PREVALENCE OF HELICOBACTER PYLORI IN HUMAN POPULATION IN RURAL AND URBAN AREAS OF DISTRICT PESHAWAR, PAKISTAN

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Abstract

Helicobacter pylori (H. pylori) is a gram negative, micro aerophilic bacterium that can inhabit various areas of stomach, particularly the antrum. It causes a chronic low-level inflammation of the stomach lining and is strongly linked to the development of duodenal and gastric ulcers and stomach cancer. The present study was carried out from June 2017 to July 2018 to investigate the prevalence of *H. pylori* infection in rural and urban areas of District Peshawar. During this period blood samples along with history were collected from 160 individuals of rural and urban areas of District Peshawar. Questionnaires were used as a tool for data collection. It was observed that apparently 55% of healthy persons were harboring the *H. pylori* antibodies and the gender wise prevalence was 31.25% in males and 23.75% in females. During this study, a high prevalence rate (38.12%) was found in the individuals belonging to urban areas as compared to peoples of rural areas (16.87%). Age wise prevalence was also observed, and the highest prevalence rate (21.25%) was found in (21-30) years of age. A higher prevalence rate was found in drivers (26.25%), followed by students (8.75%). The socioeconomic status wise prevalence of *H. pylori* shows a higher prevalence rate (35%) of infection in individuals belonging to lower class families as compared to other classes. During this study, it was observed that those people who used to eat in hotels were more infected (36.25%) as compared to those who used to eat in homes (18.75%) respectively.

Keywords: *H. Pylori*, Human Population, Peshawar, Khyber Pakhtunkhwa

INTRODUCTION

H. pylori is a gram negative, micro aerophilic bacterium that can inhabit various areas of stomach, particularly the antrum. It causes a chronic low-level inflammation of the stomach lining and is strongly linked to the development of duodenal and gastric ulcers and stomach cancer. It has infected more than 31% individual all over the globe. (Haq *et al.,* 2020). Over 80% of individuals infected with the bacteria are asymptomatic Once infected with *H. pylori*, most persons remain asymptomatic. This progression appears to be a key event in the cellular cascade that results in the development of gastric carcinoma (Peterson *et al*., 1993)   The bacterium was initially named *Campylobacter pyloridis*, then named *C. Pylori* (Pylori = genitive of pylorus) (Ali *et al.,* 2019). More than 50% of the world's population harbor *H. pylori* in their upper gastrointestinal tract. Infection is more prevalent in developing countries of Asia including Pakistan, India, Thailand, and Bangladesh while in developed countries of Asia as China and Japan it was shown in the early era (Zaidi et al., 2016).

According to World Gastroenterology Organization Global Guideline (2011) worldwide varies kind strain of *H. pylori* look to be related to the difference in virulence, and the ensuing interplay by the host and ecological factor leads to subsequent differences in the appearance of the disease. Ethnicity, Age, geography, sex, and socioeconomic position are all factors that influence the frequency and incidence of H. pylori disease, *H. pylori* disease is the key public health issue in all developing countries, the greater frequency ratio of *H. pylori* disease means that every individual intervention may be required.

The frequency rate of *H. pylori* infection is different between the urban and rural populations. The major reason for the different prevalence ratio of H. pylori infection is differences involve socioeconomic variation among the different population. the oral-oral or fecal-oral routes is the main way of spreading of H. pylori infection, due to unhygienic water system, poor diet and overcrowding is the major causes of H. pylori infection and increases the frequency of *H. pylori* infection (Choudry et al, 2014).

