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Research Article

Association between *Helicobacter pylori* and Diabetes Mellitus

Nadar Bashir Moalim *[1], Abdelhakam H. Ali [2], Eslam G. Elsheikh [3], Dalal B. Ali [4], Ahmed A. Adam[5]

1. Faculty of Medical Laboratory Sciences, University of Medical science & Technology (UMST), Sudan.

2. Faculty of Medical Laboratory Sciences, University of Al-Butana, Sudan.

3. Faculty of Medical Laboratory Sciences, National University, Sudan.

4. Faculty of Medical Laboratory Sciences, University of science & Technology, Sudan.

5. Faculty of Nursing Science, University of Medical science & Technology (UMST), Sudan

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*Address for Correspondence:

Nadar Bashir Moalim, Faculty of Medical Laboratory Sciences, University of Medical Science & Technology (UMST).

Abstract

Background: H. pylori is a gram-negative, spiral shaped, Microaerophile pathogenic bacterium that specifically colonizes on the gastric epithelium, it is one of the most common human bacterial pathogens and is the main etiological factor for peptic ulcer disease, simple gastritis and gastric malignancy. The immune status of diabetic patients is compromised, which may lead to an increased susceptibility to H. pylori infection. The aim of this study is to assess Association between Helicobacter pylori and Diabetes Mellitus.

Methods and Material: This was a cross-sectional study with 102 diabetic patients (both IDDM and NIDDM). H.pylori was assessed through the determination of stool antigen by Immunochromatography.

Results: Out of 102 samples were collected from diabetic patients, 58 were male and 44 were female. 52.9% of them are positive for H.pylori and 47.1% are negative. The mean ages of H.pylori positive patients were 44.01 years where the mean age of negative patients were 42.47 years. There was a statistically significance association (p=0.007) between the diabetes and H.Pylori infection, also there was association between history of GIT disorder and H. pylori infection, between smoking and H. pylori infection.

Conclusion: The study showed that Helicobacter pylori infection was significantly higher in diabetes Mellitus.

Keywords: H.pylori, Diabetes Mellitus, T1DM, T2DM

INTRODUCTION

H. pylori is a gram-negative, spiral shaped, Microaerophile pathogenic bacterium that specifically colonizes on the gastric epithelium, it is one of the most common human bacterial pathogens and is the main etiological factor for peptic ulcer disease, simple gastritis and gastric malignancy .[1] In some cases, such as immunodeficiency and underlying diseases, it can be problematic as opportunistic infections.[2] It represents one of the most widespread bacterial infections globally. [2-3]

Helicobacter pylori (H. pylori) infection is now broadly accepted that infection with H.pylori is one of the most common chronic infections worldwide; it approximately 50% of the world population is estimated to be infected with H. pylori. Its prevalence has been demonstrated to range considerably according to socioeconomic status and tends to be more serious in developing countries. [4]

Elevated antibodies level against H. pylori also attracted the attention to some extra-gastric diseases, including diabetes mellitus.[2]

Diabetes mellitus is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. it is one of the fastest growing diseases worldwide, projected to affect 693 million adults by 2045. Devastating macrovascular complications (cardiovascular disease) and microvascular complications (such as diabetic kidney disease, diabetic retinopathy and neuropathy) lead to increased mortality, blindness, kidney failure and an overall decreased quality of life in individuals with diabetes. [5]

Gastrointestinal inflammation caused by H. pylori can influence the absorption of glucose and lipids, which are also abnormal in DM patients[1] It is a common infection in diabetic patients who have inadequate metabolic control, individuals are colonized by H. pylori infection in the gastric antrum, probably because of chemotactic factors such as tumor necrotic factor (TNF), interleukins-IL-1, IL-2, and IL-8, which are present in gastric epithelium[6]. Several studies reported that the relationship between H.pylori and diabetes Mellitus remains controversial. With few studies reported in Sudanese diabetic patients, so this study aims to determine the association between helicobacter pylori and diabetes mellitus.

