Sero-Prevalence of *Helicobacter pylori* and Pre-Hospital Medication among Nigerians with and without Symptoms Suggestive of Peptic Ulcer in Maiduguri

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Abstract: *The present study examined the sero-prevalence of Helicobacter pylori and pre-hospital medication among subjects with and without symptoms suggestive of peptic ulcer in Maiduguri, Northeast Nigeria. The specific objectives were to establish a preliminary baseline data for H. pylori carriage among apparently healthy subjects (AHS), determine the sero-prevalence of H. pylori among subjects with symptoms suggestive of peptic ulcer (SPU) and determine the pre-hospital medication among SPU. A total of 160 subjects (80 SPU and 80 age- and sex-matched AHS) were enrolled at University of Maiduguri Teaching Hospital, Maiduguri, Northeast, Nigeria following an informed consent. A rapid chromatographic immunoassay kit was used for detection of H. pylori antibodies in blood samples obtained from the subjects. A standardized case record form was used to obtain demographic and medical information of the subjects. The mean age ± standard deviation (range) of the 160 subjects was 28.9 ± 7.1 (15.0 – 64.0) years with 32.5% (52/160) males and 67.5% (108/160) females. Abdominal pain (20.1%, 58/289) and abdominal fullness (18.0%, 52/289) accounted for the highest proportions (p<0.0001) of the symptoms presented by SPU. Sero-prevalence of H. pylori carriage among the 160 subjects was 41.3% (66/160); this was highest among SPU (67.5%; 54/80) than AHS (15.0%; 12/80) [χ^2 = 45.5; df = 1; p<0.0001]. Abdominal pain, abdominal fullness, heartburn and poor appetite were symptoms associated with H. pylori carriage among SPU. The proportion of pre-hospital medication was 88.8% (71/80) among the SPU with combination therapy reported in only 7.0% (5/71). Proton pump inhibitors accounted for highest proportion of 53.8% (43/80) as against 33.8% (27/80), 22.5% (18/80) and 11.3% (9/80) for antacids, H_2-blockers and antibacterial drugs (p<0.0001), respectively. These findings could contribute to treatment and control of peptic ulcer disease in Maiduguri.*

Keywords: *Helicobacter pylori, Peptic ulcer, Nigerians, Antiulcer drugs, Pre-hospital*

I.   Introduction

    Helicobacter pylori, a member of the family Helicobacteraceae, is a Gram-negative, microaerophilic, spiral or rod-shaped bacterium, measuring 2 – 4 µm and 0.5 – 1 µm in length and width, respectively [1,2]. It has 2 – 6 unipolar, sheathed flagella promoting motility [3]. It is often found in the stomach of about 50% of the world population [2], thus, appearing as normal flora in most apparently healthy people. Meanwhile, *H. pylori* clinical infection is common especially in developing countries where the infection is often acquired at childhood and symptoms usually manifest at adulthood [4]. Techniques for diagnosis of *H. pylori* are broadly classified into two, *viz*: invasive (e.g. histology and culture biopsy) and non-invasive (e.g. serology and urea breath tests) techniques [1,5]. In Maiduguri, Nigeria, histological and serological approaches are used for most hospital-based care and research [6].

    Peptic ulcer is a gastrointestinal tract (GIT) disorder characterized by mucosal sores with diameter of at least 0.5 cm penetrating into the muscularis mucosa of the affected region. It is termed gastric and duodenal ulcers when the lesions are located within the lesser curvature of the stomach and the duodenal bulb, respectively [1,7]. The clinical manifestations may include abdominal discomfort, poor appetite, bloating and dyspepsia among others [8]; other complications are GIT bleeding, perforation and obstruction [9]. Available evidence-based data have clearly demonstrated the role of *H. pylori* in the pathophysiology of peptic ulcer [1,10-12]. Briefly, *H. pylori* colonization of gastric mucosa often triggers sequence of events that ultimately results in gastric diseases. These events include urea hydrolysis by the bacteria to yield ammonium that reacts

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with OCl^- to form cytotoxic monochloramine [13] and release of toxic chemicals by host cells in response to the colonization [14]. Previous studies [6,15-23] reported widely varied prevalence (26.3 − 88%) of *H. pylori* infection among various populations depending on factors such as diagnostic methods, GIT disorders and personal hygiene.

