Kingdom Of Saudi Arabia
Ministry Of Education
District Education Administration, Almadinah Almunawwarah
25th Secondary School

The Effect of Well Depth over Water pH in Aqool Area Almadinah Almunawwarah

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Abstract:

Well water is considered a main source of water in Almadinah Almunawwarah. Given the historical and religious significance, and due to lack of existing studies on them, the globe team decided to take the initiative to conduct a study on the effect of well depth on water pH in Aqool area, Almadinah Almunawwarah.

In this study, 9 samples were taken from different wells of different depths. In Aqool area, Almadinah Almunawwarah. All the samples were at the same temperature of **22**° Celsius.

After measuring the pH for each sample, the globe team concluded that water pH differs according to depth, and the best average result was found between 110-130 meters depth. Thus, the alternative hypothesis assuming there is an effect of well depth on water pH was accepted.

Key Words:

Well water, depth of well, water pH, Kingdom of Saudi Arabia, Almadinah Almunwwara, Aqool area.

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Introduction:

Almadinah Almunawwarah is a city with a soulful lovely story with water. A story that started in ancient times. Crossing the prophet Muhammad peace be upon him times and the khulafaa'. Reaching our modern time.

This story began when prophet Muhammad peace be upon him and his companions had migrated to Almadinah Almunawwarah. They came to find that there is only one source of drinking water. Which is the Roomah well. That well was a private property. Thus, The water was hard to get and too pricy for the new immigrants. At that time, Uthman in Affan, who was both wealthy and generous. Decided to buy the well and donate it to be a public ownership of the city and its people, as a mercy to the poor and needy.

It is worth mentioning that this very well, for 1400 years and to this day forward is still pumping water. And its name changed to Uthman well, after the man who gave it to the people.

Almadinah Almunwaarah is famous for historic wells other than Roomah well. Such as alawaf well, Anas bin Malek well, Assoqya well and Beda'a well. The aforementioned wells are unyielding as long as they are cleaned and taken care of. The production of well water alone is estimated to be 20000-30000 m^3. well water along with spring water and desalination water is the main source of drinking water in Almadinah Almunawwarah.

Since the wells of Almadinah Almunawwarah have a great historical and religious value. And is still a great water source of domestic use. Hence, the need for a more in depth study of its properties. The Globe team of the 25th secondary school decided to conduct a research studying the effect of well depth on water pH.

Literature Review:

In a previous study done on 105 wells from different areas in Almadinah Almunawwarah, the scholar studied water properties and their effect on each other. He concluded that there is a relationship between the depth of the well and the conductivity of its water. Muhammad Tho Alfaqqar Ali Khan, Asim Bukhari, Special modelling for underground water quality in Almadinah Almunawwarah, 1992.

And in another study that compared between well water and rain water, Scholars found that both waters are equally alkalitic but the conductivity is higher in well water. The differences in chemical characteristics of well water and rain water, Razan Humood Almara'ash, Tahiyyah Majed Abulfadayil, Renad Abdulhadi Aldosari, 2018.

And another study, done on well water in the city of port Sudan, indicates the importance of the geographical spot as a factor determining water quality in a well. Ghaidaa' Ali Muhammad Abdullah, geographical variance of well water properties in the city of Port Sudan, 2016.

The globe team in the 25th secondary school concluded that these studies have found a relationship between the geographical spot and water properties, as well as depth, and conductivity. And that there are differences between well water and rain water. Therefor, due to lack of previous studies, and the the importance of pH level as a determining factor for the validity for drinking and domestic use. The team establishes the necessity to study the relationship between the depth of well and the pH of its water. In the particular area of Aqool, Almadinah Almunawwarah.

Question of the Study:

Does the depth of the well affect the pH of its water in Aqool area, Almadinah Almunawwarah?

Hypothesis:

$H_{\circ}$: *The depth of the well and the water pH are not related*
H_1: *the depth of the well and water pH are related*

Materials and Method:

Materials:

9 samples of well water from Aqool area

A device to measure well depth in meters

A device to measure water pH

Distilled water

Thermometer

Measuring cup

Method:

the samples were taken from one area in Almadinah Almunawwarah, Aqool area. The 9 samples were taken from different wells of different depths, the depth was measured im meters, the samples were taken on January, 2020. The samples were studied using water protocol, where the pH was measured at a constant temperature of 22° Celsius.

Figure (2)

Temperature measuring

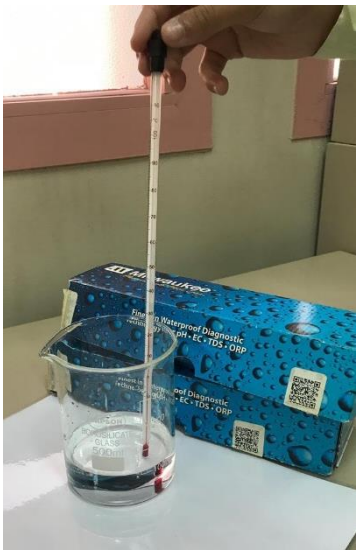


Figure (1)

pH measuring

Figure (4)

