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Heavy Metals Residues in Fish Meat: Review

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Abstract

Metals with a high density are known as heavy metals in the food chain that has gradually accumulated. To sustain various physiological acts, certain metals (Fe, I, Co, Zn, Cu, Mn, Se) are essential and then are commonly added into animal feed as dietary additives. Metals such as (As, Cd, F, Pb, Hg) are not necessary have been connected with the most serious heavy metal risks to human health. Fish eating is recommended because fish is a simple and safe food and contains omega-3 fatty acids can protect from cardiovascular diseases. It may also contain unnecessary elements, such as heavy metals. However, there are certain toxic effects that may result from the high amounts of heavy metals. Some heavy metals, such as cadmium, lead, mercury is not vital to animals, and their concentration in the body over a long period of time may cause significant disease or death, also may be affect the human health. Both natural and human causes, such as industrial processes, chemical fertilizers, and pesticides used in agriculture, can lead to heavy metal poisoning of food. In addition to the rapid growth due to their nutritional values, the consumption of fish has increased worldwide. Since it accumulates, fish muscle absorbs significant quantities of heavy metals and then transfers by bioaccumulation and biomagnifications. That explains why fish are frequently employed as markers of heavy metal contamination in aquatic ecosystems. Many techniques have been used for the detection of heavy metal concentration the most used is the Atomic Absorption Spectrophotometer and inductively coupled plasma-mass spectrometry (ICP-OES). This review reveals the definition of heavy metals in fish and the effect of toxic metals on human health condition.

Keywords: risk, heavy metals, fish meat, human health.

Introduction

Meat, fish and meat components are essential in many areas of the world for human diets, as they help resolve the worldwide food issue and include the well-known nutrients such as protein, minerals, vitamins and trace element levels. There is increasing concern regarding the impact of anthropogenic emissions on environments. Heavy metals are continuously released to marine and terrestrial environments from sources of industrial emissions. Pollution by heavy metal is a big problem as for its poisonousness, accumulation in biological system and bio-enhancement in food process chains (Eisler, 1988). Attention has been concentrated on amounts of heavy metals in fish and foods to expose of danger that can theoretically affect human health. (Mansour and Sidky, 2002; Farkas et al., 2003; Moiseenko and Kudryavtseva, 2001). Fish is a vital and vital food for human survival (Abdel-Baki et al., 2011; Sioen et al., 2007). Because of their contribution to reducing blood cholesterol levels, fatty acids in fish can minimize the risk of heart issues and also include minerals and vitamins (Al-Busaidi et al., 2011).

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Deposition of heavy metals in seafood greatly affected on human health. Besides, fish is a very suitable bio indicator of heavy metal contaminations (Livingstone, 2003).

The pieces of fish from the gills, body surface, digestive tract, muscle and liver that suck up heavy metals (Bashir et al., 2012; Saha and Zaman, 2013). Mediums for storing, settling and depositing heavy metals may be the surface of the fish body that are contacted to the environment. In fish organs, primarily liver, gill, heart, spleen and bones are contained in the metal compounds or their ions. Not only can they damage gills and other fish organs by collecting in them, they can also kill fish or change the taste and scent of fish (Jalali and Agazadeh, 2007; Van-duijn, 2000). Multiple variables depend on the absorption of metals by food. Studies suggest that substantial absorption by fish of a metal takes place only when food metals surpass the minimum limit standard (Varedi, 1997). Heavy metals such as iron, cadmium, nickel and lead have been deposited within muscles except for zinc and copper with less ability to settle in tissue (Stoskope, 1993).

Day by day, waste is rising and we must be worried for our future climate. When we start to regulate our environment, we would be undermining it either intentionally, subconsciously or unintentionally. Environmental contamination is a universal concern because, as a consequence of their toxicity, aggregation and bio aggregation, the main contaminants are heavy metals in the aquatic network. Heavy metals contain a significant portion between pollutants. The heavy metal contaminations have dreadful effects on the environmental balance and a variety of aquatic entities (Afolabi et al., 2007). Industrial growth, followed by population growth and demand growth forced on natural resources by heavy pollution loads (Nasrabadi et al., 2009; Baghvand et al., 2010). The most prevalent environmental contaminants are trace elements, especially so-called heavy metals, and their appearance in waterways and biota indicates the existence of natural or anthropogenic sources (Nabi Bidhendi et al., 2007; Mehrdadi et al., 2009).

