

**Hematological and Biochemical Results of Patients with Campylobacter Infection At King Fahd Hospital, Riyadh, Saudi Arabia.**Faisal Almajed<sup>1</sup>, Fahad Al-Saab<sup>1</sup>, Feda Aljaser<sup>2</sup>, Hazem Aql<sup>1</sup>, Sameera Al-Juhani<sup>1</sup> Shoeb Qureshi<sup>3</sup><sup>1</sup>Clinical Laboratory Sciences Department, King Saud Bin Abdulaziz University for Health Sciences, P. O. Box 3660; Riyadh 11481; Mail Code: 3129; Saudi Arabia<sup>2</sup>Clinical Laboratory Sciences Department, King Saud University, P. O. Box 10219; Riyadh 11433; Saudi Arabia.<sup>3</sup>Department of Research, College of Applied Medical Sciences, King Saud bin Abdul-Aziz University for Health Sciences**Correspondence Author:** Shoeb Qureshi, Department of Research, College of Applied Medical Sciences, King Saud bin Abdul-Aziz University for Health Sciences**Type of Publication:** Original Research Paper**Conflicts of Interest:** Nil**Abstract**

**Objectives:** The hematological and biochemical changes due to multi-organ involvement in enteritis are common. The aim of this study was to determine the frequency and severity of the above changes in patients admitted to the hospital because of enteritis.

**Methodology:** This was a hospital based descriptive study conducted at the infectious diseases unit and medical wards at King Fahd Hospital, Riyadh, Saudi Arabia, from 2010 to 2013. The study was designed to include demographics, hematological and biochemical changes observed in each patient. Only patients whose stool yielded Campylobacter species were included in the study. Full blood count, liver function tests, stool culture, urea, electrolytes, and coagulation profile were performed for all the patients.

**Results:** Data on 91 patients with Campylobacter infection, corresponding to the same number of patients, were reported, including 45 (49.45%) in 2010, 28 (30.77%) in 2011, 9 (9.89%) in 2012 and 2013. Of the total number of isolates, 60 (65.93%) were from patients <20 years of age, 21 (23.08%) were from patients 20-45

years of age, 8 (8.79%) were from patients 46-71 years of age and 2 (2.19%) were from patients >71 years of age. The sensitivity of Campylobacter species to erythromycin was higher in 2010 (48.86%) compared to 2012 and 2013 (10.23%). However, two female patients were resistant to erythromycin in 2010 and one male in 2011. The most common hematological changes observed were anemia (46.2%), lymphopenia (76.9%), Neutrophilia (78%), leukocytosis (57%) & leucopenia (2.2%). Whereas, the biochemical changes included raised alkaline phosphatase (72.5%), creatinine (50.5%), potassium (44%), and blood urea (36.3%), while the serum albumin was found to be low in 78%. All patients were discharged in good health once hematological and biochemical changes returned to reference range.

**Conclusion:** Campylobacter foodborne disease could cause significant hematological changes and hepatic dysfunction. The involvement of liver was associated with high frequency of extrahepatic complications. Despite the high incidence and serious nature of the hematological changes and liver involvement, these changes are transient

and respond favorably to the appropriate antimicrobial therapy.

**Keywords:** Campylobacter, Infection, Enteritis, Hematological, Biochemical, Changes.

### Introduction

Campylobacter, in Greek refers to curved rods, was proposed in 1963 by Sebald and Veron as a broad name for microaerophilic Vibrios [1, 2]. Campylobacter species are motile, non-spore forming, curved gram-negative bacilli [3]. Campylobacter genus contains more than 15 species that have been recognized. The principal Campylobacter species cause human diarrhea is Campylobacter jejuni, which accounts for 80 %-90 % of the cases of documented illness due to Campylobacters. Other Campylobacters could cause diarrhea, and these include Campylobacter coli, Campylobacter upsaliensis, Campylobacter lari and Campylobacter fetus. The major species causes extra intestinal illness is Campylobacter fetus [3, 5]. Moreover, the latter is known as a cause of infectious abortion in cattle and ewes [2]. Furthermore, it could cause infertility in both male and female in cattle [6].

