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Original Research

Insulin Resistance Index (HOMA-IR) levels in a General Adult Population Gender and Age in Tobruk Area, Libya

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ABSTRACT

Insulin resistance is the inability of a known quantity of exogenous or endogenous insulin to increase glucose uptake. Subsequences of insulin resistance cause several metabolic and cardiovascular changes that result in a disorder typically characterized by type 2 diabetes, obesity, dyslipidemias, coronary artery disease, and hypertension. The aim of this study undertaken to find the distribution of HOMA-IR levels between males & females in the Tobruk area and also to find who is the most common age affected between males and females individually. The data was conducted from 108 samples of females (73%) and males (27%). The result was found that males are more affected by insulin resistance than females (2. 9 vs. 2.19) respectively. The age group of females from fifty years and above is more common for insulin resistance as mean HOMA-IR signified (2.61), while males from 21-30 years are more likely to have insulin resistance as mean HOMA-IR (2.16). Obesity, diabetes, physical inactivity, dietary inverses, and genetic trait is causes of insulin resistance. it is recommended that patients exercise and follow a healthy diet.

KEYWORDS: Insulin Resistance, IR, HOMA-IR, T2DM, Etiology of IR, Lifestyle, Libya.

INTRODUCTION

Insulin resistance is distinguished as an impeded biologic reaction to insulin incitement of target tissues, basically the liver, muscle, and fat tissue. Insulin resistance impedes glucose transfer, coming about in a compensatory increment in beta-cell affront generation and hyperinsulinemia. The metabolic results of insulin resistance can result in hyperglycemia, hypertension, dyslipidemia, visceral adiposity, hyperuricemia, lifted fiery markers, endothelial brokenness, and a prothrombic state. Movement of insulin resistance can lead to metabolic disorder, nonalcoholic fatty liver illness (NAFLD), and sort 2 diabetes mellitus (Brown, J. C., *et.al* 2019); (Deacon C. F. 2019).

Insulin resistance is a procured condition related to the overabundance of body fat, although hereditary causes are recognized as well. The clinical definition of affront resistance remains slippery as there's not a by and large acknowledged test for insulin resistance. Clinically, insulin resistance is recognized through the metabolic results related to insulin resistance as depicted in metabolic disorder and insulin resistance Hossan, T., *et.al*, (2019); Bothou, C., *et.al*. (2020).

The predominant result of insulin resistance is type 2 diabetes (T2DM). Insulin resistance is thought to go before the improvement of T2DM by 10 to 15 long time. The development of insulin resistance ordinarily comes about in a compensatory increment in endogenous insulin generation. Lifted levels of endogenous insulin, an anabolic hormone, are related to insulin resistance and come about in weight gain which, in turn, worsens insulin resistance. This horrendous cycle proceeds until pancreatic beta-cell action cannot satisfactorily meet the insulin request made by insulin resistance, coming about in hyperglycemia. With proceeded bungle between insulin request and insulin generation, glycemic levels rise to levels reliable with T2DM. In addition to T2DM, the range of diseases associated with insulin resistance includes, cardiovascular disease, obesity, metabolic syndrome polycystic ovary syndrome (PCOS), and nonalcoholic fatty liver disease, Resistance to exogenous insulin has to been depicted. A self-assertive but clinically valuable benchmark considers patients requiring more prominent than 1 unit/kilogram/day of exogenous insulin to preserve glycemic control insulin resistance. Patients requiring more prominent than 200 units of exogenous insulin per day are considered extremely insulin resistant. Henstridge, D. C., *et.al*. (2019); Laursen, T. L., et.al. (2019).

In addition, another type of insulin resistance is the site dysfunction division concerning the insulin receptor itself is different from the etiology. The categories include the following: Pre-receptor, Receptor, and Post-receptor.

Muscle, liver, and adipose tissue are the main site of insulin resistance. IR is assumed to instigate in muscle tissue with immune-mediated inflammatory alteration and excess free fatty acids, triggering ectopic lipid deposition. Muscle composed up to 70% of glucose disposal. Decreasing muscle uptake, excess glucose returns to the liver growing de novo lipogenesis (DNL) and circulating free fatty acids, contributing to ectopic fat deposition and insulin resistance (Stahl, E. P., *et.al* 2019).

