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(Received 23rd May 2012. Revised 30th May
2012. Accepted 2nd July 2012. Published
Online 11th July, 2012.)

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ABO blood group associations with obesity in random samples from Advanced Medical and Dental Institute Staff and Students

Background: Obesity or a new term globesity is a complex chronic disease involving environmental, genetics, physiologic, metabolic, behavioural, and psychological components. **Aim:** This study was undertaken to find prevalence of the ABO blood types among the obese individuals. **Materials and Methods:** Longitudinal and clinical studies were performed in a random sample of the Advanced Medical and Dental Institute (AMDI) staff and students. Intravenous blood sample were collected. ABO blood grouping was carried out by standard serological methods. Various parameters related to obesity, e. g. Body Mass Index (BMI), level of Leptin Hormone, their nutrition system (eating habits?) and co-morbid risk factors were assessed and correlated with blood group profile among these individuals. **Results:** In a total 151 participants included in this study, there were 40.4% males and 59.6% females of different age groups and races. Of these, 22.1% subjects were under-weight whereas similar numbers (21.5%) were classified as having overweight. The 26.8% individuals were classified as obese and 15.4% being with 15.4% severe obesity. High incidence of obesity (mild and moderate) was found in type “B” compared to other ABO types. Relative high Leptin level was noticed also in type B. **Conclusions:** This study provides a ground for future research to confirm or refute the hypothesis of ABO type association, assessment of obesity on scientific basis and providing medical evidence base with actions to improve health and contributes to tackle activities that trying to find solutions for the excess weight gain from a new different side.

Key Words: Obesity, ABO blood types, Leptin hormone

INTRODUCTION

Within the last two decades it showed an alarming increasing rate of obesity? in millions of the world population. The spread of obesity has been declared a worldwide epidemic by the WHO. More than 1 billion adults are overweight and at least 315 million are clinically obese beside 22 million of the world's children under age of 5 are overweight or obese {1}. WHO report pointed out that worldwide obesity has more than doubled since 1980 and 65% of the world's population live in countries where overweight and obesity kills more people than underweight {2}.

Obesity has a great number of negative health's social and economic consequences ranging from nonfatal complaints that impact the quality of life, to complaints that lead to an increased risk of premature death.

In Malaysia, there is a noteworthy increase in prevalence of obesity among urban people. It was increased from 0.7% in 1990 {3} to reach 9.8% in 1993-1994 in both genders {4} and 9.5% in 1998 {5} among the males. Among Malaysian children, a study carried out by Universiti Kebangsaan Malaysia (UKM) in 2007/2008 indicated that the prevalence of overweight was 12% in male children and 13% in female children; while the prevalence of obesity

stood at 17% and 10% in male and female children respectively {6}.

1.1. ABO Blood Type and Obesity

The relationship between many of the important diseases and certain ABO blood types were studied {7,8}. Furthermore, the blood type diet hypothesis proposes that ABO type determines the individual's diet as each type evolved in response to available food sources {9}. The relationship between body weight and ABO blood types was examined in a sample of infants of Brazilian migrant families {10}. *The results showed an excess of females due almost entirely to an excess of type “A” and type “B” females, regardless of ABO phenotype, born to type “A” mothers are significantly heavier than infant daughters born to type “B” mothers (unclear statement)*. This finding suggested that selection on the ABO system may act very early in ontogeny and may act on females and not on males.

One of the recent studies pointed out that the effect of wine intake on Ischemic Heart Diseases (IHD) and all-cause mortality among middle-aged and elderly men may depend on ABO phenotypes (8). While the others {11}, reported that the associations between Breast Cancer (BC) risk and Rh factor, statistically significant after adjustment for

various risk factors including family history of BC in first degree relatives.

From hormonal point of view, Leptin is a 16 kDa protein hormone that plays a key role in regulating energy intake and energy expenditure, including appetite and metabolism. The discovery of Leptin has essentially revived a new field of research. It soon altered researchers' perception of adipose tissue from that of an inactive storage depot of energy to that of an active endocrine organ. Furthermore, it changed the perception of obesity from that of a condition related to lack of "willpower" to that of a biological problem with strong genetic and environmental determinants. These findings are currently leading physicians to take a multifaceted approach to the problem of obesity, giving increasing importance to the genetic and neuroendocrine aspects of the disease in addition to evaluating and modifying diet and lifestyle habits.

The current research is designed to assert the link between obesity in population and their food intake in relation to individuals ABO type and their ability to digest easily or difficulty different types of foods, which will reflect in response of the body appetite.

