



## Assessment of pulse rate and oxygen saturation of obese and non-obese 509 healthy males in Erbil city

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### Abstract

**Background:** Cardiovascular disease remains the leading cause of mortality among both men and women; heart rate is an important indicator of cardiovascular health. There are few studies indicating that increasing level of obesity is associated with an elevated pulse rate.

**Objective:** To assess the association between obesity and resting heart rate in our healthy population, as both are regarded as risk factors for ischemic heart disease.

**Materials and Methods:** A total of 509 apparently healthy male individuals have been selected by convenience method. An oxemeter device was used to investigate heart rate in beats per minute, and saturated pressure of oxygen measured as percentage. Data entry and analysis was done using Statistical Package for Social Sciences version 19. Chi-square was used for categorical data analysis and a P value of 0.05 was regarded as statistically significant.

**Results:** The results showed that 75% of overweight and obese participants have high pulse rate (more than 100 b/m) with significant association between body mass index & pulse rate, results also showed that the majority of overweight and obesity were between 40-60 years of age with significant relationship between body mass index and age groups, no significant association was found between association and Oxygen saturation.

**Conclusion:** High prevalence of obesity in this study was noticed. There was significant association between resting pulse rate and BMI among males. No significant association was found between body mass index and oxygen saturation among healthy males.

**Key worlds:** Oxygen saturation, pulse rate, obesity, cardiovascular disease

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### Introduction

Obesity is associated with an increased risk of morbidity and mortality as well as reduced life expectancy. Complications are directly or indirectly caused by obesity, overweight and obesity may account for as many as 15-30% of deaths from coronary heart disease (CHD) [1]. In United States,

heart disease is the leading cause of death for people of most racial/ethnic groups, and CHD is the most common type of heart disease, killing more than 385,000 people annually [2]. In Europe, cardiovascular disease (CVD) remains the leading cause of mortality among both men and women, causing almost 4.1million deaths per year, or



46% of all deaths in Europe [3]. Heart rate (HR) is an important indicator of cardiovascular health, an elevated resting heart rate (RHR) has been linked with adverse cardiovascular outcomes(4), there is an independent association between elevated heart rate and cardiovascular mortality and morbidity, and high heart rates have been associated with coronary artery endothelial dysfunction in experimental studies [5]. Elevated RHR is associated with increased risk of CVD in general population, hypertensive patients and poor prognosis in those with established CVD; these effects are particularly seen in men (6). There are few studies indicating that increasing level of obesity is associated with an elevated pulse rate [7]. It is important to assess the correlation between obesity and resting heart rate in our healthy population, as both are regarded as risk factors for ischemic heart disease (1/5). Obesity has significant effects upon the pulmonary mechanics; body mass index (BMI) has a direct relationship with the degree of airways resistance and work of breathing, and is inversely correlated with thoracic lung volumes [8]. Obesity is associated with restrictive ventilator impairment and diminished FEV1, FVC, vital capacity, total lung capacity, functional residual capacity and expiratory reserve volume. It has been found that obesity is associated with low SpO<sub>2</sub> and is a strong independent factor for low SpO<sub>2</sub>, the effect is comparable to or greater than other clinical factors commonly associated with lower SpO<sub>2</sub> [9]. The aim of this study is to determine the possible relationship between body weight and RHR on one hand, and arterial partial pressure of oxygen on the other hand using BMI and pulse oxymetry.

## Materials and Methods

### Design, setting and time

A cross-sectional study conducted from April till October 2013, a total of 509

apparently healthy male individuals have been randomly selected, and 80% of the samples were taken from dental college and 20% from college of medicine.

### Participants and ethical consideration

The sample included teaching and non-teaching male staff of both colleges. All the participants were assured that participation in the study is voluntary. Verbal consent was obtained from those participated in the study. The agreement of project proposal was taken from Ethics committee of the college of medicine.

### Materials

Anthropometric measurements were performed by a trained person using standardized protocols. Height of participants was measured with a stadiometer, they had been asked to wear standard examination suits and with shoes, while weight taken with a balance scale. Categories of BMI were defined using standard clinical definitions: normal <25 kg/m<sup>2</sup>, overweight 25–29.99 kg/m<sup>2</sup>, obese 30 kg/m<sup>2</sup>. An Oxemeter device was used to investigate heart rate in beats per minute (bpm), and saturated pressure of oxygen measured as percentage.

### Statistical analysis

Data entry and analysis was done using Statistical Package for Social Sciences (SPSS) version (19). Chi-square was used for categorical data analysis and a P value of 0.05 was regarded as statistically significant.

### Results

In this study, it is found that 62% of participants are obese and overweight, 2% are under weight and 36% are normal weight, Analysis showed statistically significant difference between the groups, as shown in table 1.



**Table (1):** Frequency distribution of overweight and obesity.

BMI Category	No.	Percentage
Under weight	9	2%
Normal weight	183	36%
Overweight	214	41.8%
Obese	103	20.2%
Total	509	100%

Table 2 shows that 75% of overweight and obese have high pulse rate (more than 100 b/m) with significant relationship between BMI and PR.