The present study was conducted in rural and urban areas of district Peshawar to estimate the frequency of *H. pylori* infection in human population living in the area if to find out major and minor risk factors responsible for transmission of *H. pylori* infection in the area while to draw the attention of government and semi government public health authorities in Pakistan for its proper control and management in the study area.
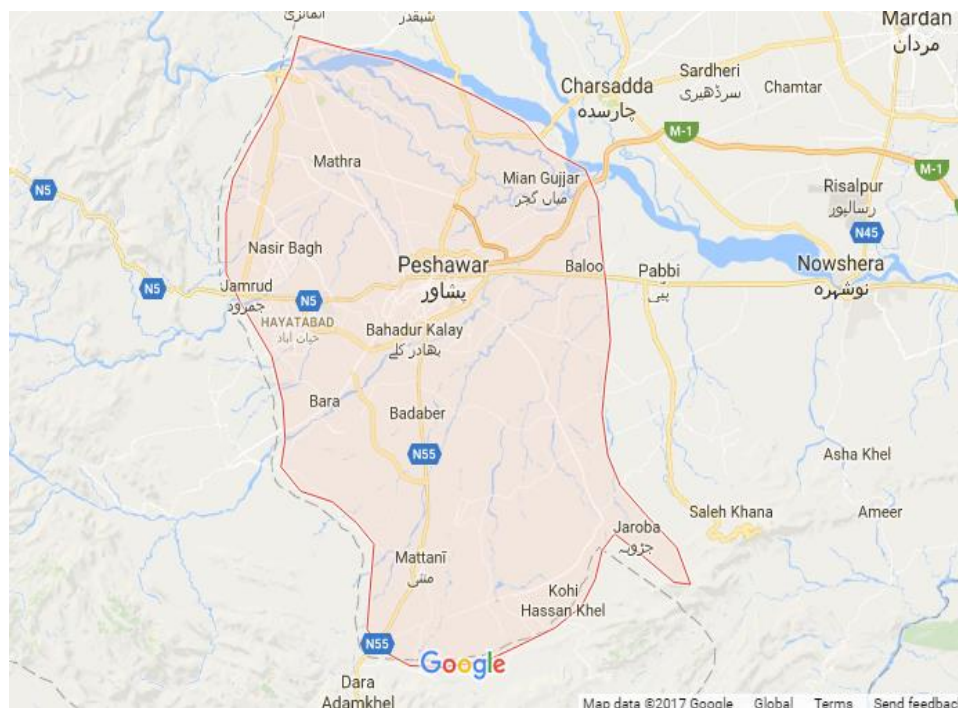
MATERIALS AND METHODS

Study Area

The present study was conducted in Peshawar, the capital of Khyber Pakhtunkhwa (KP). Peshawar lies between 34° 1' 33.3012'' N and 71° 33' 36.4860'' E. Peshawar lies just west of the Bara River, a tributary of the Kabul River, near Khyber Pass. District Peshawar has both rural and urban areas; however, the proportion of the urban zone and its population is greater than the rural zone. The total area of District Peshawar is around

1285 square km. The city of Peshawar has a population of 1,970,042 according to the 2017 census, making it the largest city in KP and the sixth largest in Pakistan (Tayyab et al, 2021).

With an influence from the local steppe climate, Peshawar features a hot semi-arid climate, with very hot summers and mild winters. The mean maximum summer temperature surpasses 40 °C (104 °F) during the hottest month, and the mean minimum temperature is 25 °C (77 °F). The mean minimum temperature during the coolest month is 4 °C (39 °F), while the maximum is 18.3 °C (64.9 °F) and the average annual rainfall in district Peshawar is 30.48 cm during monsoon (Khan, 2013)

Figure 3.1: Map of District Peshawar

Materials and Methods

Before start of sampling the people of District Peshawar were approached and were briefed about the study design and research methodology. After they agreed, blood samples were collected in gel tubes. Everyone was provided a consent form to be signed by them or by their guardians. The consent form explained methodology of the study and risks if any involved. The people of both sexes having symptoms and falling in the desired age range i.e., 5 to 70 y were included. People younger than 3-year-old of age and individuals on medication were excluded from the study.

The present study was conducted from June 2017 to October 2017. During this period blood samples along with history were collected from 160 individuals of rural and urban areas of district Peshawar. After collecting blood samples from the individuals, the gel tubes were properly labeled with their names, gender, and locations.

Questionnaires were used as a tool for data collection. The questionnaire (Annexure A) was consisting of personal information (name, sex, age, location, occupations etc.), hygienic status, food habits and any gastric problem or symptoms (abdominal pain, burning sensation, bloating, nausea etc.).

