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Biochemical Analysis And Impact Of Chicken Consumption On Human Behavior

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Abstract

Poultry meat is an integral part of human diet due to its high protein content, amino acids, low cholesterol, unique flavor, and affordable price. The production of chicken carried out all over the world. In Pakistan, the poultry industry is a notable and dynamic part of agricultural industry. The purpose of this study was to assess the effect of chicken consumption in people attending University of Okara. The questionnaire was designed to collect the data of about 500 people. It was found that 34% males and 66% females contributed. People consuming desi and poultry chicken shows significant difference and (166.67 ± 119.30) while the frequency of chicken consumption was (125±92.1710). People consumed chicken showed their interest by buying through different sites (125±127.72). People feel energy changes after consumption and those who felt no change shows non-significance. Chicken consumption relation with social bonding and impact on habits show significant differences. The Biochemical analysis including Endocrinology test, Lipids profile, and Liver function of people show variation in both groups. To conclude, mostly people consume poultry chicken rather than desi due to availability. Chicken consumers show positive response according to effect on behavior, but reduced chicken consumption due to increased prices.

Keywords: Chicken, Gallus gallus, Consumption, Poultry, Desi, Behaviour, Health

INTRODUCTION

The domestic chicken, *Gallus gallus domesticus*, first originated in southwestern Asia. It was later introduced into China around 1400 B.C. [1]. Using phylogenetic analysis in molecular studies, it has been discovered that domestic chickens descended from red jungle fowl, whose predecessors descended from green jungle fowl (Gallus varius). The most widely consumed animal products internationally by a diverse range of cultures, customs, and faiths, poultry meat and eggs are vital to nutrition and food security. The

FAO estimates that about 106 million tons of chicken meat was produced worldwide in 2016 from over 66 billion slaughtered chickens, or roughly nine birds per person. In 2020, the poultry sector consumed more than 465 million tons of feed worldwide [2]. With the planet's growing population, understanding these consumption patterns is crucial for ensuring future food security [3]. Chicken production holds significant importance as a sub-sector of agriculture in Pakistan and serves as a cornerstone in rural economic development. The commercial chicken industry in Pakistan has exhibited robust growth, expanding at a rate of 8–10% annually over the past two decades. Chicken meat contributes significantly to the total meat production in Pakistan, accounting for 32.7% (2). Of this, 70% is produced in the Punjab province. Consumption of chicken meat in Pakistan is experiencing steady growth due to its affordability compared to other meats. In 2015, Pakistan ranked as the 11th largest chicken producer globally based on the number of birds produced. Additionally, its lower fat content appeals to health-conscious individuals, further driving its popularity. The current standing population of 1,560 million broilers and 60 million layers in Pakistan. Courtyard chicken farming (Free range) serves as a potent tool for poverty alleviation in rural areas by offering livelihood opportunities to resource-poor communities. There are more native chickens in rural regions than commercial layers and broilers [4]. With the global rise in demand for halal meat, which adheres to the prescribed method of slaughter under Islamic law, Pakistan stands poised to capitalize on this trend by expanding its halal chicken meat exports worldwide. Consequently, poultry not only serves as a source of nutrition but also serves as a vehicle for the expression and perpetuation of socio-cultural norms and values within Ethiopian society [5]. The universal acceptance of chicken meat across different religions and cultural backgrounds further enhances its appeal and consumption rates. These religious dietary preferences shape food consumption patterns and influence the availability and variety of meats in different regions, reflecting the cultural and religious diversity of the population [6]. Across South China, whole chickens hold significant symbolic value and are frequently utilized as offerings in religious rituals and as prestigious banquet fate This demonstrates the profound integration of poultry into cultural practices and underscores its role in fostering communal bonds and spiritual fulfillment across diverse societies [7]. The nutritional benefits and palatability of local chicken products thus not only support individual health but also symbolize broader economic well-being [8]. This growing popularity indicates a shift in consumer habits, with more people opting for these easy-to-prepare and delicious poultry options as part of their regular diet [9]. The purpose of this study was to determine how common fast food intake is and how it relates to both overall and abdominal obesity. The rise in fast food consumption is concerning due to its potential link to increased rates of obesity, highlighting the need for further research and public health interventions to address these dietary trends and their health implications [10]. By consuming chicken respondents showing positive influence on their body energy, social bonding, habits and behavior. This trend not only affects local farming techniques but also shapes the supply chain, from farm to table, ensuring that the final product aligns with the consumers' expectations for superior, flavorful poultry [11]. This study's objective was to access the effect of chicken on the behavior of people and to access biochemical analysis among people who do not consume chicken to access biochemical analysis among people who do not consume chicken who consume chicken in excess quantity.

MATERIALS AND METHODS

Study site and duration

This study was conducted in University of Okara to collect the data about people chicken consumption. This study was conducted in the duration of 6 months from December 2023 to May 2024.

Ethical concern and permissions

The patient consent was obtained before data collection. The ethical concern was obtained from the ethical review committee in University of Okara. The study was conducted according to the declaration of Helsinki.

