

ANALYSIS OF ARSENIC IN TISSUES OF BROILER CHICKEN ITS ASSOCIATED POULTRY FEED BY KIT METHOD

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Abstract

The research conducted is a full analysis of arsenic contamination in broiler chickens on different organs and environmental sources in poultry farms based in Khairpur, Pakistan. The collection of laboratory samples and chemical analyses from gizzards, muscles, livers, and hearts of chickens, as well as feed and groundwater, from five separate poultry farms, clarify the difference in the levels of arsenic and distribution of the chemical. Analysis by standard analytical approaches, such as the one in the Arsenic Kit Method and Quality Control checking using National Institute of Standards and Technology standards, helps to establish the distribution and concentration of arsenic. Therefore, this study outlines the existence of arsenic in the broiler production environment and the political consequence on food security and public health in the animal husbandry system.

Introduction

The Broiler chicken (*Gallus gallus domesticus*) is raised and bred particularly for production of meat (Kruchten, Tom 2013). Most of the commercially farmed broilers reach to ideal slaughter weight in four to seven weeks (BESSEI, W. 2006), although the slow growing breeds of the bird reach to ideal slaughter weight in 14 weeks approximately. Typically, broiler chicken has white colored feathers and yellowish colored skin. It is also known as broiler-fryer sometimes specially to young chicks under 2.0 kilograms compared to the large roasters (Gerrard, Gene 2019). In Pakistan commercially poultry established in 1962. Now it has been become one

of the largest segments of Pakistan, it is having an investment greater than 750 billion rupees. This Industry is making a remarkable contribution in associating the gap between the supply and demand of protein in form of meat. The poultry industry of Pakistan can be considered one of the most valuable sectors as it offers a convenient and affordable source of animal protein while having a significant influence on the economic development of rural areas. It is the most affordable source of protein among the general population since cheap and constant poultry meat supply is crucial for a country where lack of affordability of food is one of the major problems. However, the affordability and

excessive availability of poultry meat can result in improper dieting where the population might not consume the recommended amount of protein from several various sources which might result in certain nutritional aggregational deficiencies (Dr. Noor Ahmed Memon, 2010). The poultry industry is also a major economic factor as more than 1.5 million people are occupied directly or indirectly in the particular sector. It is the primary or secondary income source for many households, especially those of small farmers, as poultry farming is more reliable and immediately paid in opposed to seasonal and volatile agricultural operations. Therefore, it is a primary factor in ensuring financial stability and reducing the level of poverty within rural populations. In addition, there is a wide array of job opportunities created by the industry, ranging from poultry farmers to multiple attached services such as feed producers, logistics, marketing, and veterinary services. The revealed multi-factor influence on the local economy and community development makes poultry farming specifically important. Thus, the poultry industry plays a major role in solving nutritional problems and drives economic development in Pakistan, making the industry one of the major objects for sustainable development strategy (Eton Ec, 2008).

In addition to its direct economic impact, the poultry industry influences other aspects of rural development in Pakistan. For example, due to consistent employment and stable income provided by the industry, the rural-to-urban migration is contained. As a result, families remain together, with the social fabric of rural communities sustained. This is particularly important in the areas where employment opportunities can be limited and temporary, the situation that can be observed in traditional agricultural economies that depends on weather conditions and changing market prices. Secondly, the development of the poultry industry opens entrepreneurial opportunities for the local population (Gerrard, 2019). This includes a wide range of opportunities that an individual can seize to start their own business related to the poultry supply chain, ranging from small-scale backyard poultry breeding to large integrated facilities that employ advanced breeding technologies and have their own feed

mills and processing plants (Kruchten, 2012). This diversification of the rural economy promotes technological advancement and skill development in the rural workforce. Finally, the industry supports local economies by boosting the demand for the ancillary goods and services that it requires. This includes the grain markets, for example, as most poultry feed is based on corn and soy. This increases grain prices and markets security for the grain farmers, building a symbiotic relationship between different agriculture sectors. Lastly, the poultry industry is consumer-oriented, with affordable poultry meat and eggs entering the local diet. This is important for improving the quality and composition of the people's diet, as poultry meat is rich in high-quality protein, which also contains a lot of essential vitamins and minerals.

