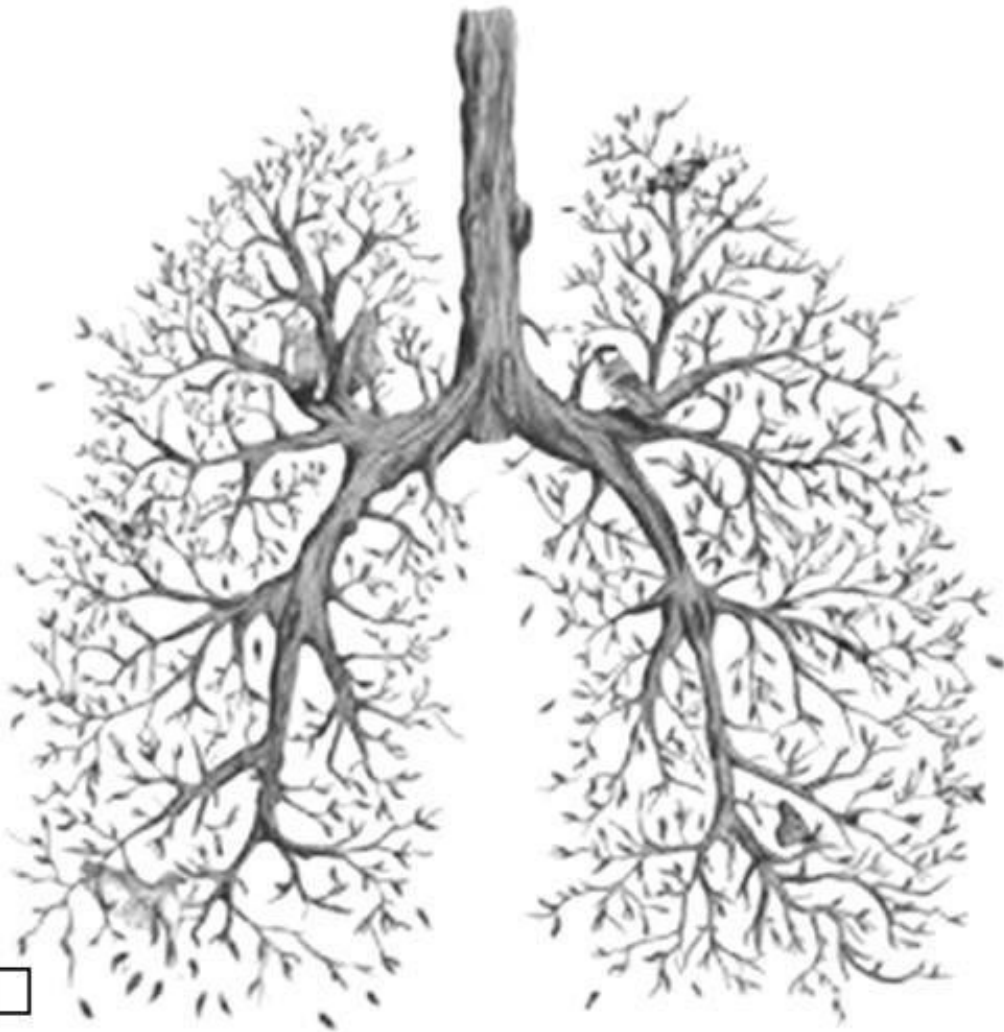


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# Community Medicine



Slides

Sheet

Lecture # 18

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## Environmental Health

### ❖ The components of the environment:

#### 1. Water:

Water covers 71% of the earth surface, but only about 3% are available as fresh water. Fresh water is generally characterized by having low concentrations of dissolved salts and other total dissolved solids (Potable). The rest is salt or saline water (oceans & seas) that make up 97% of all water on Earth. 99.9% of fresh water is not easily accessible; it is mainly found frozen in glaciers, ice and snowfields and as fresh underground water. So technically, less than 0.01% of fresh water is accessible as surface water in lakes, swamps and rivers. And add to this scarcity many other factors such as maldistribution of sources and fresh water pollution.

