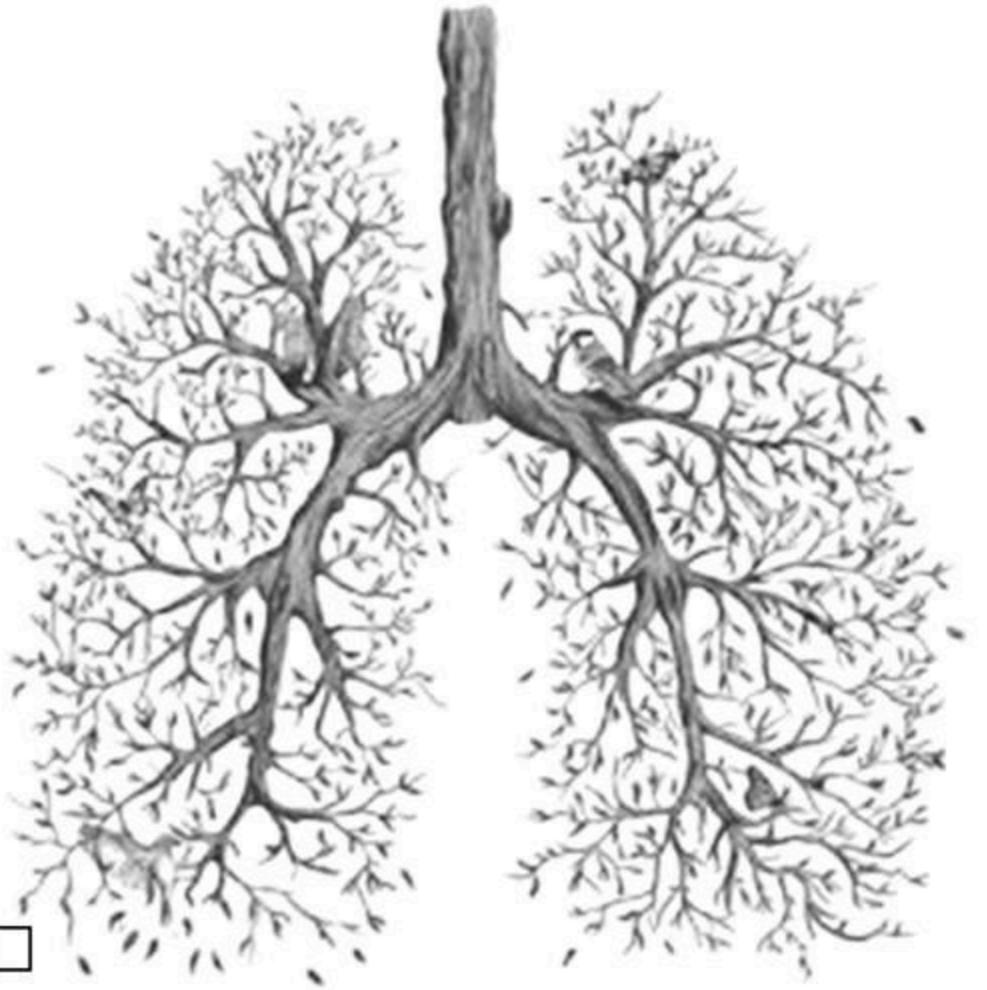
By Mohamed F. Abu Alia

Medical Committee
The University of Jordan

Community Medicine



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Lecture # 19
Date:

Doctor: Madi jaghbir
Done By: Bushra Majid Maaqabeh

Water Pollution impact on health

-Last lecture we talked about what we called waterborne diseases, and we mentioned some examples such as cholera, typhoid and cryptosporidiosis.

-How many liters of water does a person use for **domestic** consumption per day?
It depends on where you are living. In the third world countries, the average is between 40-70 liters per capita per day. In Jordan for example, the number is around 56 liter/capita/day. For developed countries, the figure/number is between 300-700 or above.

> Nobody has come out with a number/figure under which you start to have problems or water-related disease. However, last year, a group of researchers tried to estimate the amount of water under which you should not go, otherwise you will start to have water-related diseases. The data have not been published yet.

