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Obesity Average and its Relation with Packed Cell Volume (PCV) Value in a Section of Students and Employees of Al-Mustansiriyiah University in Iraq

Khalid Salih Jamela Jouda* Ban El-Haboby
Department of Biology, College of Science, Al-Mustansiriyiah University, Iraq

Abstract
It is known that the obesity distribution is very huge worldwide. However, obese persons differ in the stores and excess fat regions within the body. Cardiovascular disease, type 2 diabetes, musculoskeletal disorders, limitations of respiratory function, reduced physical functioning and quality of life, and increase the mortality rate are the sequelae of the most important of obesity and abdominal fatness (Seidell *et al.*, 2001). Packed cell volume (PCV) and obesity estimates are the essential risk factors that have been traceable for the causes of cardiovascular disease and many other diseases. In addition, it has been reported that there was statistically significant correlation between the packed cell volume and obesity. the present research amid to study: 1) study the obesity rate depend on gander using different ways such as BMI and percentage of total body fat (TBF), 2) study the diseases risk depend on gander using waist/hip (W/H) ratio, and 3) study the correlation between PCV and obesity status in these groups. Included in this study were 97 individuals randomly selected from students and employees of Department of Biology – College of Science - Al-Mustansiriyiah University in Baghdad / Iraq. The age group was in the range of 18-60 years of both genders. 2 ml of venous blood was collected from adult individuals only, which were used directly to determine PCV. While the general frequencies of obesity status according BMI does not exceed (3.1%) from total number of subjects, the general frequencies of obesity status according TBF% increased to (14.7%) from total number of subjects, mostly in female. Interestingly, while no significantly correlation were detected between the PCV and BMI (R2=0.007), there was a significantly negative correlation between PCV and TBF (R2= -0.095).
Keywords: Obesity, MBI, TBF, W/H ratio, PCV.

1. Introduction

It is known that the obesity distribution is very huge worldwide. According to the World Health Organization's report in 2005, there were about 400 million obese adults worldwide and 1.6 billion overweight (Low *et al.*, 2009).

However, obese persons differ in the stores and excess fat regions within the body, and their health-related (WHO, 2000; Kopelman *et al.*, 2006). It is therefore essential to distinguish between those at risk as a result of abdominal obesity than those with generalized obesity (Enas and Kannan, 2008). Cardiovascular disease, type 2 diabetes, musculoskeletal disorders, limitations of respiratory function, reduced physical functioning and quality of life, and increase the mortality rate are the sequelae of the most important of obesity and abdominal fatness (Seidell *et al.*, 2001).

Packed cell volume (hematocrit) and obesity estimates are the essential risk factors that have been traceable for the causes of cardiovascular disease (Smith *et al.*, 1992; Fowkes *et al.*, 1993; Ko *et al.*, 2005; Strand *et al.*, 2007) and associated with an increased risk for type 2 diabetes (Vazquez *et al.*, 2007; Nyamdorj *et al.*, 2008). In addition, it has been reported that there was statistically significant correlation in about 7,000 men between the packed cell volume and the development of non-insulin-dependent diabetes mellitus, regardless of age, BMI, smoking, physical activity, high-density lipoprotein (HDL) -cholesterol, and systolic blood pressure (Wannamethee *et al.*, 1996).

Packed cell volume (PCV) is the most important indicator to determine the viscosity of whole blood, body mass index and total body fat are indicators of the obesity rate, thereby increasing the viscosity of the blood and increase the storage of fat in the body have been reported in many studies to contribute significantly increase in the blood pressure (Fowkes *et al.*, 1993; Field *et al.*, 2005; Strand *et al.*, 2007).

The present research amid to: 1) study the obesity rate depend on gander using different ways such as Body mass index and percentage of total body fat, 2) study the diseases risk depend on gander using W/H ratio, and 3) study the correlation between packed cell volume (PCV) and obesity status in these groups.

2. Materials and Methods

Included in this study were 97 individuals. The age group was in the range of 18-60 years of both genders with apparently healthy status. These individual were randomly selected from students and employees of Department of Biology – College of Science - Al-Mustansiriyiah University in Baghdad / Iraq.