Random sampling method was used in collecting the data. A total of 160 blood samples were collected randomly from both males and females in the rural and urban areas of district Peshawar. In which the number of males were more than females. The collection of data was conducted in two phases. The ICT kit was used to detect anti-*H. pylori* IgG in serum of symptomatic patients of rural area. In second phase of the study ICT kit was also used to detect anti- *H. pylori* IgG in serum of symptomatic patients of urban area of Peshawar. In both phases, banked serum (stored at low temperature in sealed containers) was thawed to room temperature at lab and tested in the ICT kit.

Material used

Test Used

ICT: (Immuno chromatographic test)

A commercially available ICT kit was tested against characterized sera in this study. The kit contained a test card with a pink pad containing colored particles bound to anti-Human IgG, a blue pad containing a colored dye, a test line containing purified *H. pylori* antigen, and a control line containing conjugate-specific antibodies.

Test Principle

Centrifugation method in this test was used to extract the plasma/serum from the blood samples. The *H. pylori* Antibody Rapid Test Device detects antibodies specific to *H. pylori* through visual interpretation of color development on the internal strip. *H. pylori* antigens are immobilized on the test region of the membrane. During testing, the specimen reacts with *H. pylori* antigen conjugated to colored particles and precoated onto the sample pad of the test. The mixture then migrates through the membrane by capillary action and interacts with reagents on the membrane. If there are sufficient antibodies to *H. pylori* in the specimen, a colored line will form at the test region of the membrane. The presence of this colored line indicates a positive result, while its absence indicates a negative result. The appearance of a colored line at the control region serves as a procedural control, indicating that the proper volume of specimen has been added and membrane wicking has occurred.
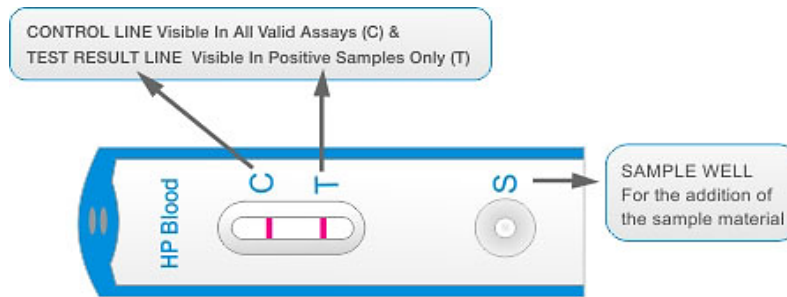
**Set-up of Test Device**

Procedure

- About 2ml Blood was taken from the individuals through disposable syringes.

- The Blood was a dispensed into clean gel tube.

- The gel tubes were placed in the cool/ ice box.

- Banked serum (stored at low temperature in sealed containers) was thawed to room temperature at lab.

- Then the gel tubes were centrifuged at the speed of 4000 rpm for 10 minutes to separate the serum from blood samples.

- After separating the serum from the blood, the serum was utilized in the ICT kit.

- The separated serum was taken up from the gel tube through pipette.

- About 10 micro-liter of blood serum was added to the "S" region of the ICT kit.

- Two drops of a buffer solution (PBS with 0.25 g/L sodium azide) were added to the serum, present at the "s" region of the test kit.

- Then the blood samples were analyzed.

Analysis of samples

a. Analysis of negative samples: In negative samples only one colored line appeared in the control region (C). No colored line appears in the test region (T). A negative result indicated that the specimen/serum contains no *H. pylori* antibodies. As shown in the below picture

b. Analysis of positive samples: In positive samples two colored lines appeared on the membrane. One line appears in the control region (C) and another line appears in the test region (T). A positive result indicated that *H. pylori*-antibodies were been detected. As show in the following picture
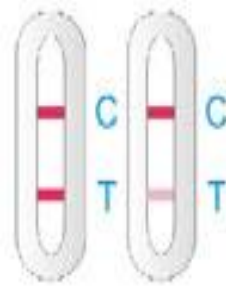

RESULTS

Sex wise prevalence of *H. pylori*

During the present study, a total of 160 blood samples were screen out for confirming of *H. pylori* infection in human population. Out of 160 samples, 88 blood samples were positive making an overall prevalence rate of 55%. During this study, a higher prevalence rate was found in males (31.25%) as compared to the females (23.75%), represented by table 4.1 and figure 4.1.

