The Correlation between COVID-19 and Diabetes Mellitus

Mouna Akeel Hamed AL-OEBADY[1], Hedaa M. NAHAB[2] & Suhair M. JABBAR[3]

Abstract

Initial studies found increased severity of coronavirus disease (COVID-19), in patients with diabetes mellitus. The relationship between COVID-19 and diabetes mellitus is complicated. On the other hand, diabetes mellitus is one of the mostessential risk factors for a severe course of COVID-19. In this study, the correlation between the prevalence of COVID-19 and Diabetes was analyzed by using data extracted from martyr Yousuf Hospital at Al-Muthanaa province. Investigation data was classified into threegroups including T1D(n= 641), T2D(n= 477) and Normal (non-diabetic cases n = 1745) male and female, in different age group. The results show a strong positive correlation coefficient of 0.8165 between infection with covid-19 and age in 641 patient with diabetes mellitus type I with P-Value < 0.00001 at p < 0.05 while the relationship between infection with covid-19 and gender is weak.

1. Introduction

At the end of 2019, a novel RNA betacoronavirus has emerged in Wuhan, China, causing coronavirus disease 2019 (Covid-19). The disease has rapidly spread in several countries (114 with more than 120 000 confirmed cases when this article was written) and by March 11, 2020, the Director-General of the World Health Organization, Tedros Adhanom Ghebreyesus, has declared Covid-19 a pandemic disease. The case fatality ratio of Covid-19 has been initially described in China to be about 1%-2% (1).

Coronavirus is a zoonotic virus, which were first isolated in 1937 and designated coronaviruses, they have a crown-like appearance under microscopy . RNA virus in the family Coronaviridae of the order Nidovirales , It is cause respiratory infections (2).

 The types of coronavirus known to date are as follows: the alpha coronaviruses HCoV-229E and HCoV-NL63; the beta coronaviruses HCoV-OC43 and HCoV-HKU1; SARS-CoV, which causes severe acute respiratory syndrome (SARS); MERS-CoV, which causes Middle East respiratory syndrome (MERS); and SARS-CoV-2, a new

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[1] Corresponding Author. ORCID: 0000-0001-7274-5536. Department of Biology, College of Science, Al Muthanna University, AL-Muthanna, Iraq, mouna@mu.edu.iq

[2] ORCID: 0000-0003-1096-3698. Department of Biology, College of Science, Al Muthanna University, AL-Muthanna, Iraq

[3] ORCID: 0000-0002-8345-0140. Department of Medical laboratories, College of Health and medical techniques, Sawa University, AL-Muthanna, Iraq

coronavirus described in late 2019 after cases were reported in China(2), which causes the disease known as coronavirus disease 2019 (COVID-19).

The clinical spectrum of coronavirus infection is broad,can range in severity from a simple cold to severe pneumonia. Clinically,The initial sign of COVID-19 is a flu-like syndrome. Individualswith COVID-19 usually develop signs and symptoms,such as mild respiratory disorder and the fever persists for 5–6 days after infection (range, 1–14 days), in contrast contrast with the progressive decline observed incases of influenza(1,3).

Fever may not be present in some cases,such as those occurring in patients with immunocompromised, very young, or elderly.

Diabetes mellitus is a complicated chronic disease characterized by glucose dysregulationdue to anabsolute or relative insulin deficiency. It contains various different types, with type 1 diabetes mellitus (T1D) and type 2 diabetes mellitus (T2D) as the most widespread subtypes. Diabetes is due to either the pancreas dose not produce enough insulin, or the cells of the body do not responding to the insulin produced. Type 1 diabetes is caused by autoimmune damage to insulin-producing pancreatic b-cells result in the body's failure to produce enough insulin.

