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**The Effects of Sex and Body Mass Index (BMI) on Blood Glucose and Total Cholesterol in College of Education –Shaqlawa Students**

A Research Project

Submitted to the Council of the College of Education-Shaqlawa, Salahaddin University – Erbil in Partial Fulfillment of the Requirements for the Degree of Bachelor in Biology

*By*

**Shno Mustafa Fatah**

**Avin faqe Tahir Omar**

*Supervised by*

**Asst. lect. Peshraw Abdulkarim Othman**

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**CERTIFICATE**

This research project has been written under my supervision and has been submitted for the award of the **BSc.** degree in **Biology** with my approval as a supervisor.

Signature

Name: Asst. lect. Peshraw Abdulkarim Othman

Date: 10 /4/2023

**DEDICATION**

We dedicate our work to our Parents whom always have encouraged our during all the steps of the study. Also, we dedicate it to our sisters and my brothers whom have been helped our in every way possible to finish the study. Our love for you all can never be quantified.

***Shno Mustafa Fatah***

***Avin Faqe Tahir Omar***

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**Abstract**

Blood sugar, or glucose, is the main sugar found in your blood. It comes from the food you eat, and is your body's main source of energy. Your blood carries glucose to all of your body's cells to use for energy. Diabetes is a disease in which your blood sugar levels are too high. Cholesterol is a fat-like, waxy substance that helps your body make cell membranes, many hormones, and vitamin D. The cholesterol in your blood comes from two sources: the foods you eat and your liver. Your liver makes all the cholesterol your body needs. The purpose of this study is to analyze the effect of sex and body mass index (BMI) on blood glucose, total cholesterol in students. The methods of our study were as follows: out of 32 sample taken from students in our college of different stages ,age ,gender, we did blood sugar and total cholesterol test . The effect of sex ( males and females ) on body measurement included  body index (BI)  and serum tests included  blood glucose and blood cholesterol , the results indicated that no significant differences between males and females in body index in spite of body index in males suppress on females . In relation of blood serum included glucose and cholesterol although none significant differences between males and females in above mentioned traits .however, there was mathematical differences between males and females in same traits.

**Key words:** Body mass index BMI, Blood glucose, Total Cholesterol

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**LIST OF ABBREVIATIONS**

1. **CVD**: cardiovascular disease
2. **LDL**: low density lipoproteins
3. **HDL**: .high density lipoproteins
4. **BGL:**  blood glucose level
5. **T1DM**:Type 1 diabetes mellitus
6. **T2DM**:Type 2 diabetes mellitus
7. **Hyperglycemia**: high blood glucose levels
8. **Hypercholesterolemia** : high cholesterol level
9. **BMI**: body mass index
10. **TC**: total cholesterol
11. **TG**: triglyceride
12. **RBS:** random blood sugar
13. **FBS:** fasting blood sugar
14. **HBA1C**: Hemoglobin is the substance inside red blood cells that carries oxygen to the cells of the body. Glucose (a type of sugar) molecules in the blood normally become stuck to hemoglobin molecules - this means the hemoglobin has become glycosylated (also referred to as hemoglobin A1c, or HbA1c).

**INTRODUCTION**

Cardiovascular disease is a public health problems and the leading cause of death in both developed and developing countries(Nangia et al., 2016).cholesterol can be defined as substance that can be found in all cells which have the characteristic   of wax like fat-substance(Rey-Barroso et al., 2014). Lipoproteins are divided into two categories which are low density lipoproteins(LDL) and high density lipoproteins(HDL).LDL is called as bad cholesterol while HDL is called as good cholesterol .The reason LDL is called bad because it will build up in the arteries whereas HDL will bring the cholesterol back to the liver so that liver can get rid of it(Guevara-Cruz et al., 2014).blood sugar concentration is also known as blood glucose level(BGL).Amount of sugar that is present in human body is known as blood glucose level .

The blood glucose levels are normally regulated by human body by a process called metabolic homeostasis (care, 2010, Innocent et al., 2013, Martin et al., 2012). Type 1 diabetes mellitus(T1DM)is chronic auto immune disease characterized by increased blood glucose levels (hyperglycemia),which are due to the insulin deficiency that occurs as the consequence of the loss of the pancreatic islet B cell (Atkinson et al., 2014, Group, 2004).Type 2 diabetes or adult onest diabetes can affect people at any age, even children however ,type 2 diabetes develops most often in middle aged and older people. who are overweight and inactive are also more likely to develop type 2 diabetes(Bradley, 2013).