Table 4.1: Sex wise Prevalence of *H. pylori* in district Peshawar.

Sex	Total Samples	Positive Samples	% Age
Male	74	50	31.25
Female	86	38	23.75
Total	160	88	55.00
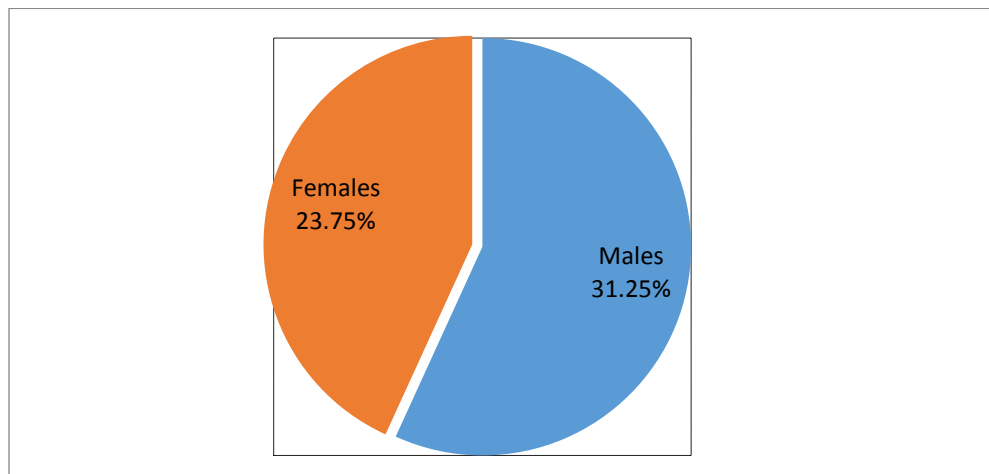
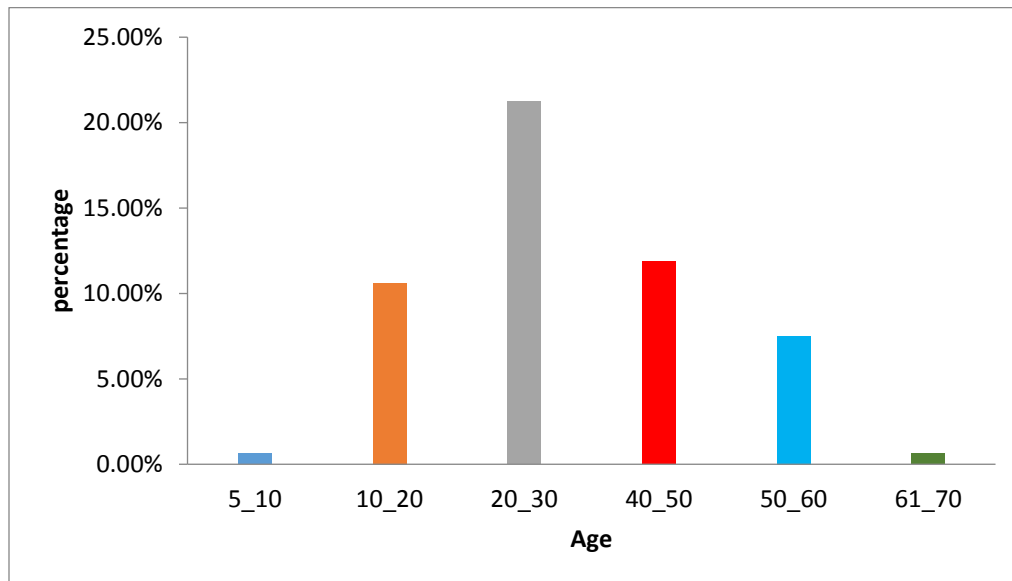**Figure 4.1: Sex wise Prevalence of *H. pylori* in district Peshawar**

Age wise prevalence of *H. pylori*

Age wise prevalence of *H. pylori* is shown in table 4.2 and figure 4.2. A higher prevalence rate (73.91%) was reported in age group of (21-30) years as compared to the other age groups. Lowest prevalence rare was reported for youngest age group (5-10) and oldest age group (60-70).