Earliest data reported from the Kingdom of Saudi Arabia in 1981 showed that Campylobacter jejuni accounted for 0.6% bacterial enteritis in a major referral center in Riyadh [7]. About 10 years later, another report from the same hospital showed that Campylobacter was isolated from the stool of 1% (82/7369) of children who were presenting gastrointestinal symptoms [8]. A diversity in the occurrence of Campylobacter as an aetiological agent of bacterial enteritis is evident in reports from Saudi Arabia. Three studies in the 1990s reported Campylobacter detection in patients with bacterial enteritis ranging from 2% [9], 4.5% [10] and 28% [11]. In Jeddah, Saudi Arabia, Campylobacter infection was found to be the second in prevalence to Salmonella with 69% of

these infections being due to C. jejuni and 31% due to C. coli [9].

The present work aimed to determine the frequency and severity of the hematological changes, hepatic dysfunction and renal involvement in patients admitted to King Fahd hospital, Riyadh, Saudi Arabia as a result of gastroenteritis.

### Methods

This was a hospital based descriptive study conducted at the Infectious Diseases Unit and medical wards at King Fahd Hospital, Riyadh, Saudi Arabia, from 2010 to 2013. The study was designed to include demographics, hematological and biochemical changes observed in each patient. Only patients whose stool yielded Campylobacter species were included in the study.

Hematological parameters including Hemoglobin (Hgb), hematocrit (Hct), red blood cell (RBC), white blood cell (WBC) and differential leucocytes count (lymphocytes, monocytes and neutrophils) were explored. Biochemical parameters including Blood urine nitrogen (BUN), potassium, Carbon dioxide (CO<sub>2</sub>), albumin, creatinine, and alkaline phosphatase (Alk) were analyzed in serum by commercially available kits.

### Results

#### Patient Data

Data on 91 isolates of Campylobacter, corresponding to the same number of patients, were reported, including 52 (57.1%) male patients and 39 (42.8%) female patients. The highest incidence of infection observed in 2010 (49.5%) and followed by 2011 (30.8%), however it declined in 2012 and 2013 by 9.9%. All isolates were collected from Stool, and of the total number of isolates, 60 (65.9%) were from patients <20 years of age, 21 (23.1%) were from patients 20-45 years of age, 8 (8.7%) were from patients 46-71 years of age and 2 (2.2%) were from patients >71 years of age. The peak of isolates was

in February and March (17.6% and 14.3%, respectively; Table 1).

### **Hematological Results**

Hematologic abnormalities were studied prospectively in 91 patients with campylobacteriosis. Hematological findings included leukocytosis in 52 (57.1%), anemia in 42 (46.2%), lymphocytopenia in 70 (76.9%), monocytosis in 59 (64.8%) and neutrophilia in 71 (78.0%) patients (Table 2).

### **Biochemical Results**

Liver function tests were impaired in 91 patients (Table 3). The abnormalities consisted basically of an increased serum albumin in 71 patients (78.0%), creatinine in 46 patients (50.6%), blood urine nitrogen in 33 patients (36.3%) and an increased serum alkaline phosphatase activity, present in 66 patients (72.6 %). Forty patients (43.9%) showed also an increase in potassium level, however the level of CO<sub>2</sub> was decreased in 40 patients (43.9%).

### **Discussion**

The occurrence of Campylobacter as an etiological mediator of bacterial enteritis is patent in reports from Saudi Arabia. Three studies in the 1990s have stated Campylobacter detection in patients with bacterial enteritis ranging from 2% [9], 4.5% [10] and 28% [11]. In the Kingdom of Bahrain, Campylobacter was detected in 1.6% of 426 children hospitalized with gastroenteritis between 1998 and 2002 [12]. In developed countries, the incidence of infection is high among older children and young adults, with a male predominance [13, 14].

In our study the incidents of human campylobacteriosis indicated continuous decrease since year 2010. The analysis of variance on the campylobacteriosis incidents from 2010-2013 showed significant decrease ( $P < 0.001$ ) by year 2013. The incidents of campylobacteriosis in the last four years were significantly higher among males ( $P <$

0.01) and was restricted to those  $< 20$  years old. The incidents in year 2010 were the highest (49.5%) whereas the incidents in year 2013 were the lowest (9.9%). This is due to the concerted efforts of public health measures such as public education, increased awareness of the disease among physicians, improved laboratory diagnosis, and treatment of cases by primary care physicians that might also have contributed to this reduction.