In conclusion, the poultry industry in Pakistan is not merely an economic sector but a catalyst of rural development, economic progress and security, and nutritional welfare. It plays a pivotal role in multiple dimensions of economic diversifications, technological progress, nutritional effects, and social cohesion that confirms its vital contribution to the country's sustainability (Aryar A *et.al.*, 2009).

MATERIALS AND METHODS

3.1 Description of the Study Area

Khairpur is a big district (length) of the province of the Sindh it is placed in Sukkur Division. In the census (2017), it was placed at 5th most occupied district in province of Sindh after 4 districts which belongs to the Karachi, it contains 2.4 million residents. It is the HQ of the district Khairpur. It consists of eight Taluka, it is the one of the cleanest City of the Sindh province, it is infamous due to its date palm trees.

3.2 Sample collections

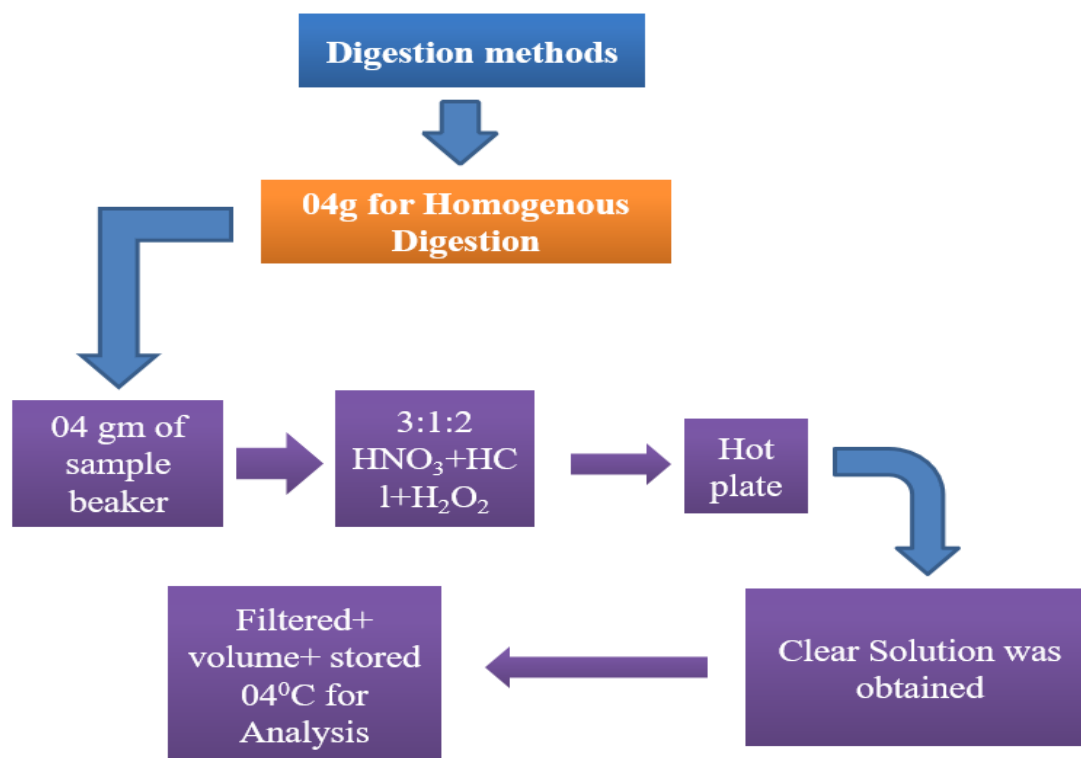
Healthy mature samples of broiler chicken with the range of 1 kg to 1.5 kg weight and age having 6 to 8 weeks were bought from the Poultry farms of the Khairpur City and its surrounding during the year 2019 (Fig. 3.1). Each chicken was slaughtered by professional slaughter and all organs were dissected individually to collecting various organs gizzard, muscle, liver and heart after transportation the samples were brought to laboratory of the Institute of Chemistry.