The modification of lifestyle should be the priority when treating IR. A calorie-restricted diet and lack of carbohydrates that stimulate excessive insulin demand are the main

processes to treatment and physical activity also assistances to increase energy expenditure and improve muscle insulin sensitivity. Drug therapy also can progress insulin response and decrease insulin demand. The aim of this study was to describe the distribution of HOMA-IR levels between males & females in the Tobruk area and also who is the most common age affected between males and females.

MATERIALS AND METHODS

The samples were taken by Alberoni laboratory, it's collected from January to April of the year 2023, and there were 108 samples, and the ages conducted in this study where it is range between 5– to 75.

Table:(1) Age Groups.

	Frequency	Percent
< 10	4	3.7
11 – 20	10	9.3
21 – 30	27	25.0
31 – 40	33	30.6
41 – 50	26	24.1
> 51	8	7.4
Total	108	100.0

HOMA IR formula

In this case, HOMA IR insulin resistance values were estimated using a formula th involves first estimated fasting blood glucos and then estimated insulin hormone levels. Then the following formula was used to determine the percent insulin resistance: Insulin resistance = [(fasting blood glucose nmol/L) x (blood insulin µU/ml)] / 22.5.

Statistical Analysis

Data were analyzed by IBM SPSS (Statistical Package for the Social Sciences Statistics) version 23, in addition to Excel to organize data and modify the graph.

RESULTS AND DISCUSSION

Figure (1) show the ratio between male and female numbered = 108 samples where male represented (27%) and female is characterized (73%).

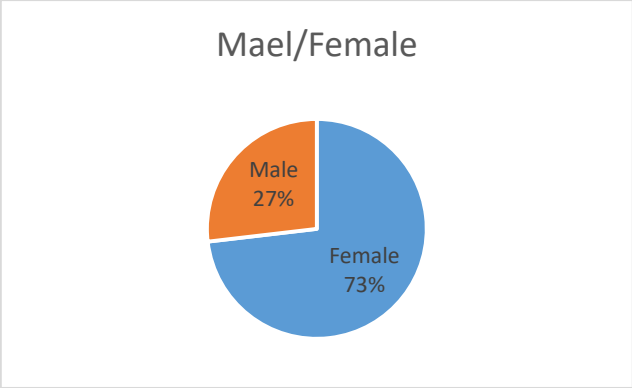

Figure: (1). Male and Female Percentage.

It is clear to notice that although the ratio of male who presented insulin resistance is lower than female, male was more affected by insulin resistance than female. Table 2 shows Mean HOMA-IR levels were higher in men than in women (2.9 vs. 2.19).

Table:(2). Sex Distribution of Homeostasis Model Assessment (HOMA-IR) Level.

HOMA- IR Concentration	
Fe Female Mean Concentration	2.19
M Males Mean Concentration	2.9

Table (3) revealed that the distribution of the mean of HOMA-IR levels varies between women ages. It is obvious to realize that HOMA-IR levels of women age 11-20 years was quite decline (1.44), whereas the HOMA-IR levels was significant increase in women over fifty (2.61) as the figure (2) shows the

mean of HOMA-IR in women ages.

Table:(3). Averaged HOMA-IR Percentiles, by Female Age Group

Female HOMA-IR in age groups			
Age Group	Mean	N	Std. Deviation
< 10	2.22	2	2.001
11 – 20	1.44	7	0.450
21 – 30	2.16	22	1.964
31 – 40	2.02	22	1.522
41 – 50	2.53	19	1.679
> 51	2.61	7	1.713
Total	2.19	79	1.646

The level of HOMA-IR in female ages was relatively high at age (41-50) which the mean was 2.53, and other ages was under this mean.