Treatment of peptic ulcer involved combination of drugs aimed at eradicating *H. pylori* and suppressing gastric acid release [1,5]. These include: proton pump inhibitors e.g. omeprazole; H_2 antagonists e.g. cimetidine; antacids e.g. sodium bicarbonate; mucosal protectants e.g. sucralfate and antibacterials e.g. clarithromycin [5]. These drugs are readily available over-the-counter, hence, they are often consumed singly (as against the recommendation of combined therapy) without recourse to doctor's prescription. This practice is common among subjects with symptoms suggestive of peptic ulcer who only present at health centre after many failed attempts of self-medications.

In Maiduguri, Northeast Nigeria, epidemiological data on *H. pylori* and peptic ulcer are grossly inadequate. The few available data are the 1992 report of 85.0% prevalence of *H. pylori* by histology [24], 57.2% *H. pylori* associated gastritis by histology [25], 93.6% sero-prevalence among dyspeptic patients and 80.0% prevalence among dyspeptic patients by histology [26]. In most of these studies, individuals with history of medication were excluded and histological technique was adopted method of diagnosis. This may not accurately reflect the reality in a population where self-medication is not uncommon and invasive diagnostic techniques may not be readily available. Thus, the present study assessed the sero-prevalence of *H. pylori* and pre-hospital medication among subjects with and without symptoms suggestive of peptic ulcer in Maiduguri.

II. Materials And Methods

2.1 Study design and Study area

The study was a 6-month (November, 2015 − April, 2016) period hospital-based cross-sectional study conducted at University of Maiduguri Teaching Hospital (UMTH), Maiduguri, Northeast Nigeria. The subjects who participated in the study were recruited among the inhabitants of Maiduguri Metropolis. UMTH is a tertiary health institution located in Maiduguri, Borno State, Nigeria but receives patients within and outside the State. Sometimes, patients are referred to the hospital from the neighbouring countries of Republics of Cameroon, Chad and Niger. Maiduguri, the capital of Borno State, is the largest city in Northeast Nigeria with a population of 732,696 people [27], however, the insecurity in the region has significantly expanded the population. Maiduguri is located on latitude 11°51 and longitude 13°09E. It occupies an area of 50,778 square kilometres. The prevalence of *H. pylori* among apparently healthy individuals has not been previously reported in Maiduguri but prevalence among individuals with dyspepsia and gastritis were 93.6% by serological technique [26] and 57.2% by histological technique [25].

2.2 Subjects enrolment

A total of 160 consented subjects were randomly enrolled at General Out-Patient Department, UMTH following an ethical approval obtained from Research Ethics Committee, UMTH. Of this value, 80 were subjects with symptoms suggestive of peptic ulcer (SPU) as described by Ramakrishanan and Salinas [8] while the remaining 80 were age- and sex-matched apparently healthy subjects (AHS) enrolled among students, staff and patient's relatives. Subjects with obvious signs of danger and emergency such as haematemesis and meleana were excluded from the study. A case record form was used to obtain demographic (e.g. age, sex, occupation and marital status) and clinical (e.g. symptoms and pre-hospital medication) data of the subjects.

2.3 Sample collection and Detection of *H. pylori* Antibodies

Approximately, 1ml of venous blood was aseptically collected from each subject by a phlebotomist into a labelled EDTA bottle as described by Cheesbrough [28]. The presence of *H. pylori* antibodies was detected using a rapid qualitative membrane strip based immunoassay kit, One step *H. pylori* test® (Spodex Diagnostics, China) as described by the manufacturer. Briefly, the device was placed on a clean levelled-surface of laboratory bench. One drop (approximately 35µl) of the whole blood was transferred into the specimen well of the device using dropper, two drops of buffer (approximately 70µl) was added and was left for 15 minutes before reading. The results were interpreted as indicated by the manufacturer [29].

