Pak. J. Biotechnol. Vol. 14 (2) 215- 220 (2017) ISSN Print: 1812- 1837
www.pjbt.org ISSN Online: 2312- 7791

EVALUATION OF SEROTONIN HORMONE LEVELS ASSOCIATED WITH OBESITY IN SOME ADULT MEN

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Article received 28.1.2017, Revised 30.5.2017, Accepted 7.6.2017

ABSTRACT

To evaluate whether serum concentration of serotonin in some healthy adult's men influenced by their characteristics of anthropometric measurements.

Ninety-eight volunteer adult's men non-smoking (20-50) years in this study, the blood samples were taken from subjects at the morning during 8:30-10:30 am during November 2015 till April 2016. ELIZA kit was used to assay the serum level of serotonin hormone, and the anthropometric measurements have been done such as; body weight, height and waist circumference(WC) to calculated body mass index (BMI), and percentage of body fat (BF%) by a special formula and the subjects were assorted depending on classes of anthropometric (physical) measurements.

The results showed a significant decrease in serum level of serotonin hormone($p<0.05$) in obese groups like the classes of anthropometric (physical) characteristics as compared with the leaner groups.

Our results suggest that the state of anthropometric (physical) characteristics which included (BMI, body fat percentage, and WC) have worked to influence on the level of serum circulating serotonin hormone in these subjects. Other words, the lake of serotonin secretion may can alter the characteristics of anthropometric measurements to individuals.

INTRODUCTION

The stable body weight depends on an equal balance calories intake from food and expenditure of calories, due to a lot of intake calories without accompaniment expenditure energy, the extra calories will store in the fat cells present in adipose tissue and cause overweight and leads to obesity. The key role in the current epidemic of obesity as well as recent researchers has suggested that endocrine and genetic, physiological, behavioral factors and common mental health disorders also play a significant role in the etiology of obesity (Bleich et al., 2008; Mary and Monica, 2011).

Obesity is also associated with an increased risk for a variety of chronic diseases, most of which are associated with depression which in turn can precipitate chronic disease due to diminished treatment adherence and/or response (Ma and Xiao, 2010), for that reason (Van Dijk et al., 2015) noted for need the safe and effective strategies for prevented of obesity. The current classification of obesity is based on the body mass index (BMI), which is the weight (in kilograms) divided by the square of height (in meters) as documented in (report of a WHO, 1995). But only the BMI is a crude indicator of body fat content, waist size is a better correlation of total body fat than BMI (Lean et al., 1995).

The total fat of the body represented as a percentage of total body weight these called as a body fat percentage. There is no generally agreeable definition of obesity according to total body fat. Most researcher have used >25% in men as cut- points to define obesity (Okorodudu et al., 2010)

If the body of human in normal weight but having a high fat percentage, it may be having the same health risk of the obesity (Zeratsky, 2011), the body fat distribution has a wide variation count than the body mass index (Sweeting, 2011), this reasonable to estimate for body fatness measured by body fat percentage (Gray and Fujioka, 1991).

The component of body fat is an essential in the diagnosis of obesity, and overweight and used as an indicator of health risk. The type of body fat is closely connected with metabolic disorders, which is considered the visceral adipose tissue (Szymocha et al., 2009, Przybylska et al., 2012).

Classification of adult men according to fat percentage categories (ACE, 2009) in table below

Table-1: General body- fat percentage categories in adult men

Description	Men
Essential fat	**2-5 %**
Athletes	**6-13 %**
Fitness	**14-17 %**
Acceptable	**18-24 %**
Obese	**25 % +**

The feeding process can be controlled by many central and peripheral physiological mechanisms including different neurotransmitters and neuropeptides within the human bodies of these neurotransmitter serotonin (Sanley et al., 2005; Lam et al., 2010). Serotonin (5-hydroxy tryptamine, 5-HT) is a monoamine neurotransmitter, biochemically derived from tryptophan (David et al., 2011), L-tryptophan, available clearly in several foods and converted to 5-hydroxy-L-tryptophan (5-HT) and another to serotonin as display in (figure1) in both the CNS and PNS by diverse isoforms of the enzyme tryptophan hydroxylase (Boadle-Biber, 1993).

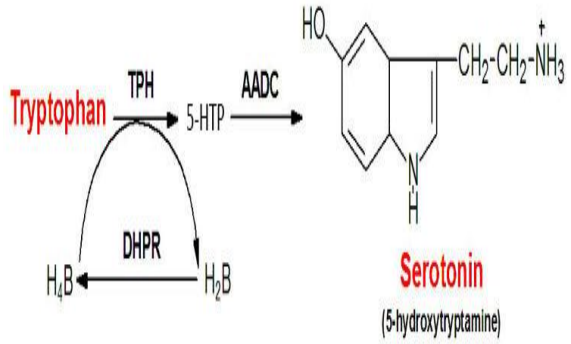

Figure -1: pathway for serotonin synthesis from tryptophan (Nagatsu et al., 1964).