2.1 Body Mass Index (BMI)

The body weights of individuals were measured by body balance and the body heights of them were measured by paper tape. BMI was calculated as weight in kilograms divided by height in meters squared (WHO, 2004). The BMI individuals was classified according WHO classification in (Table 1).

Table 1. BMI Classification

BMI(kg/m2)	Categories
<18.5	Underweight
18.5-24.9	Normal weight
25.0-29.9	Overweight
>30	Obese

2.2 Percentage of Total Body Fat (TBF%)

The relationship between densitometrically-determined body fat percentage (TBF%) and BMI, taking age and sex (males = 1, females = 0) into account, was analyzed using Deurenberg equation (Deurenberg et al., 1991) as fallowing:

TBF% = 1.2(BMI) + 0.23(age) – 10.8(sex) -5.4

Obesity is defined as a body fat content of more than 20% in males and over 30% in females (Kopelman *et al.*, 2006)

2.3 Waist-Hip Ratio (W/H)

The waist and hip circumference of individuals was measured using paper tap depend on WHO steps protocols (WHO, 2008). The waist circumference measurement should be made at the approximate midpoint between the lower margin of the last palpable rib and the top of the iliac crest. The hip circumference measurement should be taken around the widest portion of the buttocks. For both measurements, the subject should stand with feet close together, arms at the side and body weight evenly distributed, and should wear little clothing. The subject should be relaxed, and the measurements should be taken at the end of a normal expiration. Each measurement should be repeated twice; if the measurements are within 1 cm of one another, the average should be calculated. If the difference between the two measurements exceeds 1 cm, the two measurements should be repeated. Then, the ratio waist and hip circumference was calculated

The WHO states that abdominal obesity is defined as a waist–hip ratio above 0.90 for males and above 0.85 for females. The WHR has been used as an indicator or measure of health, and the risk of developing serious health conditions according WHO classification in (Table 2).

Table 2. The Risk of Health According Waist-Hip Ratio

Men	Women	Health Risk Level
0.95 or less	0.80 or less	Reduced Risk
0.96 to 1.0	0.81 to 0.85	Elevated Risk
1.0 or higher	0.85 or higher	High Risk

2.4 Packed Cell Volume (PCV) Test

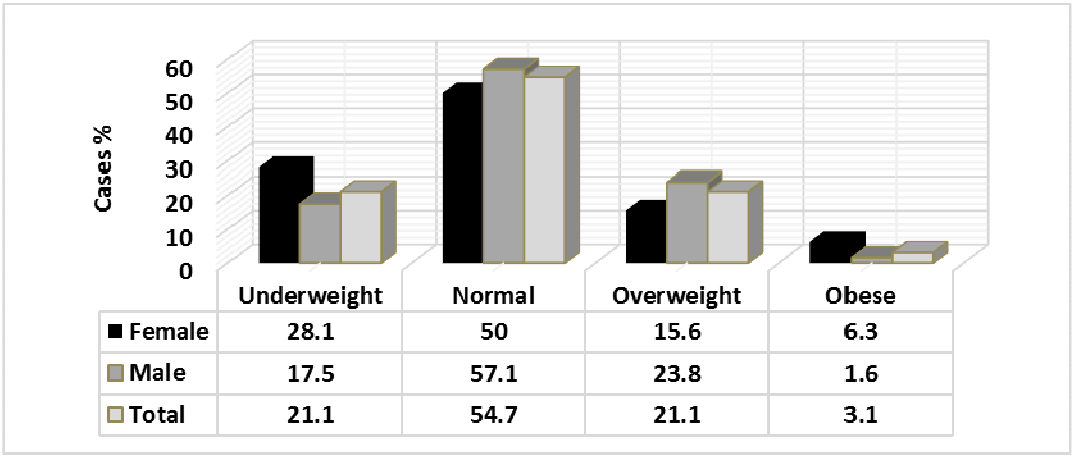
With all proper aseptic precautions 2 ml of venous blood was collected from antecubital vein by disposable syringe in a dry sterile test tube, which were used directly to determine PCV by centrifuging heparinized blood in a capillary tube at 10000 RPM for 5 min. This separates the blood into layers. The volume of packed red blood cells divided by the total volume of the blood sample gives the PCV. Since a tube is used, this can be calculated by measuring the lengths of the layers.