2.4 Data Analysis

Data were analyzed using SPSS window version 17 [30]. They were expressed as mean ± standard deviation of the mean. Unpaired student-t test was used for comparison of mean and proportion was compared using Chi-square. The risk factors were assessed by determination of odds ratio. Statistical significance was inferred at $p < 0.05$.

III. Results

3.1 Demographic characteristics of the subjects

The demographic characteristics of the 80 AHS and 80 SPU who participated in the study are presented in Table 1. The overall mean ± SD (range) of the subject ages was 28.9 ± 7.1 (15.0 – 64.0) years and was similar among AHS (29.0 ± 6.6 years) and SPU (28.0 ± 7.2 years) [p = 0.13]. The significant majority of the subjects were female (67.5%, 108/160, p = 0.031), married (61.3%, 98/160, p = 0.027) and students (41.3%, 66/160, 0.042).

3.2 Symptoms presented by the subjects

Twelve (12) symptoms were presented by the 80 SPU with total frequency of 289 and average of 3.6 symptoms per subject. Abdominal pain (20.1%, 58/289) and abdominal fullness (18.0%, 52/289) accounted for the significantly (p<0.0001) highest proportions of the symptoms presented by the subjects. Abdominal pain, abdominal fullness, poor appetite and heartburn collectively contributed 61.9% (179/289) of the symptoms (Fig. 1) and all the 80 SPU presented with at least one of these 4 symptoms.

3.3 Sero-prevalence of *H. pylori* among the subjects

The overall sero-prevalence of *H. pylori* carriage among the 160 subjects was 41.3% (66/10). The sero-prevalence was higher among SPU (67.5%; 54/80) than AHS (15.0%, 12/80) [p<0.0001] and this difference was observed for all the age groups evaluated (Table 2). For every 10 SPU, about 7 SPU harboured *H. pylori* as against only about 2 AHS that harboured the organisms in every 10 AHS. The factors associated with *H. pylori* carriage among the 160 subjects were evaluated and presented in Table 3. Of all the variables examined, presence of symptoms suggestive of peptic ulcer was the only factor associated with *H. pylori* carriage among the 160 subjects. Subsequently, the association of the presenting symptoms with *H. pylori* carriage was assessed among the 80 SPU and presented in Table 4. Abdominal pain, abdominal fullness, heartburn and poor appetite were the symptoms associated with *H. pylori* carriage among the 80 SPU.

3.4 Pre-hospital medication among the subjects

Fig. 2 showed the proportion of pre-hospital medication among SPU. The proportion of pre-hospital medication was 88.8% (71/80) with proton pump inhibitors (omeprazole and rabeprazole) accounted for the highest proportion (53.8%; 43/80; p < 0.0001) of pre-hospital drugs consumed. Of the 71 SPU who had pre-hospital medication, 5 SPU (7.0%) had combination therapy (proton pump inhibitors or H_2-blockers plus antacids) as against 66 SPU (93.0%) who had monotherapy (p < 0.0001). In addition, only 2 of the 54 SPU positive to *H. pylori* test consumed antibacterial drug.

IV. Discussion

H. pylori, a Gram-negative, microaerophilic bacterium is a normal microflora of the upper GIT in some individuals [2] and has also been implicated in peptic ulcer diseases [1,10-12]. Meanwhile, several factors have been described to influence *H. pylori* carriage, hence, the wide variation in the prevalence values previously reported across the globe [6,15-23]. The present study examined sero-prevalence of *H. pylori* and pre-hospital medication among Nigerians with and without symptoms suggestive of peptic ulcer in Maiduguri.