Serotonin has been presented to be connected with several behavioral and psychological features and is a biochemical sign of mood (Williams et al., 2005; Duffy et al., 2006). In addition to all what is mentioned, there is a new role of peripheral serotonin which is an energy homeostasis and regarded as an energy – saving hormone (Namkung et al., 2015) and we can consider central serotonin as an aim for anti-obesity treatment, as there is found a reverse correlation between central serotonin(5-HT) level and food intake.

Accordingly, this study has been debated to indicate whether BMI and body fat percentage responsible about the level of neurotransmitter hormones (Serotonin) in our study population.

MATERIALS AND METHODS

Subjects and blood collection: The present study was conducted in the college of science for women, university of Babylon, subjects enrolled in this study included (98) volunteer apparently healthy with ages between (20-50) years. Those selected non-smoking adult men were assorted into subgroups according to their body mass index (fat mass) and body fat percentage (fat distribution) and waist circumference (fat abdominal) classes.

Anthropometric measurements: Body Mass Index (BMI) was calculated by the following equation. BMI=weight (kg)/square height (m2). The world health organization (Physical status, 1995) was classifies Body Mass Index into: desirable weight which having a BMI value range between (18.5- 24.9) kilogram/square meter, while the overweight (25-29) kilograms/square meter, and medium obesity as major or equivalent to thirty kilograms /square meter, and finally morbid obesity as major or equivalent to forty kilograms /square meter

The Body fat percentage was calculated by the following equation (Chumlea et al., 2002)

Lean body weight =94.42+1.082(weight in pound)-4.15(waist in inches)

Body fat %=(body weight –lean body weight *100)/body weight.

Protocol of measured waist circumference were based on umbilicus level by measured at a horizontal level around the navel by using flexible, non-stretchable measuring tape and asked for subjects relax as he exhaling to get most accurate measurements (NHANES, 2004).

The cut- off point of waist circumference for men 94cm, 88 cm in women associated with BMI of 25kg/m^2 are indicated for health risk as define by (Lean et al., 1995) in European Community. However, the cut-off point values of WC for men 90 cm associated with BMI of 25kg/m^2 which was applied in our study by reason an action level of WC are more opportune with demographic factors with our study population and provided more signifycant data. Accordingly, our population were assorted into two groups, one of them included indi-

vidual with a large (WC)≥ 90 cm, the other group included the subjects with a small (WC) < 90 cm.

Determination of serum serotonin concentration: Human serotonin concentration was measured by Enzyme Linked Immune Sorbent Assay as mentioned in procedure of Elabscience Biotechnology company kit, and the standard curve of serotonin determination was plotted in figure 2.

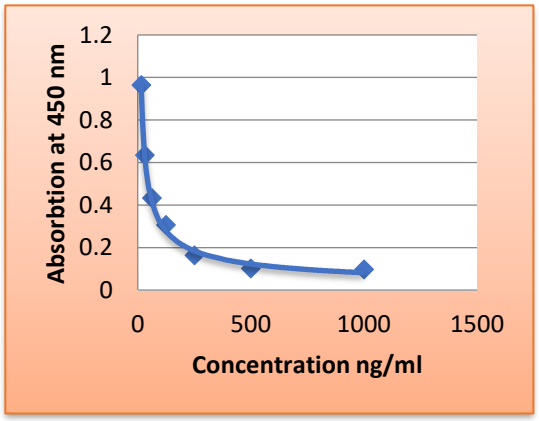

Figure- 2: The standard curve of serotonin concentration

Statistical Analysis: Data analysis were performed on SPSS (version 18.0) software, data are being expressed as mean ± SD, a nova and student's t-test were used to determine any statistical difference for investigated parameters among subjects, post hoc test applied to multiple comparison among investigated characteristics based on BMI, WC, body fat% categories, the p value <0.05 were considered statistically significant

RESULTS

Our results revealed that serotonin level was significantly lower in obese subjects (163.1± 52.1ng/ml) than normal weight group (193.3± 67.4ng/ml) but there was no significant difference (P>0.05) in serotonin levels between subjects in both overweight and obese group as showed in figure 3. As well the figure 4 showed that serum serotonin level has significantly lower (p<0.05) in obese subjects than subjects who in fitness and acceptable group, but there was no significant difference(P>0.05) found in the level of serotonin between subjects in acceptable and athletes group.

In addition, the results of serotonin values according to category of (WC) measurement exhibited in (figure 5) which showed that serotonin level has significant decrease (p< 0.05) in the sera of large (WC) group versus with small (WC) subjects group.

