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## A study of *Helicobacter pylori* infection, dietary pattern and habits in patients with gastric cancer in South India

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### ABSTRACT

**Objective:** To determine the association of *Helicobacter pylori* (*H. pylori*) infection, dietary pattern and habits with gastric cancer in populations where consumption of smoked and salted meat is not high. **Methods:** A total of 54 patients were included in the study with 27 each in case and control groups. *H. pylori* status was determined in both the groups. The dietary pattern was assessed for intake of carbohydrates, non-vegetarian diet, salt, spices, fruits and vegetables, using a food frequency questionnaire. Habits such as smoking, tobacco chewing and alcohol consumption, *H. pylori* status and dietary pattern were compared between the two groups. **Results:** Forty four percent of the patients with gastric cancer were positive for *H. pylori* infection compared to 63% of the controls, which is not statistically significant. 44% of the patients with gastric cancer had a frequent carbohydrate intake compared to 30% of the controls. Patients with gastric cancer had a lower intake of fruits ( $P > 0.05$ ) and vegetables ( $P > 0.05$ ) than controls. Habits like smoking, tobacco chewing and alcohol use were more prevalent among the cases when compared to the controls. However, these differences were not statistically significant. Intake of non-vegetarian diet, salt and spices was found to be similar in both the groups. **Conclusions:** The *H. pylori* status was similar between patients with gastric cancer and controls. High intake of carbohydrates, low intake of fruits and vegetables, habits like smoking, tobacco chewing and alcohol intake were more frequent in patients with gastric cancer compared to the controls, although the difference did not reach significance.

## 1. Introduction

Gastric cancer is the second leading cause of cancer deaths after lung cancer[1]. Prognosis for gastric cancer continues to be poor due to late stage at presentation in most of the countries, except for countries like Japan which have regular screening programmes. Thus it is essential to identify risk factors that might help in primary prevention of the disease[1].

Some studies from the West have found association between *H. pylori* infection and increased risk of gastric cancer[2]. Indian studies have not shown similar association[3]. In Asian countries a higher rate of *H. pylori* infection and low incidence of gastric cancer is seen which could be attributed to strain-specific virulence factors and host genetic makeup[4]. A few reports have

shown that gastric cancer is related to increased intake of carbohydrate, salt, non-vegetarian diet and decreased intake of fruits and vegetables[5]. However, these results are conflicting as others did not show a similar association[6]. There are limited reports from India correlating the dietary pattern with gastric cancer. Some studies have found some association between gastric cancer and habits like smoking and alcohol while others have not implicated it as a risk factor[1,7–9]. Hence, this study was carried out to determine the status of *H. pylori* infection, dietary pattern and habits in patients with gastric cancer.

## 2. Materials and methods

This was a case-control study, conducted in the department of surgery, JIPMER, Puducherry.

### 2.1. Patient groups

A total of 54 patients were included in the study with 27 each in the case and control groups, after obtaining an

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informed consent. Consecutive patients with gastric cancer diagnosed by upper gastrointestinal endoscopy (UGIE) and biopsy were included as cases. Age and sex matched individuals with normal UGIE findings were included as controls. Patients having co-existing upper gastro-intestinal disorders and those who had received any form of anti-*H. pylori* therapy in the recent past were excluded from the study. Parameters evaluated included prevalence of *H. pylori* infection, the dietary pattern assessment (intake of carbohydrate, salt, spices, non-vegetarian diet, fruits and vegetables) and assessment of habits (smoking, tobacco chewing and alcohol intake).

## 2.2. Diagnosis of *H. pylori* infection

For determining the *H. pylori* status two biopsies each were taken for rapid urease test and for Giemsa stain from normal appearing pyloric antrum or mucosa surrounding the growth. A positive *H. pylori* status was defined when any one or both of these tests were positive. A patient was considered negative for *H. pylori* infection when both tests were negative.

## 2.3. Assessment of dietary pattern

Dietary pattern was assessed using a food frequency questionnaire. These parameters were graded as frequent or less frequent for the purpose of analysis based on the study by Ray *et al*[7]. Information regarding habits was also collected.

The approval of the Institute Ethics Committee was obtained for the study.

## 2.4. Statistical analysis

Graph Pad version InStat 3 was used. The parameters were compared between the cases and controls using Fisher's exact test. A *P*-value of <0.05 was considered significant.

## 3. Results

A total of 27 consecutive cases of gastric cancer and 27 age and gender matched controls were included in the study. The male: female ratio was 3.6:1. The mean age of the cases was 54.3 years. The peak incidence of gastric cancer was found between 60–80 years. Incidence of histological types included adenocarcinoma–60%, intestinal type–37% and adenosquamous carcinoma–3%.

It was found that the prevalence of *H. pylori* infection was similar in cases at 12 (44%) when compared to controls at 17 (63%), which is not significant statistically. Patients with gastric cancer had a frequent carbohydrate intake compared to controls (44% versus 30%, *P* >0.05) (Table 1). Patients with gastric cancer consumed lower intake of fruits (*P* >0.05) and vegetables (*P* >0.05) than controls. Intake of non-vegetarian diet, salt and spices was found to be similar in both the groups. Habits like smoking, tobacco chewing and alcohol use were more prevalent among the cases when compared to the controls, however, the difference was not significant (Table 2).

