proportion in Kerala ranges from six percent in rural areas to nearly 20 per cent in the cities. The only exception for high prevalence of diabetes is the coastal sea-going fisher folk among whom the prevalence is as low as three percent.

Several community based surveys revealed that hypertension is rapidly emerging as a major public health problem even in developing countries.

A study carried out during 2005 in different parts of India revealed that the prevalence of hypertension increased by about 30 times among urban communities and 10 times among rural inhabitants during the past four decades [10].

NNMB rural survey, 2005-2006 revealed that the risk of having hypertension was 2 to 4 times higher among those having higher WC, WHR and BMI among both men and women.

Further, the risk of having DM was 7 times higher among those having higher WC, 2-4 times higher among those having higher WHR and 3-4 times higher among those with BMI≥25.

About 25per cent of men and 24per cent of women had hypertension (≥140mm of Hg SBP and/or ≥ 90 mm of Hg DBP). The prevalence of hypertension was maximum in the state of Kerala (men: 50.9%; women: 46.8%). According to Pandey (2008), one in every three Indians has high levels of triglycerides (a form of bad cholesterol) and 30-70 per cent has low levels of HDL (good cholesterol). One in three urban Indians have high blood pressure. It is predicted to increase by 60 per cent in next 20 years.

For serum triglycerides and HDL cholesterol, the proportion of subjects in each category were found to be almost the same, with a slightly higher number in the urban area having a higher range of HDL cholesterol (good cholesterol). This is surprising as the coastal adults- the regular fish eaters are expected to show cardio protective factors such as lower serum triglyceride and total

cholesterol values. This may be attributed to the trend of a gradually increasing sedentary activity pattern, increased consumption of rice, fats and oils leading to a positive energy balance which would nullify the beneficial effects of fish. A larger proportion of subjects in urban area had high values of LDL cholesterol while only subjects in the coastal area had very high levels. For above normal VLDL cholesterol levels urban population showed a higher prevalence while in case of LDL /HDL and TC/HDL ratios coastal adults had a higher prevalence.

E. Biochemical Profile of Adults based on Nutritional Status

The variations in biochemical profile of the subjects based on their nutritional status are given in Table below.

TABLE II

Biochemical parameters	Normal (N=80)	Overweight (N=80)	Obese (N=76)	Total (N=236)	F value
	Mean ± SD	Mean ±SD	Mean ± SD	Mean ± SD	
BMI	22.6 ± 1.4	27.2 ± 1.5	32.7 ± 2.8	27.4 ± 4.6	500.56**
FBS	97.9 ± 20.7	101.3 ± 18.4	105.4 ± 26.3	101.4 ± 22.1	2.31^{NS}
Systolic Pressure	12.7 ± 19.8	125.5 ± 13.9	128.7 ± 10.6	125.9 ± 15.4	2.09^{NS}
Diastolic Pressure	81.6 ±9.3	83.1 ± 9.2	85.5 ±8.3	83.3 ± 9.1	3.91^{NS}
Total Cholestrol	203.6 ± 33.1	204 ±32.8	208.6 ± 28.6	205.3 ± 31.6	0.60^{NS}
Triglycerides	122.3 ± 40	125.3 ± 32	130.1 ± 35	125.7 ± 36	0.94^{NS}
HDL cholestrol	46.1 ±.9	23 ±68	45 ± 5.9	45.9 ± 6.6	0.71^{NS}
LDL cholestrol	129 ±30.9	129.6 ± 29.6	135 ± 26.2	131.1 ± 29.1	0.99^{NS}
VLDL	28.5 ± 9.1	28.2 ±7.7	28.9 ± 7.6	28.5 ± 8.2	0.16^{NS}
TC/HDL	4.5 ± 1.0	4.5 ± 0.9	4.7 ± 0.8	4.6 ±0.9	1.08^{NS}
LDL/HDL	2.9 ± 0.8	2.9 ± 0.8	3 ± 0.7	2.9 ± 0.8	1.35^{NS}

