



A STUDY OF CARDIOVASCULAR AND RESPIRATORY PARAMETERS IN OBESE AND NON-OBESE SUBJECTS RESIDENT IN PORT HARCOURT

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ABSTRACT

The cardiovascular and respiratory parameters of obese and non-obese residents in Port Harcourt were studied using the University of Port Harcourt as a case study. The aim was to investigate the effect of obesity on the above - mentioned parameters. A total of forty subjects (twenty males and twenty females) were used for the study. Twenty of the subjects were obese while the other twenty were non-obese and served as the control. Their ages ranged between eighteen and forty years. The parameters studied were body mass index, heart rate, blood pressure, respiratory rate and peak expiratory flow rate (PEFR). The results of the investigation revealed a significantly higher heart rate, higher blood pressure, higher respiratory rate and peak expiratory flow rate among the obese subjects when compared to those of the non-obese subjects. This shows that obesity has effects on the cardio respiratory fitness of obese people.

KEYWORDS: cardiovascular parameters, respiratory parameters, obesity.

INTRODUCTION

Obesity can be understood in fairly simple terms as body weight resulting from eating too much food, and exercising too little, due largely to lack of personal will or self restraint (Garrow, 1981). It is characterized by the presence of excess fat in proportion to lean body mass (James, 1983). Obesity results from a complex interaction of genetic, behavioral and environmental factors causing an imbalance in energy intake and energy expenditure (ASBP, 1996).

Recognized since 1985 as a chronic disease, obesity is the second leading cause of major risk factor for hypertension, cardiovascular diseases, diabetes mellitus, gallstones and some cancers in both men and women. The excess weight would give an added load to the heart and lungs. From this point of view, it is necessary to know the effects of obesity on the cardiovascular and respiratory parameters and as well as assess the fitness of obese people.

MATERIALS AND METHODS

SUBJECTS

The research work was carried out on a total of forty human subjects comprising of staffs and students who were selected randomly from the three campuses of the University of Port Harcourt.

Twenty of the subjects were obese while the other twenty were non-obese, which served as the control group. Among the twenty obese subjects, fourteen were females while six were males. For the control group, eight were females and twelve were males. The age range of all the subjects was eighteen to forty eight years.

MEASUREMENT OF CARDIOVASCULAR AND RESPIRATORY PARAMETERS

Measurement of Height, Weight And Body Mass Index

Weight and height were measured using a Seca weighing balance, which has a height scale (Seca Ltd, Birmingham, UK). The subjects wore light clothing and no shoes while being weighed. Weight was measured to the nearest 0.1kg. Body mass index (Quetelet index) was calculated as weight/ height squared. (Quetelet was a Belgian mathematician who suggested weight/height² (kg/m²) as a useful index for classifying people into different sizes, Forbes et al., 1983).

Heart rate was measured by placing the surface of the terminal phalanges of the three middle fingers of the right hand gently over the radial pulse and counting the pulse with a stopwatch. With the aid of the stopwatch the pulse was counted.

Blood pressure was measured by the use of an aneroid sphygmomanometer (Samco Atlat T.M. USA) and a stethoscope (MR Surgical Co.; London).

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Peak expiratory flow rate was measured by the use of a peak expiratory flow meter (Airmed Ltd, Harlow, England).

RESULTS AND DISCUSSION

The weight of the obese subjects ranged from 62-123kg. The mean weight was 83.2 ± 15.1 kg. The height of the subjects ranged from 1.52 – 1.83m with a mean value of 1.64 ± 0.63 m. Body mass index was 31.39 ± 5.98 among the subjects studied. Fifty five percent of the subjects had grade 1 obesity, 35% had grade 2 obesity while 10% had grade 3 obesity. For the non-obese subjects, the mean weight was 61.44 ± 8.68 kg while the range was 49.4-77.5kg. The height ranged from 1.56 to 1.88m with a mean height of 1.67 ± 8.97 m. Body mass index ranged from 18.1 to 24.8. The mean value was 21.72 ± 2.02 .

The results on the heart rate, blood pressure, respiratory rate and the peak expiratory flow rate are shown in table 1. Mean systolic and diastolic blood pressure in obese subjects was 117.45 ± 17.66 and 76.05 ± 12.04 mmHg respectively, while that in non-obese subjects was 96.76 ± 13.17 and 64.8 ± 11.71 mmHg respectively. Blood pressure and heart rate were significantly higher in obese subjects than in their non-obese counterparts. It has been proven that blood pressure elevation is a common concomitant of obesity (Braitman et al., 1985). Population statistics have shown that 10% gain in weight

leads to an average rise of 6mm and 4mm/Hg in systolic and diastolic blood pressure (Penick, 1971). Also according to (Pendope, 1971) the upper body fat is more likely to raise blood pressure than the fat in the gluteal and thigh region. Though the exact mechanism is not known, it is believed that due to the extra amount of fatty issue in the obese subjects, the heart must pump additional blood. Beside overweight or obese subjects have a greater volume of blood than the normal subjects. These two factors cause the heart to work harder with every beat, thus leading to increased heart rate and blood pressure.

A close study of the result of the respiratory rate reveals a lower PEFR in obese subjects than in the non-obese subjects. This is due to the thoracic and abdominal fats in obese subjects, which increase the work of breathing and decrease respiratory efficiency. There is also the observation that the respiratory rate is higher in the obese subjects than in the non-obese subjects.

This is because in an attempt to reduce the work of breathing, there is a change in the breathing pattern to allow rapid respiration, thus leading to the marked increase in the breathing rate of obese persons (Gerald, 1974). Textbook values put the breathing rate of normal Caucasian at 12 breaths/min (Guyton, 1996). In contrast, the average value for normal Africans used in this research was found to be about 20 breaths per min.

TABLE 1 BLOOD PRESSURE, HEART RATE, RESPIRATORY RATE AND PEAK EXPIRATORY FLOW RATE IN OBESE AND NON-OBESE SUBJECTS

| | PARAMETER | OBESE | NON-OBESE |
|---|--|--|--|
| 1 | BMI (I) Mean \pm S.D. (II) Range | 31.39 ± 5.98 25.2 – 48.1 | 21.72 ± 2.02 17.9 – 24.8 |
| 2 | BLOOD PRESSURE (mmHg) (a) SYSTOLIC PRESSURE (i) Mean \pm S.D. (ii) Range (b) DIASTOLIC PRESSURE (i) Mean \pm S.D. (ii) Range | 117.45 ± 17.66 75 – 145 76.05 ± 12.04 55 - 95 | 96.76 ± 13.18 70 -86 64.05 ± 11.71 50 -86 |
| 3 | HEART RATE (I) Mean \pm S.D (II) Range | 77.95 ± 9.19 64 - 100 | 70.8 ± 7.85 60 – 86 |
| 4 | RESPIRATORY RATE (I) Mean \pm S.D. (II) Range | 24.13 ± 3.71 17 - 32 | 20.6 ± 2.58 16 – 35 |
| 5 | PEAK EXPIRATORY FLOW RATE (I) Mean \pm S. D. (II) Range | 355.73 ± 65.95 250 – 496.7 | 455.92 ± 94.4 333.3 – 702.5 |

CONCLUSION

It is obvious from this research work that obesity has some noticeable effects on the cardiovascular and respiratory parameters indicating cardio-respiratory unfitness. These include increased heart rate, increased blood pressure (systolic and diastolic), increased breathing rate and a decreased peak expiratory flow rate. Health consequences of obesity include hypertension, diabetes mellitus, cancer and pulmonary dysfunction.

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