Nigerians resident in Maiduguri, Northeast Nigeria harboured *H. pylori* irrespective of their peptic ulcer status in agreement with previous description of the bacteria as a normal flora of GIT [2]. Meanwhile, the sero-prevalence (15.0%) of *H. pylori* recorded for AHS in the present study is lower than 39.7% [31], 44.0% [32] and 66.0% [33] reported for apparently healthy individuals in Southeast Nigeria, Brazil and Mexico, respectively. The previous studies have demonstrated largely varied epidemiology of *H. pylori* and several factors (e.g. age, personal hygiene, geographical location, educational background and health status) have been implicated in the variation [1,32]. In our case, we opined that the disparity observed could be attributed to good hygiene practice among our subjects since most of them were educated and were either medical students or hospital staff. To the best of our knowledge, this is the first study providing baseline sero-prevalence data on *H. pylori* carriage among AHS in Maiduguri in recent time. However, this is a preliminary data, hence, large studies would be required to provide more robust epidemiological data. In addition, we observed that SPU are about five-folds at risk of harbouring the bacteria than AHS, indicating an association between the bacteria and peptic ulcer. This finding is in accordance with previous fact about association of *H. pylori* with some GIT disorders such as peptic ulcer, gastritis and non-ulcer dyspepsia [1].

The sero-prevalence of 67.5% recorded for SPU in the present study is similar to 73.6% reported for patients with non-ulcer dyspepsia in Zaria, Northwest Nigeria [22]. Outside Nigeria, it is also similar to 71.0%, 74.8%, 73.9% and 67.0 – 67.6% reported in Kenya [34], Ghana [18], Pakistan [35] and Saudi Arabia [36,37], respectively. In contrast, our value is lower than 80.4 – 94.5% by other Nigerian authors [6,26,38]. These later studies targeted patients with diagnosed GIT disorders such as peptic ulcer, gastritis and dyspepsis and this

could have increased the chances/risks of *H. pylori* infection since the conditions have been previously associated with the bacteria [1]. In addition, our value is similar to values reported using other diagnostic techniques such as histology [26, 39-41]. The authors acknowledged the limitation of serological technique as it concerns persisted antibodies even after eradication of the bacteria [42]. This does not invalidate our findings in any way since a strong positive correlation has been established between serological and histological techniques in the region [26]. Histological technique is considered as gold standard for diagnosis of *H. pylori* [43]. The fact that abdominal pain, abdominal fullness, heartburn and poor appetite were associated with *H. pylori* carriage is in accordance with available literature [1,2]. The clinical application of this finding is that patients with these symptoms could be presumptively treated for *H. pylori* in areas where diagnostic facilities are not available.

Our findings on pre-hospital drug consumption revealed that SPU readily consumed over-the-counter drugs prior to hospital presentation. This is not peculiar to this cohort of individuals as studies have shown that self-medication is a common practice in Nigeria [44,45]. It is of interest to note that most of the drugs consumed by these individuals are drugs recommended for treatment of peptic ulcer and eradication of *H. pylori*. Unfortunately, they were consumed mostly singly as against the recommended combination therapy [5]. In addition, only 2 of the 54 SPU who would have required antibacterial drugs actually had antibacterial medication and 7 others who did not require antibacterial drugs consumed the drugs. This is of clinical importance because such practice exposes individuals to unnecessary drugs and could predispose to emergence of drug resistance and aggravation of the health condition.

V.   Conclusion

In conclusion, both AHS and SPU harbour *H. pylori,* however, the proportion is about five-folds in SPU. Abdominal pain, abdominal fullness, poor appetite and heartburn could be an indication of *H. pylori* carriage among SPU in Maiduguri. Irrational pre-hospital drug consumption is not uncommon among this cohort of subjects, a practice that could predispose the drugs to resistance development. These findings could contribute to the effective treatment and control of peptic ulcer in Maiduguri and promote rational drug use.