Metals, including iron, copper, zinc, and manganese, are important due to their value in biological processes, while mercury, lead, and cadmium are harmful as in trace quantities. At large concentrations, the basic metals can also cause toxic effects. In human consumption food, only certain metals with confirmed dangerous existence should be totally omitted. Thus, the rules of the European Union on toxic metals contained just three metals, mercury, cadmium and lead. (EC, 2001).

The aim of the present review article is to:

1- Determination and compare the quantities of heavy metals in edible parts compared with guidelines set down by FAO/WHO for the acceptable limits of fish intake, and for another research.
2- Heavy metals accumulated in fish bodies and have toxic effect so it's very important to understand which type of heavy metals are deposited in fish body and organs.

Sources of heavy metals pollution

Pollutants and toxic metals: Since rain washes contaminants from the environment to the land and these chemicals are mixed up in the soil by rain and irrigation water, almost any form of chemical generated on the earth towards rivers and seas, where fish and shellfish can be accumulated in their bodies and organs (Gautam *et al.*, 2014). Heavy metals, and chemical compounds (carbon containing), especially dioxins and polychlorinated biphenyls or PCBs are the most common potentially dangerous contaminants in fish. Heavy metals, for example, lead, mercury, cadmium, copper, bind with oxygen, then communicate messages to the nervous system and are considered to have been a source of human brain damage. Chemical contaminants in laboratory animals cause cancer, liver and hormone disruption and cause deposition of fat within the body. Salmon and trout in the Great Lakes have quantities of contaminants large enough that the government actively warns against consuming them. Too much mercury was detected in typical ocean fish, that the United States of Food and Drug Administration suggests that kids and pregnant women should not consume swordfish, dolphin, tilefish and royal mackerel and limited their total intake of fish to 12 ounces/335 g/week. Also, tuna, which is the best-known marine commodity in the US after shrimp, can only rarely be included in the list of fish best eaten. Mercury and other pollutants are less likely to accumulate in fish body and their organs, which are tiny, short-lived in open sea and farms with a well-ordered water supply (U.S. Department of Health and Human Services, 2004).

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Human activities like industrial development, mining, milling, and combustion of fossil fuels, as well as the use of agrochemicals that release a variety of dangerous heavy metals like arsenic, mercury, cadmium, copper, nickel, cobalt, zinc, and copper into agricultural soils and water bodies, are the main causes of environmental pollution from toxic metals and minerals. (Gupta *et al.*, 2019; Kumar *et al.*, 2019).

Even though heavy metals cannot be degraded, they are stored, assimilated, or introduced into water, sediment, and aquatic animals (Linnik and Zubenko, 2000)

The additional natural sources of heavy metals come from volcanic activity, solid waste runoff, and soil and rock erosion (Verma and Dwivedi, 2013).

Heavy metal and human health:

Assessing the degree of heavy metal content is very important in fish in order to ensure that it does not pose any danger to humans and to preserve concentrations below the acceptable level (Uysal et al., 2008). The maximum allowed concentration of heavy metals in foodstuffs has been defined by a range of regulatory bodies from different countries, for example the Organization of World Health, and Organization of Agriculture Food and the Union of European (Xue et al., 2012; Chary et al., 2008). Regarding to the Union of European, for example, the overall acceptable border for lead is 0.3 mg/kg in fish meat where mercury (Hg) and cadmium (Cd) have a wet weight of around 0.5-1.0 and 0.05-0.3mg/kg consequently, depending on the fish kind. Heavy metals are basically classified into two groups, important metals and non-important metals. Heavy metals for example mercury, lead and cadmium are known as non-essential metals and are hazardous and dangerous to organisms, particularly in limited levels, for a long time (Zheng et al., 2011). Manganese (Mn), copper (Cu) and nickel (Ni), however, are metals having important for human because of their major function in natural operation (Fernandes et al., 2008; Stern et al., 2007). Due to certain metals with both deficit and copper abundance, the dosage reaction curve for essential metals is in U shape letter, resulting in detrimental health problems. (Sternet al., 2007).