Mean values of most of the biochemical parameters were found to increase steadily with increase in BMI (fasting blood glucose, systolic and diastolic pressure, total cholesterol, triglycerides). Mean HDL cholesterol was more or less same for normal and OW subjects (46.1±6.9 and 46.3±6.9 respectively) while lower for obese subjects (45±5.9) hence indicating a decrease in good cholesterol with weight gain. Mean values for LDL cholesterol and TC/HDL ratio was found to be similar among normal and OW subjects but showed an increase among obese subjects (129±30.9, 129.6±29.6 and 135±26.2 and 4.5±1, 4.5±0.9 and 4.7±0.8 mean LDL and TC/HDL ratio among normal, overweight and obese respectively) while VLDL and LDL/HDL ratios were similar among all BMI. Hence it can be inferred that levels of biochemical parameters tend to increase with weight gain, increasing health risks. Only the mean of diastolic pressure showed a statistical difference at five per cent.

IV. CONCLUSION

The biochemical parameters of the selected samples were tested included fasting blood glucose, lipid profile namely total cholesterol, triglycerides, HDL, LDL and VLDL cholesterol by standard procedures.

In case of fasting blood sugar, there was a higher percent of subjects from the coastal area with above normal values while higher number of urban adults than coastal fell into the normal category. A slightly higher number of adults from the coastal area had

moderately high cholesterol values. For serum triglycerides and HDL cholesterol, the proportion of subjects in each category were found to be almost the same, with a slightly higher number in the urban area having a higher range of HDL cholesterol (good cholesterol). A larger proportion of subjects in urban area had high values of LDL cholesterol while only subjects in the coastal area had very high levels. For above normal VLDL cholesterol levels urban population showed a higher prevalence while in case of LDL /HDL and TC/HDL ratios coastal adults had a higher prevalence.

Biochemical parameters indicated that larger number of subjects from the coastal area had high values of fasting blood sugar, moderately high cholesterol levels, very high LDL cholesterol levels, LDL /HDL and TC/HDL ratios than urban adults. A larger proportion of subjects in urban area had high values of LDL cholesterol, high cholesterol and VLDL cholesterol levels. The proportion of subjects with high serum triglycerides and HDL cholesterol, from both areas were found to be almost the same, with a slightly higher number in the urban area having a higher range of HDL cholesterol (good cholesterol).

Biochemical profile of the adults in area and gender wise indicated that subjects in the coastal area showed higher mean values than their urban counter parts for majority of the parameters. Mean values of most of the biochemical parameters were found to increase steadily with increase in BMI (fasting blood glucose, systolic and diastolic pressure, total cholesterol, triglycerides). Mean HDL cholesterol was more or less same for normal and overweight subjects (46.1±6.9 and 46.3±6.9 respectively) while lower for obese subjects (45±5.9) hence indicating a decrease in good cholesterol with weight gain.