Each part was individually washed with the de-ionized water and was dried by help of filter paper. Dried samples were kept in refrigerator at -4°C until for further treatment.

3.3 Method

Homogenous digestive method was used for the digestion of samples taken from chicken followed by acids H_2O_2 , HCl and HNO_3 along with the

ratio 2:1:3 (Fig. 3.2 and Fig 3.3). On hot plate after 01 h the samples were heated slightly until a clear solution obtained then samples were filtered with the whatman #42 filter paper (Fig. 3.4). The analysis was done followed by using the standard Arsenic Kit Method (Fig. 3.5). De-ionized water obtained was obtained and was used throughout the work.



3.3.1 Stock standard solution (1000 mg/L)

1.320 g of the arsenic trioxide (As_2O_3) were taken in water along with the 100 ml of 4 g of NaOH solution. Then it was acidified by addition of 20 ml of conc. nitric acid HNO_3 then that was diluted up to 1 L.

3.3.2 Primary dilution standard (01 mg/L)

1.0 ml of Stock sol. of arsenic was taken out using Pipette into 1000 ml flask and it was stirred with water which consist of 1.5 ml concentrated $\text{HNO}_3 \text{ L}^{-1}$.

3.3.3 Standard arsenic solution (01 $\mu\text{g/L}$)

1.0 ml from prim. Diluted standard solution of arsenic was taken out using Pipette into 1000 ml flask and was stirred with water consisting of 1.5

ml concentrated $\text{HNO}_3 \text{ L}^{-1}$ (1ml means 0.01 $\mu\text{g As}$).

3.4 Quality control

Accuracy and Precision of the analysis was observed using available Standards Reference Materials (SRM) recommended by the National Institute of Standards and Technology (NIST) along with certified concentration of arsenic. Each batch of 15 samples SRM solution and blank solution was digested. There was a good confirmation between the results obtained in the SRM and through reference values, that was signified a great analytical performance.

3.5 Statistical analyses:

The basic knowledge of broiler chicken was collected as per its age, the water source and the

usage of feed. Multiple analytical recessions, concepts of extension of logical regressions were utilized for letting multiple responses towards discovery and the effect on the depending on variables of the illustrative variables.

3.6 VALIDATION OF THE METHOD TO CHECK THE ACCURACY

Solution of 1000 ppm a certified Arsenic standard (H_3AsO_4 in HNO_3) was bought from the brand Merck Company, it was utilized for the confirmation of the analytical method. A blank of 10 ppb of standard Arsenic solution was used to make up the calibration graph (Fig 3.6), in each batch of 10 samples, it was used to tested validation the analysis. The relative errors between standard Merck arsenic and calculated solutions of the present study were not more than 5%.

RESULTS AND DISCUSSION

To quantify the level of the arsenic present in various specimens of broiler chicken like as gizzard, muscles, liver and heart obtained from the surroundings of different poultry farms of Khairpur city, the samples were analyzed and following results were obtained. Total samples were analyzed and categorize in five poultry farms, so this chapter shows the result of the

present study along with different specimen of broiler chicken.

4.1 Result of Arsenic Level in Gizzard of Different Poultry Farms

The maximum level of arsenic in gizzard of chicken in poultry farm 1 was observed as 24 $\mu g/Kg$ which was coded as PaG1 its standard deviation (STDEV) 01 and %RSTD 4.2, while minimum level of arsenic in gizzard of chicken was found in sample PaG3 as 8.7 $\mu g/Kg$, standard deviation (STDEV) and %RSTD was 0.6 and 6.7 respectively. The remaining samples i.e., PaG4 and PaG2 showed 9.3 $\mu g/Kg$ and 11 $\mu g/Kg$ along with standard deviation (STDEV) 0.6 and 01, and %RSTD 6.2 and 9.1 respectively (Table 6.1). Gizzard of broiler chicken from poultry farm 2, the high value of Arsenic was 15 $\mu g/Kg$ in sample No.3 and low value was 9 $\mu g/Kg$ in sample No.3. The value of %RSTD in sample No.3 was 9.4 similarly %RSTD in sample No.1 was also same, its arsenic level was 11 $\mu g/Kg$ (Table 4.8). Samples which were Analyzed from poultry farm No. 3 showed that the Arsenic in gizzard was greater in sample PcG3 and PcG4 as 26 $\mu g/Kg$ their STDEV and %RSTD was 1-1 and 4.0-4.0 too while arsenic in sample 1 and 2 was 11 $\mu g/Kg$ and 15 $\mu g/Kg$ coincidently the STDEV in farm No. 3 was same i.e., 1.0 (Table 4.15).