Cadmium (Cd), in most foods, occurs at low levels, in some food from plant and animal sources. The maximum Cd concentrations of metals are present in mammalian offal (kidney and liver) and mussels, oysters, and scallops (Thirulogachandar et al., 2014). Cd affects the reproduction of both men and women, impairs hormone synthesis/regulation and worsens the rate or outcome of pregnancy even at lower doses (Kumar and Sharma, 2019)

There are many undesirable effects of Cd exposure, especially targeting the kidneys, liver and vascular systems, on animal and human health. Bone effects, including increased risk of fractures and osteoporosis, are exposed to low Cd concentrations, and other effects accompanying Cd exposure can also be considered, particularly cancer(Thompson and Bannigan, 2008; Åkesson et al., 2014). A key cause of exposure to Cd is food chain (Saha and Zaman, 2013). It is generally known that Cd is an endocrine disrupting chemical and that it can lead to the development of human breast cancer and prostate cancer, Cd also induces kidney injury, hypertension, tumors, low fertility and decrease in liver performance (Rahman and Islam, 2010; Hao et al., 2013).

Manganese (Mn) is an element of low toxicity that has substantially biological importance due their ability to prevent cardiac arrest, heart attack, stroke and deficiency of Mn gave generation congenital malformations, growth defects and performance and decrease fertility (Goldhaber, 2003). However, it has been harmful and poisonous at large concentrations and can typically contribute to psychological and neurologic problems. (Saha and Zaman, 2013; Perl and Olanow, 2007).

Nickel (Ni) is normally an important metal which exists in the environment in very low amounts. Ni is found that may be reason for cancer (Salnikow and Kasprzak, 2005). Moreover, fibrosis, tumors, pneumonia and emphysema occur also caused by Ni (Forti et al., 2011).

Iron (Fe) deficiency results in fatigue, susceptibility and failure to concentrate and it is an essential mineral for every cell and vital for the development of hemoglobin (Hg), myoglobin (Mg) as well as certain enzymes. (Akoto et al., 2014). Anderson and Fitzgerald, 2010, researched the Fe deficiency in anemia such as malaria is one of the most prevalent nutritional deficiencies in the world. Due to decreased myoglobin content and poor circulatory function caused by anemia disease, muscles receive less oxygen and are less effective, which limits their endurance potential (Erdman et al., 2012).

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Chromium (Cr) in certain species of animal and humans is a vital trace element. Reduction in fat may occur by Cr and also improve lean body mass, however, relative to a well-balanced diet and exercise, their effects are negligible. (Tulasi and Rao 2014; Roussel et al., 2007) but it could have an adverse fatal impact in excess quantity, lack of Cr can disrupt the glucose, lipid and protein regulation growth and disruptions (Akoto et al., 2014). According to Stipanuk and Caudill, (2012) they found that 12 out of Fifteen experiments found a beneficial effect on the association between Cr and glucose tolerance deficiency based on a meat analysis.

Zinc (Zn) is a common trace element that is also one of the essential elements that humans and plants need. In addition to serving as a cofactor for more than 300 enzymes, zinc is crucial for the structural stabilization of a significant amount of protein in metabolites of deoxyribonucleic acid DNA and ribonucleic acid RNA (Chasapis et al., 2012). When exceeding amounts are present, Zinc is becoming hazardous, a several disorders are caused by deficiency of Zn (Krishna et al.,2014)

Copper (Cu) is an important enzyme metal required for the synthesis of hemoglobin (Sivaperumal et al., 2007). Impaired Cu transmission can result in reduced function of the cuproenzyme, System of vascular, skeletal, Anaemia, neutropenia and osteoporosis (Failla et al., 2001). Impaired the metabolism of Cu will cause two genetic disorders, Mense disease and Wilson's illness, Accumulation of Cu, a fatal condition, may lead to Mense disease (Gu et al., 2002). Additionally, excessive use of copper may result in mortality and kidney damage (U.S. Department of Health and Human Services, 2004).

Besides,

Mercury (Hg) is a non-essential element, and as fish get bigger, its levels rise (Burger and Gochfeld, 2012) Fish organs can become damaged by mercury poisoning (Krishna et al., 2014).

