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Helicobacter pylori and BMI; among obese and non obese patients in South India

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ABSTRACT

Introduction

There is no consensus among the existing research articles among the relationship between Helicobacter pylori and obesity. However obesity can alter innate and adaptive immunity, with immunological impairment related to the grade of obesity, resulting in less maturation of monocytes into macrophages, reduced polymorphonuclear bactericidal capacity and a significant decrease in NK cell activity. This contributes to reduced defence of the body against Helicobacter pylori invasion.

Aim and Objective

To analyse obese and non obese patients, classified based on BMI with respect to Helicobacter pylori positive infection.

Materials and Methods

- Study area- Thandalam
- Study period-January 2019- March 2019
- Study design-Prospective study
- Study population- Patients reporting for endoscopy with dyspepsia and other upper GI symptoms
- Sample size- 120 patients
- Sampling method- Simple random Sampling
- Data analysis- Descriptive statistics will be calculated for the variables using SPSS software.

Result

In this study, 120 patients reporting to endoscopy division of gastroenterology department of Saveetha Medical College and Hospital were included. 55.8% of the participants were male and 44.2% of the participants were female. The general prevalence of Helicobacter pylori infection in the participants is 57.5%. The prevalence of obesity in the participants was 30.8%. The prevalence of Helicobacter pylori in the non obese patients was 46.98% and the prevalence of Helicobacter pylori positive infections in obese patients was 81.08%. Increase in BMI was associated significantly with Helicobacter pylori infection ($p<0.00$).

Conclusion

Here, we observe that the prevalence of Helicobacter H.pylori infection is high in patients with high BMI (obese patients). Therefore, pending further studies and investigations, due consideration has to be given to address the problem and establishing obesity as a risk factor for Helicobacter pylori infection.

INTRODUCTION

Helicobacter pylori

It's a gram negative spiral shaped pathogenic bacterium which inhabits the human gastric mucosa. The bacterium is present in approximately half of the worlds population, but it causes symptomatic disease in only 10-15% of those infected where it invades the gastric epithelial lining [1].

Prevalence of H.pylori in India

India is a typical example of a developing country as far as Helicobacter pylori is concerned and more than 20 million Indians are estimated to suffer from peptic ulcer disease.

The prevalence of h pylori in the Indian subcontinent can be as high as 80% or more in rural areas. The most commonly recognised manifestation of H.pylori infection in India is peptic ulcer disease, particularly duodenal ulcer disease, which outnumbers gastric ulcers between 8:1 and 30:1. The population of Indians are approximately 1.2 billion. If the H. Pylori prevalence was 60%, more than 726 million individuals would be infected with h pylori. The estimated prevalence of duodenal ulcers is 3% and means that atleast 18 million people could need h pylori therapy [4-9].

Pathogenesis

pylori infection most often presents as a predominantly antral gastritis with normal or increased acid production. Local gastrin production may be increased, but hypergastrinemia (increased serum gastrin) is uncommon. When inflammation remains limited to the antrum, increased acid production results in greater risk of duodenal peptic ulcer. In other patients gastritis may progress to involve the gastric body and fundus. This multifocal atrophic gastritis is associated with patchy mucosal atrophy, reduced parietal cell mass and acid secretion, intestinal metaplasia, and increased risk of gastric adenocarcinoma. Thus, there is an inverse relationship between duodenal ulcer and gastric adenocarcinoma that correlates with the pattern of gastritis.H. pylori organisms have adapted to the ecologic niche provided by gastric mucus. Its virulence is linked to certain factors like flagella, urease, adhesins, toxins. 4

Methods of diagnosis

The current gold standard to diagnose h.pylori infection invasively is two positive tests, which in India could be a combination of rapid urease test and examination of endoscopic biopsies by histology. The urea breath test is based on the generation of ammonia by the bacterial urease. The advantage of endoscopy is that symptomatic patients can be evaluated for mucosal disease. Endoscopy also allows one to take biopsy specimens that can be examined by histology, rapid urease tearing, brush cytology, or even culture. The other non invasive tests for active infection are urea breath test, stool antigen tests, and serology [2-3].

Prevalence of obesity in India

Prevalence of obesity in India is varying from rural to urban and state wise. An urban population and states with high socio economic status were found to be having high obesity prevalence. Recent studies have reported that India is a developing country which is in a transitional state of under nutrition due to poverty and obesity due to industrialisation and rapid urbanisation. In India, more than 135 million individuals are affected by obesity [10-1].

A study published in the noted medical journal Lancet says India is just behind US and china in this global hazard list of top ten countries with highest no. of obese people.

Body Mass Index (BMI)

Body mass index, or BMI, is a persons weight in kilograms divided by the square of his/her height in metres. The national institute of health (NIH) has now defined BMI to be the deciding parameter to know if you are underweight, normal weight, overweight, or obese.

According to the Asian criteria for BMI cutoff

- Less than 18.5 represent underweight
- Amid 18.5 to 22.9 indicated normal weight

- 23-24.9 indicates overweight
- 25-29.9 indicates pre-obesity
- =>30 indicates obesity

Association between BMI and Helicobacter pylori

Several studies have been conducted over the past few decades regarding the relationship between Helicobacter pylori and BMI but the results have been contradictory.

