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TREATMENT OF HELICOBACTER PYLORI INFECTION AND IMPACT OF ITS ERADICATION IN PEPTIC ULCER DISEASE

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Abstract

Introduction: Helicobacter pylori (H. pylori) continues to be a major worldwide health issue, impacting around 50% of the global population, despite the progress made in the field of medical science. H. pylori infection consistently causes chronic active gastritis and can culminate in serious gastroduodenal conditions, such as gastric mucosa-associated lymphoid tissue (MALT) lymphoma, noncardiac gastric cancer, and peptic ulcer disease.

Methodology: The study was conducted between July 2023 to December 2023 at a tertiary care hospital in Pakistan. A data collection form was used to collect patients 'data which included demographic details, primary diagnosis, past medical history, past medication details, current medication in the hospital, ulcer associated symptoms and factors that could exacerbate the condition, and the prescription at hospital.

Results: A total of 84 participants were included in the study among whom 36 were males. 10.7% patients were presented with a wide spectrum of symptoms presenting complications. Hypertension and diabetes mellitus were common comorbid conditions, and the BMI mean was 28.71±2.43. The patients were observed over a period of six months and the relief of symptoms was noted. The severity of symptoms reduced in 63 (75%), the Quadruple Regimen was more effective for the complicated cases

Conclusion: The implementation of eradication therapy not only promotes the healing of ulcers and decreases the likelihood of them reoccurring, but also diminishes the long-term probability of developing gastric cancer. This highlights the importance of ongoing study and advancement in ways for managing H. pylori.

Introduction

The existence of Helicobacter pylori as a serious human infection that dates back nearly four decades. It is the most common bacterial pathogen in humans and may still afflict half of the world's population even with advancements [1]. As a result, it remains one of the main causes of illness and mortality worldwide. However, even with the advantages of helping those who are ill and the lower incidence of infection transmission in regions where socioeconomic living standards have improved, the pathogen is still widely spread [1].

A H. pylori infection always leads to active chronic gastritis. A considerable percentage of patients acquire gastroduodenal problems as a result, such as gastric mucosa associated lymphoid tissue (MALT) lymphoma, noncardiac gastric cancer, and peptic ulcer disease, even if the majority may never exhibit any symptoms. Along with raising the risk of bleeding and gastroduodenal ulcers in patients on nonsteroidal anti-inflammatory drugs (NSAIDs), such as aspirin, it also produces symptoms in certain individuals with functional dyspepsia. The study of H. pylori is well-established. The literature search yields over 45,000 publications. We now know a great deal more about virus epidemiology thanks to advances in biology, genetics, pathophysiology, disease expression, diagnosis, and treatment. But there's still a lot we don't know. Although several epidemiological studies have identified risk factors for infection, the precise process by which infections spread remains a mystery. Many elements, such as the host-pathogen dynamic, that affect how a disease presents itself are yet unknown. Several studies have thoroughly investigated the complex pathophysiology of this relationship. Efforts to enhance diagnostic procedures are continuing, as is the debate over the optimal therapeutic management pathways in many settings. Finding the simplest, safest, and most effective medication is still a major concern for physicians dealing with the problem of antibiotic resistance to treatments. The development of a vaccine that works well is currently ongoing, as is the best surveillance plan for harmful histological changes in the stomach mucosa [2, 3].

Methodology

The study was conducted between July 2023 to December 2023 at a tertiary care hospital in Pakistan. Patients with a recent episode of gastrointestinal bleeding due to ulcers, patients with active bleeding at the time of admission, and the patients taking treatment for stress ulcers were all included. Patients who were feeding or pregnant women, were excluded. Participants were enrolled after strictly following an inclusion and exclusion criteria.

The electronic medical records from the hospital were used to obtain data of all the patients who attended hospital for treatment of peptic ulcer. A data collection form was used to collect patients ‘data which included demographic details, primary diagnosis, past medical history, past medication details, current medication in the hospital, ulcer associated symptoms and factors that could exacerbate the condition, and the prescription at hospital.