TABLE 4.1. LEVEL OF ARSENIC IN GIZZARD OF BROILER CHICKEN OF POULTRYFARM NO. 1

Sr. No.	CODE	($\mu g/Kg$)	STDEV	% RSTD
01.	PaG1	24	01	4.2
02.	PaG2	11	01	9.1
03.	PaG3	8.7	0.6	6.7
04.	PaG4	9.3	0.6	6.2

As in Farm No. 4 was proved to be highest in two samples, sample no. 2 and 3 with the concentration of 17 $\mu g/Kg$ as for as value of STDEV is concerned was 2.0 in sample no.2 and 1.0 in sample no. 3 while lowest concentration was in sample 1 PdG2 with the value of 10 $\mu g/Kg$ (Table 4.22). Gizzard of farm no. 5 gave the result in broiler chicken as the highest arsenic content in sample PeG4 27 $\mu g/Kg$ and least as 10 $\mu g/Kg$ in sample PeG2, remaining samples showed arsenic content as 22 $\mu g/Kg$ and 25 sample no. 1 and 3 respectively (Table 4.29).

4.2 Result of Arsenic Level in Muscles of Different Poultry Farms

Muscles of farm no. 1 gave the maximum content of arsenic in sample no. 4 (PaM4) with the concentration of 9.3 $\mu g/Kg$ and sample no. 1 and 3 both gave minimum content of arsenic with the concentration of 5.3 $\mu g/Kg$, all four samples gave same value of STDEV as 0.6 while %RSTD in sample no. 1, 2, 3 and four found to be 6.8, 6.7, 7.8 and 6.2 respectively (Table 4.2). In farm 2 maximum level was 16 $\mu g/Kg$ in PbM1 and minimum level was 10 $\mu g/Kg$ in remaining all

three samples i.e., PbM2, PbM3 and PbM4 (Table 4.9). The arsenic concentration in muscles of farm no. 3 was 17 µg/Kg in sample no. 2 PcM2 as highest and 6 µg/Kg in sample no. 4 PcM4 as

lowest, while their STDEV value were 1.0 and 0.6, and %RSTD was recorded as 6.3 and 9.1 (Table 4.16).

TABLE 4.2. LEVEL OF ARSENIC IN MUSCLES OF BROILER CHICKEN OF POULTRYFARM No. 1

Sr. No.	CODE	(µg/Kg)	STDEV	% RSTD
01.	PaM1	5.3	0.6	6.8
02.	PaM2	8.7	0.6	6.7
03.	PaM3	5.3	0.6	7.8
04.	PaM4	9.3	0.6	6.2

4.3 Result of Arsenic Level in Liver of Different Poultry Farms

Highest level of Arsenic in liver of broiler chicken of poultry farm 1 which was coded as PaL3 was 65 µg/Kg, it has standard deviation (STDEV) 2.0 and sample coded as PaL2 showed arsenic level as 48 µg/Kg which found to be minimum. In poultry Farm No.1 Minimum value of STDEV was observed 1.0 in sample no. 4 and maximum 2.5 in sample no. 2. The %RSTD in sample coded as PaL1, PaL2, PaL3 and PaL4 was 3.3, 5.3, 3.1 and 1.8 respectively (Table 4.3). Samples of study Area which were collected from the poultry farm no.2 shows the result of level of Arsenic in liver of broiler chicken with the minimum value of concentration 30 µg/Kg in samples 3 and 4 with the code PbL3 and PbL4 and with the maximum value of concentration 40 µg/Kg in sample 1 with the code PbL1, while in sample 2 with the code PbL2 the concentration was 35 µg/Kg (Table 4.10)