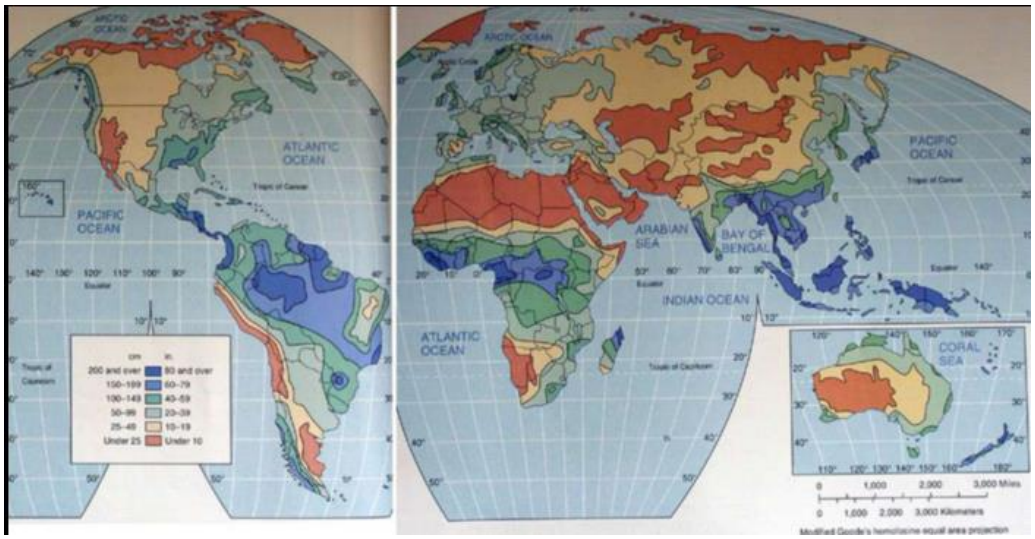
- Why do we have that much variation and differences?

- Because of the limits of water.
- Because there is enough development (in the developed countries); the government is economically as well as technologically developed. So this enables these countries to found that much of water (300-700 or above) and give it to people. In addition, those people themselves (who live in the developed countries) are capable of utilizing that much of water; they have dish washers, cloth washers, Jacuzzis, etc… so they consume a large amount of water compared to the third world countries.

-SO just by knowing the amount of water used in a given country then (without knowing the name of the country) you can judge whether it's developed or developing country.

-We have mentioned this because after we finished with the 1) waterborne disease, we want to talk about 2) **Water-washed diseases**.

-This figure shows the **availability of water worldwide**:



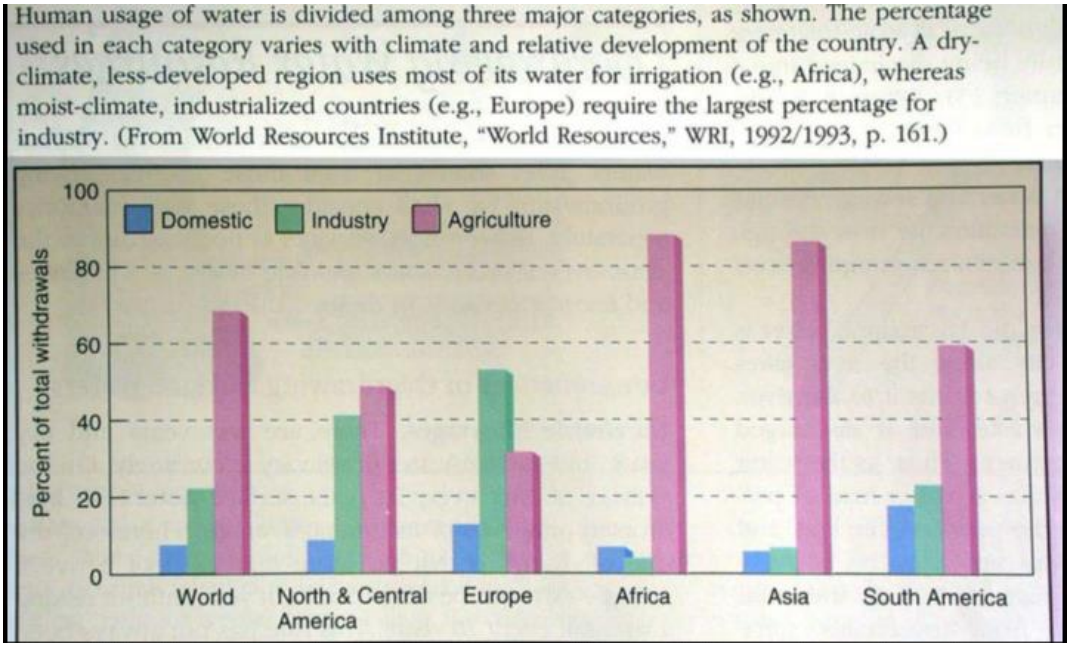
-Blue is good… Brown is bad

-We (Arab countries) are in the brown EXCEPT very small area in the northern part of Morocco and a little area between Saudi Arabia and Yemen, otherwise it's brown, we do not have much.

