

The date of the report: November 22, 2022

## INVESTIGATION REPORT ABOUT THE SPREAD OF CHOLERA IN HARIM CITY

### 1. Overview of Harim city

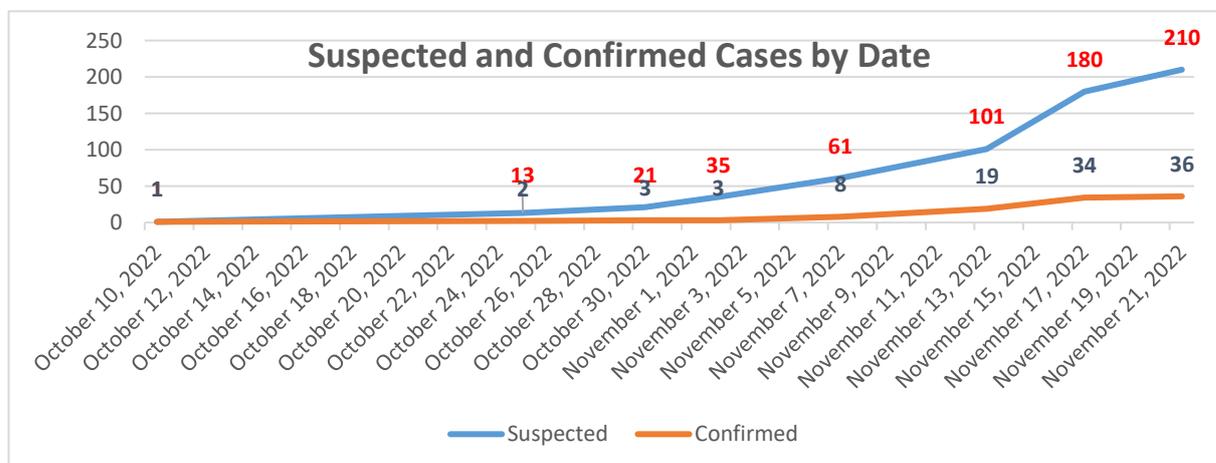
Harim is situated on the border with Turkey, 55 km west of Aleppo city and 52 km north of Idlib city, and lies along the route between Antioch and Aleppo, and has been around since the Byzantine era. Harim is an ancient city known for its unique archaeological sites such as (Harim Castle) and many of the monuments scattered in the city and its surroundings. Harim has good natural conditions, and its climate is hot in summer and cold in winter, and the rainfall is heavy which leads to an abundance of water in the area which explains a large number of natural springs in the area, which besides soil fertility, helps in developing agriculture.

* Governorate	District	Sub-district	Community	Residents	Returnees	IDPs	Total Population
Idlib	Harim	Harim	Harim	21280	0	26088	47368

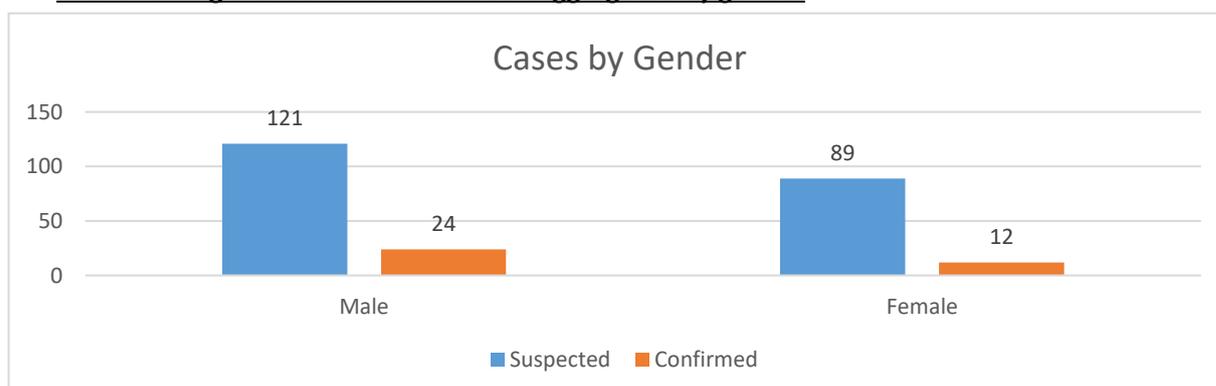
### 2. Cholera in Harim city

The first cholera case in Harim city was confirmed on October 8, 2022. Since that date, the number of cases has been increasing as the number of confirmed cases up to the date of preparing this report reached 36 confirmed cases out of 210 suspected cases.