The seasonal distribution of Campylobacter in Saudi Arabia has been documented before [10]. During this survey campylobacter infections peaked in February and March. This result is not similar to that obtained by Zaman [10] in which the isolation rates peaked in September and November. The seasonal distribution of infection varies geographically.

The most common hematological changes observed were anemia (46.2%), lymphopenia (76.9%), Neutrophilia (78%), leucocytosis (57%) and leucopenia (2.2%). Whereas, the biochemical changes included; raised alkaline phosphatase (72.5%), creatinine (50.5%), potassium (44%), and blood urea (36.3%), nevertheless the serum albumin was found to be low in 78%.

In conclusion, the study has confirmed the continuous risk of campylobacteriosis in Riyadh area. The current results emphasize the importance of increasing public awareness activities that could assist in containing or suppressing the disease.

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**Table 1.** Campylobacteriosis distribution on Demographic characteristics.

	2010			2011			2012			2013			Total
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	
<b>No of Patients</b>	29(64.4)	16(35.5)	<b>45(49.45)</b>	14(50)	14(50)	<b>28(30.77)</b>	3(33.3)	6(66.6)	<b>9(9.89)</b>	6(66.6)	3(33.3)	<b>9(9.89)</b>	<b>91(100)</b>
<b>Months</b>													
<b>Jan</b>	5 (83.3)	1 (16.6)	<b>6 (13.3)</b>	1(100)	0 (0)	<b>1 (3.6)</b>	0 (0)	1 (100)	<b>1(11.1)</b>	1(100)	0 (0)	<b>1(11.1)</b>	<b>9(9.89)</b>
<b>Feb</b>	5 (62.5)	3 (37.5)	<b>8 (17.7)</b>	3(42.9)	4(57.1)	<b>7 (25)</b>	0 (0)	0 (0)	<b>0 (0)</b>	1(100)	0 (0)	<b>1(11.1)</b>	<b>16(17.58)</b>
<b>Mar</b>	4 (66.6)	2 (33.3)	<b>6 (13.3)</b>	2(40)	3 (60)	<b>5 (17.9)</b>	0 (0)	0 (0)	<b>0 (0)</b>	0 (0)	0 (0)	<b>2(22.2)</b>	<b>13(14.29)</b>
<b>Apr</b>	2 (100)	0 (0)	<b>2 (4.4)</b>	3(60)	2 (40)	<b>5 (17.9)</b>	0 (0)	2 (100)	<b>2(22.2)</b>	1 (50)	1(50)	<b>2(22.2)</b>	<b>11(10.09)</b>
<b>May</b>	2 (66.6)	2 (40)	<b>4 (8.89)</b>	1(25)	3 (75)	<b>4 (14.3)</b>	2 (100)	0 (0)	<b>2(22.2)</b>	0 (0)	1(100)	<b>1(11.1)</b>	<b>11(10.09)</b>
<b>Jun</b>	2 (66.6)	1 (33.3)	<b>3 (6.6)</b>	0 (0)	0 (0)	<b>0 (0)</b>	0 (0)	0 (0)	<b>0 (0)</b>	1(100)	0 (0)	<b>1(11.1)</b>	<b>4(4.39)</b>
<b>Jul</b>	1 (33.3)	2 (66.6)	<b>3 (6.6)</b>	0 (0)	1 (100)	<b>1 (3.6)</b>	0 (0)	0 (0)	<b>0 (0)</b>	0 (0)	0 (0)	<b>0 (0)</b>	<b>4(4.39)</b>
<b>Aug</b>	2 (66.6)	1 (33.3)	<b>3 (6.6)</b>	1 (100)	0 (0)	<b>1 (3.6)</b>	0 (0)	2 (100)	<b>2(22.2)</b>	1(50)	1(50)	<b>2(22.2)</b>	<b>8(8.79)</b>
<b>Sep</b>	0 (0)	0 (0)	<b>0 (0)</b>	1 (50)	1 (50)	<b>2 (7.1)</b>	0 (0)	0 (0)	<b>0 (0)</b>	1(100)	0 (0)	<b>1(11.1)</b>	<b>3(3.29)</b>
<b>Oct</b>	0 (0)	2 (100)	<b>2 (4.4)</b>	0 (0)	0 (0)	<b>0 (0)</b>	1 (50)	1 (50)	<b>2(22.2)</b>	0 (0)	0 (0)	<b>0 (0)</b>	<b>4(4.39)</b>
<b>Nov</b>	1 (50)	1 (50)	<b>2 (4.4)</b>	1 (100)	0 (0)	<b>1 (3.6)</b>	0 (0)	0 (0)	<b>0 (0)</b>	0 (0)	0 (0)	<b>0 (0)</b>	<b>3(3.29)</b>
<b>Dec</b>	3 (80)	1 (20)	<b>4 (8.89)</b>	1 (100)	0 (0)	<b>1 (3.6)</b>	0 (0)	0 (0)	<b>0 (0)</b>	0 (0)	0 (0)	<b>0 (0)</b>	<b>5(5.49)</b>
<b>Age</b>													
<b>&lt;20</b>	21 (60)	14 (40)	<b>35(77.7)</b>	10(58.8)	7(41.2)	<b>17(60.7)</b>	2 (50)	2 (50)	<b>4(44.4)</b>	3(75)	1 (25)	<b>4(44.4)</b>	<b>60(65.93)</b>
<b>20-45</b>	5 (71.4)	2 (28.6)	<b>7 (15.5)</b>	1 (14.3)	6(85.7)	<b>7 (25)</b>	1 (25)	3 (75)	<b>4(44.4)</b>	2(66.6)	1(33.3)	<b>3(33.3)</b>	<b>21(23.08)</b>
<b>46-71</b>	1 (100)	0 (0)	<b>1 (2.2)</b>	3 (75)	1 (25)	<b>4(14.3)</b>	0 (0)	1 (100)	<b>1(11.1)</b>	1(50)	1(50)	<b>2(22.2)</b>	<b>8(8.79)</b>
<b>&gt;71</b>	2 (100)	0 (0)	<b>2 (4.4)</b>	0 (0)	0 (0)	<b>0 (0)</b>	0 (0)	0 (0)	<b>0 (0)</b>	0 (0)	0 (0)	<b>0 (0)</b>	<b>2(2.19)</b>