Table 4-2: Age wise Prevalence of *H. pylori* in district Peshawar

| Age	Total Samples	Positive Samples	Percentage
5-10	5	1	0.62
11-20	30	17	10.62
21-30	46	34	21.25
31-40	33	19	11.87
41-50	23	12	7.5
51-60	14	4	2.5
61-70	9	1	0.62
Total	**160**	**88**	**55.00**

Figure 4.2: Age wise Prevalence of *H. pylori* in district Peshawar

Occupation wise prevalence of *H. pylori*

The occupation wise prevalence of *H. pylori* in district Peshawar shows that the rate of infection is different in different peoples, belonging to different fields/professions. A higher prevalence rate was found in drivers (26.25%), followed by students (8.75%) and other individuals, belonging to different occupations. Which is shown in Table 4.3 and Figure 4.3.

Tab 4.3: Occupational wise Prevalence of *H. pylori* in district Peshawar

Profession	Total Samples	Positive Samples	Percentage
Housewives	27	12	7.5
Drivers	60	42	26.25
Students	24	14	8.75
Teachers	13	5	3.12
Laborers	13	7	4.37
Shopkeepers	10	5	3.12
Farmers	13	3	1.87
Total	**160**	**88**	**55.00**
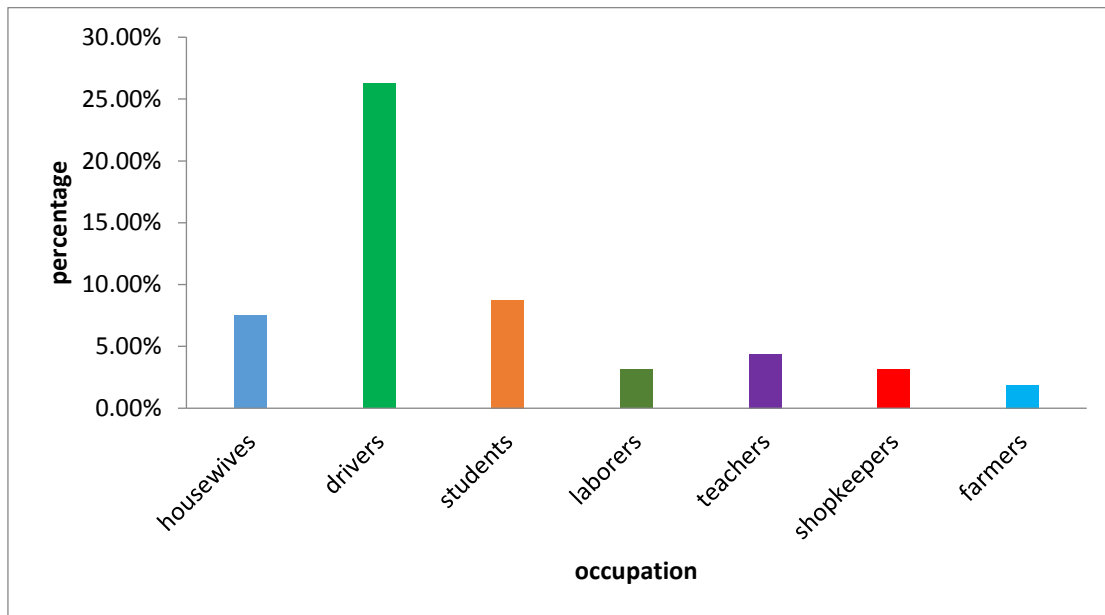
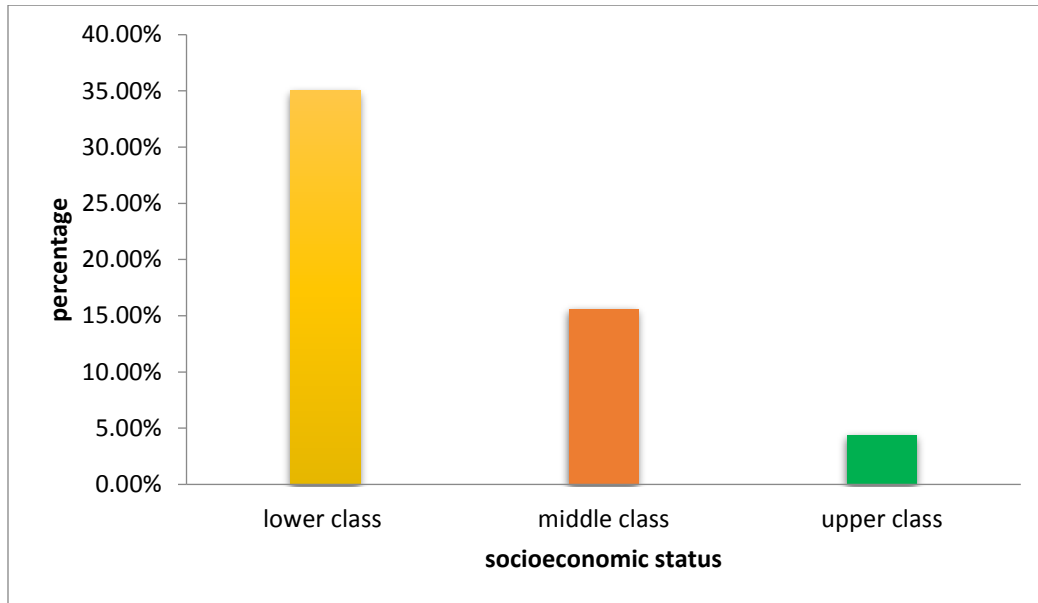**Figure 4.3: Occupation wise Prevalence of *H. pylori* in district Peshawar**