This form was previously referred to as "insulin-dependent diabetes mellitus" (IDDM) or "juvenile diabetes". while Type 2 DM result[s from a combination of b-cell secretory defect and insulin resistance. Type 2 DM begins with insulin resistance, a condition in which cells fail to respond to insulin properly. As the disease progresses a lack of insulin may also develop. This form was previously referred to as "non insulin-dependent diabetes mellitus" (NIDDM) or "adult-onset diabetes"(4). It is oftenaccompanied by various complications, including hypertension,obesity, a proinflammatory, vasculopathy, and cardiovasculardisease (5,6).

The presence of diabetes mellitus and the individual degree of hyperglycaemia seem to be independently associated with COVID-19 severity and increased mortality(7,8,9,10).Numerous factors that are often present in diabetes mellitus are likely to participate to this risk, such as hyperglycemia, older age, a proinflammatory , and underlying comorbidities (cardiovascular disease, hypertension, obesity and chronic kidney disease) increases COVID-19 mortality(7,11).

The aim of this research is explain the relationship between covid 19 and diabetes mellitus.

2. Materials and Methods

Clinical, laboratory, radiologic, treatments, complications, and clinical outcomes data were extracted from medical records of martyr Yousuf Hospital at Al-muthanaa province,data was classified into three groups including T1D (n= 641) T2D (n= 477) and Normal (non-diabetic cases n = 1745) male and female, in different age group.

Routine analysis were applied to determine the risk factors for the prognosis of COVID-19, blood sugar,blood urea,serum creatinine, T.Serum Bilirubin ,S. GOT, S. CPT,S. Alt Phosphate and S. Uric were tested.

2.1. Statistical Analysis

Microsoft Excel 2010 and Minitab 19 Statistical Software ,were used to analysis the data.

2.2. Details & Calculation

The infection with covid-19 and age correlation in patient with diabetes mellitus type I. Coefficient of correlation = 0.8165.

The P-Value is <0.00001. The result is significant at p <0.05.

X Values
$\sum$ = 641
Mean = 80.125
$\sum(X - M_x)^2 = SS_x = 3914.875$

Y Values
$\sum$ = 323.5
Mean = 40.438
$\sum(Y - M_y)^2 = SS_y = 4235.219$

X and Y Combined
N = 8
$\sum(X - M_x)(Y - M_y) = 3679.562$

R Calculation
$r = \sum((X - M_y)(Y - M_x)) / \sqrt{((SS_x)(SS_y))}$

$r = 3679.562 / \sqrt{((3914.875)(4235.219))} = 0.9036$

Meta Numerics (cross-check)
r = 0.9036

The value of R is 0.9036.

This is a strong positive correlation, which means that high X variable scores go with high Y variable scores (and vice versa).

The infection with covid-19 and gender correlation in patient with diabetes mellitus type I. Coefficient of correlation = 0.027.

The P-Value is0.000029. The result is significant at p <0.05

X Values
$\sum$ = 288
Mean = 36
$\sum(X - M_x)^2 = SS_x = 1452$

Y Values
$\sum$ = 353
Mean = 44.125

$\sum(Y - M_y)^2 = SS_y = 1914.875$

X and Y Combined
$N = 8$
$\sum(X - M_x)(Y - M_y) = 274$

R Calculation
$r = \sum((X - M_y)(Y - M_x)) / \sqrt{((SS_x)(SS_y))}$

$r = 274 / \sqrt{((1452)(1914.875))} = 0.1643$

*Meta Numerics (cross-check)*
$r = 0.1643$

The value of R is 0.1643.

Although technically a positive correlation, the relationship between your variables is weak (the nearer the value is to zero, the weaker the relationship).

3. Results and discussion

Clinic characteristics were collected from a total of 2863 confirmed cases of COVID-19, including 641 subjects with T1D (n = 353 male, n=288 female),477 subjects with T2D and 1745 non-diabetic cases (Figure 1).