MATERIALS AND METHODS

This study was cross-sectional study, that was carried out between August 2022 to December 2022. The research was carried out in Jabir Abu Eliz diabetic centre, Khartoum state, sudan. All diabetic patients attending jabir abu eliz diabetic centre at the study period had been included, with 102 stool sample were collected from these patients.

Sample collection and Laboratory investigation

A stool sample was collected using sterile container and was tested by detecting stool antigen using Immuno-chromatography kits.

H.pylori Antigen detection method by ICT

The H.pylori antigen rapid test a double antibody sandwich technique based lateral flow chromatographic immunoassay. Two drops of the sample after diluted with buffer were squeezed into the well of cassette. The result was readed after 5 minutes, a positive result was confirmed by the presence of red line,while the negative result was indicated by the absence of red line.

Data collection and Analysis

Data was collected using structured questionnaire. Age, sex, body mass index, duration of DM. the diabetic patients were also enquired for intake of treatment, family history of diabetes mellitus, state of smoking, history of GIT infection, and chronic disease status. The collected data was proceeded for analysis using SPSS version 23.

RESULTS

A total of 102 samples were collected from diabetic patients, 52.9% of them are positive for H.pylori and 47.1% are negative. The mean age of H.pylori positive patients were 44.01 years where the mean age of negative patients were 42.47 years with a no statistically significance association (p=0.711) between age and H.Pylori. The mean duration of DM for H.pylori positive patients were 7.39 years where the mean duration of DM for negative patients were 6.72 years with a no statistically significance association (p=0.660) between the diabetes and H.Pylori as indicated by **(Table 1,2).** Diabetic patients was assessed with regard the H.pylori results, of the 102 participants, all of them (100%) were diabetic with a statistically significance association (p=0.007) between the diabetes and their H.pylori as indicated **(Table 3).**

Table 1: Frequency of H.pylori in the study population

H.pylori	Frequency	Percent
Positive	54	52.9%
Negative	48	47.1%
Total	102	100.0%

Table 2: comparison of study population according to the age and duration of the disease

	H,pylori Result	N	Mean	p-value
Age	Postive	54	44.01	0.711
	Negative	48	42.47	
Duration of DM	Postive	54	7.39	0.660
	Negative	48	6.72	

Table 3: H.pylori results and Diabetes

Diabetic							
Yes	**54**	**52.9**	**48**	**47.1**	**102**	**100.0**	**0.007**
No	0	0.0	0	0.0	0	0.0	
Total	54	52.9	48	47.1	102	100.0	

4: association between H.pylori results and information about history of participants:

History of chronic disease were assessed with regard to the H.pylori result of participants, of the 102 participants, 19.6% had hypertension, 12.7% had Rheumatoid and HTN, 10.8% had HTN, Rheumatoid and TB, 8.8% had TB, 7.8% had Rheumatoid, 2% had heart disease, one participant had Heart disease and Rheumatoid, while 37.2% had other diseases, among that 52.9% were positive H.pylori and 47.1% were negative with a no statistically significance association (p=0.103) between the History of chronic disease for participants and their H.pylori results. History of GIT were assessed with regard to the H.pylori result of participants, of the 102 participants, 24.5% had Peptic ulcer, 13.7% had Appendicitis, 5.9% had Pancreatitis, while 55.9% had other diseases, among that 52.9% were positive H.pylori and 47.1% were negative with a statistically significance association (p=0.045) between the History of GIT disease for participants and their H.pylori results **(Table 4).**

Table 4: H.pylori results and DM information of participants

	Helicobacter pylori Results						
Variable	**Positive**	**%**	**Negative**	**%**	**Total**	**%**	**P-value**
Chronic disease							
Heart disease	2	2	0	0	2	2	
TB	6	5.9	3	2.9	9	8.8	
Rheumatoid	5	4.9	3	2.9	8	7.8	0.103
HTN	6	5.9	14	13.8	20	19.6	
Rheumatoid+ HTN	7	6.8	6	5.9	13	12.7	
Heart disease+ Rheumatoid	0	0	1	1	1	1	
HTN+ Rheumatoid+ TB	9	8.8	2	2	11	10.8	
Others	19	18.6	19	18.6	38	37.2	
Total	54	52.9	48	47.1	102	100.0	
History of GIT							
Peptic ulcer	14	13.7	11	10.8	25	24.5	
Appendicitis	12	11.8	2	2	14	13.7	0.045
Pancreatitis	3	2.9	3	2.9	6	5.9	
Others	25	24.5	32	31.4	57	55.9	
Total	54	52.9	48	47.1	102	100.0	