2.5 Statistic Analysis

Results are expressed as mean ± standard error (M±SE) and as frequency of observations percentage (Cases %). Data were analyzed by one-way analysis of variance (ANOVA) followed by Fisher's test for multiple comparisons, using Stat view version 5.0. Differences were considered significant when $p<0.05$. Regression analysis was performed by analysis of covariance (ANCOVA) also using Stat view version 5.0.

3. Results

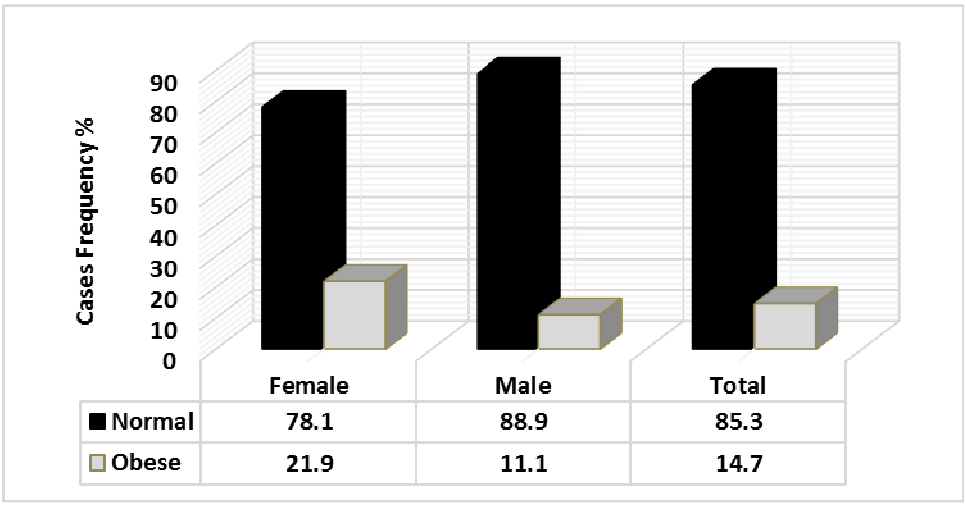
While no significant differences in normal weight according BMI scale, the gender of participants showed significant differences ($P<0.05$) were revealed in obese, overweight and underweight status between female and male subjects. Obese and underweight were significantly higher in females compared to males (6.3%, 28.1% and 1.6%, 17.5%, respectively), but overweight was lower in the females compared to males (15.6% and 23.8%, respectively), as shown in (Figure 1).



	Underweight	Normal	Overweight	Obese
Female	28.1	50	15.6	6.3
Male	17.5	57.1	23.8	1.6
Total	21.1	54.7	21.1	3.1

Figure 1. Frequency of Body Weight Status According to BMI Measurement

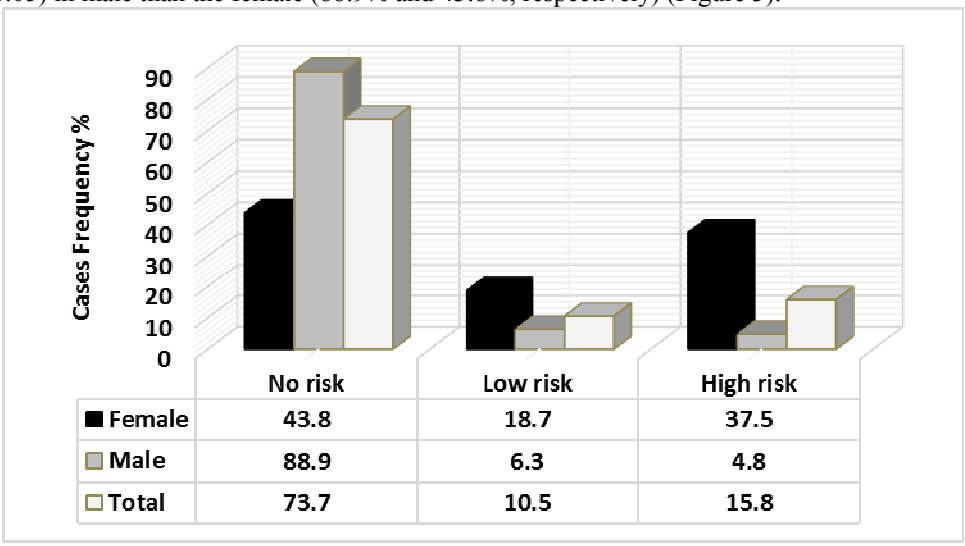
Figure 2 showed frequency of obese and normal subjects according to TBF scale. While no significant differences in normal between the gender were detected, obese frequency were significant (P<0.05) higher in female subjects (21.9%) than those male subjects (11.1%).