**Table (2):** Relationship between BMI and PR.

BMI category	PR (b/m)				P value
	Low PR No. (%)	Normal PR No. (%)	High PR No. (%)	Total No. (%)	
Under weight	4 (44.4%)	5 (10%)	0 (0%)	9 (1.8%)	0.001
Normal weight	2 (22.2%)	177 (36.6%)	4 (25%)	183 (36%)	
Overweight & obesity	3 (33.3%)	302 (62.4%)	12 (75%)	317 (62.3%)	

According to table 3, majority of overweight and obesity is between 40-60 years of age with significant relationship between BMI and age groups.

**Table (3):** Relationship between BMI and age group

No. percentage	Age group (in years)					P value
	< 18 No. (%)	18-39 No. (%)	40-50 No. (%)	50-60 No. (%)	> 60 No. (%)	
Under weight	0 (0.0%)	9 (35%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0.001
Normal weight	2 (66.7%)	115 (49%)	18 (15.5%)	22 (28.2%)	26 (46.4%)	
Overweight & obesity	1 (33.3%)	132 (51.6%)	98 (84.5%)	50 (71.8%)	30 (53.6%)	
Total	3 (100%)	256 (100%)	116 (100%)	78 (100%)	50 (100%)	

Regarding relationship between BMI and age groups, it is found that 10% of those between 18-50 years old have PR more than 100 b/m with significant

relationship between PR and age groups, as shown in table 4.



**Table (4):** Relationship between pulse rate and age groups.

PR (b/m)	Age groups (in years)					P value
	< 18	18-39	40-49	50-59	> 60	
< 60	1(33.3%)	6 (2.3 %)	2 (1.7%)	0 (0.0%)	0 (0.0%)	0.016
60-100	2 (66.7%)	242 (94.5%)	106 (91.4%)	56 (100%)	56 (100%)	
> 100	0 (0.0%)	8 (3.1%)	8 (6.9%)	0 (0.0%)	0 (0.0%)	
Total	3 (100%)	256 (100%)	116 (100%)	78 (100%)	56 (100%)	509 (100%)

Regarding table 5, vast majority of normal weight, over weight and obese participants has normal Spo2 and no

significant relationship between BMI and Spo2 was found.

**Table (5):** Relationship between BMI and SPO2.

BMI	SPO2			P value
	65%-94%	95%-100%	> 100%	
Under weight	0 (0.0%)	9 (1.8%)	0 (0.0%)	0.933
Normal weight	4 (40%)	170 (35.9)	0 (0.0%)	
Overweight and obesity	6 (60%)	302 (62.2%)	1 (100%)	
Total	10 (100%)	498 (100%)	1 (100%)	

## Discussion

To our knowledge this is the first study examining the relationship between resting heart rate and SPO2 with body mass index in Erbil city. The study has shown that 20% of individuals are obese and 41% are overweight, It is also found that a positive correlation exists between age and BMI, an important conclusion of this was the presence of significant positive correlation between BMI and resting heart rate, We failed to find any relationship between BMI and SPO2. This may be explained by sample size, or because participants were assessed during rest. In this study participants selected from the average Erbil population and included a wide age range, with wide distribution BMI including obese, overweight, and average weight individuals.

In addition to that selecting males only makes the study more specific, two important variables were examined which are pulse rate and SPO2 among different age groups, Study

population were 509, t was better if the study population was larger, Regarding obesity measurement we depended on BMI alone and if abdominal circumference was also taken it was more precise more over if the pulse rate was taken during exercise as well.

In the study done by kanavi *et al* [1] ,217 individuals included and blood pressure and pulse rate were examined andthe conclusion was positive correlation between resting heart rate and BMI, while this study included 509 individuals and pulse rate and SPO2 were examined and the conclusion was the same regarding pulse rate and BMI. In another study done by Talay [4], also significant correlation found between resting heart rate and BMI, But the study population included secondary school students alone which represent a restricted age group, high heartrates have been associated with coronary artery endothelial dysfunction in experimental studies [5]. There are few studies indicating that increasing level of



obesity is associated with an elevated pulse rate [7]. The possible mechanisms may include increased demand for oxygen by obese individuals in addition to impaired autonomic nervous system function among obese individuals, there was no significant correlation between SPO2 and BMI in this study, the results are incongruent with findings of Vishesh *et al* [9]., in which lower SPO2 was noticed mainly among obese persons [9]. This difference may be explained by differences in the sample sizes in both studies.

In conclusion, high prevalence of obesity in this study was noticed. There was significant association between resting pulse rate and BMI among males, no significant relationship between BMI and SPO2 in healthy males was found.

Further studies are needed regarding the extent of contribution of high resting heart rate to different cardiovascular diseases, The mechanism and pathophysiology of autonomic nervous system dysfunction among obese individuals also need to be clarified in future studies, Studies are necessary regarding the exact relationship between oxygen saturation and obesity as respiratory complications of obesity are well known..

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