5: Association between *H. pylori* results and DM information of participants:

Diabetes mellitus (DM) information of participants were assessed with regard to the *H. pylori* result of participants, of the 102 participants, 97.1% were used treatment of DM, while 2.9% were not used treatment of DM, among that 52.9% were positive *H. pylori* and 47.1% were negative with a no statistically significance association (p=0.629) between the use of DM treatment and their *H. pylori* results. The type of treatment used by the participants was assessed by 102 participants, majority 52.9% were used Insulin, 23.5% of the participants used tablet, 10.8 of the participants used Metformin, 5.9% of the participants used Amaryl, 3.9% of the participants used Insulin and Metformin, 2% of the participants used Insulin and Amaryl, while one participant who was negative for *H. pylori* used Insulin, Metformin and Amaryl, among that 52.9% were positive *H. pylori* and 47.1% were negative with a no statistically significance association (p=0.119) between the type of treatment used by the participants and their *H. pylori* results. Family history of DM was assessed, the majority 66.7% of the participants had no family history of DM while 33.3% of the participants had a family history of DM, among that 52.9% were positive *H. pylori* and 47.1% were negative with a no statistically significance association (p=0.400) between the family history of DM by the participants and their *H. pylori* results **(Table 5).**

Table 5: *H. pylori* results and DM information of participants

	Helicobacter pylori Results						
Variable	**Positive**	**%**	**Negative**	**%**	**Total**	**%**	**P-value**
Treatment							
Yes	52	51	47	46.1	99	97.1	0.629
No	2	1.9	1	1	3	2.9	
Total	54	52.9	48	47.1	102	100.0	
Type of treatment							
Tablet	14	13.7	10	9.8	24	23.5	
Insulin	24	23.5	30	29.4	54	52.9	0.119
Metformin	9	8.8	2	2	11	10.8	
Amaryl	4	3.9	2	2	6	5.9	
Insulin+ Metformin+ Amaryl	0	0	1	1	1	1	
Insulin+ Metformin	1	1	3	2.9	4	3.9	
Insulin+ Amaryl	2	2	0	0	2	2	
Total	54	52.9	48	47.1	102	100.0	
Family history of DM							
Yes	16	15.7	18	17.7	34	33.3	
No	38	37.2	30	29.4	68	66.7	0.400
Total	54	52.9	48	47.1	102	100.0	

6: Association between H.pylori results and state of Smoking:

Smoking status was assessed with regard to the H.pylori result of participants, of the 102 participants, among that 52.9% were positive H.pylori and 47.1% were negative with a statistically significance association (p=0.004) between the smoking status of participants and their H.pylori results **(Table 6).**

Table 6: H.pylori results and state of smoking

	Helicobacter pylori Results						
Variable	**Positive**	**%**	**Negative**	**%**	**Total**	**%**	**P-value**
State of Smoking							
Current	21	20.6	12	11.8	33	32.3	
Former	19	18.6	8	7.8	27	26.5	
Never	14	13.7	28	27.5	42	41.2	0.004
Total	54	52.9	48	47.1	102	100.0	

7: Association between *H. pylori* results and socio-demographic characteristics:

Gender of participants were assessed with regard the *H. pylori* result, of the 102 participants (34.3% male and 18.6% female) were 53% positive and (22.5% male and 24.5% female) were 47% negative with a no statistically significance association (p=0.213) between the gender of participants and their *H. pylori* results. Educational level was assessed in 102 participants those 28.4% were secondary level, 27.5% were university level, 22.5 were illiterate level and 21.6% were primary level, among that 53% were positive *H. pylori* and 47% were negative with a no statistically significance association (p=0.322) between the educational level of participants and their *H. pylori* results. Occupation of participants were assessed with regard the *H. pylori* result in 102 participants 52.9% were free worker, 16.7% were student, 12.7% were employer, 11.8% were housewife and 5.9% were employee among that 52.9% were positive *H. pylori* and 47.1% were negative with a no statistically significance association (p=0.158) between the occupation of participants and their *H. pylori* results. Marital status were assessed with regard the *H. pylori* result in 102 participants 50% were married 42.2% were single and 7.8% were divorced among that 53% were positive *H. pylori* and 47% were negative with statistically significance association (p=0.038) between the marital status of participants and their *H. pylori* results. **(Table 7).**