**The following chart shows the chronological progression of suspected and confirmed cases**

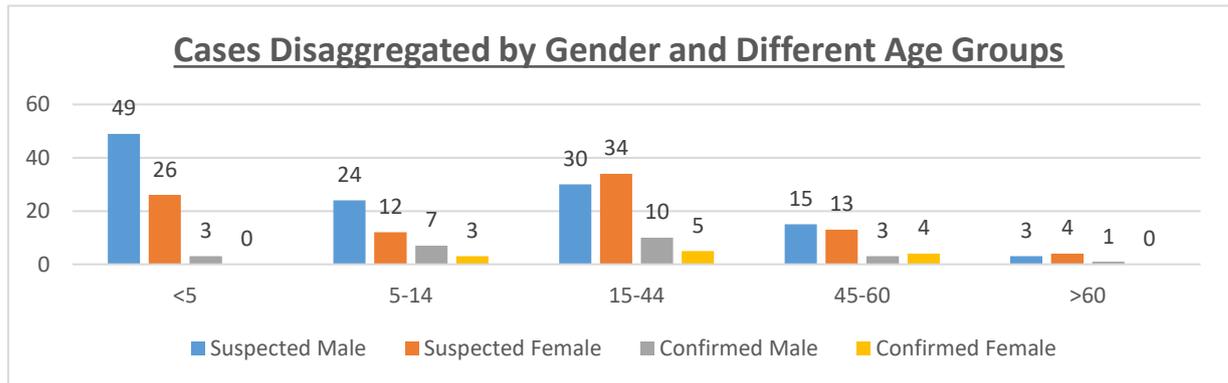


**The following chart shows the cases disaggregated by gender**



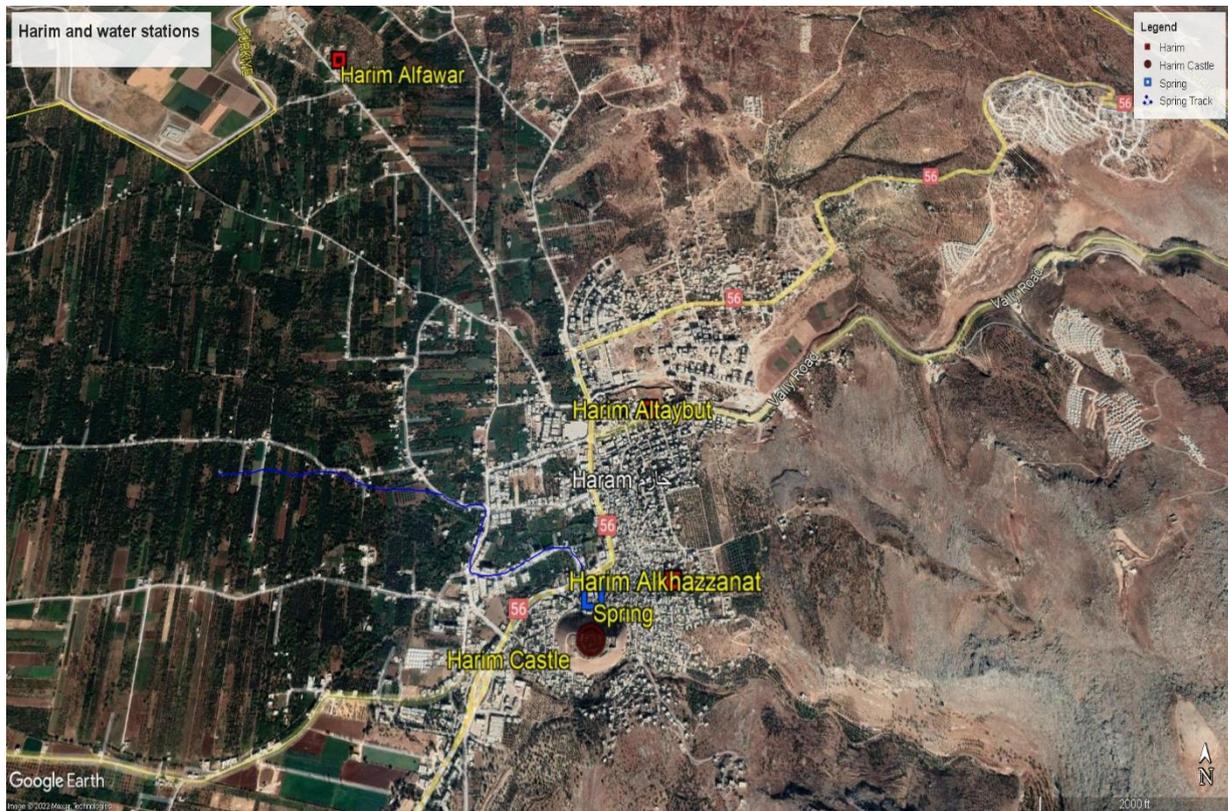
\* Sources: Population: HNAP

The following chart shows cases disaggregated by gender and different age groups



### 3. The main water sources in the city

Basically, there are three water stations in Harim, and all of them are functional currently, as water is pumped by these three stations through the network to reach the houses of the residents (The final beneficiaries). The table below shows the water stations in Harim city



Station code	Station name	Station type	Functionality Status	Chlorination
B030300301	Harim Alfawar	Well Station	Functional	Yes
B030300302	Harim Alkhazzanat	Well Station	Functional	Yes
B030300303	Harim Altaybut	Well Station	Functional	Yes

The water stations that pump water through the network are not the only source of water for the residents in the city, as there is a natural **spring** that springs from the city center and it considers an important water source for the population of Harim, as they depend on it to secure additional quantities of water for other uses and to irrigate crops and fruit trees as well.

#### 4. Surveillance and Investigation

ACU WASH team conducted successive field visits to Harim city since the date of the first confirmed case to carry out the necessary investigation in order to find out the various possible reasons behind the spread of cholera and test the quality of the water sources as well.

##### The results of the investigation were as follows

Regarding the status of water quality and sterilization in the main water sources in the city (Water stations), as the previous table shows, all water sources (Water stations) are subject to sterilization, and chlorine is added to the water before pumping it through the network and this was confirmed by the water quality tests conducted by ACU WASH field team for samples taken from the water stations and the network, which showed good percentages of FRC (Free Residual Chlorine), which proves the quality and suitability of water for drinking (Potable water).

After ensuring the quality of the main water sources in the city, the investigation was scaled up to figure out other reasons that might be behind the spread of cholera in the city, which could be related to secondary water sources, contaminated vegetables, and foods, or wastewater related contamination or any other reasons that might be a direct or indirect cause of cholera outbreak.