**Table 1**

Comparison of dietary pattern between the cases and the controls.

| Dietary parameters            |               | Cases No. (%) | Controls No. (%) |
|-------------------------------|---------------|---------------|------------------|
| Carbohydrate intake           | Frequent      | 12 (44%)      | 8 (30%)          |
|                               | Less frequent | 15 (56%)      | 19 (70%)         |
| Intake of non vegetarian diet | Less          | 21 (78%)      | 21 (78%)         |
|                               | More          | 6 (22%)       | 6 (22%)          |
| Salt intake                   | Less          | 19 (70%)      | 19 (70%)         |
|                               | More          | 8 (30%)       | 8 (30%)          |
| Intake of spices              | Less          | 16 (59%)      | 16 (59%)         |
|                               | More          | 11 (41%)      | 11 (41%)         |
| Intake of fruits              | Less          | 18 (67%)      | 16 (59%)         |
|                               | More          | 9 (33%)       | 11 (41%)         |
| Intake of vegetables          | Less          | 21 (78%)      | 16 (59%)         |
|                               | More          | 6 (22%)       | 11 (41%)         |

**Table 2**

Comparison of habits between cases and controls.

| Habits              |         | Cases No. (%) | Controls No. (%) |
|---------------------|---------|---------------|------------------|
| Smoking             | Present | 11 (41%)      | 6 (22%)          |
|                     | Absent  | 16 (59%)      | 21 (78%)         |
| Alcohol consumption | Present | 13 (48%)      | 7 (26%)          |
|                     | Absent  | 14 (52%)      | 20 (74%)         |
| Tobacco chewing     | Present | 9 (33%)       | 4 (15%)          |
|                     | Absent  | 18 (66%)      | 23 (85%)         |

## 4. Discussion

Association between *H. pylori* and gastric cancer is controversial all over the world, especially in the Indian subcontinent. Some studies have reported a strong association between *H. pylori* and gastric cancer[2,10,11]. On the contrary, various Indian studies did not find an association between *H. pylori* and gastric cancer[3,4,12–14]. Similarly, a study from our institute conducted in 1998 did not find a significant difference in the prevalence of *H. pylori* infection between gastric cancer patients and controls (65% versus 35%, *P* >0.05)[12,13]. In the present study, it was found that the *H. pylori* status was similar in patients with gastric cancer and controls as seen in our earlier study. Epidemiological data also support these findings. Seroprevalence of *H. pylori* infection in adult population of India is 55–92% as compared to 44% and 55% in Chinese and Japanese populations, respectively. However the incidence of gastric cancer in India is 10.6/100000 population compared to 32–59/100000 population in China and Japan[3]. Thus, it appears that the pathogenesis of *H. pylori* induced malignant changes is dependent on other factors apart from *H. pylori* for the carcinogenesis. Particularly in India the association between *H. pylori* and gastric cancer is not strong and other risk factors must play relatively significant role in causation of gastric cancer. Ghoshal *et al* termed it like the enigma of *H. pylori* infection and gastric cancer where there is incongruence between infection prevalence and cancer incidence[15–19]. High prevalence of *H. pylori* infection with low cancer rates.

Studies conducted to find an association between intake of carbohydrates, fruits and vegetables with gastric cancer have also shown controversial results. Navarro Silvera *et al* reported a high meat/nitrite intake, a low intake of

fruits and vegetables to be associated with increased risk of gastric cancer<sup>[5]</sup>. However, Marjorie *et al* did not find an association between intake of whole grains (which signifies carbohydrate intake) and risk of gastric cancer<sup>[6]</sup>. On the contrary, increased risk of gastric cancer with increased vegetables consumption in females was observed. A high overall plant food intake was associated with decreased risk in men but not in women. In the present study, we found that more number of patients with gastric cancer had a high carbohydrate intake compared to controls ( $P > 0.05$ ). Furthermore, a higher number of patients with gastric cancer had a low intake of fruits and vegetables when compared to controls ( $P > 0.05$ ) though statistically not significant. Thus the association of dietary factors with gastric cancer is probably not so direct. Kim *et al* and Marjorie *et al* suggested that it is the intake of anti-oxidant containing fruits like citrus fruits that has a protective effect, rather than the total intake of fruits<sup>[6,20]</sup>. Similarly in case of vegetables consumption, vegetables containing nitrosamine (which are associated with increased risk of gastric cancer) might neutralize the effect of vegetables containing antioxidant. Therefore, we need to refine our criteria when we say that increased consumption of fruits and vegetables is associated with a decreased risk of gastric cancer. However, Ray *et al* failed to find an association between increased intake of non-vegetarian diet and gastric cancer<sup>[7]</sup>. In our study, intake of salt, spices and non-vegetarian diet was found to be similar among the cases and controls. As cooking practices and storage conditions influence the level of carcinogenic nitrosamines in food, the intake of non-vegetarian diet has to be interpreted considering these factors. However, this type of analysis was not done in the present study. Intake of spices has not been associated with increased risk of gastric cancer in other studies as well<sup>[7]</sup>.

In the present study smoking, tobacco chewing and alcohol intake were seen more frequently among cases than controls, though the difference was not statistically significant. Sung *et al* found a weak association of smoking with gastric cancer<sup>[8]</sup>. Alcohol is generally not implicated as a risk for gastric cancer but some studies have found a weak association<sup>[1,8,9]</sup>.

It was concluded that the *H. pylori* status was similar between patients with gastric cancer and controls. High intake of carbohydrates, low intake of fruits and vegetables and habits like smoking, tobacco chewing and alcohol intake were seen more frequently in patients with gastric cancer when compared to controls although the difference did not reach significance.

### Conflict of interest statement

We declare that we have no conflict of interest.

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