#### - **Water in Amman.**

Amman's main water supply comes from Zay that is supplied by Al-Ghor area from Yarmouk River through King Abdullah's canal crossing approx. 200km. Another water drop travels about 400kms (325km actually) from Al-Disi aquifer to reach Amman causing water to be rather expensive and precious. If you examine your water bill, you will find that we only pay a fraction of the total water value because it's very expensive (if your bill comes to be 50 JD, you haven't really consumed 50 L of water but probably 150 L). Water is subsidized in Jordan by the government as we can't afford to pay the actual price which is high due to the large distances travelled by a water drop and this requires

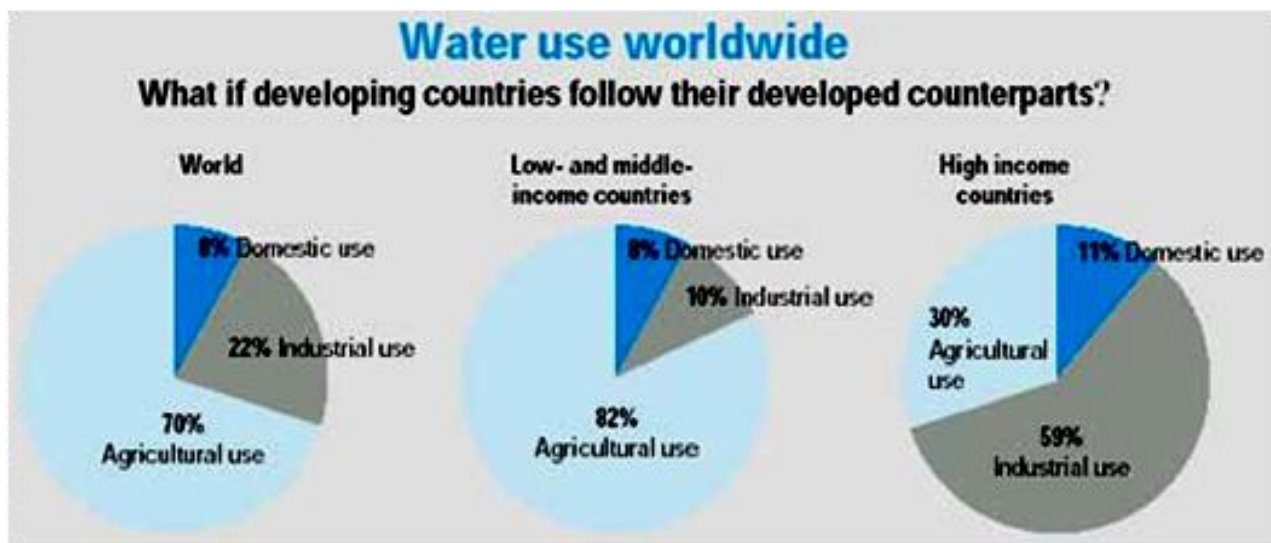
pumping and well-established pipelines. Further more water requires treatment processes in order to be safe.

❖ This is considered an example of maldistribution; the capital city is located in the north whereas the water source is far away from it. (Al-Disi in the south most of the country).

❖ The original source of water in Amman previously was 12 internal artesian wells but they turned to be insufficient as the city continued to expand and the population increased.

- **Water Worldwide.**

❖ 70% of water worldwide is used in agriculture, more than 22% is used in industry and only 8% is used by humans and animals as a drinking water and for household use.



❖ Another important issue is that water isn't distributed equally around the world so some countries like the Arab countries have the least amount of rain and on the

other hand South American countries receive the highest amount of rain and water is highly available. Brazil has the most renewable water sources in the world such as the Amazon River creating huge jungles which in turn increase rainfall as transpiration levels increase. Conversely, Jordan has one of the lowest levels of water resource availability.

- About 66% of Arab lands receive less than 250 ml of rain per year resulting in deserts making 2/3 of Arab countries' region. With the exception of some places like the northern parts of Morocco and some parts of Syria that are close to the Mediterranean sea that have good amounts of rain relatively.