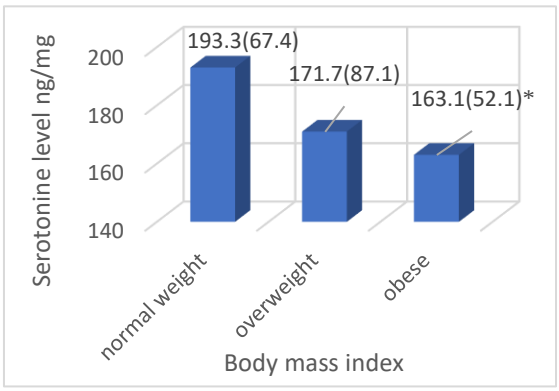

Figure 3. values of serotonin according to body mass index categories.
*p< 0.05 vs. normal weight group

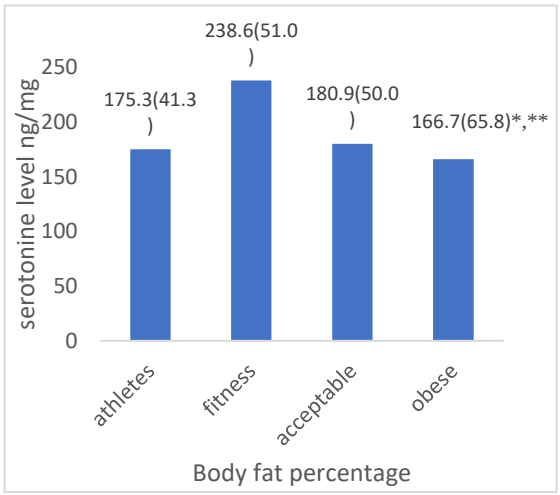

Figure 4. values of serotonin according to body fat percentage categories.
*p< 0.05 vs. acceptable group, **p< 0.05 vs. fitness group

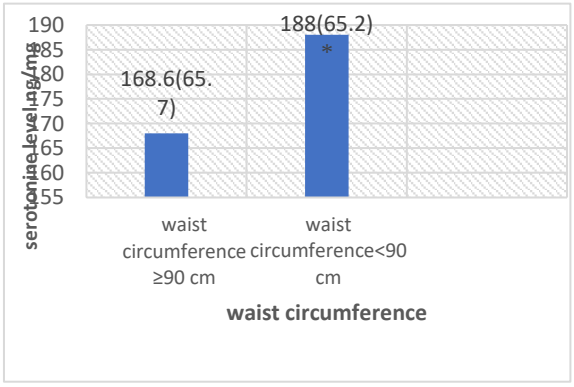

Figure- 5: values of serotonin according to waist circumference categories.
*p< 0.05 vs. large WC group

DISCUSSION

Data for subjects of our study showed that lower serotonin level associated with greater body fat percentage and fat mass(BMI) and with larger waist circumference measurement (abdominal fat). This attain settles with those from rodent studies (Watanabe et al., 2016) and indicates that peripheral serotonin shows role in the progress of obesity. This may be regard with that serotonin hormone acts as a key role in satiety by several receptors which make as an exhibits control over hunger and satiety, the reduced intake of food and energy balance are done by these receptors (Heisler et al., 2006), so serotonin and serotonergic systems throughout the body have been shown to apply an influence on food ingestion by control of satiety and hence body fat scattering (Wurtman and Wurtman,1995; Fuemmeler et al., 2008)

Other theories according to (Kaplan and Kaplan,1957) whom established that obesity get up when people over eat in response to undesirable mood, these theories included that over eating in prompted by the motivate to fulfil a psychological requirement, such urges could be linked with a neurochemical lopsided in the (CNS) or (PNS) as noted by Hodge et al., 2012), as the secretion is one of chemical neurotransmitter has been shown is a biochemical marker of mood (Nagastu et al., 2011), and the low serotonin level which may be contributed in lower of mood state (Karimi and Noori, 2015)

However this allowing to excessive eating to improve mood supporting of the trend to become overweight or obese, this agree with(Monti, 2011) who reported that function of serotonin in regulates mood and food intake, moreover, (Namkung et al., 2015) was established there was an inverse relationship between central serotonin level and food intake, wher-eas due to the selective nature of blood, brain barrier, peripheral serotonin level may not automatically parallel to serotonin accessibility in the brain (Zhang et al., 2004) where (CNS) serotonin dependent upon plasma tryptophan tripping the barrier from blood-brain, brain serotonin concentration however one determined by percentage of tryptophan plasma to another large neutral amino acids (LNAAs) which participate with it for uptake into the brain, through consumption of carbohydrates, insulin is released which allows uptake of the(LNAAs) into skeletal muscle means that tryptophan can pass into the brain more easily (Fernstrom and Wurtman, 1972; Fernstrom and Wurtman, 1974) so increased serotonin production in the brain subsequent to high carbohydrate intake can yield mood- enhancing post- ingestional effects additional motivation eating of this type of foods and weight obtain (Fernstrom and Wurtman,1971).

Our results showed that highly increase of serotonin concentration in fitness group, this agreement with (Lambert, 2006) who reported that motor activity increase the rate of circulating serotonin in human whereas that aerobic exercise can improve mood.

Conclusion

Our results indicated that low level of sero-tonin contributed in occurrence of obesity, in other word, the obesity enhances with the dec-rease of serotonin secretion in the body.

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