V. ACKNOWLEDGEMENT

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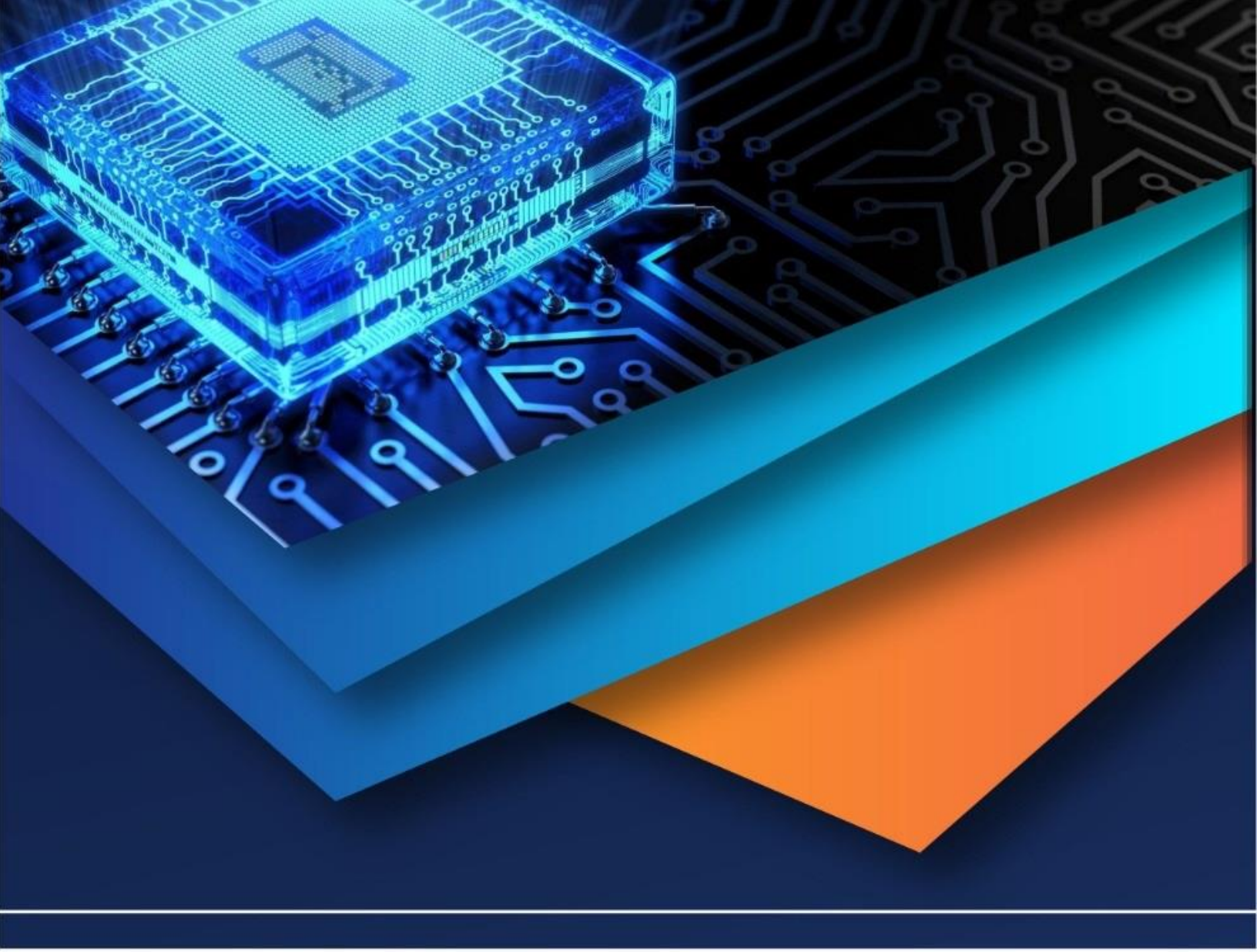
REFERENCES

[1] Sauberlich HE, (1984), *Implications of nutritional status on human biochemistry, physiology and health*, Clinical biochemistry pubmed, April 17(2), 132-42.
[2] Nayantara Bhat. et al., (2008), A Textbook of Nutrition for Nurses, 11.12
[3] Mokdad, A.H., Barbara, A.B., Ford, E.S., Vinicor. F., Marks, J.S., Jeffrey, K. (2001), *The continuing epidemics of obesity and diabetes in the United States* JAMA, 286(10),1195-1200
[4] Flodmark, C.E., Svegar, T. and Nillson-Ehle, P. (1994), *Waist measurement correlates to a potentially atherogenic lipoprotein profile in obese 12-14 year old children*, Acta Paedatr., 83, 941-945.
[5] Wurmser, H., Laessle, R.G., Jacob, K., Mueller, A. and Pirke, K.M. (1998), *Resting metabolic rate in pre adolescent girls at high risk of obesity*, Int. J. Obes., 22, 793-799.
[6] Bhaskarachary,K, Rao,S.V and Subba Rao, G.M,(2010) Concepts and Skills for Practical Dietetics ,p 33.
[7] Misra, A. and Khurana, L. (2008), *Obesity and the metabolic syndrome in developing countries*, The J. of Clin. Endocrin. and Metab., 93, s9-s30.
[8] Danaei, G. et al., (2011), National, regional and global trends in systolic blood pressure since 1980: systematic analysis of health examination surveys and epidemiological studies with 786 country-years and 5·4 million participants, The Lancet, 4.
[9] Soman, C.R. (2004), *The future of Kerala's health - the time bomb that ticks*, Kerala Calling, 17.
[10] Shyamal, K.D., Sanyal, K. and Basu, A. (2005), *Study of urban community survey in India: Growing trend of high prevalence of hypertension in a developing country*, Int. J. Med. Sci., 2(2), 70–78.
[11] Pandey, V. (2008), World is fat, India is slim, Daily News Analysis.



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