Balakumar et al. (2016) , Founded that several risk factors have been identified as a contributing factor to cardiovascular disease including age, sex, increased body mass index, hyperglycemia, hypercholesterolemia and increased blood pressure. Tsai et al. (2014), said that age is very important factor for cholesterol level, there are studies in US shows that if an elderly man above 45 years old and women above 55 years old have the higher risk for cholesterol Studies show women have better cholesterol level than men. Saely et al. (2009), Reported that The analysis that was done referring few journals from the period of 2010 to 2014 total cholesterol does increase with excess bodyweight. Sepp et al. (2014) Innocent et al. (2013) Have founded that Glucose levels are usually the lowest in the morning and increases after meal for about two hours around few mill molars(mmol/L).blood pressure, cholesterol, and random blood glucose level showed a positive correlation with BMI. Organization (2017), Founded that Obesity is an excessive buildup of fats in the human body which leads to many ailments. Recently, WHO has documented that 1.9 billion adults of age 18 year and above were found to be overweight and 650 million of them were considered obese. Bahiru et al. (2021), Founded that T2DM patients often present with characteristic plasma lipid and lipoprotein abnormalities, including low HDL-C, high LDL-C. Wang et al. (2020), reported that fasting plasma glucose levels were significantly associated with HDL and TC , but not with LDL and TG among T2DM patients in Qingdao, China.

The purpose of this study is to analyze the effect of age and body mass index (BMI) on blood glucose, total cholesterol in students. In practical process, Blood samples (ml) were collected for analyzing measure the blood levels of sugar, cholesterol, triglyceride in human randomly by using commercial kits which is available in our city , in blood we have three test ( HBA1C , FBS,RBS) but we use FBS (fasting blood sugar) this measures your blood sugar an overnight fast (no eating ).on the other hand for cholesterol we have two test ( by serum -by kit) we choose kit because it take less costs and time.

**Methodology and Research design**

**Study design, setting, and sample size:** This study Employed an analytical observational design method. The study was conducted in salahaddin University College of education –shaqlawa using a purposive sampling method 32 students age between 19-27 years old and both gender were recruited to participate in the study.

**Variables and instrument of data collection:** There were four variables in the study including Sex, BMI, Blood glucose, Blood cholesterol as described below.

**a. Sex:** The data of sex was obtained from the sociodemographic characteristics of the respondents stated during the data collection. Other sociodemographic data included marital status, employment status and co-morbidity.

**b. Body mass index (BMI):** The body mass index was obtained from the measurement of body weight (kg) and height (m). The formula to calculate the BMI is as follow: (weight (kg) /weight (m)?. BMI was classified as underweight (BMI <20 kg/m?, normal (BMI= 20-24.9 kg/m?), overweight (BMI= 25-29.9 kg/m), and obesity (BMI230 kg/m?).

**c. Blood glucose:** The blood glucose was measured based on the capillary blood glucose level (mg/di) using a glucose meter. For the purpose of this study, blood glucose was measured from a random glucose test. A blood glucose level of less than 200 mg/dl was categorized as normal and a level of 200 mg/dl or higher was classified as hyperglycemia.

**d. Blood cholesterol**: Blood cholesterol was measured from serum cholesterol refers to overall level of cholesterol obtained by venipuncture, collection of blood from vein and use centrifuge to prepare serum, medical devices called chemistry analyzers use to calculate the amount of cholesterol in a blood sample. They measure the color of light emitted when certain chemical read to the presence of cholesterol.