**Table 2.** Hematological changes in Campylobacteriosis patients.

	Hematological Parameters (%)													
	White Blood Cells		Lymphocytes		Monocytes		Neutrophils		Red Blood Cells		Hemoglobin		Hematocrit	
	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
<b>2010</b>														
Male	18(67)	0	0	26(70)	21(66)	0	24(65)	0	1(100)	16(67)	5(10)	12(55)	1(10)	17(63)
Female	9(33)	0	0	11(30)	11(34)	0	13(35)	0	0	8(33)	0	10(45)	0	10
<b>Total</b>	<b>27</b>	<b>0</b>	<b>0</b>	<b>37</b>	<b>32</b>	<b>0</b>	<b>37</b>	<b>0</b>	<b>1</b>	<b>24</b>	<b>5</b>	<b>22</b>	<b>1</b>	<b>27</b>
<b>2011</b>														
Male	10(63)	0	0	12(52)	12(60)	0	11(48)	0	0	0	0	9(60)	0	0
Female	6(38)	0	0	11(48)	8(40)	0	12(52)	0	0	9(69)	0	6(40)	0	9(56)
<b>Total</b>	<b>16</b>	<b>0</b>	<b>0</b>	<b>23</b>	<b>20</b>	<b>0</b>	<b>23</b>	<b>0</b>	<b>0</b>	<b>4(31)</b>	<b>0</b>	<b>15</b>	<b>0</b>	<b>7(44)</b>
<b>2012</b>														
Male	2(50)	1(100)	1(100)	2(29)	0	2(100)	1(17)	2(100)	0	0	0	2(50)	0	0
Female	2(50)	0	0	5(71)	3(100)	0	5(83)	0	2(100)	0	0	2(50)	0	2(50)
<b>Total</b>	<b>4</b>	<b>1</b>	<b>1</b>	<b>7</b>	<b>3</b>	<b>2</b>	<b>6</b>	<b>2</b>	<b>2</b>	<b>2(100)</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>2(50)</b>
<b>2013</b>														
Male	2(40)	1(100)	0	1(33)	4(100)	0	3(60)	0	0	2	0	1(33)	0	0
Female	3(60)	0	0	2(67)	0	0	2(40)	0	0	0	0	2(67)	0	2(50)
<b>Total</b>	<b>5</b>	<b>1</b>	<b>0</b>	<b>3</b>	<b>4</b>	<b>0</b>	<b>5</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>2(50)</b>
														<b>4</b>