Impact of socioeconomic status on the prevalence of *H. pylori*

The socioeconomic status wise prevalence of *H. pylori* is shown in table 4.4 and figure 4.4. A higher prevalence rate (35%) of the infection was reported in the individuals belonging to lower class families as compared to the other classes.

Table 4.4: Prevalence of *H. pylori* according to the socioeconomic status of the individuals of district Peshawar

| Socioeconomic Status	Total Samples	Positive Samples	Percentage
Lower class	77	56	35.00
Middle class	49	25	15.62
Upper class	34	7	4.37
Total	**160**	**88**	**55.00**

Figure 4.4: Prevalence of *H. pylori* according to the socioeconomic status of the individuals of district Peshawar

Impact of Food Habits on the prevalence of *H. pylori*

The research study about food habits of the individuals belonging to district Peshawar shows that the people who used to eat in hotels showed high prevalence rate (36.25%) as compared to people who used to eat in homes (18.75%). (Table 4.5 and Figure 4.5.)

Table 4.5: Prevalence of *H. pylori* in district Peshawar according to the Food Habits of the people

| Food Habits	No. of Samples	Positive Samples	Percentage
Hotels/hostels	89	58	36.25
Homes	71	30	18.75
Total	**160**	**88**	**55.00**
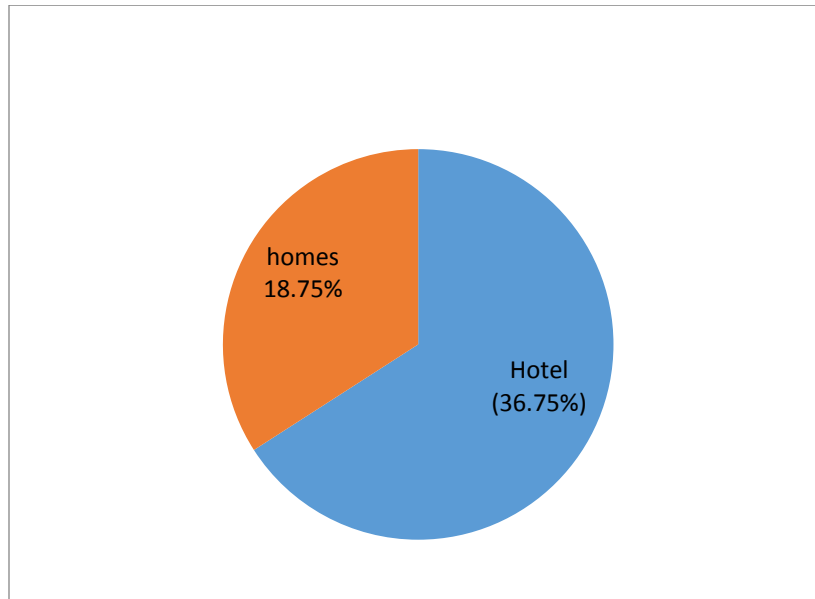
Figure 4.5: Prevalence of *H. pylori* in district Peshawar according to the Food Habits of the people