Level of Arsenic in liver of broiler chicken of poultry farm 3 provided the high concentration in PcL2 and low concentration in PcL3 60 µg/Kg and 31 µg/Kg respectively, while samples PcL1 and PcL4 provided 50 µg/Kg and 35 µg/Kg of arsenic level in the liver of broiler chicken (Table 4.17). Liver of broiler chicken poultry farm 4 gave the low value of Arsenic in PdL2 with value 25 µg/Kg and high value in PdL3 with the value of 50 µg/Kg (Table 4.24). Samples of study Area which were collected from the poultry farm No.5 shows the result of level of Arsenic in liver of broiler chicken with the maximum value of 52 µg/Kg along with STDEV 2.6 and %RSTD 5.3 and with the minimum value of 25 µg/Kg along with STDEV 1.0 and %RSTD 4.0 respectively in samples PeL2 and PeL1, while PeL3 and PeL4 showed 50 µg/Kg and 47 µg/Kg arsenic content, 6.4 and 2.5 STDEV and 6.0 and 3.0 %RSTD (Table 4.31).

TABLE 4.3. LEVEL OF ARSENIC IN LIVER OF BROILER CHICKEN OF POULTRYFARM No. 1

Sr. No.	CODE	(µg/Kg)	STDEV	% RSTD
01.	PaL1	60	2.0	3.3
02.	PaL2	48	2.5	5.3
03.	PaL3	65	2.0	3.1
04.	PaL4	55	1.0	1.8

4.4 Result of Arsenic Level in Heart of Different Poultry Farms

The farm no. 1 of study area revealed that the content of arsenic in the heart of chicken was highest in sample no. 1 coded PaH1 with value of 48 µg/Kg with STDEV of 2.1 and %RSTD of

4.4 and lowest in sample no. 3 coded PaH3 with the value of 22 µg/Kg and its STDEV was 1.5 and %RSTD was 7.1, remaining samples sample no. 2 and 4 showed little resemblance with sample 3 with the value of 24 µg/Kg and 28 µg/Kg respectively, while their STDEV and %RSTD

were calculated as 1.0-1.5 and 4.2-5.4 (Table 4.4). In farm 2 maximum and minimum concentration was in sample 1 and 3 with the values of 45 µg/Kg and 25 µg/Kg here also the remaining two sample 2 and 4 showed

resemblance with sample having minimum concentration, their concentration of arsenic was calculated as 30 µg/Kg and 26 µg/Kg (Table 4.11).

TABLE 4.4. LEVEL OF ARSENIC IN HEART OF BROILER CHICKEN OF POULTRYFARM No. 1

Sr. No.	CODE	(µg/Kg)	STDEV	% RSTD
01.	PaH1	48	2.1	4.4
02.	PaH2	24	1.0	4.2
03.	PaH3	22	1.5	7.1
04.	PaH4	28	1.5	5.4

During analysis of arsenic in samples of bird obtained from farm 3 the greater level was calculated in sample Pch2 40 µg/Kg and least level in sample Pch1 with STDEV 4.0 and 1.0 and %RSTD 6.2 and 4.0 (Table 4.18). Heart of chicken in farm 4 was with the maximum concentration of arsenic 40 µg/Kg in sample no. 2 PdH2 and with the minimum concentration of arsenic 23 µg/Kg in sample no. 1 PdH1, while concentration of sample no. 3 PdH3 and sample no. 4 PdH4 was same 25 µg/Kg (Table 4.25). Farm five gave highest and lowest amount of arsenic in sample PeH3 and PeH1 52 µg/Kg and 11 µg/Kg which showed the large difference, while remaining two sample PeH2 and PeH4 showed resemblance with the result which was with the highest concentration 29 µg/Kg and 40 µg/Kg respectively (Table 4.32).