MATERIAL AND METHODS

2.1. Samples Collection and Investigation

The regional medical ethics board approval was obtained from Medical Review & Ethics Committee, (USM). Particular data were collected from 151 participants such as weight, height, race, gender, age, obesity in family, co-morbidities, feeding behaviours...etc, and body mass index (BMI) was calculated and analyzed according to the WHO standards classification.

A venous blood sample was drawn using a serum separator tube (SST) for the purpose of ABO typing and Leptin level determination. The methodology used was according to kit manufacturer's instructions. Immediately before clotting, required specimen from collected samples was taken for ABO typing and cell suspension was prepared, then samples were allowed to be clotted for 30 minutes, then centrifugation for 15 minutes at 1500rpm. Serum was removed and stored as aliquot samples at $\leq 20^{\circ}\text{C}$. Repeated freezing thawing was avoided.

2.2.ABO Typing

ABO typing was done using DiaMed[®] Company ABD confirmation gel cards.

2.3.Human Leptin Immunoassay

Human Leptin Assay for the collected samples was done using RayBio[®] Company Human Leptin ELISA Kit. This assay employs the quantitative sandwich enzyme immunoassay technique. A monoclonal antibody specific for Leptin has been pre-coated onto a microplate. Standards and samples were

pipette into the wells and any Leptin present was bound by the immobilized antibody. After washing away any unbound substances, an enzyme-linked monoclonal antibody specific for Leptin was added to the wells. Following a wash to remove any unbound antibody-enzyme reagent, a substrate solution was added to the wells and colour develops in proportion to the amount of Leptin bound in the initial step. The colour development was stopped and the intensity of the colour was measured at specified wavelength.

RESULTS

In a total of 151 participants in this study, 21% of the subjects obesity as family features, 55% had digestion problem and 16% have co morbid risk factors. The sleeping habit on daily basis among the participants was shown as 6-8 hours among the three-quarters of the participants, while the remaining participants slept for 6 hours or less every day. (Fig.1). This means that there is sufficient evidence to claim that these variables have significant effects on BMI.

Body mass index (BMI), an important parameters for obesity was seen to be >27.5 among females (60%) as compared to male subjects.

Table (I) show the distribution of BMI among ABO blood groups, gender, age and race. The results indicated that the obesity was more frequent among the individual with group B, followed by group A while group O represented the least among the blood groups studied.

3.1. Leptin levels in the random samples

Thirty three samples were collected from different staff to correlate Leptin hormone concentration and ABO blood groups, results are listed in Table (II) Data listed in this table showed high average Leptin level in moderate obese individuals compared to normal weight. It can be noticed that most of "B" and "AB" blood type cases falls within the area of high Leptin level, while more than 50% of cases were in the lowest level of Leptin (0-20ng/ml).

DISCUSSION

Obesity mainly results from an imbalance between energy intake and energy expenditure. Main causes of obesity are gathering of some factors in most cases such as the increase in [uncontrolled] consumption of fast foods, modernization and ease of transport facilities, and the low level of exercise activities.

Even with rapidly growing awareness in the pathogenesis of the obesity, the pathophysiology of obesity remains poorly understood. While studies in animals have yielded many perceptions, it has become clear that human obesity differs in important ways from that in rodents. Bariatric surgery offers better outcomes, but in the highest

grades of obesity (BMI>50) remains a high risk responsibility with >5% reported mortality.

Despite this progress, current strategies for obesity management remain for the most part ineffective. Most hard work have focused on lowering caloric intake or increasing energy expenditure, either through personal behaviours modification or amplified by pharmacologic efforts to diminish appetite, inhibit fat absorption, or correct metabolism. As reported by Macgregor {12}, bariatric surgery remains the only proven long term treatment of morbid obesity.

In Malaysia, even if it is only recently that interest has been increased about the problem of obesity, these data propose that Malaysia can expect to have a very high rate of cardiovascular disease and diabetes in the near future as a consequence of the high prevalence of overweight and obesity and as supported by the finding of Ismail *et al.*, {13}. All ethnic groups in Malaysia seem to be involved in nutritional transition, with rapidly increasing rates not only of overweight but particularly of abdominal obesity with its recognized serious health outcomes. The present study highlights the very low levels of physical activity (27.7%) in a sample of Malaysian adults, about 68% of them are below forties. 15.4% of selected volunteers considered moderate obese (BMI >30). This percentage is very high compared to previous studies (4.5%) as reported by Ismail and Vickneswary {3}. Another recent study by Rampal, {14} showed that the overall national prevalence of obesity among Malaysians aged 15 years old and above was 11.7%.