- **Why is water necessary for life?**

❖ Water is a universal solvent; so it is a medium for any biochemical reaction that occurs in our body. From the moment we swallow food it needs to be dissolved in water to be absorbed through the GIT and then water is needed by the liver to perform many metabolic reactions and then water is used again to transport nutrients all over your body.

Water is essential to cool down the body by excreting sweat and is necessary for excreting other toxic materials. It also supports your tissues and cells by maintaining homeostasis.

For example, patients with gallbladder problems (either cancer or obstruction...) present with severe pain whenever they eat fat and it is excreted out of their bodies. This is because bile is saturated with fat and it is not emulsified sufficiently with water by bile salts. This further emphasizes the importance of water as a universal solvent.



- **Water sources:**

1. Rain:

It is scarce and unstable in Arab countries. In the 90s Jordan hadn't enough rainfall for around 6 years forcing us to look for water outside the country for the first time. As a result, we demanded our water from Israel; Lake Tiberias or Sea of Galilee; which is now a reservoir for freshwater. The surrounding countries (Syria, Israel, and Jordan) have a certain portion from the lake water and a fight occurred for the water supply and as the fight ended we got the amount we wanted, but the water that we received was the worst; pumped from the bottom of the lake which was contaminated by algae and helminthes.

And at that time, our water treatment station in Zay wasn't capable of processing this water causing us many problems and harsh times to the extent that World Bank experts advised Jordan to stop irrigating bananas and citrus fruits. The problem was then solved by Syria that provided the water supply from its share of the lake (20 million cubic meters) and helped us until the crisis was over.

That was when Jordan realized the extreme necessity of finding new water sources. Even Al-Disi water supply won't last forever. It is a reservoir with a certain amount of water and the usage rate is much higher than its refill rate. It is estimated to provide water for the next 100 years only at the current rate of usage. One of the suggested solutions is to connect the Red Sea and the Dead Sea together in order to save the Dead Sea and if possible desalinize water using nuclear energy that we are still trying to develop. However, desalinization is extremely expensive and not many countries are capable of doing it. Saudi Arabia and some other Gulf countries which are fuel-rich can desalinize sea water.

## 2. Surface water (lakes & rivers):

If we want to compare the number of lakes in Arab countries to that in Canada for example, we will find great difference. Canada has about 100-1000 lakes while here in the Arabian region it doesn't exceed 3-4 lakes. Moreover, the major lake in the Arabian countries is synthetic which is Aswan Dam Lake located in south Egypt (السد العالي).

There are several major rivers in Arabian regions like Al-Nile River, Tigris River (نهر دجلة) and Euphrates River (نهر الفرات). However, these rivers originate from non-Arab countries raising political tension as these countries (Uganda and Turkey) can divert this water by doing industrial or agricultural projects.

Lately, Uganda wanted to build a dam that would cause the water flow of the river Nile to decrease significantly harming several countries including Sudan with its two parts and Egypt.

Other local rivers are small with no major importance.

## 3. Underground water (ground water):

It is water present in reservoirs underground and the lower part of it is called "water table". In some places the water table is close to the surface and by digging few metres you get the water while in other places it is much deeper in what we call (Artesian wells). In Jordan, superficial groundwater is nearly consumed, so deep wells should be dug to locate water. In northern parts of the country there are more than 200 deep artesian wells and in the majority of them water is found at the level of 1km beneath the surface which makes digging very expensive.

Spring water is considered as ground water that leaks out through weak points and comes out to the surface. There is a misconception that spring water is drinkable and can be used directly but that's not correct because underground water might be contaminated and polluted causing health problems.

▪ **Remark.**

Concerning domestic water use, some countries that have plenty of water use it recreationally in water parks and other places for amusement. But that is not the case in Jordan where water is really scarce.