According to information collected in the field, there is a “public water **spring**” in the city that existed before 2011 and the local population relied on it as a secondary source to secure water for various uses including “drinking” considering the **spring** as a natural and free resource, since it is connected to a group of ancient Roman underground channels carry out the water through the city to the western part of it where water pours into agricultural land. In addition, the city was bombed during the previous years, especially the market area (The city center), which is an area very close to the **spring** which led to significant damage to the sewage network, consequently contaminating **spring** water as a result of mixing with wastewater (In 2018, the WASH field team tested the quality of **spring** water by taking a sample from one of the channels that transport **spring** water and the result at that time stated that the water was bacterial contaminated and it is not suitable for drinking).

The track of the **spring** was studied as well, as it was found that many household drainage lines along the track of the **spring** flow into it thus polluting the water of the **spring** in a large and clear way, as the water appears in some places like or similar to wastewater, knowing that the water of the **spring** that pours into agricultural lands as mentioned previously is used to irrigate crops of all kinds, such as vegetables and fruit trees .

##### The following pictures show the track of the spring in several places.





Regarding the cases and their spread in Harim city, it was found that most of the cases are located in two neighbourhoods Al-Nabaa (The market) and Al-Marjah neighborhoods, where these two neighborhoods are located in the area through which the **spring** track. As for the rest cases in other neighborhoods, it turns out that they are people who either work in the market or frequently visited the market neighbourhood to do their own business.

In one of the cases in Al-Marjah neighborhood we visited, our field team noticed that the sewage lines surrounding or passing next to the patient's house were clearly damaged and uncovered, as the wastewater drains to the ground and spreads near the houses of the residents there .