-Brown means that we have average rainfall between 200-250 mL annually. While the blue areas receive an annual average rainfall of about 2000 mL, such as in Brazil, Argentina, parts in the middle of Africa, some parts of the United States, and in the Far East.

-You can notice the difference in averages of rainfall between 250 and 2000 mL.

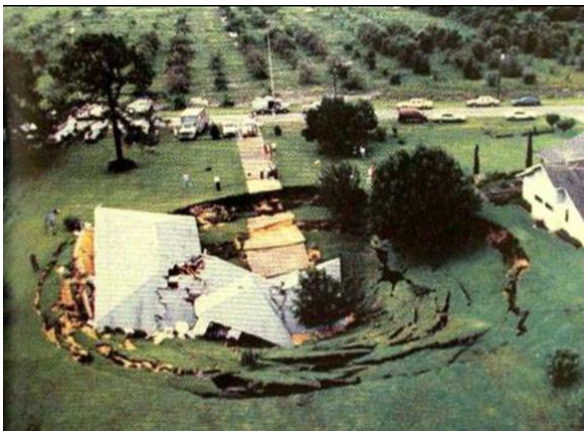
-We have mentioned before the way of using water in the world; domestic, industry, and agriculture.

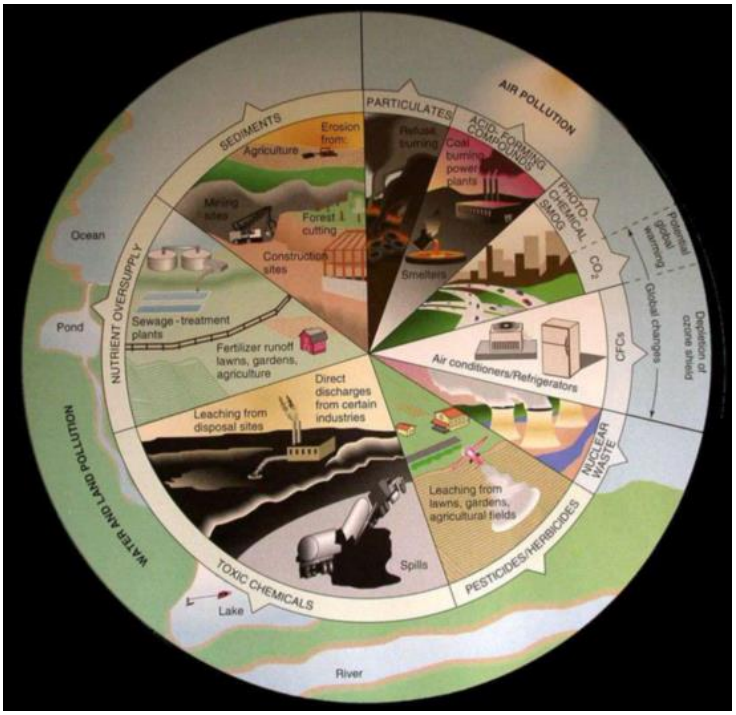


-**The impact/consequences of overdrawing groundwater; when we use more water from underground, what would happen?**

- **Falling water tables and depletion**. That's why in Jordan nowadays, if you want to look for a new source of groundwater, you have to go more than one kilometer below the ground/surface. Of course this is very costly and needs a lot of work.
- We have **diminishing surface water**, and we do not have that much surface water left in Jordan; we consume it all.
- **Land subsidence**. You will see this subsidence where overdrawing water from underground (under the surface) will cause it to collapse. We need some water to be down so that it will support the under part of the surface/below surfaces.
- **Saltwater intrusion**. We have mentioned this in Libya.