Table 7: *H. pylori* results and socio-demographic characteristics

	Helicobacter pylori Results						
Variable	**Positive**	**%**	**Negative**	**%**	**Total**	**%**	**P-value**
Gender							
Male	35	34.3	23	22.5	58	56.9	0.213
Female	19	18.6	25	24.5	44	43.1	
Total	54	53	48	47	102	100.0	
Educational level							
Illiterate	12	11.8	11	10.8	23	22.5	
primary	8	7.8	14	13.7	22	21.6	0.322
Secondary	17	16.7	12	11.7	29	28.4	
University	17	16.7	11	10.8	28	27.5	
Total	54	53	48	47	102	100.0	
Occupation							
Free worker	33	32.3	21	20.6	54	52.9	
Employer	6	5.9	7	6.9	13	12.7	0.158
Employee	2	2	4	3.9	6	5.9	
Housewife	3	2.9	9	8.8	12	11.8	
Student	10	9.8	7	6.9	17	16.7	
Total	54	52.9	48	47.1	102	100	
Marital status							
Married	31	30.4	20	19.6	51	50	
Single	22	21.6	21	20.6	43	42.2	0.038
Divorced	1	1	7	6.8	8	7.8	
Total	54	53	348	47	102	100.0	

DISCUSSION

In the present study, we found a significant association between H. pylori infection and diabetes, while other studies did not find an association between H. pylori infection and diabetes. So the relationship between H. pylori infection and diabetes remained controversial for the last years. However, several studies supported my result on the positive association between H. pylori infection and diabetes [4, 9]. In contrast, others found H. pylori infection to be positively associated with diabetes [7, 10].

Regarding the chronic diseases, there was no statistical significant association (p=0.103) between the hypertension and H.Pylori infection and this were consistent to publish studies[8]. In contrast, others found H. pylori infection to be positively associated with hypertension[4]. According to the history of GIT, there was statistical significant association (p=0.045) between the history of GITand H.Pylori infection and this was consistent to publish studies[11].

With regard to history of smoking there was statistical significant association (p= 0.004) between the status of smoking for the participants and H.Pylori infection and this was consistent to publish studies[11]. In which there was significant association (p= <0.001) between smoking for the participants and H.Pylori infection.

According to the BMI of the participants, the majority (61%) of the participants were normal and there was no statistical significant association (p >0.05) between the BMI of the participants and *H. pylori* infection and this was contradictory to publish studies[12] in which there was significant association (p= <0.0001) between the BMI of the participants and *H. pylori* infection.

According to the gender of the participants, 56.9% was male and 43.1% was female and there was no statistical significant association (p= 0.213) between the gender of the participants and *H. Pylori* infection and this were consistent to publish studies[12].

Regarding the educational level of participants, there was no difference in education between Illiterate, primary, secondary, and university participants about Helicobacter pylori results and also there was no statistical significant association (p=0.322) between the educational level of participants and *H. Pylori* infection and this was contradictory to publish studies[4].

Regarding the type of treatment for participants, there was no statistical significant association (p=0.119) between the type of treatment and *H. pylori* and this were consistent to publish studies[8]. Although we know that there is a strong relationship between diabetes and family history, in my study, the majority (66.7%) of the participants had no family history of diabetes and also there was no statistically significant association (p=0.400) between the family history of diabetes and *H. pylori* infection and this was consistent to publish studies[4].

CONCLUSION

The study concluded that there was association between Helicobacter pylori and Diabetes Mellitus, between history of GIT disorder and H.pylori infection and between smoking and H. pylori infection.

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