	Female	Male	Total
Normal	78.1	88.9	85.3
Obese	21.9	11.1	14.7

Figure 2. Frequency of Body Weight Status According to TBF% Measurement

The low and high risk according (W/H ratio) were significantly higher (P<0.05) in the females (18.7% and 37.5% respectively) compared to males (6.3% and 4.8% respectively), but the No risk was significantly higher (P<0.05) in male than the female (88.9% and 43.8%, respectively) (Figure 3).



	No risk	Low risk	High risk
Female	43.8	18.7	37.5
Male	88.9	6.3	4.8
Total	73.7	10.5	15.8

Figure 3. Frequency of Body Weight Status According to W/H Ratio Measurement

Interestingly, while no significantly correlation was detected between the PCV and BMI (R2=0.007), there was a significantly (P<0.05) negative correlation between PCV and TBF, R2= -0.095 (Figure 4).

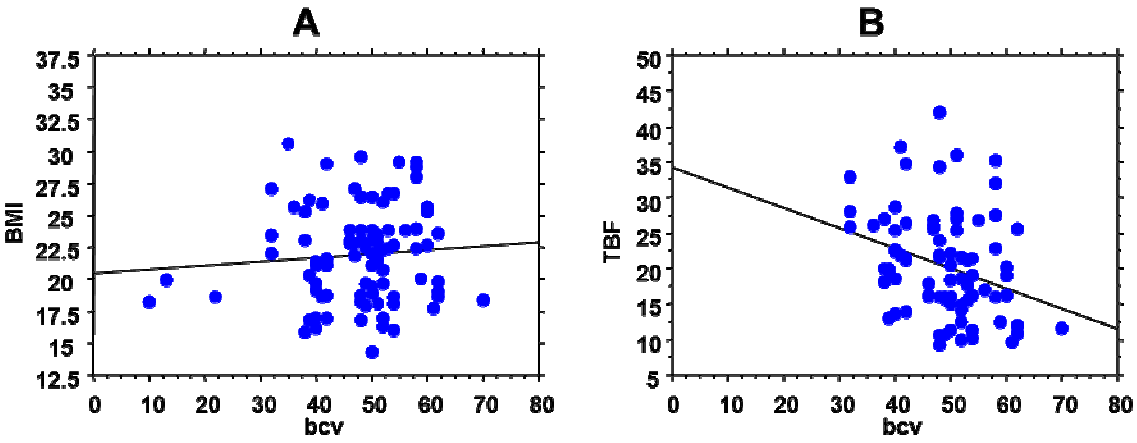


Figure 4. Correlation Between PCV, BMI, and TBF

4. Discussion

The obesity general rate is about (3.6%) from total number of individual included in this study mostly in women. This rate is nothing compared to what WHO showed in 2007, that the obesity rate worldwide has reached a 34% in the adult (Flegal *et al*., 2012); and compared to the obesity rate in the Middle East countries, including Arabic countries, which has reached 40%, mostly in women (Ng *et al.,* 2014). Many factors could be a reason to lower obesity rate in the current study sample, such as, wars and Iraq's situation which make Iraq still features the low living standard of its members. Many studies suggested a positive relationship between high living standard for individuals and obesity rate (McLaren, 2007). The low living standard decrease intake calories and effect on quality, lifestyle of the individual, which makes them work in order to receive his strength (Salmon and Timperio, 2007).