# Result AND DISSCUSION

Table 1 , showed that the effect of sex ( males and females ) on body measurement included body index (BI) and serum tests included blood glucose and blood cholesterol , the results indicated that no significant differences between males and females in body index in spite of body index in males suppress on females . In relation of blood serum included glucose and cholesterol although none significant differences between males and females in above mentioned traits . However, there was mathematical differences between males and females in same traits. In study was done by Yi et al. (2019) , indicated that the men had on average higher cholesterol levels than women between 24–25 to 48–49 years old, while women had higher levels than men in the age ranges of 18–23 years and ≥50 years . Among men, the mean cholesterol levels increased from 159.0 mg/dL at 18–19 years to a maximum of 201.4 mg/dL at 50–51 years, and among women, the mean levels increased from 170.5 mg/dL at 20–21 years to a maximum of 212.4 mg/dL at 56–57 years. The decrease in TC levels after the peak values were reached was greater in men than in women. The gradient of increase in cholesterol levels with age was steepest from 18–19 to 28–29 years in men, while it was steepest from 44–45 to 52–53 years in women . In the other study was done by Ishii *et al* ., 2016 , they showed that Glucose of sucrose in young men was not significantly different from glucose of glucose in men, but glucose of sucrose in young women was 67.8% of GI of glucose. We used substances of distinct structures such as glucose or sucrose which has 50% of glucose in the structure. Even substances of such distinct structure were used glucose was different depending upon age and gender of persons who took such substances.

Table -1 Effect of sex on human body index, glucose and cholesterol

|  |  |  |  |
| --- | --- | --- | --- |
| Sex | Body Index  | Glucose | Cholesterol |
| Male | 23.11± 0.63 | 95.125± 2.70 | 126 ± 10.07 |
| Female | 22.83 ± 0.97 | 100.87 ± 2.84 | 122.87± 5.66 |
| Overall  | 22.97± 0.55 | 98 ± 2.01 | 124.43 ± 5. 52 |

* None-significant between males and females in above traits

In relation to phenotypic correlation between above mentioned traits, table 2 , the results illustrated that negative correlation between body index and blood glucose, their data was (-0.062), the cause of this due to body index located in normal range. However, the results revealed positive correlation between body index and blood cholesterol, their data was (0.232), this means that the increase body weight led to increase cholesterol level . In the study was carried out by Li et al ., 2021 , they found that in the population with normal or light weight, the association between BMI and LDL-C was linearly and positively correlated, while in the overweight population, with increasing BMI, LDL-C levels gradually tended to be flat or even decreased. The trend of the above association was different between sexes . High BMI is associated with the occurrence of cardiovascular diseases (CVD) Kivimäki et al. (2017) , It has been reported that for every 5 kg/m2 increased in BMI, the average of all-cause mortality and vascular mortality increases by 30 and 40%, respectively(Whitlock G, 2009).

Previous studies evaluated the linear relationship between LDL-C and BMI in limited or selected samples, however, data on potential sex differences is limited. For example, a study performed in the US population suggested that LDL-C linearly associated with BMI . Another cohort study involving US children, also indicated that BMI is a strong determinants of lipid and lipoprotein levels. One study reported that LDL-C only increased with greater BMI among younger subjects, but not among male over 50 years (Laclaustra et al., 2018).

Table -2 . Correlation between two traits .

|  |  |  |  |
| --- | --- | --- | --- |
|  | Body Index  | Glucose | Cholesterol |
| Body Index | 1 | -0.062 | 0.232 |
| Glucose | -0.062 | 1 | -0.279 |
| Cholesterol | 0.232 | -0.279 | 1 |

**CONCLUSIONS AND RECOMMENDATIONS**

Sex has none significant effect on blood glucose, blood cholesterol and , Body index . Sex puts men at a greater level of having an increased level of blood glucose and blood cholesterol. To maintain a normal level of blood sugar, blood cholesterol and body index can be managed by practicing a healthy lifestyle such as reducing fat, salt, and sugar intake in their diet, promoting physical activity, and maintaining a normal body weight .

REFERENCES

ATKINSON, M. A., EISENBARTH, G. S. & MICHELS, A. W. 2014. Type 1 diabetes. J The Lancet, 383**,** 69-82.

BAHIRU, E., HSIAO, R., PHILLIPSON, D. & WATSON, K. E. 2021. Mechanisms and treatment of dyslipidemia in diabetes. J Current Cardiology Reports, 23**,** 1-6.

BALAKUMAR, P., MAUNG-U, K. & JAGADEESH, G. 2016. Prevalence and prevention of cardiovascular disease and diabetes mellitus. J Pharmacological research, 113**,** 600-609.

BRADLEY, C. 2013. Handbook of psychology and diabetes: a guide to psychological measurement in diabetes research and practice, Routledge.