Rural and Urban Areas wise prevalence of *H. pylori*

By studying the blood samples of individuals of rural and urban areas of district Peshawar. Out of total samples of 160, 88 blood samples were positive making an overall prevalence rate of 55%. During the present study, a high prevalence rate of (38.12%) was found in the individuals belonging to the urban areas as compared to the peoples residing in rural areas (16.87%). Data is indicated in Table 4.6 and Figure 4.6.

Table 4.6: Prevalence of *H. pylori* in Urban and Rural area of district Peshawar

Area	No. of Samples	Positive Samples	Percentage
Rural	65	27	16.87
Urban	95	61	38.12
Total	**160**	**88**	**55.00**
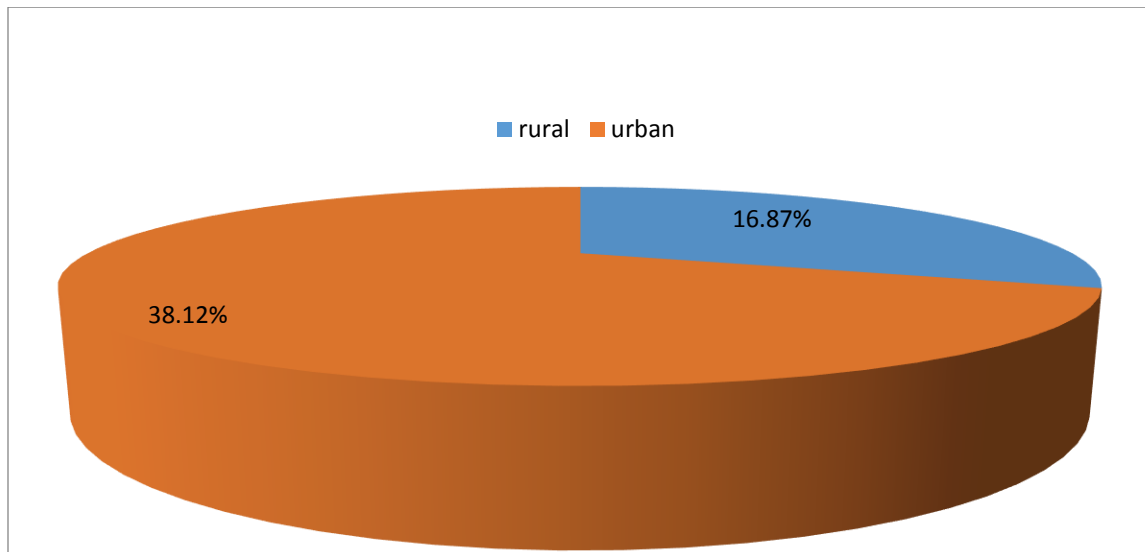
Figure 4.6: Prevalence of *H. pylori* in Urban and Rural area of district Peshawar

DISCUSSION

The present study was carried out from June 24, 2017, to October 29, 2017, on the prevalence of *H. pylori* in human population of rural and urban areas of district Peshawar, Pakistan. During this research study, a total of 160 blood samples were screened out for confirmation of *H. pylori* infection in human population. Out of the total 160, 88 blood samples were positive making an overall prevalence rate of 55%.

From table 4.1 and figure 4.1, it has been observed that a high prevalence rate was found among males (31.25%) as compared to females (23.75%) in the population of district Peshawar. Most of infected individuals were men because male eat outside in hotels etc. Similar results were also observed by Hasan, *et al.,* (2013)*.* They conducted a research study on the frequency of *H. pylori* infection by testing antigen in patients with frequent dyspepsia. They included 221 patients in the study in which 126 (57%) were males and 95 (43%) were females.