The following pictures show the status of sewage in Al-Marjah neighborhood.



As for the cases in Al-Nabaa neighborhood (The market), it was found when we investigated one of the cases that the house is linked to a water line connected directly to the water network (water stations) and another line connected to the water of the natural **spring**, which is used one day a week when the water coming from the network is stopped due to the shift system currently applied in the city.

In fact, the double-line approach (The network and the **spring**) is widely followed in this neighborhood to compensate for the quantities of water needed for the residents. In addition, it was found through the investigation and investigation visit to the city and interviews with people who were infected with cholera that the vendors in the city market mainly depend on the water of the **spring**, especially when the Interruption of water is pumped through the network. Moreover, some vegetable vendors spray vegetables and fruits from the **spring** water to maintain their freshness during the day, knowing that most of the vegetables sold in the market are produced in Harim, which is originally irrigated from the **spring**.

Water quality tests were conducted for a number of samples, which included water taken directly from the **spring**, houses and tanks of some patients in Al-Marjah and Al-Nabaa neighborhoods (The market), and water that had soaked some vegetables and fruits taken from the market .

**All water quality tests proved that this water is not drinkable and bacterial contaminated. The results of the tests are below.**

1. **A water sample from a patient's house in Al-Marjah neighborhood (a positive cholera case).**

### تقرير نوعية مياه (حارة المرجة) Water Quality Report

بيانات مصدر المياه Water Source Data		
Idleb	إدلب	Governorate المحافظة
Harim	حارم	District المنطقة
Harim	مركز حارم	Subdistrict الناحية
	مركز حارم	Community التجمع السكاني
Household	منزل	Sample Source مصدر العينة
	حارة المرجة	Sampling Location مكان اخذ العينة
	36.517989	Longitude خط الطول
	36.212147	Latitude خط العرض
		Station Code Water كود المحطة
بيانات التحليل Test Data		
	19/Nov/2022	Sampling Date تاريخ سحب العينة
	19/Nov/2022	Test Date تاريخ التحليل
	Firas Al-Fetrawi	Tester القائم بالتحليل
	ACU	Requested By الجهة الطالبة للتحليل

Physical Test الخصائص الفيزيائية للمياه		
The Result النتيجة	Standard الحد المسموح به	Test التحليل
Colorless	Colorless عديم اللون	Color اللون
Odorless	Odorless عديم الرائحة	Odor الرائحة
7.3	6.5 - 8.5	pH الرقم الهيدروجيني
	C°	Temperature حرارة المياه
1.11	5 NTU	Turbidity العكارة
461	1200 ppm	TDS الأملاح الكلية المنحلة
640	1500 µs/cm	Conductivity الناقلية الكهربائية
Bacteriological Test التحليل الجرثومي للمياه		
The Result النتيجة	Unite الواحدة	Test التحليل
	PPM	FRC الكلور الحر المتبقي
6	Cfu/100 ml مستعمرة/100 مل	Coliforms Total تعداد الكولونيئات
50	Cfu/100 ml مستعمرة/100 مل	E.Coli (44 °C) تعداد الإشيريشيا كولاي
Sample Culture Photos صور الزرع الجرثومي للعينات		
Notes ملاحظات	at 37 C°	at 44 C°
		
Test Result النتيجة الإجمالية		
Result The النتيجة	Test التحليل	
Safe To Drink صالح للشرب	نتيجة التحليل الفيزيائي للمياه Physical Test Result of	
	نتيجة التحليل الكيميائي للمياه Chemical Test Result of	
Not Safe To Drink غير صالح للشرب	نتيجة التحليل الجرثومي للمياه Biological Test Result of	
	حالة منظومة التعقيم Chlorination Status	

