International Surgery Journal
Illahi MF et al. Int Surg J. 2024 Mar;11(3):386-391
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: https://dx.doi.org/10.18203/2349-2902.isj20240570

Original Research Article

Association of salted tea (noon chai), *Helicobacter pylori* infection and gastric carcinoma

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Received: 27 December 2023
Revised: 05 February 2024
Accepted: 06 February 2024

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ABSTRACT

Background: Gastric cancer remains the second leading cause of cancer-related deaths worldwide. Various dietary and environmental factors have been implicated in the pathogenesis of gastric cancer. *Helicobacter pylori* has strong association with peptic ulcer disease and gastric cancer.
Methods: This study was conducted in department of general and minimal invasive surgery SKIMS Srinagar, from May 2019 to April 2022 comprising of 50 patients. All the patients were studied prospectively using set of questionnaires about the quantity and quality of salted tea. Final inferences were drawn after analysing the data using various statistical tools.
Results: The most common age group was >60 years of age with male preponderance. Majority of patients had no comorbidity. About 50% of the patients were smokers. The most common histology found was intestinal type. 20% patients had proximal (cardia) tumor and 80% had distal location. Only 14% of the patients came positive for intra-operative *H. pylori* testing. Among the *H. pylori* positive patients, 14.3% were <40 years of age and 85.7% were >40 years of age. The most common histological grade found in *H. pylori* positive patients was poorly differentiated with signet ring cell type. About 88% of all the patients had a history of Noon chai intake with 14% positive and 86% negative for H. Pylori.
Conclusions: There is a positive relation between Noon chai and gastric carcinoma and an inverse relation between ca stomach and presence of *H. pylori* intraoperatively at the time of surgical intervention.

Keywords: *H. pylori*, Noon chai, Gastric cancer

INTRODUCTION

Gastric cancer describes a broad mix of malignant neoplasms derived from the different histological components that make up the stomach. These include adenocarcinoma, lymphoma, carcinoid, and sarcoma. Gastric adenocarcinoma accounts for over 90% of all cases of gastric cancers globally.[1,2] Incidence of gastric cancer decreased dramatically in the latter half of the 20th century. However, a recent rise in proximal gastric cancer incidence has been noted. Gastric cancer remains the second leading cause of cancer-related deaths worldwide.[1-5] The risk of developing gastric cancer is associated with a complex interrelationship between environmental factors and their influence on an individual's genetic and epigenetic make up.[1,2,5-7] Aside from *Helicobacter pylori* infection, smoking, and possibly a high dietary salt intake, very few proposed environmental risk factors have been validated through scientific analysis.[3] In addition to environmental factors, a clear impact of genetic susceptibility on the risk of developing gastric cancer has been identified.

H. pylori

Helicobacter pylori (*H. pylori*) is a gram-negative microaerophilic bacterium which resides in the mucous linings of the stomach. It has been implicated in the causation of various gastric disorders including gastric cancer. The primary mechanism is thought to be the presence of chronic inflammation. Long term infection with this bacterium leads to gastritis, primarily within the gastric body, with ventral gastric atrophy. In some patients, this progresses to intestinal metaplasia, dysplasia and ultimately to intestinal-type adenocarcinoma

Dietary factors

High salt foods particularly those with salted or smoked meats that contain high levels of nitrate, are linked to an increased risk of gastric cancer. The mechanism is thought to be conversion of nitrates in the food to N-nitroso compounds by bacteria in the stomach.

Salt intake (noon chai)

Noon Chai is a traditional pink colored salted tea beverage made in Kashmir. This beverage (salted tea) in Kashmir is referred to as Noon Chai. It is a prime traditional salted cuisine in Kashmir and almost everyone takes this daily.[8-14] A critical issue in interpreting relation of salt intake (in Noon Chai) with stomach cancer risk, is variation in salt consumption levels across the population in Kashmir valley. A high consumption of salted tea (>4 cups a day) is independently associated with high risk for gastric cancer.[10] Excessive salt intake has been identified as a possible risk factor for gastric cancer in many correlation studies and case-control studies.[15-18] Tea consumed at high temperature may cause thermal injury to gastric mucosa.[19-21] Inflammatory response then leads to inflammation and generation of free radicals of oxygen and nitrogen that promote carcinogenesis.[22] A large case-control study in Mongolia on healthy controls reported almost three times increased risk for gastric cancer with drinking hot tea.[23] The frequent consumption of hot salted tea is shown to result in exceptionally high exposure to methylamine, ethylamine, diethylamine, pyrrolidine, and methylbenzylamine, an animal carcinogen besides the presence of preformed N-nitrosodimethylamine (NDMA). Salt exerts an enhancing effect at both initiation and promotion steps within the two-stage model of gastric carcinogenesis.[24] A temporal corollary of precancerous changes that eventually leads to the development of gastric cancer involving a high salt diet results in chronic active gastritis.[25,26] In some cases, this may lead to atrophic gastritis with loss of glandular tissue followed by intestinal metaplasia, dysplasia, early gastric cancer and eventually advanced gastric cancer. Chronic hypergastrinemia by high salt intake can synergize with helicobacter infection and lead to eventual parietal cell loss and progression to gastric cancer.[27] The aim of our study was to know whether there is an association between salt intake (noon chai), *H. pylori* infection and gastric carcinoma.