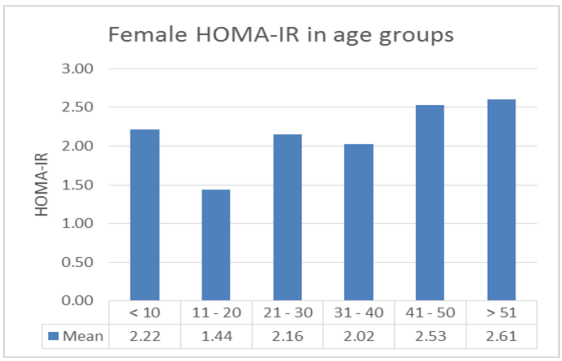

Figure: (2). HOMA-IR Levels in Female Age

Table 4 below shows the Percentile curves and average of HOMA-IR level for male ages. The HOMA-IR levels in men age less than 10 years was slightly lower compared to age 21-30 which was significantly high (mean= 1.34, 3.19) respectively.

Table: (4). HOMA-IR Percentiles, by Male Age Group

AGE GROUP	Mean	N	Std. Deviation
< 10	1.34	2	1.039
11 – 20	2.45	3	1.032
21 – 30	3.19	5	3.537
31 – 40	3.13	11	1.539
41 – 50	2.96	7	2.317
> 51	3.10	1	
TOTAL	2.90	29	2.033

In general, the HOMA-IR levels were higher in men (2.9) than women (2.19). This may lead to many reasons: Men and women differ concerning lifestyle, body composition, and energy balance, and men also have higher lean mass and more visceral and hepatic adipose tissue, whereas women have elevated general adiposity, these differences in adipose tissue distribution may contribute to a more insulin-sensitive environment in man, as visceral and hepatic adiposity is associated with increased insulin resistance.

Geer EB & Shen w (2009) conducted studies on the gender differences in degrees of insulin resistance and body composition, and found

that greater amounts of the visceral and the hepatic fat in men than women it may be due to greater insulin sensitivity and lack of the protective effects of the estrogen.

The result found a different distribution of HOMA-IR levels between men and women related to age. In men, reported a slight decrease in HOMA-IR levels in aged over 50 years 3.10, compared to HOMA-IR levels in those aged 21–30 years (3.19) which was slightly high, and that it may due to lifestyle of that age such as they may tend to some bad habit (fast food), lack of exercises, smoking, metabolic rate, and obesity (Lann D, & LeRoith D (2007): as this study agrees with our result.

Although, the level of HOMA-IR in women over fifty years was significantly high (2.61) it slightly decreased at aged 21-30. Gayoso-Diz, P., e*t.al* (2011) conducted that age is the most powerful predictor of insulin resistance, in women the increase in insulin resistance with menopause suggests that due to hormone disorder, estrogens may play a role in the insulin sensitivity observed in women.

The age differences in HOMA-IR levels found in our study may reflect the effect of menopausal changes (decreased estrogens levels) on insulin resistance in women, as lifestyle may play the main reason in body mass in male ages especially younger ages who are so sensitive to IR (Gayoso-Diz, P., *et.al* 2011).

CONCLUSION

Insulin resistance is a changed biological response to insulin stimulation of target tissues, mainly liver, muscle, and adipose tissue. There is gender-specific differences, with increased levels in men than women that may be related to lifestyle, fat distribution, and body mass. Increased levels in women over fifty years of age that may be related to changes in hormone distribution after menopause. Exercise helps increase energy expenditure and improve insulin sensitivity. Insulin response may be enhanced and insulin requirements reduced through medications.

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REFERENCES

Bothou, C., Beuschlein, F., & Spyroglou, A. (2020). Links between aldosterone excess and metabolic complications: A comprehensive review. *Diabetes & metabolism*, *46*(1), 1–7. https://doi.org/10.1016/j.diabet.2019.02.003.

Brown, J. C., Harhay, M. O., & Harhay, M. N. (2019). The Value of Anthropometric Measures in Nutrition and Metabolism: Comment on Anthropometrically Predicted Visceral Adipose Tissue and Blood-Based Biomarkers: A Cross-Sectional Analysis. *Nutrition and metabolic insights*, *12*, 1178638819831712. https://doi.org/10.1177/1178638819831712.

Deacon C. F. (2019). Physiology and Pharmacology of DPP-4 in Glucose Homeostasis and the Treatment of Type 2 Diabetes. *Frontiers in endocrinology*, *10*, 80. https://doi.org/10.3389/fendo.2019.00080.