Figure 1: Total of 2863 confirmed cases of COVID-19, including 641 subjects with T1D 477 subjects with T2D and 1745 non-diabetic cases(normal).
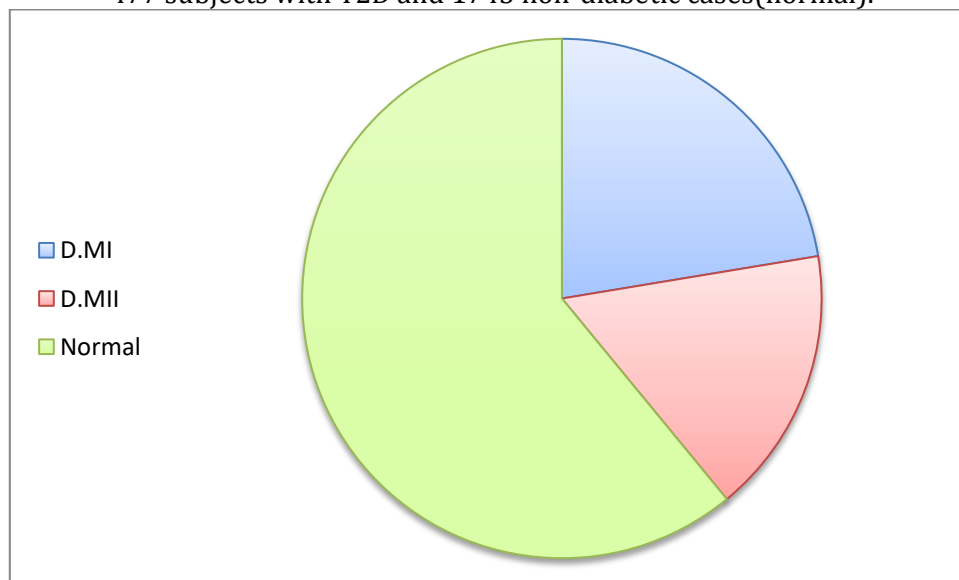
The results show a significant positive correlation coefficient between two disease this indicate that if the prevalence of Diabetes Mellitus increases, the prevalence of COVID-19 cases may also increase.

It has been well established that patients with diabetes are more susceptible to infections in general and exhibit worse prognosis once infected compared to the non-diabetic population (12,13). Such a higher susceptibility has also been previously observed for other coronaviral epidemics. For example, in patients with severe acute respiratory syndrome (SARS), pre-existing T2D was independently

associated with poor outcomes. The percentage of known T2D history was significantly higher among patients who succumbed to SARS than who survived (14, 15). Further, epidemiological studies also indicate that T2D was the primary comorbidity associated with severe or lethal MERS-CoV infections (16). And with regard to the current COVID-19 pandemic, several recent studies, though with limited participants, have already suggested that T2D is a common comorbidity and constitutes a higher proportion of patients with severe and ICU-admitted cases of COVID-19 than patients with mild symptoms (17, 18, 19). These associations between diabetes and worse outcome in viral infections are not unexpected as hyperglycemia is detrimental to the control of viremia and inflammation, aggravating morbidity and mortality in a variety of patients (20). However, an overly rigid glucose control may increase the risk of severe hypoglycemia, which can also lead to an increased mortality (21).

3.1. The infection with covid-19 and age correlation in patient withdiabetes mellitus type I.

The correlation of coefficient between infection with covid-19 and age in 641 patient with diabetes mellitus type I equals to 0.8165 with P-Value <0.00001 at p <0.05 which indicates that there is a strong positive correlation between two variable (figure 2).

Figure 2: Scatterplot for infection with covid-19 and age in 641 patient with diabetes mellitus type I .