Data Collection

The questionnaire was designed to collect the data about chicken consumption. The questions were designed as previously worked by [12]. The questions include in the performa includes: i) Type of Chicken meat, ii) Chicken consumption frequency, iii) Chicken consumption type, iv) Chicken consumption reason v) Chicken buying sites, vi) Energy changes after Chicken consumption, vii) Feeling comfort on chicken consumption, viii) Chicken association with social bonding, ix) Positive influence on chicken consumption, x) Chicken consumption effect on habit.

Biochemical analysis
The blood samples were collected from patients for the biochemical analysis including Endocrinology test, Lipids profile, and Liver function of people who consume and do not chicken.

Statistical analysis
The statistical analysis was performed according to the method of [13]. The Microsoft excel MS Excel was used to compute the results. The mean and standard deviation was calculated. The P-values were also computed.

RESULTS

Gender and age discrimination
Based on the provided data, it was found that there were a total of 500 respondents to the questionnaire, comprising 171 males and 329 females aged between 20 and 50 years. Among these respondents, 320 individuals fall within the age group of 20 to 30 years, indicating a significant proportion of younger respondents. Additionally, there are 130 respondents aged between 30 and 40 years, suggesting a slightly smaller but still substantial representation within this age range. Furthermore, 50 respondents are in the age range of 40 to 50 years, representing the smallest portion of the surveyed population. The figure 1 depicts the gender and age discrimination.

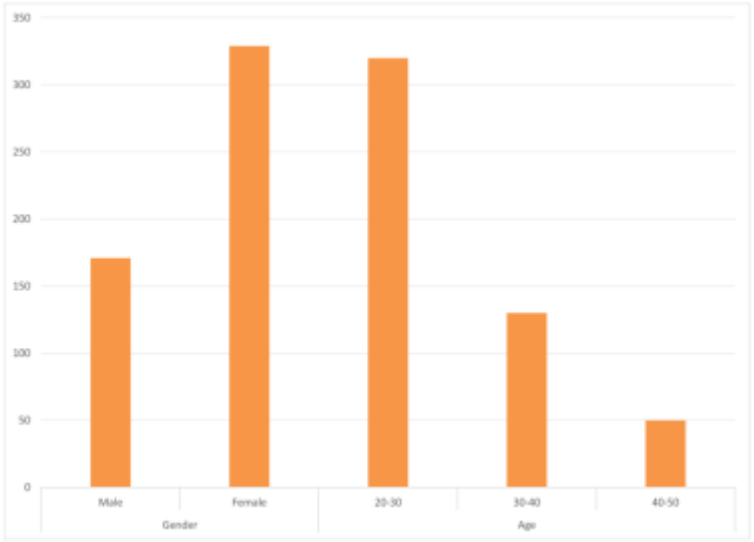

Figure 1: Indicates the frequency of people

Chicken consumption effect on humans
Based on the data provided, it's evident that there's a considerable interest in chicken consumption in the Okara area, with a total of 500 people surveyed. The mean and standard deviation of type of meat consumption was 166.67 ± 119.30 and shows significant differences. Chicken consumption on daily based shows non-significant difference while chicken consumption on rare and once shows significant difference having 166.67 ± 119.30. The mean and standard deviation of type of chicken consumption was 125±83.35 shows significant difference .Reason of chicken consumption (taste, health benefit and social norm) shows significant differences while chicken consumption for excitement shows non-significant differences having means and standard deviation 125±90.28. Chicken buying sites which most important factor shows significant differences and 125±127.72. Energy changes after chicken consumption shows non-significant differences while people felt no any change show non-significance having means and standard deviation 166.67 ± 14550. Respondents felt comfort after chicken consumption shows significant differences 166.67 ± 32.8261. Chicken consumption association with social bonding also shows significant differences having means and standard deviation 166.67 ± 73.75 .The means and standard deviation of positive influence was 166.67 ± 92.71 shows significant differences. The impact of chicken consumption on habits shows significant differences with means and standard deviation 166.67 ± 48.45. The details are shown in table 1.