From table 4.2 and figure 4.2, it has been observed that a high prevalence rate of 21.25% was reported in age group of (21-30) years, while least prevalence rate of 0.62% reported for (5-10) and (60-70) year's age group. In the present study most of the patient were men and relatively young adults. The high prevalence rate of *H. pylori* in young adults is partly explained by the fact that the members of the age group (21-40) are under most stress and are more exposed to the hotel/hostel food due to their activities. This is compatible with research studies conducted by Chung, *et al.,* (1996) and Aman, *et al.,* (2002)· Fock, *et al.* (2010)**,** In Taiwan, however, the seroprevalence rate of 27.1% in less than 10 years of age compared to 72.3% in the adults > 30 years.

From table 4.3 and figure 4.3, it has been observed that a high prevalence rate (26.25%) was reported in drivers, followed by the students (8.75%), laborers (4.37%), shopkeepers

(3.12%), housewives (7.50%), teachers (3.12%) and farmers (1.87%) by their occupations. Epidemiological status has shown that the prevalence of *H. pylori* infection in a community and occupational health are closely related to lifestyles and socioeconomic status. Similar research work has been done by Bener *et al.,* (2002) for prevalence of *H. pylori* profiles among low-socioeconomic workers in the United Arab Emirates (UAE). According to their research study, *H. pylori* serology by IgG was positive in 167 industrial workers (78.4%) and 137 in others (64.3%).

From table 4.4 and figure 4.4, it has been observed that a high prevalence rate (72.72%) was reported in individuals belonging to lower class families as compared to middle class families (51.10%) and upper-class families (20.58%). The lower-class families and middle-class families have usually had poor hygienic status as compared to the upper-class families of district Peshawar. Similar results were also observed by Hoda, *et al.,* (1996). According to their study the prevalence rate was recorded 12% in upper class, 25% in middle class and 41% in the lowest socioeconomic class. Similar results were also found by Rastogi *et al.* (2014)·

From table 4-5 and figure 4-5 a high prevalence rate (65.16%) reported in the individuals who used to eat in hotels while low prevalence rate (42.25%) was found in the peoples who used to eat home foods. It is well known that some dietary factors such as consumption of fast foods and low intake of fresh vegetables may increase the chance of *H. pylori* infection and severity of infection. Similar results were also found by Mord, *et al.,* (2014)· Who evaluated dietary factors? They demonstrated a significantly higher consumption of fruit, vegetables and vitamin C among the persons who were not infected. Prospective Investigation into cancer and nutrition study reported a significant increase of gastric cancer risk associated with intake of total meat, red meat, and processed meat.

From table 4-6 and figure 4-6 it has been observed that high prevalence rate (64.21%) was found in the individuals belonging to urban areas and low prevalence rate (41.53%) was recorded in the peoples belonging to the rural areas of district Peshawar. Similar results were also found in research study of Fock *et al.*, (2010). According to their research study results, in Turkey the highest prevalence rate (63.4%) in rural areas where gastric cancer rates were highest as compared to 40.5% in urban areas where gastric cancer rates were lowest and in Vietnam, the *H. pylori* prevalence rate was 78.8% in Honoi, an urban area, compared to 69.2% in Hatay, a rural area. Similarly, Abro, *et al.*, (2011) worked on *H. pylori* infection in patients of rural and urban areas of Sindh, Pakistan. According to their research study out of 55 *H. pylori* infection patients, 38 (69%) belonged to urban areas and 17 (31%) were from rural areas.

CONCLUSION

The present study showed an alarming situation of *H. pylori* infection in human population of the studied area of District Peshawar. Unfortunately, the disease is gradually spreading due to lack of knowledge about the disease among the people. As high prevalence of *H. pylori* infection has been observed in the human population of different age groups and

both male and female gender, therefore, it has been concluded that some control measures for *H. pylori* infection should be adopted to reduce and control the intensity of this serious infection in human population of the area. Moreover, the health department of government, semi government and private sectors should take urgent and comprehensive steps for its proper and immediate control and should perform a responsible role. It is also suggested that extensive studies on prevalence of *H. pylori* in human hosts should be undertaken in different geographically localities and seasons throughout the country. Moreover, there is a need for a comprehensive study assessing the importance of economic losses (due to treatment) from *H. pylori* infection in Peshawar and other parts of the country.

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