A picture shows a land subsidence>>





<<The sources of water pollution that we have mentioned before

-Now let's start with…

2) Water-washed diseases:

-They are diseases which we can reduce their incidence (wash them out) by giving people more water. Infrequent washing and inadequate personal hygiene are the main factors in these types of diseases.

-So is it quantity or quality? **Quantity**. This category of diseases is affected more by quantity of water than by quality.

-**Examples:** They are two subgroups; intestinal diseases, eye and skin diseases.

- **Intestinal diseases**, there are many examples; cholera, typhoid, paratyphoid, infectional hepatitis, and dysentery.

-IF you remember, we have mentioned these diseases as waterborne diseases, how come they are water-washed now? How can we differentiate between them? How can you do it? *Because the treatment is different*, the way you handle it later/management is different. Actually this is a problem you might face in the hospital, you have to distinguish between waterborne and water-washed since the treatment is not the same >> We take a water sample from which the people drink (not the source) and send it to the lab/authority. Suppose I have typhoid, what should you ask for**?** If you ask for typhoid causing pathogen (*Salmonella typhi*), you need to do a culture and the result would take days to bring me the answer (four days plus), What would happen to people during this time?! We cannot wait that long. >>> The only thing I can do is to ask for sth called **Coliform test.**

It is not practical to test for pathogens in every water sample collected. Instead, the presence of pathogens is determined with indirect evidence by testing for an "indicator" organism such as coliform bacteria.

-**Coliform** is not pathogenic bacteria. However, coliform is more capable than any other microorganism to survive in bad situations in water, and if they do not find it, this means that there is no way that other pathogens are there. So being more hardy in water, easy to test for, quick results within 12 hours or more, and then I can do sth.

-IF I find coliform in water, then it will be waterborne. If I do not find coliform in the water, then it is water-washed.

-What should I do if it's waterborne? We ask the authority to clean up the water.

-What should I do if it's water-washed? We ask to have more water coming to people.

-If you do not know how to do it then you keep fighting with the disease and people get sicker and you are the one who causes this problem.

-Many hospitals in Jordan were facing such a problem. One of the latest was in Jarash while people start to have hepatitis because they were drinking from sink water, and again you have to ask for the right type of test.

- **Eye and skin diseases:** One example on skin diseases is **scabies**. And one example on eye diseases is **trachoma**.

-Trachoma is one of the leading causes of blindness in the world**.** What does water have to do with trachoma since the pathogen is not in water? When the mother of a child having trachoma is unable to clean his eyes thoroughly, does not have enough water to wash him or may use a handkerchief and use it on other children, or maybe the fly will stop on his eye and transmit it to another child. All of this can be seen in the third world countries where they do not have enough water.

-So trachoma is caused by a pathogenic bacterium and spreads easily from person-to-person through fluids discharged from infected eyes.

Dr.Madi thinks that Taha Hussein was one of the victims of trachoma in Egypt, he had problems with his vision as he (Mr. Hussein) wrote in his story. When he went to a doctor who seems to be ignorant, the doctor put a certain material in Mr. Hussein's eyes and he lost his vision completely after that.

Dr.Madi says; "my guess is that this material is *silver nitrate*".

Silver nitrate is used in some places for babies born to mothers with severe UTI or having genetic system infections, so during delivery they are afraid that some of these microorganisms get in the eye of the baby, so they put some drops in the eye of the baby.

It seems that he (the ignorant doctor) gave him excess, and it was the last time for him (Taha Hussein) to see.

-This is the issue of water-washed diseases.

Between the two; water-washed and waterborne diseases there are 400 million **cases** of diarrheas every year. Does this mean necessarily that 400 million people are affected? No. It could be 400 million people or **less** because the same person can have diarrhea many times.

-A study in Jordan tells that a child could have 2-4 times diarrhea per year, sometimes even more. This would happen especially with drinking bad water, whereas in developed countries we might not see this.

3) Water-based diseases:

-The pathogen that causes the diseases spends part of its life cycle in an aquatic or marine animal.

-**Examples:** Bilharzia (Schistosomiasis).

-Another example is in the Far East and other countries where they eat raw fish, they might have sth called; **clonorchis/ dicrocoelium (16:25)**. It is caused by worms that live in the liver and cause liver flukes and thus damage it by causing an abscess or infections. Because they do not cook their fish and it would be contaminated with water.

What is the difference between Bilharzia and Schistosomiasis? Nothing, they are the same. But the name "Bilharzia" is sth like a trade name, and it is more accurate to say Schistosomiasis.