The most toxic heavy metal present in the aquatic environment is Hg. Hg is gaining special attention in the world due to its volatility, mobility and strong tendency to bioaccumulate. Mercury was ingested from fish in humans and processed into the gastrointestinal tract and then transferred to the blood. The key target organs for Hg toxicity are the kidneys and brain(Bridges and Zalups, 2010).

Although Hg impacts on cell protection and energy production, in many organ systems it can cause significant toxicity and symptoms for example, changes in personality, convulsions, impaired memory, loss of balance, such as the nervous system. Cardiovascular system, such as elevated risk of arterial absorption, hypertension, stroke, heart attack, atherosclerosis, Hg also affect gastrointestinal tract causing nausea, diarrhea, ulceration, and may cause kidney failure (Galanis et al., 2009).

Hg is regarded as a carcinogen because in humans, its toxicity can cause the growth of the fetus to be damaged, Although, Vettori et al. (2003) studied to see whether adult brain damage from Hg poisoning includes discrete visual cortical area damage and granule layer neuronal loss in the cerebellum.

Further**, lead (Pb)** is a occurs naturally and manufactured element that is highly toxic to humans, particularly children, children are the most susceptible to Pb since the fetal brain has a higher vulnerability to the harmful effects of Pb relative to the mature brain because of less successful renal excretion and greater gastrointestinal absorption (Koyashiki et al., 2010). Umar et al. (2001), indicated that the signs cramps of intestinal, anaemia and weakness induced by Pb toxicity have been reported. Nephrotoxicity and neurotoxicity can also be caused by Pb (García, et al., 2010), Pb, with trace amounts occurring in soil, water, and plants, a natural component of the earth's crust is Pb. Air, food, and water pollution may provide environmental sources of Pb. Pb fuel and paints are considered to be the key sources of environmental lead emissions (Meyer et al., 2003). Pb poisoning is a significant environmental disease and is wiping out its effects on the human body. In human body, there is almost no feature which is not impaired by Pb poisoning.

Pb has ideal physicochemical characteristics that make it suitable for a wide range of industries for which historical times have benefited people and that is why it has become a common environmental pollution. The digestive system, neurological system, respiratory system, reproductive system, etc. are all affected by Pb toxicity. Additionally, Pb stops enzymes also interrupts the natural process of transcription of DNA and causes disability in bones (Ara and Usmani, 2015).

Nowadays, **Arsenic (As)** is a powerful toxin and carcinogen that is widely distributed in nature as a result of both natural and artificial processes. It also has the ability to wipe out ecological communities (Sadiq et al., 2003) The toxicity of As is based on speciation and the highest toxicity is trivalent as III. Mono- and dimethyl-arsenics have low toxicity, according to ATSDR (Agency for Hazardous Substances and Disease Registry, 2004).

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Techniques or Apparatus that used for heavy metal detection

For their work, the majority of researchers used the Atomic Absorption Spectrometer because atomic absorption spectrometer is now a well-established and commonly used technique in a broad range of analytical forms for the determination of trace and major elements such as Cadmium, Mercury, Nickel, Copper, and Zinc.

Over the last decade, and for this purpose and to satisfy the demand, there have been many developments in the atomic spectrometer. With the work of Kirchhoff and Bunsen in 1860, spectrochemical analysis emerged, but saw very little use until the 1930s. Of course, each technique has its benefit and drawback, high sample throughput, simple to use, high accuracy, and Inexpensive technique are the most advantage. Only solutions can be studied with this method, it has lower sensitivity than a graphite furnace, requires relatively large sample sizes (1-3 ml), and has issues with refractory materials (Lindon et al., 2016). Alturiqi and Albedair, (2012); Atobatele and Olutona, (2015); Aziz and Rasheed, (2017); Salam et al., (2019); Aakre et al., (2020); Di Bella et al., (2020) they all are used Atomic Absorption Spectrometer.

While Almashhadany et al. (2020)has using the instrument for determining the number of critical elements and non-essential elements with inductively coupled plasma optical emission spectrometry (ICP-OES).

