

Study of the Obesity and the Rate of Cholesterol and Triglycerides Concentrations among Male Prison Inmates in Southern Libya

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Abstract: This study was conducted to investigate body mass index (BMI), levels of cholesterol and triglycerides in prison inmates at the Institution for Reform and Rehabilitation in Southern Libya to be considered as an indication about their health and the provided foods. The results of this study showed that 26.5% of BMI of the prison inmates were found to be higher than the normal levels. Generally, the average level of cholesterol and triglycerides concentrations were found to be within normal range 142.6 mg/dl and 135.4 mg/dl, respectively. The findings also established that there were a significant relationship and direct correlation between BMI levels and age and concentration of cholesterol and triglycerides levels. The results of this showed that the served foods for these prison inmates are well balanced as indicated by their cholesterol and triglycerides levels.

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1. Introduction:

Several studies were conducted in different countries to investigate the rates of obesity and above normal weight gains among prison inmates as well as their cholesterol and triglycerides concentrations (Katharine et al., 2012). Previous studies included sixty thousand (60,000) prisoners around the world in fifteen different countries. They found out that male inmates are likely to be obese by nearly 20 % than the general female population except in the United Kingdom¹. These male inmates tend to be less obese compared to those living freely in public. However, the researchers noted that the rate varies from one country to another.¹In Saudi Arabia, a study of measurements of obesity among female inmates revealed that 37.3 % of those women have normal Body Mass Index (BMI), while 62.7 % of them fall outside the normal range. Underweight inmates comprised 2.7%, whereas 30.9 % are overweight (Ahmed and Asiri, 2007). Body Mass Index of prison inmates in Pakistan was also conducted to assess the effects of dietary habits on body weight. A total number of 269 inmates participated in that study. It was established that 125 were found to have normal BMI with values ranged between 18-24. Seventy-one inmates were found to be overweight with BMI ranged between 25-29, while 73 inmates were found to have BMI greater than 30 and none of the inmates were found to be underweight.³Weight gain and obesity is defined based on the BMI and calculated as weight (kg) divided by height in meters squared (Mukhtar et al., 2013). A person with a BMI between 25.0–29.0 is measured to be overweighted and ≥ 30.0 is considered

obese (NIH, 1998; WHO, 2008; WHO, 2009; WHO, 2011). Prison inmates in most of the countries, especially in the developing countries are suffering from several health conditions such as malnutrition and anaemia, in contrast to some countries where inmates suffer greatly from obesity and subsequently cardiovascular disease, where both conditions caused premature death. It can be observed that person's lifestyle, high blood cholesterol levels, and excessive alcohol consumption all contributes to the development of hypertension and stroke (Osses-Paredes and Riquelme-Pereira, 2013). Due to limitation of similar studies in Libya, this study was aimed to measure the BMI, levels of cholesterol and triglycerides in a sample of prison inmates at the Institution for Reform and Rehabilitation in Southern Libya.

2. Material and Methods:

In this study, 87 prison inmates from Institution of Reform and Rehabilitation in Southern Libya participated were as volunteers, who aged between 18-61 years old and with duration of institutional stay from one year to nine years. Blood samples were collected randomly for several days at the clinics allocated by the institution to rule out the possibility of infectious and chronic diseases. A questionnaire was used to take the demographic data of the samples and the height and weight measurements were taken to determine their individual BMI. For each prison, a 5 ml of blood was collected and placed in plastic tubes, which do not contain anti-coagulants and left for some time to complete the clotting process (more than half

an hour). The process of separating the serum was done using centrifuge at a speed of 3,000 rpm for 5 min and later used to determine the levels of triglycerides and cholesterol concentrations. The measurement of total cholesterol and triglycerides concentrations was performed using serum by ready solutions kits prepared by Biocon Company, India.

3. Statistical analysis:

Firstly, the data was computed to have the averages and the standard deviations. The data obtained was statistically analysed using frequencies and simple percentages. A statistical program MINITAB was also utilized to determine the significance differences and extent of correlation between variables namely BMI, age, cholesterol and triglycerides.

4. Results and Discussion:

This study was conducted on 87 samples, who were prison inmates at the Institution of Reform and Rehabilitation located in Southern Libya with age ranged between 18 – 61 years old and represents a sample rate percentage of 18% from the total number of inmates totalling to 479. The results of this study showed that the average BMI of all samples is 22.9 kg/m² and that 65.5% (57 cases) of the samples are within the normal limits of BMI. However, 34.5% (30 cases) are found to be beyond the normal limits, where 8.0% (7 cases) represents underweight and 26.5% (23 cases) are began between overweight and obese as shown in Table 1.

