

Determination of cholesterol concentration

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Determination of Cholesterol Concentration

Determination of cholesterol levels in patients is a health assessment procedure that helps provide necessary information, for management of patients with cardiovascular disease, and at high risk of developing such diseases. This is a report about a patient with high likelihood of developing cardiovascular problems. It was aimed at determining her cholesterol levels. Cholesterol when in excess causes different health problems, one of which is myocardial infarction. She is 40 years of age, has very close family members who died of heart attacks and diseases, and experienced a mild heart attack recently. The results revealed high cholesterol levels placing her under the high category risk. The normal range is 200-240mg/dl (NHS, 2010; American Heart Association, 2013), while her level read 330mg/dl. Recommendations on her management are given in the report.

Introduction Cholesterol is a necessary substance for the normal functioning of the body. It is a fatty substance found in all cells of the body. When cholesterol is in excess, it can cause health problems. An example is excess cholesterol deposited in the arteries. This forms a plaque that can grow with time. Formation of such a plaque is known as atherosclerosis; one of the causes of myocardial infarction. The risk of heart attacks is also increased by the presence of blood clots in the arteries. Cholesterol plays a role in formation of these clots. When a part of the plaque breaks off, it leaves an exposed surface. Blood clots form on this surface causing blockage, or decrease in oxygen and blood flow to various organs. If such blockage happens in the arteries that supply blood and oxygen to the heart, and is significant, it can cause heart attack (Birtcher & Ballantyne, 2004). This report is about determination of cholesterol concentration. It is based on patient assessment results which

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show a very high likelihood of heart attack, due to high cholesterol levels in the blood. Some family members have died of heart attack, and the patient has experienced a heart attack. It is only appropriate to determine cholesterol levels and determine the risk of heart attacks. Below is a summary of the patient's assessment: The patient is 40 years old. She is female and has recently recovered from a mild heart attack. The patient's brother died of heart attack recently, at the age of 45. The patient's father died due to heart disease at the age of 52. Her mother is 75 years old and is still alive. Her grandmother is also still alive but very old. Her grandfather used to smoke. She weighs 10 stones 8 pounds. Her height is 5 foot 6. The patient is worried about her health in general. This patient has a strong family history of heart disease, but there is also high likelihood of low risk for cardiovascular disease based on her gender. It is important to measure her cholesterol levels to determine the risk of cardiovascular disease. Method: Determination of Cholesterol by Spectroscopy. 40 micro litre of each sample was added to each of the 7 test tubes using a pipette, 2 ml of cholesterol reagent was poured into each of the sample using a pipette. The product was then mixed and allowed to stand for 30 minutes. The mixture was then transferred from the test tubes into a cuvette. The cuvette with the sample was then taken to spectrophotometer at 555nm, and the absorbencies were measured. The concentration was calculated using Beer's law. The standard solution contained 720mg/dl of cholesterol. Results: The results were as shown in the table below:

SAMPLE	ABSORBANCE	CONCENTRATION
son	1.451	792
Daughter	1.475	768
Mother	0.898	467
Grandmother	0.901	469
Normal person	0.931	484
Standard	1.382	720
Patient	1.726	899
blank	0.000	0.000

A graph was plotted using the absorbance of solutions. This was <https://assignbuster.com/determination-of-cholesterol-concentration/>

used to develop a standard curve as below; using the concentration on the X axis, and Absorbance on the Y axis. Normal cholesterol levels are measured differently, for example, by use of units such as milligrams and mols. In this analysis, the normal cholesterol level is 484 mg/dl of cholesterol. The standard level is 720ml/dl. The patient's concentration level is almost three times the normal person, and 179mg/dl more that the standard level. This shows very high risk of cardiovascular disease, and cardiovascular events such as stroke and heart attack (American Heart Association, 2013).