The key analytical advantages of Inductively Coupled Plasma ICP over other sources of excitation derive from its ability to vaporize, atomize, excite, and ionize a wide variety of elements in different sample matrices efficiently and reproducibly. The ICP is also less noisy and capable of handling liquid samples better. Also, the ICP is much less of a source electrode, so there is no contamination from the impurities in an electrode material. Also, creating an ICP assembly is relatively simple, and compared to other sources, it is cheap (Wang and Cazes, 2004)

To assess the metals, present in the tissue sample qualitatively and quantitatively, X-ray fluorescence (XRF) was used. X-Ray fluorescence (XRF) is a quick, economical, and non-destructive analytical method for the analysis of a variety of hazardous materials and environmental samples. It can be used at the same time to classify up to 30 elements (Ahmed, 2020). Another research by Djedjibegovic et al. (2020) for the detected cadmium, mercury, and lead levels in the adult population of fish and seafood products in Bosnia and Herzegovina

. They use Graphite furnace atomic absorption spectrometry (GFAAS) for cadmium and lead detection and FIAS AAS (flow injection cold vapor atomic absorption spectrometry) for mercury analysis.

Concentration of heavy metals in fish parts:

In study of Khidhir (2022), to evaluate the levels of the heavy metals Cu, Cd, Pb, and Zn in the gills, liver, and muscles of the Kattan (*Luciobarbus xanthopterus*) and Xashni (*Planiliza abu*), as well as to evaluate any potential dangers to human health. Metal occurrences often occurred in the following order: Cu> Zn> Cd> Pb. According to the locations, the ranked order for Cu and Cd was Tharthar>Al Uzym>Tigris, while Zn was Tigris>Al Uzym>Tharthar. The concentration in tissue was rated in the following order: liver>gill>muscle for Cu and Cd, gill>liver>muscle for Pb, and muscle>liver>gill for Zn. Cu and Pb concentrations in the fish species were ranked Kattan > Xashni. The results of the comparison of Cd and Zn between the two species likewise suggested that there are no health hazards associated with eating fish meat. The results of this investigation showed that heavy metals bioaccumulation was unevenly distributed across fish species, tissue types, and habitats, with no discernible consequences on human heal. Study of Almashhadany *et al.* (2020) on various fish samples obtained from local markets in the city of Erbil to evaluate heavy metal levels (Cd, Cr, Co, Cu, Ni, Se, Pb, Hg, Mn and Zn. The concentrations were 0.03, 0.02, 0.07, 0.10, 0.03, and 2.90mg/kg for Co, Cr, Cu, Mn, Ni, and Zn, in order. In any sample, Cd, on the other hand, was not detected, whereas lead was only found in one sample. Hg was detected and ranged in all samples from (0.05 to 0.30 mg/kg), and found that consumption of such fish has no possible risks to humans based on detectable levels of targeted heavy metals. They also reported that the highest metal content was found in Dukan type samples. The mean heavy metal load of Dukan fish (9.15 mg/kg) is approximately 3 times higher than the observed load of Daquq fish (3.6 mg/kg).

Furthermore, Ahmed (2020)had studied the heavy metals accumulation (Cu, Zn, Cr, Ni, Hg, Pb, and Cd) in the muscles of common carp (*Cyprinus carpio*) with the mean concentration (Cr 11.42, Ni 2.75, Hg1.53, Pb 1.93, and Cd 4.42 mg/ kg dry weight) Furthermore the research suggests that heavy metals may contaminate the groundwater in the Khor al- Zubair area of Basrah Province, Iraq, and that the examined fish muscle tissue was not fit for human consumption. In research conducted by Aakre *et al.* (2020) for Fe, Cu, Zn, Pb, Cd, Cr, and Mn concentrations in water, sediment, and fish samples from the Ureje water reservoir, the higher levels of Zn (13.08mg/g) and Fe (2.10mg/g) relative to other heavy metals examined were found in fish samples. Cr reached the toxicity level in fish muscles in compliance with World Health Organization's (WHO) food requirements, while other metals in water, except for Fe (1.25) mg/L, were below the acceptable water limit concerning the WHO guidelines, also found that the outcome of his research suggests that the water is safe for both aquatic life and man.

In another study, Salam *et al.* (2019)studied the accumulation of heavy metals (Zn, Cu, Fe, Cd, and Pb) on four widely eaten fish (*Euthynnus affine*, *Pampus argenteus*, *Decanters macrosomia*, and *Leiognathus Daura*), prawn (*Fenneropenaeus indicus*) and crab (*Portunus pelagicus*) from Tok Bali Port, Kelantan in Malaysia, They found that the concentration of heavy metals in the gill was the highest of all fish species followed by in the liver and flesh. This result was different from Atobatele and Olutona (2015) in that the distribution of trace metal in the kidneys and liver was found to be substantially higher for all fish species studied compared to gill, intestine, and muscle.