<b>Total</b>												
<b>High</b>	52 (57.14)	1 (1.10)	59 (64.84)	71 (78.02)	3 (3.30)	5 (5.49)	1 (1.10)					
<b>Low</b>	2 (2.20)	70 (76.92)	2 (2.20)	2 (2.20)	42 (46.15)	44 (48.35)	51 (56.04)					
<b>Abnormal</b>	54 (59.34)	71 (78.02)	61 (67.03)	73 (80.22)	45 (49.45)	49 (53.85)	52 (57.14)					
<b>Normal</b>	37 (40.66)	20 (21.98)	30 (32.97)	18 (19.78)	46 (50.55)	42 (46.15)	39 (42.86)					

**Table 3.** Biochemical changes in Campylobacteriosis patients.

	<b>Biochemical Parameters (%)</b>											
	<b>BUN</b>		<b>Potassium</b>		<b>CO<sub>2</sub></b>		<b>Creatinine</b>		<b>Albumin</b>		<b>Alkaline Phosphatase</b>	
	<b>High</b>	<b>Low</b>	<b>High</b>	<b>Low</b>	<b>High</b>	<b>Low</b>	<b>High</b>	<b>Low</b>	<b>High</b>	<b>Low</b>	<b>High</b>	<b>Low</b>
<b>2010</b>												
Male	17(89)	1(11)	19(100)	1(100)	0	25(69)	19(70)	0	0	23(66)	24(69)	0
Female	2(11)	8(99)	0	0	0	11(31)	8(30)	0	0	12(34)	11(31)	0
<b>Total</b>	<b>19</b>	<b>9</b>	<b>19</b>	<b>1</b>	<b>0</b>	<b>36</b>	<b>27</b>	<b>0</b>	<b>0</b>	<b>35</b>	<b>35</b>	<b>0</b>
<b>2011</b>												
Male	9(100)	0	8(53)	1(100)	0	11(50)	9(56)	0	0	12(52)	11(48)	0
Female	0	7(100)	7(47)	0	0	11(50)	7(44)	2(100)	0	11(48)	10(52)	0
<b>Total</b>	<b>9</b>	<b>7</b>	<b>15</b>	<b>1</b>	<b>0</b>	<b>22</b>	<b>16</b>	<b>2</b>	<b>0</b>	<b>23</b>	<b>21</b>	<b>0</b>
<b>2012</b>												
Male	1(33)	0	1(25)	0	0	2(33)	0	2(100)	0	3(38)	2(29)	0
Female	2(67)	0	3(75)	0	0	4(67)	2(100)	0	0	5(62)	5(71)	0

Total	<b>3</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>6</b>	<b>2</b>	<b>2</b>	<b>0</b>	<b>8</b>	<b>7</b>	<b>0</b>
<b>2013</b>												
Male	1(50)	0	1(50)	0	0	2(50)	0	2(100)	0	3(60)	1(50)	0
Female	1(50)	0	1(50)	0	0	2(50)	1(100)	0	0	2(40)	1(50)	0
Total	<b>2</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>1</b>	<b>2</b>	<b>0</b>	<b>5</b>	<b>2</b>	<b>0</b>
<b>Total</b>												
<b>High</b>	33 (36.26)		40 (43.96)		0		46 (50.55)		0		66 (72.53)	
<b>Low</b>	16 (15.58)		2 (2.20)		68 (74.73)		6 (6.59)		71 (78.02)		0	
<b>Abnormal</b>	49 (53.85)		42 (46.15)		68 (74.73)		52 (57.14)		71 (78.02)		66 (72.53)	
<b>Normal</b>	42 (46.15)		49 (53.85)		23 (25.27)		39 (42.86)		20 (21.98)		25 (27.47)	