4.5 Result of Arsenic Level in Groundwater Samples of Different Poultry Farms

To quantify the level of the arsenic present in various specimens of broiler chicken like as gizzard, muscles, liver and heart obtained from the surroundings of different poultry farms of Khairpur city, the groundwater samples were also collected. Present study shows the level of Arsenic in samples No.1 and 4 was maximum and minimum as 24 µg/L and 16 µg/L, while in samples No.2 and 3 the result was noted 23 µg/L, values of %RSTD is calculated as 04, 09, 07 and 06 in samples 1, 2, 3 and 4 respectively and STDEV 1, 2, 2 and 1 (Table 4.5). Level of Arsenic in groundwater of farm 2 of study area were collected and analyzed, the high value 30 µg/L with STDEV was noted as 2 and low value 12 µg/L with its STDEV 1.5 was observed in sample 1 and 4, similarly, the values of %RSTD was noted as 05 and 02. The arsenic in sample 2 and 3 was 25 µg/L and 22 µg/L (Table 4.12).

TABLE 4.5. LEVEL OF ARSENIC IN GROUNDWATER SAMPLES OF POULTRY FARM No.1

Sr. No.	CODE	(µg/L)	STDEV	%RSTD
01.	GaW1	24	01	04
02.	GaW2	23	02	09
03.	GaW3	23	02	07
04.	GaW4	16	01	06

4.6 Result of Arsenic Level in Feed Samples of Different Poultry Farms

In various farms of study area feed samples were also analyzed to detect the accurate result in samples of broiler chicken. In farm 1 FaF3

sample showed highest value 32 µg/Kg, its STDEV was 03 and FaF4 showed lowest value 22 µg/Kg, its STDEV was 02, as for as %RSTD is concerned the result shows 08 and 07 (Table 4.6). Level of arsenic in feed samples of broiler chicken

of poultry farm 2 found to be as 32 µg/Kg the highest in sample 3 and 22 µg/Kg the lowest in sample 4 (Table 4.13). In case of farm 3 sample with most arsenic content found to be in sample 3 as 32 µg/Kg and sample with least arsenic content found to be in sample 4 as 22 µg/Kg (Table 4.20).

Maximum value of arsenic in farm 4 was 32 µg/Kg in sample FdF3 and minimum was 22 µg/Kg in sample FdF4, the STDEV were found to be 3 and 2 and %RSTD 8 and 7 respectively, the arsenic in remaining samples was 25 µg/Kg and 28 µg/Kg with STDEV 1 and 2, and %RSTD 5 and 5 (Table 4.27). Feed samples of farm 5 showed maximum and minimum concentration as 32 µg/Kg and minimum 22 µg/Kg too in samples sample 3 and 4 (Table 4.34).

4.7 COMPARATIVE STUDY OF ARSENIC LEVEL IN WATER and FEED AMONG ALL POULTRYFARMS

Level of arsenic analyzed in ground water obtained from five farms were compared with each other, the highest concentration was found in sample 1 in farm no. 5 with the concentration of 60 µg/L and lowest concentration in sample 1,

2 and 4 of farm no. 3 and sample 4 of farm no. 4 with the concentration of 2 µg/L (Table 4.36). Arsenic in feed samples of different poultry farms, poultry farm no. 5 showed highest result of level of arsenic 32 µg/Kg, while low value was noted 22 µg/Kg in poultry farm no.1 (Table 4.37).

4.8 COMPARATIVE STUDY OF ARSENIC LEVEL IN DIFFERENT ORGANS AMONG ALL POULTRYFARMS

Comparative study of individual organs of broiler chicken in concentration of arsenic level in different poultry farm. As for as values of gizzard of broiler chicken concerned maximum average value was 19.5 µg/Kg in farm no.3 and 11.75 µg/Kg in farm no 2. On basis of present study muscles showed highest value poultry farm no.4 which is 12.75 µg/Kg and the low value was noted 7.15 µg/Kg in farm no.1. liver showed highest value of level of arsenic in farm no.01 which is 57 µg/Kg and low result was observed in poultry farm 5 that is 33.75 µg/Kg, heart showed highest values of level of arsenic in poultry farm no.05 which is 33 µg/Kg and poultry farm no.04 shows least value 28.25 µg/Kg (Table 4.38).