METHODS

This study was prospective cohort study conducted in the Department of General Surgery, Sheri-Kasmir institute of medical sciences (SKIMS), Soura, Srinagar from May 2019 to April 2022. The study comprised of 50 patients. All the patients were above 18 years of age. Inoperable patients and patients on salt restriction due to any specific medical reason were excluded from the study. All newly diagnosed and histologically proven cases of gastric cancer were prospectively recorded. The data collected included age, sex, smoking status, co-morbid conditions, presenting symptoms, radiological features, histological report of biopsy material, surgical findings, and histological report of the resected specimens. A set of questionnaires was asked to the patient in the history which include: Quantity of intake viz number of cups of salted tea each day, Duration of intake viz number of years of intake, whether intake was of hot/cold tea, whether they used to take tea empty stomach or post prandial and Time of appearance of first symptoms.

Intra operative biopsy specimen was taken from antral area of stomach for the detection of *H. pylori* by using a rapid urease testing (RUT) kit; besides a specimen for routine HPE to follow. In our study we used a simple RUT Slide test which had urea-impregnated agar with a pre-testing yellow colour indicator and a labelling for patient particulars viz name of the patient, Age, sex, Mrd number and time of testing. The RUT dry slide was inspected to make sure that the indicator dot is yellow before testing. If the dot was pink or orange the slide was discarded. A biopsy of gastric tissue was placed into a medium containing urea and a pH indicator. When the bacterial urease splits the urea, the liberated ammonia increased the pH; that was recognized by a color change in the test indicator from yellow to pink or orange. The test is read preferably within first 4 hours and is valid up to 24-hour. The data was compiled and analyzed using SPSS Version 20.0 (SPSS Inc. Chicago, Illinois, USA) and final inferences were drawn.

RESULTS

In our study, majority of the patients i.e. 24 (48%) belonged to the age group of >60 years followed by 20 (40%) who belonged to 50-60 years. There were 4 (8%) patients who were in the age group of 40-50 and 2 patients (4%) who were between 30-40 years (Table 1). 34 patients (64%) were of male gender and 16 patients (32%) were females. 25 patients (50%) were smokers and an equal number i.e. 25 patients (50%) were nonsmokers. In our study 35 patients i.e. (70%) had no co-morbidity. The most common comorbidity found was HTN in 7 patients (14%) followed by COPD in 2 patients (4%), T2DM and hypothyroidism in 1 (2%) of patients each (Table 2). 10 patients (20%) had proximal tumour

location while as 40 patients (80%) had distal location of tumour.

Table 1: Age distribution of the study patients.

Age (years)	N	%
30-40	2	4.0
40-50	4	8.0
50-60	20	40.0
>60	24	48.0
Total	50	100.0

Table 2: Underlying comorbidities of the study patients.

Comorbidity	N	%
None	35	70.0
HTN	7	14.0
T2DM	1	2.0
Hypothyroid	1	2.0
COPD	2	4.0
HTN, T2DM	1	2.0
HTN, COPD	2	4.0
Any other	1	2.0
Total	50	100.0

In our study all the patients i.e. 50 (100%) of Ca Stomach had intestinal type of histology while as none of the patients were of Diffuse variant. 8 patients i.e. (16%) had onset of symptoms <40 years of age while as 42 (84%) of patients had onset of their symptoms >40 years of age. 7 patients i.e. 14% came positive for intra operative *H. pylori* testing while as 43 patients i.e. (86%) tested negative for intra operative *H. pylori* testing.

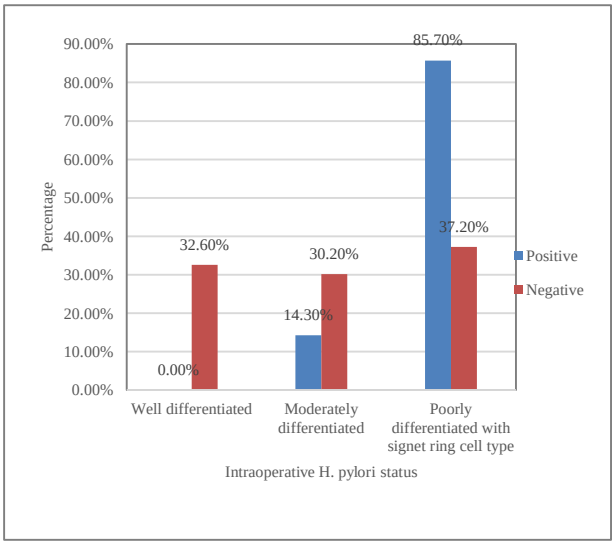

Figure 1: Correlation of histological grade and intraoperative *H. pylori* status.

