Sultanate of Oman

Ministry of Education

Dhahar for Basic Education School (1-12)

Al Wusta Governorate

A Study on the effect of climate on the increasing number of children with Down syndrome in Dhahar village in the wilayat of Duqm, Al Wusta Governorate, Sultanate of Oman

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➢ Abstract

The aim of our research is to study the effect of climate (air temperature, humidity, and soil) on the increasing number of children with Down syndrome in the village of Dhahar, to answer the following research questions: Does the high air temperature affect the increasing numbers of children with Down syndrome? Does high atmospheric humidity affect the occurrence of a genetic mutation in the meiosis of sexual cells (fertilized cell formation)? Does the *Eiter (in Arabic)* plant have a role in the occurrence of the genetic mutation?

The research was applied in Duqm in Dhahar School for Basic Education, where it was noticed in the recent years from 2017 to 2019 that the number of Down syndrome children has increased to six, although the region is small in terms of area and population, and contains a large number of Down syndromes compared to the simple population. The phenomenon was examined by applying the atmosphere protocol and soil protocol to measure the temperature and humidity of a number of samples at the study site.

The results of the research indicate a high humidity in the atmosphere, which could be one of the main causes of the genetic mutation. Based on the results of the research, we recommend that air purifiers be acquired in homes.

➢ Key terms

- Air humidity: It is the amount of water vapor present in the air, especially in the troposphere (the lower air layer).
- Down syndrome or chromosome 21 or chromosome G: Down syndrome is a genetic disorder that occurs as a result of a defect in the division of chromosome 21, which leads to the sufferer of this syndrome having a complete copy of a full or partial additional chromosome twenty-one.

- **Research questions:**

1. Does high air temperature affect the number of children with Down syndrome?
2. Does high atmospheric humidity affect the occurrence of a genetic mutation in the meiosis of sexual cells (fertilized cell formation)?
3. Does the *Eiter (in Arabic)* plant have a role in the occurrence of the genetic mutation?

- **Introduction:**

Down syndrome is a genetic disease, not a hereditary condition, but there are rare cases where a genetic mutation is caused by a hereditary defect. The study that can support our research is Harvard University study (2015), which demonstrates that there is a strong relationship between air pollution and autism. The high humidity level in Dhahar area (the study site) has a strong influence on iron as it corrodes easily and very quickly. This strikes our attention as the same high humidity may have affected the plant directly and humans indirectly. The desert plant does not have water but rather uses the water vapor present in the air and there is a possibility that the air is polluted. Therefore, the pollution in the air and soil has possibly affected the plant in dividing its cells. This might affect the human directly or indirectly. Directly when a person feeds on plants, and indirectly through the food chain. A student in Dhahar school has a brother with Down syndrome, in Dhahar, (the study site), a desert area that is large in size in Al Wusta Governorate, in the Sultanate of Oman. The mother is not over thirty years old, and the kid is two years old. What is surprising, however, is that more than three families with children with Down syndrome in the same region are of similar ages but of different nationalities. In addition, there are deaths of newborns with Down syndrome. So, the cases are far from heredity. It is scientifically recognized that in every thousand births, there is a possibility of having one case

of children with Down syndrome, but the occurrence and the current reality in the region of Dhahar shows more than six cases of children with Down syndrome in the recent years who are close in ages. What led to this research is the presence of more than one case in the same region. This stimulated the need of an investigation to find out the reasons that led to the occurrence of this genetic mutation in meiosis.

- **Search methods:**

1 - Research plan

- Set a time plan for conducting the research

Month	**work plan**
December 2019	Defining the search problem.
January 2020	Distribution of work and formation of a working group to collect data.
February 2020	Implementation of search procedures.
February 2020	Writing and presenting the paper.

Table (1) Research time plan

- **Distribute the work to team members:**

Work performed	**Student performing**
Formulating the research problem	Athari Saeed Al-Junaibi
Data collection and analysis	Athari Saeed Al Junaibi - Noran Ayman - Tasneem Mohammed
Taking measurements at the sample collection sites and at the school	Athari Saeed Al Junaibi - Noran Ayman - Tasneem Mohammed
Writing the research	Athari Saeed Al Junaibi - Noran Ayman - Tasneem Mohammed
Conducting interviews with some families with Down syndrome children	Athari Saeed Al Junaibi - Noran Ayman - Tasneem Mohammed

- **Search Plan:**

- Read some books about Down syndrome to get an idea about the topic and know the common reasons for its occurrence. Use the Internet to obtain more information on the subject of the study and review the papers on the GLOBE program.

- Determine the protocols that will be applied to carry out the research procedures.

- Determine the work site and the tools to be used to implement the protocol.

- Apply the search procedures to the samples collected from the research sites.

- Data collection and organization.

- Entering data in the program's website.

- Interviewing families with children with Down syndrome to answer some research inquiries.

- **Study site:**

The research was conducted in Dhahar village, Al Wusta Governorate, Sultanate of Oman. Humidity and temperature were measured in Dhahar School and some of the dwellings with children with Down syndrome.