A study by Kimáková *et al.* (2018) they found that the highest Hg concentration was found in the muscle of fish (*Leuciscus aspius*),the Hg concentration (6.552 mg.kg-1) in the muscle exceeded the maximum amount of Hg admitted to food in European countries by more than 13 times, according to the results of the research, for selected population groups: infants, women of childbearing age, pregnant women, and nursing mothers, the consumption of fish, in particular seafood (meat of sharks, swordfish, and king mackerel), is not recommended.

Aziz and Rasheed (2017) discovered that the Cu concentration in fish muscle differs with the season, the maximum value recorded in *Barbus. grypus* during winter while the minimum value was found in the same fish during summer.

In research conducted by Aakre *et al.* (2020) for Fe, Cu, Zn, Pb, Cd, Cr, and Mn concentrations in water, sediment, and fish samples from the Ureje water reservoir, the higher levels of Zn (13.08mg/g) and Fe (2.10mg/g) relative to other heavy metals examined were found in fish samples. Cr reached the toxicity level in fish muscles in compliance with World Health Organization's (WHO) food requirements, while other metals in water, except for Fe (1.25) mg/L, were below the acceptable water limit concerning the WHO guidelines.

The findings of Mohamed et al. (2018) showed that in the analyzed muscle samples of wild Nile tilapia, the mean value of total Hg concentration was 0.73 mg/kg in small fish, while the mean value of total Hg concentration in large size fish samples was1.18 mg/kg.

Dehghani (2017)conducted an analysis to define the concentration of heavy metals (Pb, Cd, Cr, Zn, Co, and Cu) in eight Iranian and Khur-e Khuran International Wetland commercial fishes, In result, the findings show that the calculated values of most heavy metals in some of the KIW fish examined were higher than the maximum permissible limit , as specified by international standards, and that the high concentrations of some metals in several of the fish examined were due to residential and industrial activities on the adjacent shore, i.e. on the mainland and Qeshm Island, and marine traffic.

Adebayo, (2017) revealed that heavy metal concentrations in various parts of the adult *Hemichromis fasciatus* fish from the Ureje dam. Concentrations of Fe,Cu, before Zn is taken under cool temperature for further study of the Atomic Adsorption Spectrophotometer (AAS). In addition, the concentrations of Mn, Zn, Pb, Cd, and Cr in the muscles, head, eye, tail and gills of the fish samples were calculated. While there was no substantial variation in metal content in each section of the fish for each metal but the findings revealed higher amounts of Zn (13.08mg/g) and Fe (2.10 mg/g) in contrast with other heavy metals tested.

Marzouk et al. (2016) published a similar finding that the mean Pb concentration was 0.25 ppm. The average Cd level was 0.05 mg/kg in a small fish in farmed Nile, whereas the average value in large fish samples evaluated was 0.08 mg/kg. This result like that obtained by Marzouk et al., (2016) who cited that Cd concentration ranged from 0.0466 to 0, 0686 ppm. Results reveal that tilapia samples obtained from the canals and markets of Menoufia Nile have certain heavy metal residues different from Hg, Cd and Pb in high values exceeding the safe Egyptian permissible limits for human consumption. The examined wild tilapia samples contained higher Hg, Pb and Cd than those of farm tilapia. The result proved that the large size wild and farmed tilapia samples have high residues of Hg, Pb and Cd than

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those of small size tilapia samples. It is imperative that, in order to regulate heavy metal contaminants in fish and to ensure the welfare of customers, a surveillance scheme should be placed in place to resolve these issues. The mean value of Cd concentration in the examined muscle samples of wild Nile tilapia was 0.10 mg/kg in small size fish, while it was 0.15 mg/kg in large size fish. In addition, the results revealed a distinction between the concentrations of heavy metals studied in the spleen, liver and muscle tissues, and that reported by Taweel et al. (2013).