Amongst the *H. pylori* positive patients, 1 patient i.e. (14.3%) was <40 years of age and 6 patients i.e. (85.7%) were >40 years of age (Table 3). In our study group it was found that most of the patients i.e. 6 (85.7%) who were positive for *H. pylori* had poorly differentiated with signet ring cell type of histological grade, followed by 1 patient (14.3%) who had moderately differentiated histological grade. while as none of the patient with well differentiated gastric carcinoma was positive for *H. pylori* testing (Figure 1). 1 patient (10%) with proximal tumor location was positive for *pylori* and 6 (15%) patients with distal tumor location were positive for *H. pylori* (Figure 2).

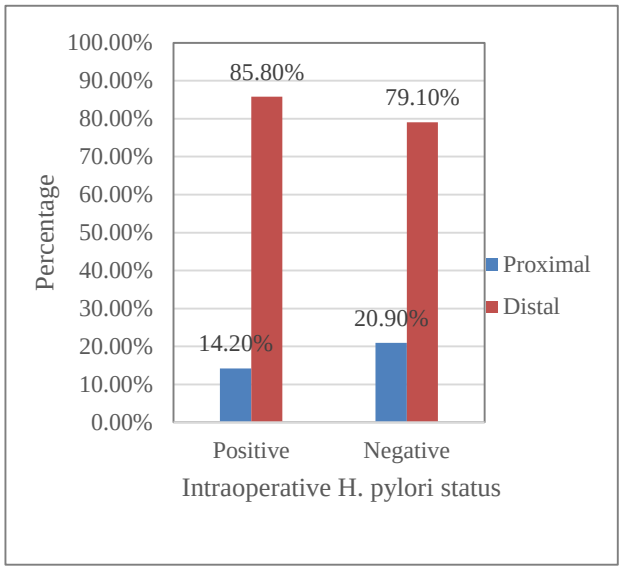

Figure 2: Correlation of tumour location and *H. pylori*.

In our study 44 patients i.e. (88%) were Noon Chai consumers while as 6 patients (12%) did not consume noon chai. All the noon chai consuming patients i.e. 44 patients (88%) consumed more than 4 cups a day. 44 noon chai consuming patients had a duration of intake of more than 10 years. 42 patients i.e. (84%) consumed the beverage hot. 2 patients i.e., (4%) consumed it cold while as remaining 6 patients (12%) did not consume it all. In our study 32 patients (64%) consumed it empty stomach while as 12 patients (24%) consumed it post prandial.

Total 7 patients (15.9%) out of 44 among noon chai users developed symptoms <40 years of age. In the non-user group, 1 out of 6 patients (16.6%) developed symptoms <40 years. In our study amongst the *H. pylori* positive group, 6 patients (85.7%) were noon chai users and 1 patient (14.3%) were noon chai non users.

While as amongst the *H. pylori* negative group 38 patients (88.4%) were noon chai users, and 5 (11.6%) patients were noon chai non users. In our study amongst the noon chai user group, 6 patients (13.6%) were positive and 38 patients (86.3%) were negative for *H. pylori*. While as amongst the noon chai non user group, 1 patient (16.6%) were positive and 5 (83.3%) were negative for *H. pylori* testing (Table 4).

Table 3: Correlation of age of patients and intraoperative *H. pylori* status.

Age group (years)	Intraoperative *H. pylori* status		Total
	Positive	Negative	
<40	N	1	1	2
	%	14.3	2.3	4.0
>40	N	6	42	48
	%	85.7	97.7	96.0
Total	N	7	43	50
	%	100.0	100.0	100.0

Table 4: Distribution of study patients (noon chai users and non-users) as per age of onset of symptoms and intra-operative *H. pylori* status.