The general rate of obesity depend on TFB scale rise to (14.7%) from total number of individual included in this study compared to (3.6%) according to BMI scale. It is known that the individuals differ than each other in their body fat rate and body fat places (Kopelman *et al.,* 2006). BMI cannot investigate all the stored fat and the places of its collected in the body as TBF (Gallagher *et al.,* 2000). These factors may be explaining the difference between these scales.

To determine the degree of risk to human health depend on body weight, W/H ratio was used. If this ratio increased than 1 in males and 0.86 in women, become the higher degree of risk of cardiovascular disease, infertility, diabetes and prostate cancer, as well as high risk for ovarian cancer in females (Derby *et al*., 2006; Swami *et al*., 2009). Our results shown, that the high risk rate was higher in female compared to males, which reached 37.5% in the females and only 4.8% in the males. The members involved in this study are university students and employees; In addition, most of these members are married and have children. After childbirth, the supporting function of women's pelvic floor was lose (Swift, 2000). Some researchers reported that 20–26% women have major injuries to the pelvic floor muscles following vaginal delivery (DeLancey *et al*., 2003; Dietz and Lanzarone, 2005). The pelvic floor is a "hammock" of muscles attached to the pelvic girdle. These muscles hold the pelvic organs in place (Salvesen and Morkved, 2004). During pregnancy and delivery, the pelvic floor can become stretched and weakened. A weakened pelvic floor can also allow one or more pelvic organs to sag, as in the case of uterine prolapsed (Morkved *et al*., 2003). Any increase in the abdominal area, including a pelvic floor, thereby increasing waist circumference, which will eventually lead to increased waist / hip ratio (Derby *et al*., 2006; Swami *et al*., 2009). Pelvic floor exercises during pregnancy and after childbirth strengthen the lower pelvic muscles (Salvesen and Morkved, 2004). High number of the women in Iraq does not make sport during pregnancy and after childbirth due to old culture and believing. On the other hand, the women including in this study are employed, so they cannot breastfeed their children. It is well established that the breastfeeding reduce the pelvic floor due to reduce the Relaxin and Estrogen hormones and increase Oxytocin hormones (Korsten-Reck, 2010). Korsten-Reck 2010 reported that the physical activity in pregnancy and breastfeeding period reduce obese mothers rate (Korsten-Reck, 2010).

It is known, that the PCV value is very important indicator for anemia and iron deficiency. Iron balance is affected by obesity and obesity-related insulin. On one hand, iron deficiency and anemia increase with recurrent stages of obesity progress. This phenomenon has been well studied in obese adult. Several studies appear less iron concentrations in the blood associated with a higher obesity rate in adulthood (Cheng *et al.*, 2012), especially in women (Micozzi *et al*., 1989). On other hand, obesity- associated inflammation related

tightly to iron deficiency and involves of weakness iron absorption in duodenal associated with low expression of the duodenal ferroportin (FPN) along with high concentrations of hepcidin levels (Aigner *et al.*, 2014). Amato et al. reported that the serum hepcidin level was decrease and iron absorption was increased after a six-month weight-loss program in children (Amato *et al*., 2010). All these evidences may explain the significant negative correlation between PCV level and TBF% value, which were reported in this study.

All the individuals in this study, including obese, are healthy. The general rate of obesity according BMI scale was very low compared to TBF scale, as mention above. These two factors together can explain insignificant correlation between PCV and BMI. Similarly, Akinnuga *et al*, 2011 (Akinnuga *et al*., 2011) reported insignificant correlation between PCV level of the normotensive subjects and BMI rate.

5. Conclusion

1. The obesity general rate of Al-Mustansiriyiha university students and employees in Iraq is very low compared to adult obesity rate in worldwide and in Middle East countries, including Arabic countries.
2. The obesity rate depend on TFB scale higher than it depend on BMI scale.
3. The high risk rate depend on (W/H) was higher in female compared to male.
4. While no significantly correlation was detected between the PCV value and BMI, there was a significantly negative correlation between the PCV value and TBF.

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