-Do we have Bilharzia in Jordan?

In 1989, there were 13 students in the southern part of the country from one school having bilharzia, how? An Egyptian worker came to that area with bilharzia, and he used one of the outdoor swimming pools there and it seems that he urinated in that water. When those students came, they were having the disease.

Bilharzia needs snails not fishes; freshwater snails. And it is NOT transmitted through drinking water.

-And that's why if you aware about certain centre in the ministry of health, it was called the centre for malaria prevention/protection, and now they add to it bilharzia and then they add leishmania because every time they discover new diseases and they add them, so that they can control these diseases.

-When talking about water-based diseases, there are 200 million people at any time in the 3rd world countries having bilharzia; in Egypt, Yemen, Iraq and the Far East. Where ever you have agriculture in which they use the flooding methodology of irrigation. If you want to raise sugar cane or rice you have to do it in this way; the worker is inside this field, he is inside the water and they have this bilharzia there, **it penetrates the skin and gets inside the body**. Although we know the cycle, we are unable yet to stop this disease. And people there took it for granted; they wait their turn (when they're going to have bilharzia), they do not do anything till it's too late.

4) Water-related insect vectors diseases

-It is mentioned as "water-related diseases", and this is not true because it is the umbrella for all the diseases mentioned before, so now how it is a subgroup?! Although it's the WHO classification, it is wrong (it is a mistake); you should add *Insect vectored water-related diseases* to distinguish it. It is a type of water-related diseases but insect vectored.

-**Insect vectored** means that you need insects to transmit/carry these diseases; they cannot be transmitted by themselves. So the first type of diseases (waterborne) occurs when drinking contaminated water, the second one (water-washed) when you have inadequate water so that you cannot wash vegetables well.

-In 1982, it was the last time we had severe cholera in the country, very bad outbreak, why? That outbreak was water-washed. The reason; because we were having waste water treatment (treatment of sewage), it was built by one of the best in the world; the Swedish (but he built for Sweden not Jordan) and it took one to two years where we start to have failure, the water coming out of it was supposed to be with a good quality but unfortunately it was not. People used this water to irrigate vegetables for salad. It was one of the worst situations in the country.

-Examples on water-related insect vector diseases: **Malaria** and the vector is mosquito.

-Examples on diseases transmitted by mosquitoes; yellow fever, Japanese encephalitis, malaria, dengue fever, Rift Valley fever and west Nile fever. However, they are not transmitted by the same kind of mosquito. We do have different types of mosquitoes; *Anopheles* in Jordan, but we do have *Aedes aegypti*, and so on. So we have different types of mosquitoes transmitting those diseases.

The closest region to Jordan that has dengue fever (حمى الضّنك) is Jeddah in Saudi Arabia.

-**How** is malaria transmitted by mosquitoes? A student's answer: "The pathogen lives in the salivary gland of the mosquito. When it injects another person, it will inject the saliva with the pathogen, and then it will travel in blood and go to the liver." The dr.'s answer: "When the mosquito comes to you, it will take/suck blood from you (it won't give you blood), it takes some time inside the body (this is a sexual life cycle). At the end of this cycle, the body of that mosquito is full with plasmodium (the cause of malaria) and including its saliva. The moment when the mosquito comes to someone else to refeed, it will excrete the saliva, so that it will keep the blood going/moving, otherwise it will clot and it will die. And this excreted saliva includes the parasite themselves that get in your body and cause the illness."

-Do we have malaria in Jordan?

If you see a case of malaria in your practice, is it normal? You should ask the patient from where he came. Suppose that he came from outside but if not that's a problem.

-Do we have **local** malaria?

Actually it happened in 1985, it was the first outbreak of malaria in Jordan after being free of local malaria for 20 years or more. The time they decide to have less activity against malaria/against mosquitoes, it comes back again. So there were several cases, but after treatment they came back to what they were doing. *And by that we now do not have local cases of malaria.*

-Nowadays malaria is back, which means after many countries have been able to control it, due to these wars everywhere and due to the economic problems in many countries as well, It comes back even with resistance to pesticides, and it becomes one of the leading problems in the world. So we have to be careful about malaria, and we have to keep **continuous** programs for that disease, so that we will not have this problem again.

-Malaria is a major killer. It has been known for a long time ago.