Noon chai user	Age group (years)		Intraoperative *H. pylori* status		Total
	<40	>40	Positive	Negative	
Yes	N	7	37	6	38	44
	%	87.5	88.0	85.7	88.4	88.0
No	N	1	5	1	5	6
	%	12.5	12.0	14.3	11.6	12.0
Total	N	8	42	7	43	50
	%	100.0	100.0	100.0	100.0	100.0

DISCUSSION

We had 50 patients in our study who were newly diagnosed and histologically proven cases of gastric cancer. It was an observational study and our aim was to know whether there is an association between salt intake (Noon chai), *H. pylori* infection and gastric carcinoma. In our study, majority of the patients i.e. 24 (48%) belonged to the age group of >60 years followed by 20 (40%) between 50-60 years. There were 4 (8%) patients between 40-50 years and 2 patients (4%) between 30-40 years of age. 34 patients (64%) were of male gender and 16 patients (32%) were females. The results are comparable with the study by Lou et al.[29] 25 patients (50%) in our study were smokers and an equal number i.e. 25 patients (50%) were non-smokers. Among the *H. pylori* positive patients all the patients were smokers. This result is comparable with results of the study by Siman et al.[30] In our study 35 patients i.e. (70%) had no co-morbidity. The most common comorbidity found was HTN in 7 patients (14%) followed by COPD in 2 patients (4%), T2DM and hypothyroidism in 1 (2%) of patients each. 10 patients (20%) had proximal tumour location while as 40 patients (80%) had distal location of tumour. All the patients i.e. 50 (100%) of Ca Stomach had intestinal type of histology. 8 patients i.e. (16%) had onset of symptoms <40 years of age while as 42 (84%) patients had onset of their symptoms >40 years of age. 7 patients i.e. 14% came positive for intra operative *H. pylori* testing while as 43 patients i.e. (86%) tested negative. So, in our study we saw an inverse relationship between ca stomach and *H. pylori* at the time of surgery The results again were comparable with the study done by Forman and Khanna et al.[31,32] Another study done by Abraham Nomura et al also concluded same results.[33] In our study, amongst the *H. pylori* positive patients, 1 patient i.e. (14.3%) was <40 years of age and 6 patients i.e. (85.7%) were >40 years of age. When the correlation between *H. pylori* and grade of tumor was studied, it was found that most of the patients i.e. 6 (85.7%) who were positive for *H. pylori* had poorly differentiated with signet ring cell type of histological grade, followed by 1 patient (14.3%) who had moderately differentiated histological grade. While as none of the patient with well differentiated gastric carcinoma was positive for *H. pylori* testing. In our study 1 patient (10%) with proximal tumor location was positive for *H. pylori* and 6 (15%) patients with distal tumor location were positive for *H. pylori*. In our study out of 50, 44 patients i.e. (88%) were noon chai consumers while as 6 patients (12%) did not consume noon chai. Lee et al concluded heavy salt consumption and cooking methods like broiling and salting seem to play a major role in gastric carcinogenesis among Koreans.[34] In our study all the noon chai consuming patients i.e. 44 patients (88%) consumed more than 4 cups a day; all of them had a duration of intake of more than 10 years; with 42 patients i.e. (84%) consuming the beverage hot, 2 patients i.e. (4%) consumed it cold while as remaining 6 patients (12%) did not consume it at all; 32 patients (64%) consumed it empty stomach while as 12 patients (24%) consumed it post prandial. In our study amongst the *H. pylori* positive group, 6 patients (85.7%) were noon chai users and 1 patient (14.3%) was noon chai non user. While as among the *H. pylori* negative group 38 patients (88.4%) were noon chai users, and 5 (11.6%) patients were noon chai non users, which is statistically insignificant, we could not find any significant association between the intake of noon chai and prevalence of *H. pylori* infection in diagnosed cases of gastric carcinoma at the time of surgical intervention. In our study amongst the noon chai user group, 6 patients (13.6%) were positive and 38 patients (86.3%) were

negative for *H. pylori*. While as amongst the noon chai non user group, 1 patient (16.6%) was positive and 5 (83.3%) were negative for *H. pylori* testing. Also, out of all the *H. pylori* positive patients 6 out of 7 (85%) were noon chai users while as 1 out of 7 (15%) were noon chai non users. Comparable with the results of the study by Khuroo et al.[35] So, our study gave a positive relation between Ca stomach and noon chai.

Limitations

Since present study was done on a small sample size in a single center, we recommend further studies which include a large sample size over an adequate period of time for further elaboration and generalization of our findings.

CONCLUSION

Gastric cancer remains the second leading cause of cancer-related deaths worldwide. The most common age group involved is >60 years of age with male preponderance. The most common histology found is of intestinal type Most patients had distal location (non cardia) of tumour. Our study was a prospective observational study and we could not find any direct or indirect relationship between use of noon chai and incidence of H pylori in gastric carcinoma patients at the time of surgical intervention. However, we saw a positive relation between noon chai and gastric carcinoma and an inverse relation between ca stomach and presence of H. Pylori intraoperatively at the time of surgical intervention.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Illahi MF, Gani M, Naqash SH, Shah MA. Association of salted tea (noon chai), *Helicobacter pylori* infection and gastric carcinoma. Int Surg J 2024;11:386-91.