TABLE 4.6. LEVEL OF ARSENIC IN FEED SAMPLES OF POULTRY FARM No. 1

Sr. No.	CODE	(µg/Kg)	STDEV	%RSTD
01.	FaF1	25	01	04
02.	FaF2	28	02	05
03.	FaF3	32	03	08
04.	FaF4	22	02	07

TABLE 4.7. COMPARATIVE STUDY OF ARSENIC LEVEL AMONG DIFFERENT ORGANS OF POULTRY CHICKEN IN SAMPLES OF POULTRY FARM No. 1

GIZZARD	MUSCLES	LIVER	HEART
24	5.3	60	48
11	8.7	48	24
8.7	5.3	65	22
9.3	9.3	55	28

TABLE 4.8. LEVEL OF ARSENIC IN GIZZARD OF BROILER CHICKEN OF POULTRYFARM No. 2

Sr. No.	CODE	(µg/Kg)	STDEV	% RSTD
01.	PbG1	11	1.2	9.4
02.	PbG2	9	0.6	6.2
03.	PbG3	15	1.5	9.4
04.	PbG4	12	1.0	9.1

Discussion

The above discussions confirm the significance of the current study regarding the analysis of arsenic contamination in different broiler chicken production components throughout Khairpur, Sindh. The discussion then draws conclusions from the produced results and contrasts the results with known literature, followed by recommendations surrounding public health. They were compared with available literature and distributed to policyholders for implementation and poultry infrastructural development. Arsenic in broiler organs; different levels of the tissue section demonstrated there was arsenic, the liver consistently recording the most concentrated. These observations seem to concur with work done by Ghosh et al and Mondal, who theorized that there would be more arsenic in the liver since it plays a unique role in detoxification and metabolism. They reported high levels of arsenic in heart tissue, possibly attributed to the ample blood supply that helps move arsenic hence deposition. Different environmental sources of log arsenic; the results showed substantial amounts of arsenic in both feed and groundwater, illustrating similar findings to works of Van Geen and Zhao et al. Arsenic in feed appears when the components are contaminated or when it includes additives that attract Arsenic, as it has been historically admitted to facilitate growth and feed conversion in poultry. Variability among farms; the significant difference in Arsenic levels among the farms indicates more retained Information across other factors like water and feed sources. Farms with top recordings in groundwater and feed arsenic showed high levels of Arsenic in broilers organs dumping. It infers that direct vast environmental arsenic exposure results in bioaccumulation in broilers organs.

4. Implications for public health: The arsenic levels reported in this study can constitute a risk to consumers if consumed frequently due to the toxicological characteristics of arsenic, which include systemic and carcinogenic effects. Given the tendency of frequent chicken consumption and the likelihood for arsenic exposure to cause arsenicosis among other health conditions, it is a public health issue, especially since few communities have food safety awareness and assessment tools. **5) Policy and**

regulatory recommendations: This study recommends that the poultry industry be regulated more stringently concerning arsenic usage in feeds. For example, arsenic-based feed additives should be banned, as in some states in the United States and the entire European Union, and feed and water should be tested regularly for arsenic. Best practices in water quality should also be implemented. **6) Future research directions:** future study should focus on finding the sources of this arsenic in the feed and water quality supply chains, develop food safety methods that are cheap for use in farming to reduce arsenic, and innovate new feed additives. Additionally, long-term studies should be conducted to determine whether frequent low-level exposure of consumers to arsenic through the poultry feed can lead to better data on the long-term effect of arsenic exposure to poultry. In conclusion, this study indicates that arsenic contamination in poultry farms should be approached on a multi-sectoral level to eradicate the arsenic toxins from consumers down to the source to prevent further occurrences of these kinds of wicked problems.

5. Conclusion

The examination of arsenic levels in the broiler chicken and its environmental sources indicate high contamination of the tissues and farms. High levels of arsenic presented in the liver and heart tissue reveal the occurrence of arsenic food bio-accumulation that threatens human health. The high presence of arsenic in the feed and groundwater samples indicate that the environmental sources is a major factor contributing to the results. The results call for the immediate need to curb the situation of the arsenic in the poultry farming environment to mitigate the health problems presented. The examination highlights the need to enact stringent legal measures and safer practices in the poultry farm to prevent exposure. Future research is vital to investigate the most common exposure pathways in the poultry farm and the measures to curb the high exposure of arsenic in the food chain.

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