Table 1. Body Mass Index of the samples with Corresponding Interpretation

| Body mass index (kg / m) | | Number of Samples | Percentage |
|--|---------------------------------|-------------------|------------|
| <i>Normal level or ideal (18.5-24.9)</i> | | 57 | 65.5 |
| Abnormal levels | underweight (< 18.5) | 7 | 8.0 |
| | Overweight (25-29.9) | 16 | 18.4 |
| | First-class obesity (30-34.9) | 6 | 6.9 |
| | Second-degree obesity (35-39.9) | 1 | 1.2 |
| | Obesity third degree (≥ 40) | 0 | 0 |
| Total | | 87 | 100% |

As shown in Table 1, 26.5% of the inmates gained weight and that caused a rise in the BMI at the Institution of Reform and Rehabilitation. However, this percentage is still low in comparison to the results of female inmates in Saudi Arabia with 62.7% and Pakistan with 53.3% (Katharine et al., 2012; Mukhtar et al., 2013). Moreover, a study in the New South Wales also revealed that 50% of men and 44% of women inmates were found to be overweight or obese (Lines, 2008; Osses-Paredes and Riquelme-Pereira, 2013). An issue of concern, considering that prison inmates have

the right to have a good health as defined in the international law (Lines, 2008). These results highlights the importance and the kind of foods in terms of its nutritional value, which are provided to inmates, as well as the opportunity to have a regular exercise to support the daily lifestyle.

Table 2 shows the level of cholesterol and triglycerides obtained from the tested samples. The results suggest that the over-all average for the two tests is within the normal limits, specifically 142.6 mg/dl for cholesterol and 135.4 mg/dl for triglycerides.

Table 2. Cholesterol and triglyceride levels of the inmate samples

| Cholesterol (mg / 100 ml) | | | Triglycerides (mg / 100 ml) | | | | |
|---------------------------|------------------------|-------------------|-----------------------------|------------------------|-------------------|--------------|------|
| Level | | Number of Samples | Percentage% | Level | Number of Samples | Percentage % | |
| Normal level (≥200) | | 79 | 90.8 | Normal level (≥200) | | 76 | 87.4 |
| Abnormal levels (<200) | Average Risk (200-239) | 7 | 8.1 | Average Risk (200-400) | | 9 | 10.3 |
| | High Risk (≤ 240) | 1 | 1.1 | High Risk (≤ 400) | | 2 | 2.3 |
| | | N= 87 | 100% | | | N= 87 | 100% |

The data on Table 2 is presented according to rank from highest to lowest values. It can be seen that cholesterol results of those seventy nine samples were within normal levels, which represent 90.8%, while 8.1% (seven samples) fall within the average risk (200-230 mg/dl), and 1.1% (one sample) was found to be at high risk (≤ 240). The results also established the

levels of triglycerides, where out of the total number of samples (87 samples), seventy six samples (87.4%) were found to have normal levels, while, nine samples (10.3%) fall within the average risk (200-400) and only two samples (2.3%) at high risk (≤400). The moderate level of dietary fat in meals served for these inmates explains the satisfactory levels of cholesterol and

triglycerides in most number of samples. However, it is also necessary to note that a factor in the development of abnormal levels may be due to a decrease in the dietary intake of fibre-rich vegetables in the served meals (Anderson et al. 1991).

Table 3 illustrates the relationship and the extent of correlation between the results (BMI, Age, TG and CHOL) using Pearson Correlation Coefficient and P-value. The data reveals that there are significant relationship and direct correlation between tests namely BMI and TG, BMI and CHOL, BMI and Age and between CHOL and T.G. This analysis is derived because the coefficient values of Pearson correlation and the P-value is lesser than 0.05.

Table 3. Relationship and correlation between BMI, Age, TG and CHOL

| Variables | Pearson correlation coefficient | P-Value |
|-----------|---------------------------------|---------|
| T.G, BMI | 0.324 | 0.002 |
| CHOL, BMI | 0.289 | 0.007 |
| AGE, BMI | 0.281 | 0.008 |
| CHOL, T.G | 0.339 | 0.001 |

Conclusion:

It can be concluded that this study showed 26.5% of the prison inmates were found to be above the normal levels in terms of Body Mass Index. This result however, is still low compared to results of other studies that were performed in other countries. The over-all averages of cholesterol and triglycerides concentrations were found to be within normal limits 142.6 mg/dl and 135.4 mg/dl, respectively. Only one prison inmate was within the high risk of cholesterol level (≥ 240) and two prison inmates were at the high risk of triglyceride level (≥ 400). Pearson correlation and P-values also revealed significant proportional relationship between the tests, which included TG, BMI, CHOL and AGE with a P-value at < 0.05 level of significance. This study therefore indicated that the inmates in the Institution of Reform and Rehabilitation in Southern Libya are well taken care in terms of their dietary needs. The average result of cholesterol and triglycerides levels suggested that the served foods are well-balanced by the management and that they have enough physical activity to maintain their blood cholesterol and triglyceride at normal levels.

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