All the data was collected on an excel sheet and then transferred to an SPSS sheet. The data was analysed using statistical methods and the descriptive statistics including mean and standard deviation for continuous variables and frequency and percentage for categorical variables were obtained using inferential statistics.

Results

A total of 84 participants were included in the study among whom 36 were males and 48 were females. 10.7% patients were presented with a wide spectrum of symptoms presenting complications.

Table 1: Characteristics of the study population

Variable		Frequency	Percent
Gender	Male	36	42.86
	Female	48	57.14
Past medication	No	68	80.95
	Yes	16	19.05
Complicated Symptoms	No	75	89.29
	Yes	9	10.71
Symptoms of the Disease	Burning stomach pain	79	94.05
	Vomiting or vomiting blood — which may appear red or black	31	36.9
	Dark blood in stool, or stools that are black or tarry	28	33.33
	Feeling of fullness, bloating, or belching	72	85.71
	Fatty food intolerance	69	82.14
	Heartburn	76	90.48
	Nausea	73	86.9
	Trouble breathing	23	27.4
	Feeling faint	9	10.71
	Change in appetite	52	61.9
Age	Less than 60 years	41	48.8
	More than 60 years	43	51.2
Time Since the Ulcer Developed	Less than 6 months	46	54.76
	More than 6 months	38	45.24
Medicine Prescribed	*Quadruple Regimen	36	42.86
	**Triple Regimen	48	57.14
Outcomes	Symptoms Severity Reduction	63	75.0
*Omeprazole 20 mg BD, 500 mg of clarithromycin, 500 mg of amoxicillin, 400 mg metronidazole BD **Clarithromycin 500 mg BD, amoxicillin 1 g OD, and PPI omeprazole 20 mg BD			

All the common symptoms were recorded in the Table 1. There were two types of treatments given, one comprised of three drugs and the other comprised of four drugs.

Table 2: Comorbid Conditions in Patients

Body mass index (kg/m^2)	28.71±2.43
Complicated diseases	
Hypertension	30 (35.71)
Diabetes	28 (33.33)
Respiratory Disease	9 (10.71)
Others	11 (13.1)

Hypertension and diabetes mellitus were common comorbid conditions, and the BMI mean was 28.71±2.43. The patients were observed over a period of six months and the relief of symptoms was noted. The severity of symptoms reduced in 63 (75%), the Quadruple Regimen was more effective for the complicated cases.

Discussion

Complications of an untreated H. pylori infection

Perforation: H. pylori infection, if left untreated, can cause the mucosal lining of the stomach and small intestine to become more fragile. A perforation of the ulcer, which occurs when the ulcer breaks through the wall of the stomach or the intestinal tract, may be the consequence of this vulnerability.

These kinds of perforations pose a significant risk to one's life and so demand immediate medical attention.

The bleeding: It is possible for H. pylori to produce chronic inflammation, which can then lead to the erosion of blood vessels within the ulcer. This erosion can lead to bleeding in the gastrointestinal tract, which can be an extremely serious condition that requires immediate medical attention.

The obstruction of the gastric outlet: Untreated peptic ulcers can sometimes cause the obstruction of gastric outlet, to become constricted or blocked at gastrointestinal junction. It is possible for this obstruction to result in symptoms such as nausea, vomiting, stomach pain, and difficulties eating [4].

Gastric Cancer: The presence of a persistent H. pylori infection is a well-known risk factor for the development of stomach cancer. There are several reasons why this relationship is important.

The stomach mucosa is subject to persistent inflammation when H. pylori is present. This inflammation goes through numerous stages as time goes on. Atrophic gastritis is characterized by a thinning of the lining of the stomach because of chronic inflammation. Metaplasia of the intestines refers to the transformation of normal stomach cells into cells that are like those occurring in the intestines. The last stage of gastric adenocarcinoma is the development of malignant cells from the changed tissue they originated from.