There is an ongoing debate over the association between obesity and Helicobacter pylori. A recent ecological review of several cross sectional studies found an increase in Helicobacter pylori was associated with a decrease in obesity in the developed countries. This theory was further strengthened by the corroboration with several interventional studies stating that Helicobacter pylori eradication was associated with weight gain and an increase in BMI.

There are also a few neutral studies which state that Helicobacter pylori has no association with change in BMI nor does it cause obesity.

In Contrast to these studies, there has been a rise of several observational or clinical studies from developing countries reported a linear relationship between *H. pylori* positive infection and obesity. However obesity can alter innate and adaptive immunity, with immunological impairment related to the grade of obesity, resulting in less maturation of monocytes into macrophages, reduced polymorphonuclear bactericidal capacity and a significant decrease in NK cell activity. This contributes to reduced defence of the body against Helicobacter pylori invasion. In light of the limited literature to assess the prevalence of Helicobacter pylori in patients reporting to hospitals from India and specifically South India, we aimed in this hospital based study to determine the estimate of Helicobacter pylori positive infections in a group of obese subjects reporting for upper GI endoscopy and compare it to a match control group (age and gender) who had an upper GI endoscopy in the same period in the same setting, but had normal BMI. Based on the conflicting results of the current studies and available literature, we hypothesized, after controlling for age and gender,that we will be able to find out whether there is any correlation between Helicobacter pylori positive infections and obesity.

MATERIALS AND METHODS

Study design and Setting

A case control study design was adopted in the department of endoscopy at a central hospital (Saveetha Medical College and Hospital).

Subject's Reruitment and Inclusion and Exclusion criteria

A total of 120 patients who reported to the endoscopic division of Gastroenterology department of Saveetha Medical College and Hospital between January, 2019 – March 2019 were selected for the study. A consecutive test group consisting of 37 individuals defined with a BMI of more than or equal to 30kg/m^2 reporting to the gastroenterology department for upper GI endoscopy between the months January, 2019 – March, 2019 was formed. A group containing 83 patients with BMI < or equal to 30kg/m^2 who underwent upper GI endoscopy in the same Hospital and Gastroenterology Department, in the same duration were selected as controls. The control to test ratio was approximately 2.24.

We excluded patients with history of taking eradication therapy of Helicobacter pylori positive infections within 6 months, patients with acute infection and gastro intestinal bleeding or patients with history of proton pump inhibitor (PPI) or antibiotics intake 2 weeks before the endoscopic procedure as these factors may result in false negative results for Helicobacter pylori testing.

Variables and Clinical Procedures

The data for both groups included the demographics (age, gender),IP number, Height, Weight, Blood group, symptoms on admission,provisional diagnosis, endoscopic and histological finding.

Standard technique was used to perform endoscopy on all patients to assess for Helicobacter pylori positive infection test. Patients were made to lie in the left lateral position with a mouth piece placed and adequate xylocaine was sprayed on their throats. Two antral biopsies were taken from antrum for each patient, as per the routine practice of the endoscopy unit, and submitted for histologic evaluation. No complication related to endoscopy was reported in any patient. The specimens were stained by hematoxylin and eosin stain or methylene blue. The

laboratory investigator was not informed of the sample status to avoid investigator bias.

Body mass index (BMI) is a weight for height index used to classify individuals into categories such as underweight, normal, overweight, obese,etc.

- BMI= Weight (kg) divided by the square of height (in metres) of the patient.
- According to the Asian criteria for BMI cutoff:
- Less than 18.5 were recorded as underweight;
- Between 18.5 to 22.9 indicated normal weight ;
- Between 23-24.9 indicates overweight ;
- Between 25-29.9 indicates pre-obesity ;
- =>30 indicates obesity

A weighing scale was used to measure the weight of the patients. Height was taken in a standing position without shoes and light clothing.

Conflicts of interest: The author declares no conflict of interest.

Statistical Analysis

Statistical Analysis was conducted using SPSS software. Descriptive analysis was conducted for the continuous and categorical variables. The different variables such as age, sex, height, weight, BMI, Helicobacter pylori positivity and negativity were first independently calculated and represented in the form of frequencies and percentages. Chi square tests were conducted to explore the relationship of continuous and categorical variables with the dependent variable. A *p* value of <0.05 was considered significant.