-There are other kinds of flies, not only mosquitoes. One example is the **"black fly"** which causes sth called **River blindness** or **Onchocerciasis**.

-So these flies, like the mosquitoes, lay their eggs in water. Water is important but not in huge amounts though, they need it to complete their cycle.

-It injects a parasite in your body when it bites you, and it moves under your skin until it reaches your eyes. Some doctors are capable of seeing these worms inside the eyes of the patient when the look in their pupils, they go to the optic nerve and damage it causing blindness.

-So far we have mentioned two water-related diseases that cause blindness; the first one is trachoma, and the second is river blindness (Onchocerciasis).

-What about tsetse fly in Africa?
It causes the African sleeping sickness. It does not live in water, it lives nearby water. It needs the humidity coming out of water.

-Regarding river blindness, there are 15 million people, at any time, blind because of this disease. As well as, 150 million people live nearby water might have this sickness. So it's a serious issue.

-There are more than half million new cases of malaria every year.

-We give these numbers just to show you that 80% of all diseases are water-related disease.

5) Water-dispersed diseases:

-Diseases transmitted by water droplets.

-If you swim in a pool and start splashing, tiny drops of water might disperse in the air and you might breathe them. The first time it was discovered in Yugoslavia where couple of young people was swimming there and they ended up with severe encephalitis and they died. What happened? There were microbes causing problems in that water. Before this encephalitis, those children had sth called *basal skull fracture* which is a minor fracture that might be unnoticed. (When someone plays and jumps, he might have such a fracture and nobody will discover it because there are no signs and symptoms). So they will go to the brain and cause this encephalitis.

-What is more common than them is Legionella. Where ever you have air conditions, Legionella can live in the humidity and water inside these AC, and they are dispersed in the water coming out of them, and people might have pneumonia-like diseases (infection of lungs).

-Some people may go and swim and after several days, they would be affected by bilharzia-like creatures (not bilharzia). Those go inside the body and cause skin itch (and not bilharzia).

Chemical Pollutants

-A simple way to classify chemicals in water is in this way: Organic vs. Inorganic.

-We are talking about **soluble** chemicals. If they are not soluble, they will not reach you. (For example; if you see a stone in water, you won't drink it). Whereas you might not discover soluble chemicals because you drink it quickly before noticing for example.

-Dr.Madi actually does not like this classification. Instead, WE will use another one.

-WE classify chemicals in water into three groups:

- **Toxic chemicals.** They can cause problems when they exceed certain limits.
- **Chemicals that interfere with acceptability of water for drinking purposes.** When the water has bad smell, bad taste, bad color or look, you will not take it not because you are afraid that it will cause you problems, but because you do not like it (esthetic problems). But we are losing this water source; nobody wants it, so it is a problem.
- **Beneficial chemicals.** We need them, they are useful. However, they still can cause you problems if exceeding certain limits.

For example; you can notice on any water bottle that there are many chemicals but present in certain concentrations, but if we raise those, diseases would occur.

Toxic chemicals

-**Examples**: lead, mercury, chrome, nitrate, pesticides, etc..

❖ Lead (Pb)

Sources:

-Car batteries; the liquid ones not the solid.

-Some base paintings.

-Pesticides. (ex. Rodenticides)

Many people think that pencils contain lead but this is a common mistake. It is *graphite* rather than lead.

-The containers of fountains from where you drink. Sometimes they solidify them with lead and thus may cause problems.

-Arabic Kohol (الكُحْل) can be contaminated with lead. (some people use Kohol as a treatment injuries; for example they put it on the umbilicus of the baby the moment he has delivered to help recovering quickly, so it may go inside the body, but this has no relation with water; it is just to complete the picture for you.)

-Canned food. Some containers contain lead. (Again it is not for water)

Three major outbreaks have happened in Arab countries recently. In Nablus, Jerusalem, and Cairo. All of them in common eat bread and put wheat by using all technology from the Romanian empire where you have two huge stones and a handle moves them. To fit this handle inside the upper big stone they put lead around it. After several years of doing this, you cut part of it which would go in the bread of people.

-So lead is still a problem in the third world countries.

-Young people/children are the most ones in danger. Lead affects the brain and can cause low IQ; they lose their intelligence because they are exposed to lead.

THE END

GOOD LUCK

Done by: Bushra Maaqbeh