Table 1: Demographic characteristics of the subjects who participated in the study

Variables	AHS	SPU	Total
Number	80	80	160
Age (years)			
Mean ± SD	29.0 ± 6.6	28.0 ± 7.2	28.9 ± 7.1
Range	15.0 – 62.0	15.0 – 64.0	15.0 – 64.0
Sex (%)			
Female	54 (67.5)	54 (67.5)	108 (67.5)
Male	26 (32.5)	26 (32.5)	52 (32.5)
Marital Status (%)			
Single	29 (36.3)	33 (41.3)	62 (38.8)
Married	51 (63.7)	47 (58.7)	98 (61.2)
Occupation			
Student	29 (36.3)	37 (46.3)	66 (41.2)
Civil servant	27 (33.7)	25 (31.3)	52 (32.5)
House wife	14 (17.5)	14 (17.5)	28 (17.5)
Business	10 (12.5)	4 (5.0)	14 (8.8)

AHS   Apparently healthy subjects
SD   Standard deviation
SPU   Subjects with symptoms suggestive of peptic ulcer

Table 2: Age-distribution of the sero-prevalence of *H. pylori* carriage among the subjects

Age Group (years)	Sero-prevalence (%)		p Value
	AHS (N=80)	SPU (N=80)	
≤ 20	14.3 (2/14)	78.6 (11/14)	**0.00018**
21 – 30	12.8 (5/39)	64.1 (25/39)	**0.00001**
31 – 40	16.7 (3/18)	66.7 (12/18)	**0.0059**
> 40	22.2 (2/9)	66.7 (6/9)	**0.05**
Total	15.0 (12/80)	67.5 (54/80)	**<0.0001**

AHS   Apparently healthy subjects
N   Number
SPU   Subjects with symptoms suggestive of peptic ulcer

Table 3: Factors associated with *H. pylori* carriage among the subjects

Variable	Number	Sero-prevalence (%)	Odds Ratio (95% CI)	p Value
Age (years)				
≤ 20	28	13 (46.4)		
21 – 30	78	30 (38.5)	0.7 (0.3 – 1.7)	0.46
31 – 40	36	15 (41.7)	0.8 (0.3 – 2.2)	0.75
> 40	18	8 (44.4)	0.9 (0.3 – 3.0)	0.89
Sex				
Female	108	40 (37.0)		
Male	52	26 (50.0)	1.7 (0.9 – 3.3)	0.12
Marital Status				
Single	62	28 (45.2)		
Married	98	38 (38.8)	0.8 (0.4 – 1.5)	0.42
Occupation				
Student	66	31 (47.0)		
Civil servant	52	19 (36.5)	0.7 (0.3 – 1.4)	0.25
House wife	28	11 (39.3)	0.7 (0.3 – 1.8)	0.49
Business	14	5 (35.7)	0.6 (0.2 – 2.1)	0.44
Symptoms				
Absent	80	12 (15.0)		
Present	80	54 (67.5)	11.8 (5.4 – 25.5)	**< 0.0001**

CI   Confidence Interval

Table 4: Symptoms associated with *H. pylori* carriage among subjects with
symptoms suggestive of peptic ulcer

| Variable	Total Number	Frequency (%)	Odds Ratio (95% CI)	p Value
Belching	80	17 (21.3)	1.0	-
Abdominal fullness	80	52 (65.0)	6.9 (3.4 – 13.9)	**0.0000003**
Abdominal pain	80	58 (72.5)	9.8 (4.7 – 20.2)	**0.0000001**
Constipation	80	9 (11.3)	0.5 (0.2 – 1.1)	0.13
Diarrhoea	80	17 (21.3)	1.0 (0.5 – 2.1)	1.00
Fever	80	19 (23.8)	1.2 (0.6 – 2.4)	0.85
Headache	80	22 (27.5)	1.4 (0.7 – 2.9)	0.46
Heartburn	80	30 (37.5)	2.2 (1.1 – 4.5)	**0.037**
Nausea	80	23 (28.8)	1.5 (0.7 – 3.1)	0.36
Poor appetite	80	39 (48.8)	3.5 (1.8 – 7.0)	**0.0004**
Vomiting	80	2 (2.5)	-	-
Weight loss	80	1 (1.3)	-	-