CARE, A. D. A. J. D. 2010. Diagnosis and classification of diabetes mellitus. 33**,** S62-S69.

GROUP, S. S. 2004. SEARCH for Diabetes in Youth: a multicenter study of the prevalence, incidence and classification of diabetes mellitus in youth. J Controlled clinical trials, 25**,** 458-471.

GUEVARA-CRUZ, M., TORRES, N., TOVAR, A. R., TEJERO, M. E., CASTELLANOS-JANKIEWICZ, A. & DEL BOSQUE-PLATA, L. 2014. A genetic variant of the CAPN10 gene in Mexican subjects with dyslipidemia is associated with increased HDL-cholesterol concentrations after the consumption of a soy protein and soluble fiber dietary portfolio. J Nutrición Hospitalaria, 30**,** 671-677.

INNOCENT, O., THANKGOD, O. O., SANDRA, E. O. & JOSIAH, I. E. 2013. Correlation between body mass index and blood glucose levels among some Nigerian undergraduates. J Hoaj Biology, 2**,** 4.

KIVIMÄKI, M., KUOSMA, E., FERRIE, J. E., LUUKKONEN, R., NYBERG, S. T., ALFREDSSON, L., BATTY, G. D., BRUNNER, E. J., FRANSSON, E. & GOLDBERG, M. 2017. Overweight, obesity, and risk of cardiometabolic multimorbidity: pooled analysis of individual-level data for 120 813 adults from 16 cohort studies from the USA and Europe. Lancet Public Health, 2**,** e277-e285.

LACLAUSTRA, M., LOPEZ-GARCIA, E., CIVEIRA, F., GARCIA-ESQUINAS, E., GRACIANI, A., GUALLAR-CASTILLON, P., BANEGAS, J. R. & RODRIGUEZ-ARTALEJO, F. 2018. LDL cholesterol rises with BMI only in lean individuals: cross-sectional US and Spanish representative data. Diabetes Care, 41**,** 2195-2201.

MARTIN, R. J., RATAN, R. R., REDING, M. J., OLSEN, T. S. & TREATMENT 2012. Higher blood glucose within the normal range is associated with more severe strokes. J Stroke research, 2012.

NANGIA, R., SINGH, H. & KAUR, K. 2016. Prevalence of cardiovascular disease (CVD) risk factors. J medical journal 72**,** 315-319.

ORGANIZATION, W. H. 2017. Overweight and obesity in the Western Pacific Region: an equity perspective, WHO Regional Office for the Western Pacific.

REY-BARROSO, J., ALVAREZ-BARRIENTOS, A., RICO-LEO, E., CONTADOR-TROCA, M., CARVAJAL-GONZALEZ, J. M., ECHARRI, A., DEL POZO, M. A. & FERNANDEZ-SALGUERO 2014. The Dioxin receptor modulates Caveolin-1 mobilization during directional migration: role of cholesterol. J Cell Communication Signaling, 12**,** 1-19.

SAELY, C. H., RISCH, L., FREY, F., LUPI, G. A., LEUPPI, J. D., DREXEL, H. & HUBER, A. R. 2009. Body mass index, blood pressure, and serum cholesterol in young Swiss men: an analysis on 56784 army conscripts. J Swiss Medical Weekly, 139**,** 518.

SEPP, E., KOLK, H., LÕIVUKENE, K. & MIKELSAAR, M. 2014. Higher blood glucose level associated with body mass index and gut microbiota in elderly people. J Microbial Ecology in Health

Disease, 25**,** 22857.

TSAI, C.-H., WU, H.-H. & WENG, S.-J. 2014. Comparison of various formulae for estimating low-density lipoprotein cholesterol by a combination of ages and genders in Taiwanese adults. J BMC Cardiovascular Disorders, 14**,** 1-8.

WANG, S., JI, X., ZHANG, Z. & XUE, F. 2020. Relationship between lipid profiles and glycemic control among patients with type 2 diabetes in Qingdao, China. J International Journal of Environmental Research

Public Health, 17**,** 5317.

WHITLOCK G, L. S., SHERLIKER P, CLARKE R, EMBERSON J, HALSEY 2009. Body-mass index and cause-specific mortality in 900 000 adults: collaborative analyses of 57 prospective studies. Lancet, 373**,** 1083-1096.