All in all, several Arab countries are among the worst 10 countries worldwide in water availability and Jordan is in the 4<sup>th</sup> place with the possibility of progressing. So we must conserve water and find new ways to get clean water as many regional countries have insufficient water supply and low rainfall even Palestine has low rainfall.

- **Water contamination.**

All water sources can get contaminated by a variety of pollution sources such as industrialization, urbanization, manmade contaminants like wars (Iraq and Kuwait war and at a larger scale Rwanda war where one million people were killed and thrown into the Nile leading to microbiological disaster), trading and **agriculture** which can be a major source of water contamination in some places like **Al-Ghor area**. Agrochemicals that are used in agriculture can reach water and cause contamination. In **Amman**, the major source of contamination is **urbanization** (industry, vehicles...).

\*Generally, the presence of people in any area will lead to water pollution.

- **Types of water contaminants.**

1. Physical.
2. Chemical.
3. Biological.

And this classification can be applied to many contaminants in any part of the environment.

- **The effects of water contamination.**

Firstly and the most important are health problems.

If water is contaminated physically, biologically or chemically, **water-related diseases** will arise. WHO stated that around 80% of all diseases in developing countries are water-related diseases. Obviously that doesn't apply to all developing countries; in Jordan the quality of water is vastly improved compared to other developing countries.

Bangladesh vs Jordan:

Bangladesh has an enormous water supply with large rivers however water contamination is very high due to misuse, as common people use the fresh water source directly for domestic uses at the same time and the water-related diseases are more than 80%. While in Jordan water is treated well and it is much less contaminated.

**The most important water contaminant in 3rd world countries is microorganisms (pathogens). Why?**

- In developed countries, such as the United States, Cholera, Typhoid, and many other water-related diseases haven't been seen for a long time (Cholera-120 years!) as clean and waste water are completely separated.



This hasn't been achieved yet in third world countries so cross contamination is common.

Four people in four different states in the U.S got hepatitis infections. The cases were reported to disease control center (CDC), an investigation was done and history was taken from the patients and they discovered that these four people visited in the last two months one of the southern states and all four ate oysters ( a seafood that can be eaten raw). These oysters were provided by the same oysters' farm which happened to have sewage water pipe leaking into the oyster pool and that caused hepatitis infections; the problem was solved. This is hard to apply in third world countries, because there are no valuable records or investigations and it needs a lot of hard work. When there is an outbreak of food or water contamination in third world countries it is often a chaos and no one keeps track of the situation.

- **Water-related diseases :**

- GI tract infections, Amoeba, diarrhea, Cholera...etc.

-Any microorganism that can reach water and survive in it can cause water contamination and disease.

WHO classification of water-related diseases:

1. Water –Borne diseases: Pathogens are found in the water ( live there) and water must be drunk to get the disease.

Examples: Amoeba, helminthes and in Jordan there is Giardia lamblia (a flagellated protozoan parasite that colonizes and reproduces in the small intestine). Also, typhoid, paratyphoid, infectious hepatitis, cholera, amoebic

dysentery and Cryptosporidium (is a genus of protozoans that can cause gastrointestinal illness with diarrhea in humans–Cryptosporidiosis).

Note: About 6 years ago, in the northern part of Jordan (Mansheyat Bani Hasan) there was nearly 1,000–2,000 people who suffered from diarrhea and severe abdominal pain (Cryptosporidiosis). There was a conflict between ministry of health and the ministry of water over the possibility of water contamination and both ministries were taken out because they were unable to handle the situation. It was later revealed that the pipeline that is supplying this area has been contaminated and not the water source because other regions used the same source and there were no such complaints. And contamination occurred when a shepherd wanted water for his herd and he shot the pipeline to get the water. Nothing would have happened if water flow is consistent but unfortunately it is not, so water got contaminated with animal dirt (due to negative suction) that carries cryptosporidium and disease occurred. As we see, water was treated properly but a misuse happened afterwards that caused water contamination; this can even result at homes when people store water in a wrong manner.

Note: Schistosomiasis or Bilharzia is a water-based disease and not water-borne disease because contact with water is sufficient to get the disease without the need of drinking.