Discussion: Measurement of cholesterol concentration is interpreted according to Beer's law. Beer's law states that the amount of absorbed light is directly proportional to the concentration of the sample that has passed through the light in the spectroscopy. The equation is normally given as $A = \epsilon \cdot c \cdot l$. It means that, with a fixed path length, a solution's light absorbance is directly proportional to the concentration of the absorbing species. With a fixed concentration, a solution's light absorbance is directly proportional to its path length. This equation is normally used to determine concentrations of unknown solutions. With a graph plotted, the solution concentrations can be read directly from the graph. A straight line passing through the origin shows that the system obeys Beer's law (Sathyanarayana, 2001). This is exactly as presented in the graph above. Readings from the graph show clearly that the patient has high levels of cholesterol concentration. This is the same to the son and the daughter. There is a deviation from the graph which shows a deviation from Beer's law. There are various reasons for such a deviation. When the concentration of the absorbing species is high, there could be intermolecular interactions. Other causes of deviation are; variations in temperatures during absorption, cooling of the substance in

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liquid nitrogen temperature, solute/solvent interactions, dissociation and association of the absorbing substance in the solution, solutions containing suspended particles or with weak fluorescence, stray radiations, and even higher concentrations. The deviation shown in the graph is a negative one, means it on the downward side of the straight line (Sathyanarayana, 2001). High cholesterol concentration best describe the negative deviation observed in the graph. Cholesterol level measurement is aimed at providing the doctor with necessary information about risk levels to cardiovascular disease. This is important for provision of informed advise to the patient; hence management of the patient's situation (Nauck, Warnick & Rifai, 2002; NHS, 2010). Like in the patient whose samples was analysed above, the results can be used to prevent heart attacks that are likely to occur, or even stroke. Level of risk is classified as high, moderate or low. High risk begins from 240mg and above. Other risk factors considered in the risk factor calculator are; age, smoking status, sex, blood pressure and family history. The patient described above has a family history of cardiovascular disease. According to UK health guidelines, those who should be assessed for cardiovascular disease are; adults with a family history of the disease, and adults of 40 years and above (NHS, 2010). These two factors increase the risk level of the patient having or developing a cardiovascular disease. The patient should therefore, be given cholesterol reducing drugs, and advice on lifestyle issues that will change factors contributing to her current status (NHS, 2012). Conclusion High cholesterol levels in the patient are a sign of high likelihood of more frequent heart attacks. They may have been the cause of the mild heart attack that the patient experienced. The patient should keep a regular visit to her doctor for regular assessment and

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management of her condition. This is because of the high likelihood of developing a cardiovascular disease; her family history, her age, and her cholesterol levels. References American Heart Association, 2013, What Your Cholesterol Levels Mean, Retrieved on 9th November 2013 from: http://www.heart.org/HEARTORG/Conditions/Cholesterol/AboutCholesterol/What-Your-Cholesterol-Levels-Mean_UCM_305562_Article.jsp Birtcher, K. K., and Ballantyne, C. M., 2004, Measurement of Cholesterol: A Patient Perspective, *Circulation*. Retrieved on 9th November 2013 from: <http://circ.ahajournals.org/content/110/11/e296.full.pdf+html> Nauck, M., Warnick, G. R. and Rifai, N., 2002, Methods for Measurement of LDL-Cholesterol: A Critical Assessment of Direct Measurement by Homogeneous Assays versus Calculation, *Clinical Chemistry* 48(2): 236–254. NHS, 2010, Prevention of Cardiovascular Disease, NICE Public Health Guidance 25. Retrieved on 9th November 2013 from: <http://www.nice.org.uk/nicemedia/live/13024/49273/49273.pdf> NHS, 2012, Preventing Heart Disease. Retrieved on 9th November 2013 from: <http://www.nhs.uk/Conditions/coronary-heart-disease/Pages/prevention.aspx> Sathyanarayana, D. N., 2001, *Electronic Absorption Spectroscopy and Related Techniques*, Hyderabad: Universities Press.