There is evidence that an infection with H. pylori can lead to the development of stomach adenocarcinoma in animal models. There is a persistent and unambiguous link between H. pylori infection and stomach cancer, which affects both the intestinal and diffuse subtypes of gastric cancer, according to research conducted on humans. It has been demonstrated that eradicating H. pylori can lower the likelihood of developing stomach cancer in persons who are infected with the bacteria. Treatment of the infection has the potential to halt the progression of chronic inflammation into cancer, which would otherwise be terminal. Not only is it essential to treat H. pylori infection to manage peptic ulcers, but it is also essential to prevent complications that might potentially be fatal and to lower the risk of developing stomach cancer [4-6].

Challenges and obstacles in H. Pylori control

Resistance to Antibiotics: The development of resistance to antibiotics, to clarithromycin and metronidazole, is one of the most critical obstacles that must be overcome to eradicate H. pylori.

Because H. pylori strains are becoming increasingly resistant to antibiotics that are routinely used, the efficiency of traditional treatment regimens is continuing to decrease. Consequently, this may result in the treatment being unsuccessful and the infection continuing to persist.

To combat antibiotic resistance, healthcare practitioners need to examine alternate techniques, like identifying the medicines that are most successful for a particular patient by "culture-based antibiotic susceptibility testing." Personalized treatment that is based on the individual's susceptibility patterns is referred to as tailored therapy [7].

Compliance of the Patient: The treatment for H. pylori frequently consists of a combination of acid suppression medicines and various antibiotics. Obtaining patient cooperation is necessary to get optimal treatment outcomes. It is necessary to finish the entire course of treatment to eradicate H. pylori. The necessity of adherence is something that people need to be educated about by their healthcare providers. It is of the utmost importance to address obstacles such as lifestyle modifications, complex dosing schedules, and adverse effects [8-9].

H. pylori Eradication

The most efficient combination is believed to be antibiotics plus a proton pump inhibitor (PPI). Since the regimen's success depends on the raising of stomach pH, concurrent antacid therapy is essential. The global rate of antibiotic resistance, particularly to the commonly used medication clarithromycin, is rising, which poses a significant obstacle to the effective management of H. pylori infection. A triple-drug regimen consisting of clarithromycin 500 mg BID, amoxicillin 1 g BID, and a standard-dose PPI (omeprazole 20 mg or pantoprazole 40 mg) given twice was the first-line therapy in the USA historically [10]. Comparing 14-day triple therapy regimens to 7- or 10-day alternatives, some meta-analyses have shown that the former had higher cure rates. Less than 80% eradication rates are

currently being reported globally due to the emergence of clarithromycin resistance. Given that the United States is currently thought to have a high rate of clarithromycin resistance (15–40%), most US clinicians support the use of a triple medication regimen as first-line therapy [11].
The most popular "quadruple regimen," which contains bismuth, is advised as second-line treatment in regions where there is no evidence of clarithromycin resistance; in regions where there is a significant prevalence of clarithromycin resistance, the "quadruple regimen" is to be taken into consideration as the preferred course of treatment. In addition to standard-dose PPI twice daily for 10–14 days, the dosage for the “quadruple regimen” consists of bismuth subsalicylate 525 mg QID, metronidazole 250 mg QID, and tetracycline 500 mg QID [12].
First- or second-line treatments, particularly in locations with high levels of metronidazole and clarithromycin resistance, may include a non-bismuth-containing quadruple regimen referred to as concurrent therapy. The 14-day regimen of concurrent therapy consists of a standard-dose PPI taken twice daily along with 500 mg of clarithromycin, 500 mg of amoxicillin, and 500 mg of metronidazole BID. When used as first-line therapy, quadruple regimens have been demonstrated to yield H. pylori cure rates of greater than 90% [13].
Sequential therapy and therapies based on fluoroquinolones are examples of alternative regimens. For 10–14 days, the most popular fluoroquinolone-based therapy consists of twice-daily standard-dose PPI together with 500 mg BID of levofloxacin and 1 g BID of amoxicillin. It is not advised to use this region as a first-line therapeutic option due to the rising prevalence of fluoroquinolone resistance [14]. Cure rates of about 80% are observed with second-line regimens. For patients who don't respond to first-line therapy, sequential therapy is an additional choice. It alludes to a split regimen, which is divided into two sessions of five to seven days of treatment per phase. Typically, this regimen consists of a standard-dose PPI taken twice daily along with 1 gm of amoxicillin for the initial treatment period, followed by 5-7 days of standard-dose PPI BID, 500 mg of clarithromycin BID, and 500 mg of metronidazole BID. Though not as effective as 14-day triple therapy, sequential therapy has been demonstrated to achieve greater cure rates than 7- or 10-day triple therapies [15].
For 8–12 weeks, patients receiving triple or quadruple therapy for stomach ulcers should continue taking proton pump inhibitors; for patients with complex duodenal ulcers, the recommended duration is 4–8 weeks. After the antibiotic course, people with simple duodenal ulcers usually don't require any more PPI treatment. A H. pylori eradication regiment will not be successful in curing more than one in five patients. Therefore, it is crucial to check that all patients have completely eradicated H. pylori four weeks or longer following treatment. This is usually done with a urea breath test, but faecal antigen testing is also an option and is particularly helpful for patients who have an excluded stomach, such as those who have had a Roux-en-Y gastric bypass [16].