Regression Line ($\hat{y} = 0.87X + 44.99$)
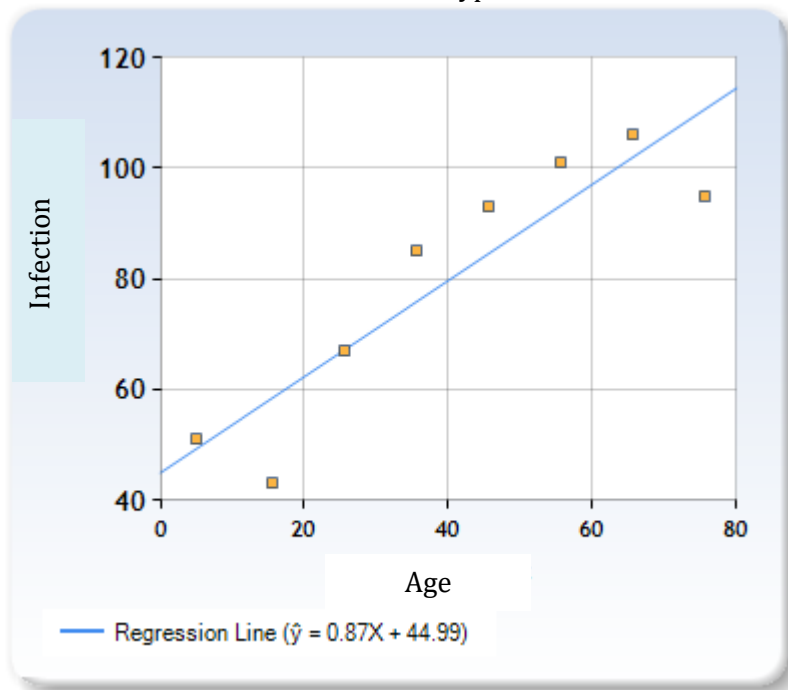
3.2. The infection with covid-19 and gender correlation in patient with diabetes mellitus type I.

The correlation of coefficient between infection with covid-19 and gender in 641 patient with diabetes mellitus type I equals to 0.027.with P-Value = 0.000029. at p <0.05 which indicates that the relationship between your variables is weakFigure 3.

Figure 3: Scatterplot for infection with covid-19 and gender in 641 patient with diabetes mellitus type I.
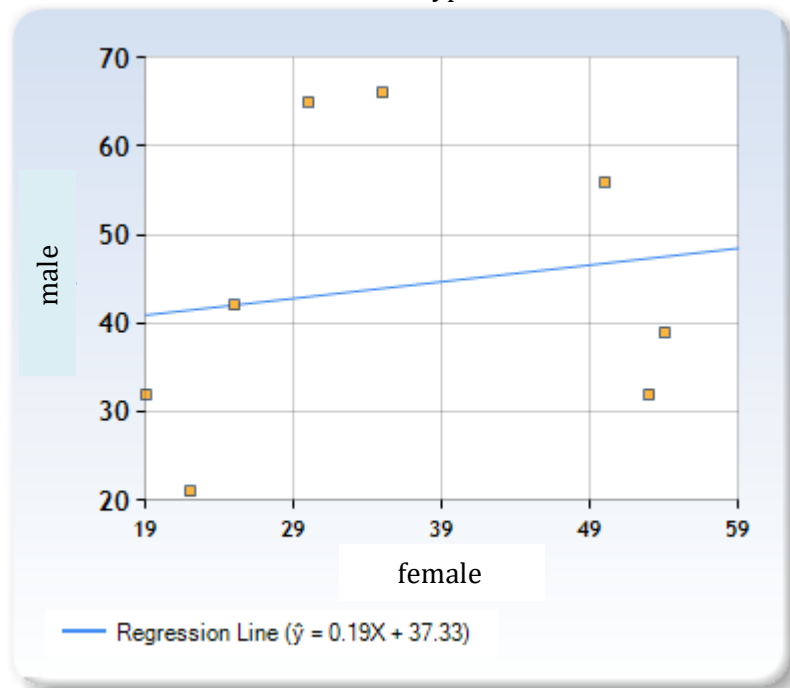
4. Conclusions

During the COVID-19 pandemic, patients with diabetes mellitus should be aware that COVID-19 can increase blood levels of glucose and, as such, they should follow clinical guidelines for the management of diabetes mellitus.

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