2. A water sample from a patient's house in Al-Nabaa neighborhood (a positive cholera case).

تقرير نوعية مياه (حارة النبعة) Quality Report Water

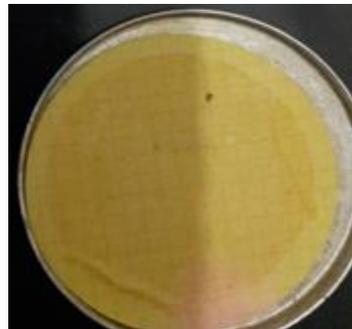
بيانات مصدر المياه Water Source Data		
Idleb	إدلب	Governorate المحافظة
Harim	حارم	District المنطقة
Harim	مركز حارم	Subdistrict الناحية
	مركز حارم	Community التجمع السكاني
Household	منزل	Sample Source مصدر العينة
	حارة النبعة	Sampling Location مكان اخذ العينة
	36.519272	Longitude خط الطول
	36.20955	Latitude خط العرض
		Station Code Water كود المحطة
بيانات التحليل Test Data		
	19/Nov/2022	Sampling Date تاريخ سحب العينة
	19/Nov/2022	Test Date تاريخ التحليل
	Firas Alfetrawi	Tester القائم بالتحليل
	ACU	Requested By الجهة الطالبة للتحليل
الخواص الفيزيائية للمياه Physical Test		
The Result النتيجة	الحد المسموح به Standard	التحليل Test
Colorless	عديم اللون Colorless	اللون Color
Odorless	عديم الرائحة Odorless	الرائحة Odor
7.3	6.5 - 8.5	الرقم الهيدروجيني pH
	C°	حرارة المياه Temperature
1.88	5 NTU	العكارة Turbidity
427	1200 ppm	الأملاح الكلية المنحلة TDS
600	1500 µs/cm	النقلية الكهربائية Conductivity
التحليل الجرثومي للمياه Bacteriological Test		
The Result النتيجة	الواحدة Unite	التحليل Test
	PPM	الكولور الحر المتبقي FRC
250	Cfu/100 ml مستعمرة/100 مل	تعداد الكولونيات Coliforms Total
250	Cfu/100 ml مستعمرة/100 مل	تعداد الأشيرشيا كولاي E.Coli (°C 44)

Sample Culture Photos صور الزرع الجرثومي للعينات		
Notes ملاحظات	at 37 C°	at 44 C°
		
Test Result النتيجة الإجمالية		
Result The النتيجة	Test التحليل	
Safe To Drink صالح للشرب	Physical Test Result of المياه التحليل الفيزيائي للمياه	
	Chemical Test Result of المياه التحليل الكيميائي للمياه	
Not Safe To Drink غير صالح للشرب	Biological Test Result of المياه التحليل الجرثومي للمياه	
	Chlorination Status حالة منظومة التعقيم	

### 3. A sample of water from soaked vegetables

### Water Quality Report (تقرير نوعية مياه (مياه نقتت فيها بعض الخضراوات)

Water Source Data بيانات مصدر المياه		
Idleb	إدلب	Governorate المحافظة
Harim	حارم	District المنطقة
Harim	مركز حارم	Subdistrict الناحية
	مركز حارم	Community التجمع السكاني
Other	أخرى	Sample Source مصدر العينة
	مياه نقتت فيها بعض الخضراوات	Sampling Location مكان اخذ العينة
		Longitude خط الطول
		Latitude خط العرض
		Station Code Water كود المحطة
Test Data بيانات التحليل		
	19/Nov/2022	Sampling Date تاريخ سحب العينة
	19/Nov/2022	Test Date تاريخ التحليل

Firas Alfetrawi		القائم بالتحليل Tester
ACU		الجهة الطالبة للتحليل Requested By
Physical Test الخواص الفيزيائية للمياه		
The Result النتيجة	Standard الحد المسموح به	Test التحليل
Colorless	Colorless عديم اللون	Color اللون
Odorless	Odorless عديم الرائحة	Odor الرائحة
	6.5 - 8.5	pH الرقم الهيدروجيني
	C°	Temperature حرارة المياه
	5 NTU	Turbidity العكارة
	1200 ppm	TDS الأملاح الكلية المنحلة
	1500 µs/cm	Conductivity الناقلية الكهربائية
Bacteriological Test التحليل الجرثومي للمياه		
The Result النتيجة	Unite الوحدة	Test التحليل
0	PPM	FRC الكلور الحر المتبقي
20	Cfu/100 ml مستعمرة/100 مل	Coliforms Total تعداد الكولونيئات
9	Cfu/100 ml مستعمرة/100 مل	E.Coli (°C 44) تعداد الإشريشيا كولاي
Sample Culture Photos صور الزرع الجرثومي للعينات		
Notes ملاحظات	at 37 C°	at 44 C°
تم نقع بعض الخضراوات اخذت من حارم في مياه ثم تم تحليل هذه المياه		
Test Result النتيجة الإجمالية		
Result The النتيجة	Test التحليل	
Safe To Drink صالح للشرب	نتيجة التحليل الفيزيائي للمياه Physical Test Result of	
	نتيجة التحليل الكيميائي للمياه Chemical Test Result of	
Not Safe To Drink غير صالح للشرب	نتيجة التحليل الجرثومي للمياه Biological Test Result of	
	Chlorination Status حالة منظومة التعقيم	