Joy et al. (2013) noted that the concentrations of heavy metals in gills of fish and muscle there were no significant ($p>0.05$) variations between Pb, Zn and Cd in the muscles of the 5 types of fish. Pb means (milligram/gram) were 35.27, 76.07, 23.16, 37.80, 42.15, and 22.72 consequently, for *Liza falcipinis*, *Citharinus citharus*, *Polydactylus quadrifilis*, *Brycinus macrolepidotus*, Tilapia zilli and samples of control. Cr is not present in *B. macrolepidotus* Although the mean concentration levels observed in *L falcipinis* and *C citharus* were 1.60 milligram/gram and 0.48 milligram/gram respectively, *B. macrolepidotus, P quadrifilis and T zilli*. In the gills of the fish species, the pattern of heavy metal deposition was slightly different from the muscles. The amount of Pb, Zn and Cd reported in the 5 fish type's gills showed a very substantial difference. The highest Pb and Cd concentrations were registered in species of *B. macrolepidotus* 47.80 and 5.35 milligram/gram And *Liza falcipinis* has been reported with lowest concentrations 29.92 and 2.38 milligram/gram. The greatest proportion of Zn (140.76 milligram/gram) are recorded in L falcipinis and the lower in gills of *C. citharus* (61.23 milligram/gram), in contrast to the concentration in the other animals, the Cr values found in *B macrolepidot* is significantly different (7.80 milligram/gram). In all five fish species, Zn concentrations were maximum in both gills and muscle when contrasting the patterns found in the muscles and gills of fish, accompanied by Pb amounts. In the fish's exposed, Cr and Cd ratios were considerably smaller. In muscles of 5 species of fish included herein analysis there was no major effect in Pb concentrations; the concentrations of *Citharinus citharus* were approximately twice that of Pb. Also, this level was almost fifty times higher when compared with allowable maximum of 1.5 ppm, prescribed norm being FAO/WHO (1984). In addition, variations were noticed in the capacity of different fish species to deposit Pb. While the value was 15.3 times greater than the allowable maximum, Tilapia had the lowest Pb concentration.

In their study site of major industrial and urban cities (Tabouk, Riyadh, Damamm, and Jazan) in the Kingdom of Saudi Arabia Alturiqi and Albedair (2012) found the highest concentration of Pb, Cd, Fe, Mn, and Zn were detected in sardines caught in the eastern district.

Khidhir (2011) has studied on the farmed fish and wild captured fish in Sulaimani city markets for the concentration of Cd and Hg and he found the differences in Hg and Cd between farmed and wild captured fish is indicated, without any doubt, that the natural water sources at which the tested fish were hunted are contaminated with heavy metal, the obtained results were comparatively lower than that obtained by Hussien et al. (2011), who reported that mean concentration was1.87 mg/kg. In the analyzed muscle samples of farmed Nile tilapia, the mean value of total Hg content was 0.45 mg/kg in small-sized fish, whereas the mean value of total Hg level in large-sized fish samples was 0.94 mg/kg.

Conclusion

Because heavy metal contamination can harm both humans and animals and is prone to bioaccumulation in the food chain, it is currently regarded as one of the worst issues in the world. Although there are many various sources of heavy metals in the globe, exposure to Hg, Cd, Pb, and as has been associated with the greatest risks to human health from heavy metals. Through eating, they get into the human body. Fish are a source of heavy metal pollution for humans and can show how harmful the environment's heavy metals are. Know a day that the world's consumption of fish has expanded along with quickly rising due to their nutritional and medicinal benefits.

Since heavy metal contamination is an international hazard, governments, scientists, and communities need collaborative efforts to do so. Both source control and pollution remediation require governmental regulations. In this region, while the consumption of fish is increased among the family much more attention to the case of heavy metal contamination of this product is necessary and considerable actions by the government must be taken by continuous observation of the farms of growing fish such as how much pesticide and other chemical material that used in this area and what is the water source if it is contaminated or near the industrial area or other human activity, another point is that the continuous

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inspection of fish that enter the market this point is can be obtained by providing the facility to the governmental laboratories.
In summary, this review was done to obtain knowledge on heavy metal level of flesh and their organs in fish meat. However, detect the amount or concentration of As, Cu, Pb, Hg, Fe, Mn, Cd, Cr, Ni and Zn and comparison with maximum permissible limits of heavy metal from FAO/WHO, for acceptable limits of fish intake. However, the effect of heavy metal accumulation on fish and then on human health.

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