Gayoso-Diz, P., Otero-Gonzalez, A., Rodriguez-Alvarez, M. X., Gude, F., Cadarso-Suarez, C., García, F., & De Francisco, A. (2011). Insulin resistance index (HOMA-IR) levels in a general adult population: curves

الملخص

مقاومة الأنسولين هي عدم قدرة كمية محددة من الأنسولين، سواءً كان خارجيًا أو داخليًا، على زيادة امتصاص الجلوكوز. وتؤدي سلسلة من مضاعفات مقاومة الأنسولين إلى العديد من التغيرات الأيضية والقلبية الوعائية التي تُفضي إلى اضطراب يتميز عادةً بداء السكري من النوع الثاني، والسمنة، واضطرابات الدهون، وأمراض الشريان التاجي، وارتفاع ضغط الدم. هدفت هذه الدراسة إلى تحديد توزيع مستويات مؤشر HOMA-IR بين الذكور والإناث في منطقة طبرق، بالإضافة إلى تحديد الفئة العمرية الأكثر تأثرًا بين الذكور والإناث على حدة. جُمعت البيانات من 108 عينات، 73% منها من الإناث و27% من الذكور. وأظهرت النتائج أن الذكور أكثر تأثرًا بمقاومة الأنسولين من الإناث (2.9 مقابل 2.19 على التوالي). كما تبين أن الفئة العمرية للإناث من 50 عامًا فما فوق هي الأكثر شيوعًا لمقاومة الأنسولين، حيث بلغ متوسط مؤشر HOMA-IR 2.61، بينما يُرجح أن يُصاب الذكور من 21 إلى 30 عامًا بمقاومة الأنسولين، حيث بلغ متوسط مؤشر HOMA-IR 2.16. تُعدّ السمنة، وداء السكري، وقلة النشاط البدني، وسوء التغذية، والعوامل الوراثية من أسباب مقاومة الأنسولين. يُنصح المرضى بممارسة الرياضة واتباع نظام غذائي صحي.

الكلمات المفتاحية: مقاومة الأنسولين، مؤشر مقاومة الأنسولين (HOMA-IR)، داء السكري من النوع الثاني، أسباب مقاومة الأنسولين، نمط الحياة، ليبيا.

percentile by gender and age. The EPIRCE study. *Diabetes research and clinical practice*, *94*(1), 146–155. https://doi.org/10.1016/j.diabres.2011.07.015.

Geer, E. B., & Shen, W. (2009). Gender differences in insulin resistance, body composition, and energy balance. *Gender medicine*, *6 Suppl 1*(Suppl 1), 60–75. https://doi.org/10.1016/j.genm.2009.02.002.

Henstridge, D. C., Abildgaard, J., Lindegaard, B., & Febbraio, M. A. (2019). Metabolic control and sex: A focus on inflammatory-linked mediators. *British Journal of Pharmacology*, *176*(21), 4193–4207. https://doi.org/10.1111/bph.14642.

Hossan, T., Kundu, S., Alam, S. S., & Nagarajan, S. (2019). Epigenetic Modifications Associated with the Pathogenesis of Type 2 Diabetes Mellitus. *Endocrine, metabolic & immune disorders drug targets*, *19*(6), 775–786.https://doi.org/10.2174/1871530319666190301145545.

Lann, D., & LeRoith, D. (2007). Insulin resistance as the underlying cause for the metabolic syndrome. *The Medical clinics of North America*, *91*(6), 1063–viii. https://doi.org/10.1016/j.mcna.2007.06.012.

Laursen, T. L., Hagemann, C. A., Wei, C., Kazankov, K., Thomsen, K. L., Knop, F. K., & Grønbæk, H. (2019). Bariatric surgery in patients with non-alcoholic fatty liver disease - from pathophysiology to clinical effects. *World journal of hepatology*, *11*(2), 138–149. https://doi.org/10.4254/wjh.v11.i2.138.

Stahl, E. P., Dhindsa, D. S., Lee, S. K., Sandesara, P. B., Chalasani, N. P., & Sperling, L. S. (2019). Nonalcoholic Fatty Liver Disease and the Heart: JACC State-of-the-Art Review. *Journal of the American College of Cardiology*, *73*(8), 948–963. https://doi.org/10.1016/j.jacc.2018.11.050.