CI   Confidence Interval
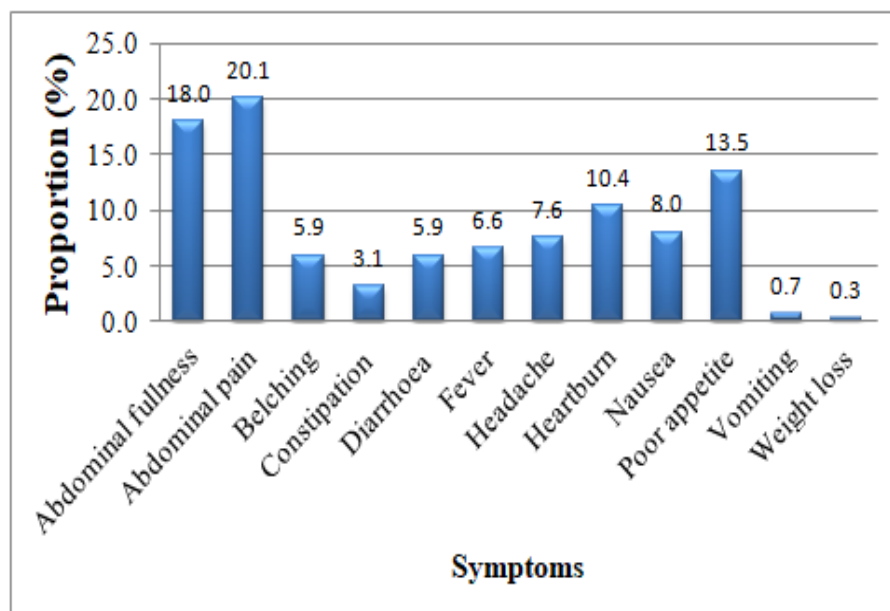
Figure 1: Symptoms presented by the subjects with symptoms
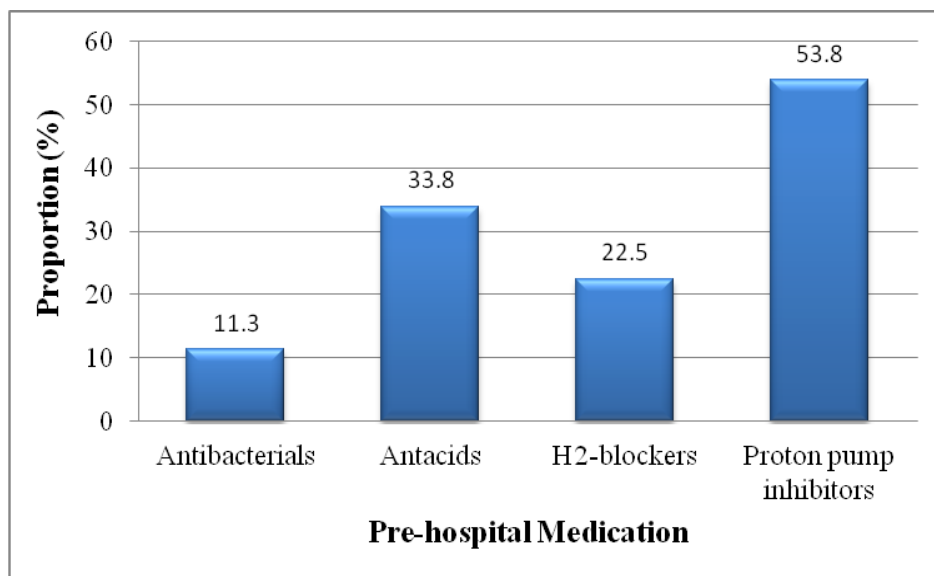suggestive of peptic ulcer (p<0.0001)

Figure 2: Pre-hospital medication among the subjects with symptoms
suggestive of peptic ulcer (p<0.0001)

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