RESULTS

Sample characteristics and distribution of H.pylori between obese and non obese

The following are the demographic characteristics of the study population

Age * BMI Crosstabulation

Count

		BMI				Total
		healthy weight	overweight	pre obese	obese	
Age	10-19	2	0	1	2	5
	20-29	8	4	2	8	22
	30-39	11	4	1	7	23
	40-49	11	2	4	5	22
	50-59	8	7	2	8	25
	60-69	5	4	0	5	14
	70-79	3	1	1	0	5
	80-89	0	1	1	1	3
	9	0	0	0	1	1
Total		48	23	12	37	120

pylori * BMI Crosstabulation

Count

		BMI				Total
		healthy weight	overweight	pre obese	obese	
h pylori	1	15	17	7	30	69
	2	33	6	5	7	51
Total		48	23	12	37	120

sex * BMI Crosstabulation

Count

	BMI				Total
	healthy weight	overweight	pre obese	obese	

Sex	male	28	10	10	19	67
	female	20	13	2	18	53
Total		48	23	12	37	120

The properties of the control and test groups are as follows

age * BMI Crosstabulation
Count

		BMI		Total
		non obese	**obese**	
age	10-19	3	2	5
	20-29	14	8	22
	30-39	16	7	23
	40-49	17	5	22
	50-59	17	8	25
	60-69	9	5	14
	70-79	5	0	5
	80-89	2	1	3
	9	0	1	1
Total		83	37	120

h pylori * BMI Crosstabulation
Count

		BMI		Total
		non obese	**obese**	
h pylori	1	39	30	69
	2	44	7	51
Total		83	37	120

sex * BMI Crosstabulation
Count

		BMI		**Total**
		non obese	**obese**	
sex	male	48	19	67
	female	35	18	53
Total		83	37	120

There is a male predominance in both the groups. The general prevalence of Helicobacter pylori infection in the participants is 57.5%. The prevalence of obesity in the participants was 30.8%. The prevalence of Helicobacter pylori in the non obese patients was 46.98% and the prevalence of Helicobacter pylori positive infections in obese patients was 81.08%. Thus, a statistical difference in the prevalence of HPPI in obese and non obese patients was observed. Within the partiipants, HPPI seemed to be more prevalent in males than females.

Sex * h pylori crosstab
Count

		h pylori		**Total**
		1	2	
sex	male	41	26	67
	female	28	25	53
Total		69	51	120

Also significant association between weight of the patient and Helicobacter pylori infection was observed.

Weight and H.pylori infection

		h pylori		Total
		1	2	
weight	40-49	2	6	8
	50-59	17	21	38
	60-69	16	14	30
	70-79	20	5	25
	80-89	10	4	14
	90-99	4	1	5
Total		69	51	120

Chi-Square Tests

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	13.530[a]	5	.019
Likelihood Ratio	14.159	5	.015
Linear-by-Linear Association	10.996	1	.001
N of Valid Cases	120		

A p value <0.05 has been observed.

Chi square tests were also performed crosslinking BMI and Helicobacter pylori infection and a p value less than 0.05 was recorded rendering a very significant link between H.pylori and BMI.

Crosstab
Count

		h pylori		Total
		1	2	
BMI	healthy weight	15	33	48
	overweight	17	6	23
	Pre obese	7	5	12
	Obese	30	7	37
Total		69	51	120

Chi-Square Tests

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	24.493[a]	3	.000
Likelihood Ratio	25.424	3	.000
Linear-by-Linear Association	18.824	1	.000
N of Valid Cases	120		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 5.10.

DISCUSSION

This case control study conducted in South India models the relationship between BMI and Helicobacter pylori infection. The key finding was that there was increased prevalence of HPPI in patients with increased BMI (without adjustment for non modifiable factors such as age and gender). This adds to the current studies being undertaken about the same topic. Many controversial studies have been reported from different parts of the world. An inverse relationship was found between obesity and Helicobacter pylori infection was noticed in developed countries. The results of these studies were based on the theory that Helicobacter pylori infection alters ghrelin and obestatin levels and that on eradication of H.pylori, body weight and subsequently BMI decreases.

Several neutral studies were also published stating that there was no correlation between Helicobacter pylori and BMI. Studies with Mendelian randomization showed no causal relation between *H. pylori* genetic risk score and BMI/obesity, neither did it show any causal relationship between BMI or obesity genetic risk scores and *H. pylori* positivity. This Mendelian randomization study provides no evidence for a

clinically relevant association between *H. pylori* and BMI/obesity.

Subsequently, several studies conducted in developing countries show results showing increased prevalence of Helicobacter pylori in obese patients (or those with an increased BMI)

More specifically the case control studies which took place in Saudi Arabia with respect to BMI and obesity, among obese and non obese patients. Reported that Helicobacter pylori infections were more prevalent in obese individuals.

Also, studies in a Chinese population have reported that BMI was significantly and positively correlated with H.pylori infection and a high BMI was associated with an increased risk of the infection

In Turkey a prevalence of 57.2% of Helicobacter pylori positive infection is seen in Turkish obese subjects compared to prevalence of 27.0% in normal body weight was found. US studies were found to have a higher prevalence rate of 61% in morbidly obese patients compared to 48% in the control group though this later used *H. pylori* serologies, histopathology diagnosis was used in our study.

Difference in participant inclusion, study methodology, diagnostic procedure, investigation, geographical variation, differing lifestyles can be attributed to the differing results from different studies.

CONCLUSION

Within the limitations of the study, we observe that the prevalence of Helicobacter pylori infection is high in patients with high BMI (obese patients). Therefore, pending further studies and investigations, due consideration has to be given to address the problem and establishing obesity as a risk factor for Helicobacter pylori infection.

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