Impact of H. Pylori eradication

If H. pylori is successfully eradicated, the following occurs to peptic ulcers:
Elimination of Inflammation in the Gastric Region: It has been shown that persistent inflammation of the stomach relates to H. pylori infection. Eliminating it results in a dramatic reduction in the inflammatory reaction that occurs inside the mucosa of the stomach. Peptic ulcers can heal more quickly because of this reduction in inflammation.
Symptomatic Relief from Peptic Ulcers: The increased healing of peptic ulcers is the key advantage that comes from eliminating H. pylori. The stomach and duodenal mucosa can heal themselves more efficiently when they are not subjected to the persistent inflammatory stimulus that is provided by H. pylori. Symptoms related to inflammation fade and the patients feel relieved.
Reduction in the occurrence of Later Ulcers: A large decrease in the number of recurrences of peptic ulcers is one of the most important effects that can be attributed to the elimination of H. pylori. In the presence of H. pylori, ulcers may reoccur due to continuous mucosal damage and inflammation; nevertheless, the elimination of the bacteria significantly decreases the risk that ulcers would resume their previous state.

Outcomes Over the Long Term: Peptic ulcers are associated with several problems, including bleeding, perforation, and obstruction of the gastric outlet. The successful eradication of H. pylori considerably reduces the probability of these complications occurring [17].
Maintenance of a Normal Level of Gastric Acid Secretion: No matter where the infection is located, H. pylori has the potential to affect the secretion of stomach acid in several different ways. It is possible that the elimination of H. pylori will result in the normalization of acid secretion, which will in turn reduce the likelihood of ongoing ulceration.
Reduced Requirement for Acid Suppressive Treatment: There is typically no need for continuous acid suppression therapy, such as proton pump inhibitors (PPIs), once H. pylori has been eradicated and ulcers have healed. The only exception to this rule is when there are other indications for the use of these medications.
Modifications to the Microbiota: In the process of eliminating H. pylori, the microbiome of the stomach may undergo several modifications. Investigations are currently being conducted to determine the full ramifications of these modifications; nonetheless, it is possible that they will influence the general health of the stomach mucosa after the eradication.
Lower Probability of Developing Gastric Cancer: One of the most well-known risk factors for the development of gastric cancer is chronic H. pylori infection. This is especially true for the development of adenocarcinoma and mucosa-associated lymphoid tissue (MALT) lymphoma.
There is a significant long-term benefit of eradication therapy, which is that it has been demonstrated that eradication of H. pylori can lessen the risk of getting these harmful cancers [18].

Conclusion:

The treatment of peptic ulcer disease (PUD) has been significantly improved by successfully eliminating H. pylori, which emphasizes the bacterium's crucial involvement in stomach pathophysiology. The implementation of eradication therapy not only promotes the healing of ulcers and decreases the likelihood of them reoccurring, but also diminishes the long-term probability of developing gastric cancer. This highlights the importance of ongoing study and advancement in ways for managing H. pylori.

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