A quite higher obesity rate in this study was noticed in females compared to males. This finding is also come in parallel with the finding of Rampal, {14}, who found that the prevalence of obesity was significantly higher in females 13.8% as compared to 9.6% in males.

As we had included ABO blood typing in our study, findings of distribution of obese according to ABO blood types showed to increase obesity prevalence in females compared to males. High female obesity (mild and moderate) rate was noticed in type "A" and type "O". Type "B" showed increase of mild obesity only (BMI >27.5-30) in males and still moderate obesity (BMI >30) is higher in females by almost double. Type "AB" had did not showed any female case in mild or high obesity, it is reasonable because of low frequency (n=11).

The increasing of obesity trouble mostly in the females is a cause of alarm. The present study showed that it is independent of age, the likelihood of women were 1.5 times more likely to be obese compared with men. Obesity prevalence rates were highest in adults between the ages of 40–50 years old. This may be due to increased inactive lifestyle with age accompanied by a change in body composition leading to higher lean body mass

proportion. Independently the risk of cardiovascular and other chronic disease (mainly high blood pressure) increases as one gets older; therefore, any daily life involvement programs intended for the people should include this group specifically as one of the main target groups.

The interactions of the energy extent of the diet, no or very low physical exercising action, and the appearance of significant physiological ability of overweight in females could well be a major contributors as to why women are more prone to obesity problems than men.

Association between obesity and ethnicity was significant to show there are more obese Malays and others (those were mainly from Arab race) as compared to Chinese and Indian whom they have low individuals count in AMDI. These results are likely to reflect different dietary patterns and physical activity behaviour among these ethnic groups.

Ronco {11}, reported that the associations between Breast Cancer (BC) risk and Rh factor, statistically significant after adjustment for various risk factors including family history of BC in first degree relatives.

One of the important studies about the crossing between Leptin and insulin showed that the increase in circulating insulin, in conjunction with retention of peripheral insulin sensitivity, produces an expansion of adipose mass and a concomitant increase in circulating Leptin. This increase in Leptin, though perhaps initially acting to limit body adiposity, leads to hypothalamic Leptin resistance and a further dysregulation of energy balance and glucose homeostasis. Adipose tissue in particular becomes resistant to inhibition of Leptin release by SNS input, resulting in chronic hyperleptinemia and Leptin resistance.

They recognize the possibility that excess dietary fat may also directly induce hypothalamic Leptin (and insulin) resistance, with this effect serving to exacerbate the initial deterioration of peripheral insulin sensitivity and whole body energy homeostasis {15}.

From the already mentioned knowledge we can noticed the high importance of Leptin in the current researches and this is an important cause that we select Leptin to be part of current study.

The obtained results show the final measurement of Leptin in the collected 33 samples from different ABO types and BMI classes which is summarized and averaged in table (2), according to different BMI levels. Since Leptin is an adipose tissue hormone, so it is normally to be higher to certain limit in obese, however it has been mentioned in reviews of literature that obesity in humans is a Leptin-resistant and not a Leptin deficient state as concluded by Considine *et al.* {16}, and this also has been confirmed recently by Castracane and Henson

(17) who suggest that an extended period of exposure of the brain, especially the hypothalamus, to a high level of Leptin may result in the development of central Leptin resistance during Dietary-Induced Obesity (DIO).

It was noticed also that type "B" recorded high Leptin level compared to type "A" and "O". One collected sample of type "AB" showed very high Leptin result compared to all tested samples, but as mentioned previously that type "AB" still has "B" antigen and can be considered slightly supporting since type "B" result was also the highest between blood types.

The obtained results showed also more than 50% of total cases were in the lowest level of Leptin (i.e. 0-20ng/ml). It can be noticed that most of type "B" (about 75% of cases) and type "AB" cases are at the area of high Leptin level (i.e. >20ng/ml).

On the other hand, it is possible that our observed associations are not due to the ABO antigens themselves, but to the effects of genes closely associated with them. Furthermore, it might have nothing to do with molecular mechanisms or genetics which can be studied in future using bigger sample size than ours to proof or abolish such findings.

In conclusion, it is obvious that there is the need for a national strategy, trends, and policy solutions to tackle contributors to the excess weight gain of the population. While each individual's weight is a personal issue, obesity rates and associated costs have increased dramatically in recent years and warrant public policy attention. Addressing the rise in obesity means acknowledging that personal responsibility, consumer choice and public interests need to be balanced.

Acknowledgments:The authors gratefully acknowledge Advanced Medical and Dental Institute (AMDI), University Science Malaysia (USM) for the approval and financial support of this research. The authors thank also Dr Nasser Abbas for providing help in this research.