- **The coordinates of the site:**

  19,2374 North

  57,6213 east

- **The protocol used:** 1- Atmosphere

  2- Soil

- **Data collection and analysis:**

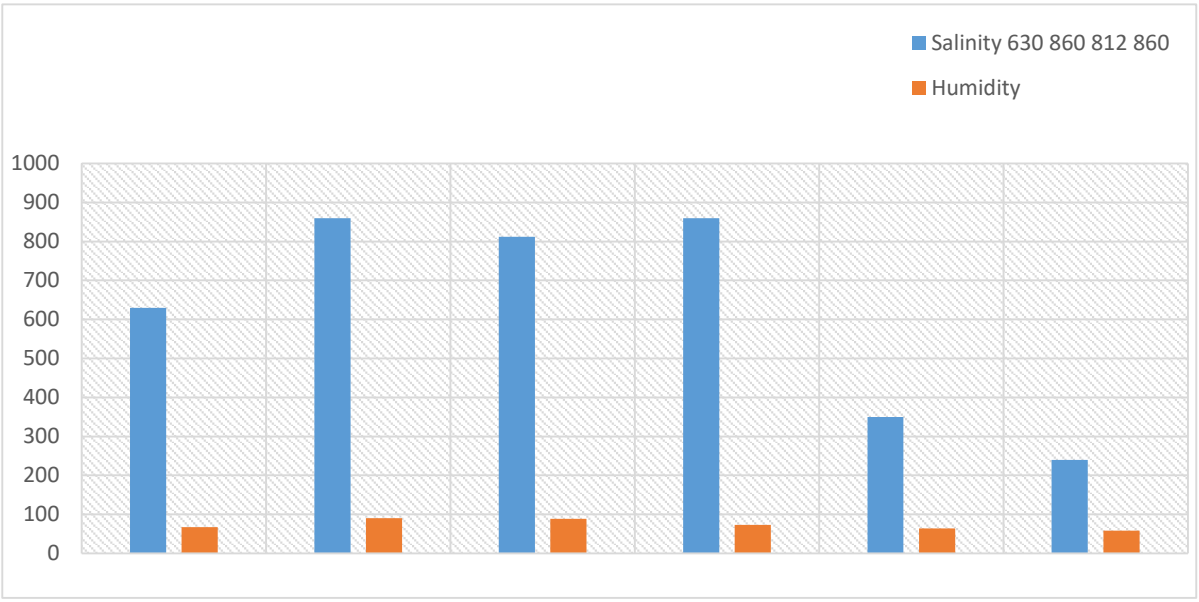
Data were collected by monitoring humidity and air temperature in several different places in Dhahar village. A significant increase in the percentage of humidity was observed, compared to the normal rate. The highest humidity level reached (90%), while the normal rate is around (30%-50%).

Several soil samples were collected from different locations in the same region, and their acidity and salinity were checked.

- **Pictures of the research team during the implementation of the research steps:**

➢ **Research results:**

	Soil color	Temperature	PH	Salinity	Humidity percentage
Sample number 1	8/3	26	7.3	630	67
Sample No. 2 (home with Down syndrome)	8/3	29	8.28	860	90
Sample No. 3 (home with Down syndrome)	7/4	27	8.19	812	89
Sample No. 4 (home with Down syndrome)	7/4	30	8.28	860	73
Sample number 5	7/3	23	8.13	350	64
Sample number 6	3/6	25	7.90	240	58



The graph shows: the relationship between Salinity and Humidity

- **Discussing the results:**

From the results, we have arrived at the following hypothesis:

The *Eiter (in Arabic)* is a desert plant that gets a large part of its water from the steam in the air and gets its food from the saturated soil, which are both unusual environment elements for a desert plant, which always suffers from an acute shortage of water. Therefore, if the air humidity is very high in an abnormal way, the soil is contaminated and the plant grows in large quantities, this means the possibility of a genetic mutation in the plant and perhaps eating it may lead to changes or a genetic mutation. Eating this plant by people might have a great possibility in causing Down syndrome. Therefore, we call on the relevant actors to expedite the study of this phenomenon in the village of Dhahar.

- **Research Summary:**

We sought in this research to identify the causes that lead to the increasing birth of children with Down syndrome in Dhahar village. It became clear to us that high humidity, polluted soil, and high salinity may be among the main causes that lead to the genetic mutation.

- **Recommendations:**

These results lead us to more research in studying the properties of the soil and the atmosphere and knowing their effect on the occurrence of a genetic mutation in newborns to know the optimal conditions for the nature of the region, in order to avoid future human losses.

- **Thanks and appreciation:**

We thank God Almighty for helping us to carry out this research study, and thanks to the central team of the program for its constant support to us and for choosing our school to be one of the schools that have had this wonderful environmental program that helps creating young researchers with great minds.

Thanks to Mr. Ali Al Busaidi, Head of the Department of Applied Sciences, who encouraged us to participate this year in environmental research.

Thanks to the program supervisors in the governorate, Mr. Mohamed Hamouda, for his constant follow-up.

Thank you, Mrs. Maryam Al-Rubaie and Mrs. Nujoom Al-Mamari, who supported us during the implementation of the research.

Thanks are extended to the families of the children with Down syndrome.

Thanks to Dr. Samah for the information she provided to us.

Thanks are also to Dr. Rasha, Maternity and Childhood head, at Haima Health Services Department.

- **References:**

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- **Pictures of children with Down syndrome**