4. Water sample was taken from the spring

## تقرير نوعية مياه (جانب المسجد) Quality Report Water

بيانات مصدر المياه Water Source Data		
Idleb	إدلب	Governorate المحافظة
Harim	حارم	District المنطقة
Harim	مركز حارم	Subdistrict الناحية
	مركز حارم	Community التجمع السكاني
Spring	نوع	Sample Source مصدر العينة
	جانب المسجد	Sampling Location مكان اخذ العينة
36.519689		Longitude خط الطول
36.209931		Latitude خط العرض
		Station Code Water كود المحطة
بيانات التحليل Test Data		
19/Nov/2022		Sampling Date تاريخ سحب العينة
19/Nov/2022		Test Date تاريخ التحليل
Firas Alfetrawi		Tester القائم بالتحليل
ACU		Requested By الجهة الطالبة للتحليل
الخواص الفيزيائية للمياه Physical Test		
The Result النتيجة	الحد المسموح به Standard	التحليل Test
Colorless	عديم اللون Colorless	اللون Color
Odorless	عديم الرائحة Odorless	الرائحة Odor
7.2	6.5 - 8.5	الرقم الهيدروجيني pH
	C°	حرارة المياه Temperature
0.76	5 NTU	العكارة Turbidity
458	1200 ppm	الأملاح الكلية المنحلة TDS
640	1500 µs/cm	الناقلية الكهربائية Conductivity
التحليل الجرثومي للمياه Bacteriological Test		
The Result النتيجة	الواحدة Unite	التحليل Test
	PPM	الكولور الحر المتبقي FRC
200	Cfu/100 ml مستعمرة/100 مل	Coliforms Total تعداد الكولونييات
200	Cfu/100 ml مستعمرة/100 مل	E.Coli (°C 44) تعداد الإشريشيا كولاي
صور الزرع الجرثومي للعينات Sample Culture Photos		

Notes ملاحظات	at 37 C°	at 44 C°
		
Result The النتيجة	Test التحليل	
Safe To Drink صالح للشرب	Physical Test Result of التحليل الفيزيائي للمياه للمياه	
	Chemical Test Result of التحليل الكيميائي للمياه للمياه	
Not Safe To Drink غير صالح للشرب	Biological Test Result of التحليل الجرثومي للمياه للمياه	
	Chlorination Status حالة منظومة التعقيم	

## 5. Recommendations

1. Immediately stop using spring water for drinking purposes, irrigation, and other domestic uses such as bathing, dishwashing, and washing vegetables and fruits knowing that the number of confirmed cases in Harim has increased clearly because of non-stopping using the polluted spring water.
2. The local authorities must carry out strict measures in this regard and raise awareness among the local population and work with other organizations and actors to find proper solutions to the sewage network problems in both Al-Nabaa and Al-Marjah neighborhoods which contaminate the spring, in addition to preventing the discharge of wastewater into the track of the spring.
3. Carrying out complete and effective maintenance for the sewage system in the city, especially the neighborhoods near the spring to stop the leakage from the sewage pipes, which at the same time leads to the contamination of the freshwater coming out of the spring. Also, effective maintenance must be carried out for the spring channels, especially those underground, which were previously damaged, in addition to working to cover the exposed parts and stop the entering wastewater into the channels.
4. Working with the local authorities to raise awareness among the local population about the need for keeping the spring safe, healthy, and unpolluted, and taking serious and tangible steps in this regard.
5. Working to provide additional safe and clean water sources to meet the other and increased needs related to drinking water or raising the capacity of the current sources by increasing the number of pumping hours or pumping days.

----The end of the Report----