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Table I: Distribution of BMI among ABO blood types, gender, age and race in Advanced Medical and Dental Institute (MDI) students & staff members

BMI	Gender				Age												Race																											
	Male				Female				20-30				30-40				>40				Malay				Chinese				Indian				Others											
	A	B	AB	O	A	B	AB	O	A	B	AB	O	A	B	AB	O	A	B	AB	O	A	B	AB	O	A	B	AB	O	A	B	AB	O	A	B	AB	O								
≤18.50	4	5	2	3	6	6	3	5	4	4	6	3	4	4	4	2	2	2	1	1	0	8	11	6	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>18.50-25.99	6	9	3	2	6	8	6	4	7	9	6	6	5	3	5	2	1	2	2	1	1	9	13	7	5	1	0	0	0	1	1	0	1	2	2	1	1	1	1	1				
≥25-30	2	5	3	2	3	7	5	6	4	5	3	3	2	3	3	1	2	3	4	2	1	8	10	6	5	0	0	0	0	1	0	1	0	1	1	0	0	1	1	0				
>30-35	2	4	1	1	3	3	2	1	1	3	2	1	1	2	3	2	1	1	1	0	0	5	6	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
>35	3	4	2	2	2	5	3	2	3	2	2	1	4	3	2	2	1	1	1	1	1	7	9	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				

≤ 18.50: underweight, >18.50 -24.99: Normal weight, ≥ 25.00-30.00 : Overweight >30.00 -35.00 : Mild Obesity >35.00 : Severe Obesity

Table II:Classification of Leptin Levels and ABO Blood Types in Random Samples from AMDI Students and Staff Members.

Leptin (ng/ml)	Total Cases	Percent of Total Cases	Blood Type	Cases	Percent	BMI
0-20	19	57.58%	A	9	47.37%	U=4 N=1 O=1 M=2 Mod=1
			B	5	26.32%	U=1 N=1 O=2 Mod=1
			O	5	26.32%	N=1 O=3 M=1
21-40	7	21.21%	A	3	42.86%	N=2 Mod=1
			B	3	42.86%	O=1 M=1 Mod=1
			O	1	14.29%	U=1
41-60	4	12.12%	A	1	25%	M=1
			B	2	50%	N=1 Mod=1
			O	1	25%	Mod=1
61-80	2	6.06%	B	1	50%	Mod=1
			AB	1	50%	O=1
81-100	---	---	---	---	---	---
101-120	---	---	---	---	---	---
121-140	1	3.03%	B	1	100%	Mod=1

Legend: U=Underweight, N=Normal Weight, O=Overweight, M=Mild Obesity, Mod=Moderate Obesity

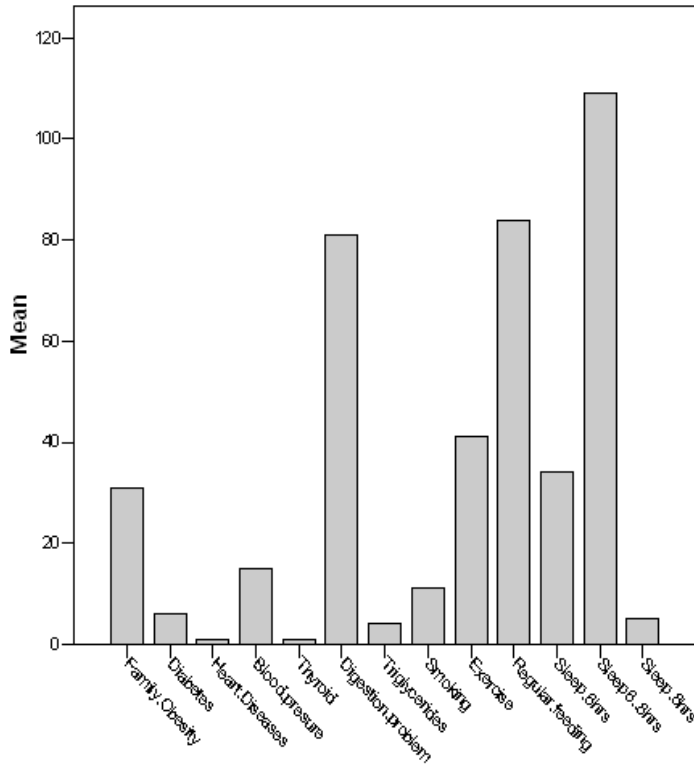


Figure1: Distribution of co- morbid factors and habits in random sample from Advanced Medical and Dental Institute staff and students.