YI, S.-W., YI, J.-J. & OHRR, H. J. S. R. 2019. Total cholesterol and all-cause mortality by sex and age: a prospective cohort study among 12.8 million adults. 9**,** 1596.

پوختە

دەکات (BMIتوێژیینەوەکە باس لە شیکردنەوەی کاریگەری رەگەز و تەمەن وپێوەرەکانی بارستاییجەستە لەسەرتێکڕای کۆلیستیڕۆڵ وڕێژەی شەکرلە خوێندا. زۆربەی دانیشتوانانی جیهان لەهەردوو رەگەر (نێر و  مێ)  لەتەمەنی جیاوازدا بەدەست شەکرە و کۆلیستیڕۆڵ دەناڵێنن و کاریگەریشی هەیە.شەکرە بریتیە بەرزبونەوەی رێژەی گلوکۆز، بەهۆی خۆراکی نادروست و شیرینی کەدەولەمەندە بە نیشاستە  کێشەی دەرونی و بۆماوەیی و کەم خەوی و جگەرە کێشان توشمان دەبێت. کۆلیستیرۆڵ بە جۆرێک لە چەوری خوێن دادەنرێت و پێکهاتی دیواری خانەکانی لەش پێک دەهێنێت.کۆلیستیرۆڵ بەهۆی خۆراکی ناتەندروست و ئەو خۆراکانەی چەوریان زۆرە و کێشانی نێرگلە و کێشە لە غودەی دەرەقەی و بۆماوەیی توش دەبێت. پێویستە لە هەردوو رەگەز بێ گوێدانە تەمەن پشکێنین ئەنجام بدەن. بەتایبەتی ئەو کەسانەی کە تەمەنیان لەسەروی 45 ساڵە پێویست لە سالێکدا 3 جار پێشکێنین ئەنجام بدات.بۆ خۆپاراستن لە نەخۆشی شەکرە، کۆلیستیڕۆڵ کە چەند جۆرێکی هەیە. شەکری جۆری یەک و جۆری دوو و شەکری دووگیانی.کۆلیستیڕۆڵ باش و کۆلیستیڕۆڵی HDL کۆلیستیڕۆلی خراپ LDL.دورکەوتنەوەیە لە خۆراکی ناتەندروست و وەرزش کردنی رێک و پێک یان لە رێگایە دەرمان و چارەسەری سروشتی. نەخۆشی شەکرە لەرێگای دەرمان بەهۆی دەرزی ڵێدان دەبێت ئەویش دەرزی ئەنسۆلینە یان چەند دەرزی تر.رێگای سروشتی خورادنی دارچین و شملی گەلای پەلکی زەیتون دەبن هۆی کەم کردنەوەی رێژەی شەکر.چارەسەری رێژەی کۆلستیڕۆڵ لە خوێندا بە چەند جۆرێک ئەنجام دەرێت.مەبەستی دووبارە گەرانەوەی بۆ دۆخی تەندروست. زیاد کردنی سەوز و میوە لە ژەمەکانماندا وەکو کاهو گێزەرو مزرەمەنیەکان وەک پرتەقاڵ  چەرەزات وەکو فستەق گوێز.ئەو کاتە دەرمان بە کاردێت کە نەخۆشەکە ئاستی چەوری بەرز بێت یان نەخۆشی شەکرە یان دڵی لەگەڵ دابێت.بە بەکارهێنانی حەبی omega 3.

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**(BMI) کاریگەرییەکانی تەمەن و پێوەرەکانی بارستەی جەستە**

 **لەسەر گلوکۆزی خوێن وتێکڕای کۆلیسترۆڵ لە نێوان قوتابیانی کۆلێژی پەروەردە/شەقڵاوە**

**پرۆژەی دەرچوونە**

 پێشکەش بە بەشی بایۆلۆژی کراوە، وەک بەشێک لە پێداویستیەکانی بەدەستهێنانی بروانامەی بەکالۆریۆس لە زانستی بایۆلۆژی

**ئامادەکراوە لەلایەن:**

شنۆ مستەفا فتاح

‌‌ئەڤین فەقى تا‌هیر

**بە سەرپەرشتی:**

م. پێشرەو عبدالکریم عثمان

نیسانی - ٢٠٢٣