Satellite picture of Aqool area, Almadinah Almunawwarah, Saudi Arabia

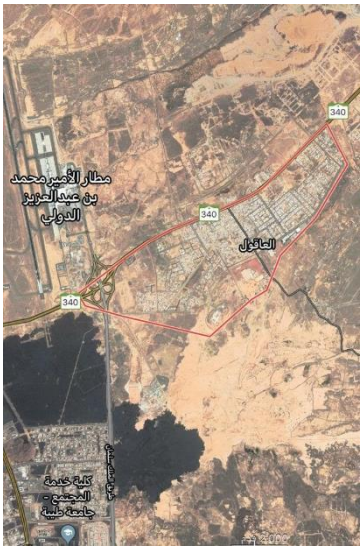


Figure (3)

Washing the pH measuring device with distilled water

Data Summary:

Table (1)

Showing pH levels in wells measuring 80-110 M

Average pH	pH	Well depth	Area
	8.5	85	Well 1
	8.3	95	Well 2
8.3	8.3	102	Well 3

Table (2)

Showing pH levels in wells measuring 110-130 M

Average pH	pH	Well depth	Area
	7.5	110	Well 3
	7.6	130	Well 4
7.5	7.6	135	Well 5

Table (3)

Showing pH levels in wells measuring 130-160 M

Average pH	pH	Well depth	Area
	7.9	140	Well 6
	7.8	170	Well 7
7.9	8	180	Well 8

Figure (5)

Showing pH levels in wells measuring 80-110 M

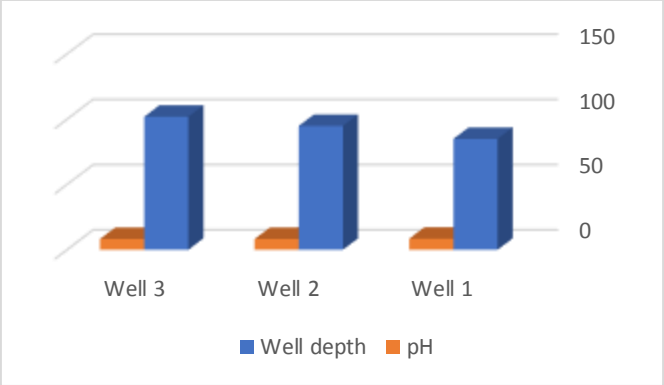


Figure (6)

Showing pH levels in wells measuring 110-130 M

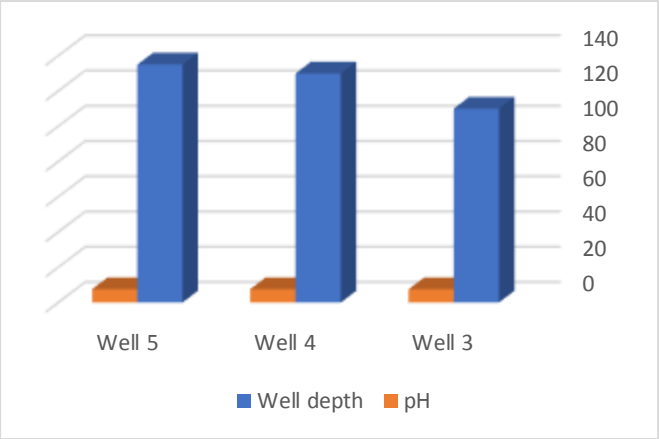
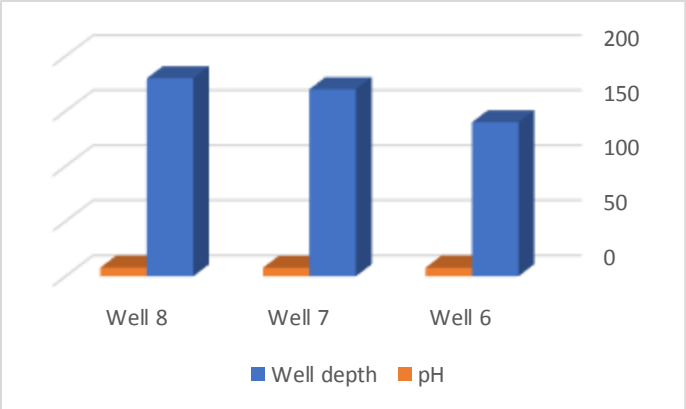


Figure (7)

Showing pH levels in wells measuring 130-160 M



Analysis and Results:

After finishing sample collection some statistical measurements were calculated using Excel to get the results helping to accept or decline the hypothesis. The average value of pH of well water taken from different wells of different depths in Aqool area.

Average Equation:

$$\overline{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$$

Conclusions:

When the globe team of 25th secondary school started analysing well water using the globe accredited protocols, it was highly probable to find an effect of the well depth on water pH at a constant temperature of $\mathbf{22}^{\circ}$ Celsius in the tested area. The team found that there primarily in wells ranging from 80-110 M in depth, and the pH of 7.5 found in wells ranging from 110-130 M, and pH of 7.9 in wells 130-160 M. This indicates that there is a definite effect of well depth on water pH, and the best pH for water was found in wells ranging 110-130 Min depth. Thus, the alternate hypothesis, which states that there is an effect of well depth on water pH, was accepted.

Proposal and Recommendations:

The needed to do further studies using a larger sample still exists. To find more about water in this area, its chemical and physical properties and to determine its validity to be used as drinking water and other domestic uses. We recommend to drill wells at depth of 110-130 M for a better water pH.

Difficulties:

1.Finding water samples from different wells of different depth in Aqool area, Almadinah Almunawwarah.
2.Some farms did not have built in wells.
3.The transportation of samples to the school for testing.

Acknowledgment:

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