Table 1: The impact of chicken consumption on humans

Sr. No.	Questions	Frequency Male	Frequency Female	Percentage male	Percentage female	Total	Mean ± stdev	P-value
1	**Type of Chicken meat**							
	Desi	60	100	12%	20%	160	166.67 ± 119.30	0.01
	Poultry	96	220	19%	44%	316		0.01
	none	15	9	3%	2%	24		0.01
2	**Chicken consumption frequency**							
	Daily	34	60	7%	12%	94	125±92.1710	0.24
	Once	99	180	20%	36%	279		0.05
	Rare	20	73	4%	15%	93		0.01
	None	18	16	4%	3%	34		
3	**Chicken consumption type**							
	Fried	31	88	6%	18%	119	125±83.35	0.01
	Grilled	40	20	8%	4%	60		0
	Baked	20	38	4%	8%	58		0
	Cultural dishes	79	184	16%	37%	263		0.05
4	**Chicken consumption reason**							
	Taste	79	197	16%	39%	276	125±90.28	0.01
	Excitement	24	32	5%	6%	56		0.24
	Health benefit	45	68	9%	14%	113		0.01
	Social norm	23	32	5%	6%	55		0
5	**Chicken buying sites**							
	Super market	29	52	6%	10%	81	125±127.72	0.01
	Online	17	16	3%	3%	33		0.01
	Local butcher shop	100	244	20%	49%	344		0
	Others	25	17	5%	3%	42		0.01
	Total number					500		
6	**Energy changes after Chicken consumption**							
	Yes	69	100	14%	20%	169	166.67 ± 14550	0.24
	No	38	114	8%	23%	152		0.01
	Not sure	49	130	10%	26%	179		0.01
7	**Feeling comfort on chicken consumption**							
	Yes	88	125	18%	25%	213	166.67 ± 32.8261	0.01
	No	26	115	5%	23%	141		0
	Not sure	52	94	10%	19%	146		0
8	**Chicken association with social bonding**							
	Yes	79	190	16%	38%	269	166.67 ± 73.75	0.01
	No	55	78	11%	16%	133		0.01
	Not sure	42	56	8%	11%	98		0.01
9	**Positive influence on chicken consumption**							
	Yes	80	150	16%	30%	230	166.67 ±	0.01

	No	60	120	12%	24%	180	92.71	0.01
	Not sure	40	50	8%	10%	90		0.01
10	**Chicken consumption effect on habit**							
	Yes	95	139	19%	28%	234	166.67 ± 48.45	0
	No	42	102	8%	20%	144		0.05
	Not sure	32	90	6%	18%	122		0.24

Biochemical analysis

The Biochemical analysis reveals three tests including Endocrinology test, Lipids profile, and Liver function of people as control and experimental group. The results in control group show the Testosterone tests under endocrinology report, their mean and standard deviation was 7.49±30. the lipid profile includes tests Total Lipids, Cholesterol, Triglycerides, HDL Cholesterol, LDL Cholesterol, VLDL Cholesterol, the their mean and standard deviation was 7171.7±153.86, 217±93.55, 118.8±252.26, 40.3±9.27, 100.4±25.82, 19.7±2.86 respectively. The liver functionality shows the Bilirubin Total, SGPT (ALT),SGOT (AST), Alkaline Phasphatase, Total Proteins, Albumin, Globulin, A/G Ratio, Urea, BUN, Creatinine, their means and standard deviations were 1.303±0.85, 72.4±81.93, 76±76.33, 310.2±108.23, 8.08±1.52, 5.15±1.51, 2.859±0.949, 2.862±1.412, 40.5±16.84, 19.9±8.69, 1.717±1.62 respectively. In experimental group, the Testosterone tests under endocrinology report, their mean and standard deviation was 7.16±2.18. The lipid profile includes tests Total Lipids, Cholesterol, Triglycerides, HDL Cholesterol, LDL Cholesterol, VLDL Cholesterol, the their mean and standard deviation was 703±146.24, 201.67±60.44,134.33±9.91,46.67±7.59124.27±27.87, 124.27±27.87 respectively. The liver functionality shows the Bilirubin Total, SGPT (ALT), SGOT (AST), Alkaline Phosphatase, Total Proteins, Albumin, Globulin, A/G Ratio, Urea, BUN, Creatinine, their means and standard deviation was 67.63±238.41,59.87±59.44, 50±34.22, 236.27±81.84, 15.10±24.62, 5.01±4.47, 66.57±238.51, 20.06±67.34, 40.06±15.73, 22.67±14.61, 6.55±20.17 respectively. This can be seen in table 2.

Table 2: Indicates the biochemical analysis of people consuming chicken

Test	**Normal range**	**Unit**	Controls	Experimentals
			Mean±SD	**Mean±SD**
Endocrinology test				
Testosterone	3.0 - 12.0	ng/nlm	7.49±30	7.16±2.18
Lipids profile				
Total Lipids	450 - 1000	mg/dl	7171.7±153.86	703±146.24
Cholesterol	Less than 200 (Expected), More than 220 (Suspected), More than 260 (Elevated)	md/dl	217±93.55	201.67±60.44
Triglycerides	50 – 150	mg/dl	118.8±252.26	134.33±9.91
HDL Cholesterol	35 – 55	mg/dl	40.3±9.27	46.67±7.59
LDL Cholesterol	0 – 150	mg/dl	100.4±25.82	124.27±27.87
VLDL Cholesterol	0 – 25	mg/dl	19.7±2.86	124.27±27.87
Liver Functionality				
Bilirubin Total	0.0 - 1.0	mg/dl	1.303±0.85	67.63±238.41
SGPT (ALT)	Oct-40	U/L	72.4±81.93	59.87±59.44
SGOT (AST)	Sep-36	U/L	76±76.33	50±34.22
Alkaline Phosphatase	85 – 306	U/L	310.2±108.23	236.27±81.84
Total Proteins	6.0 - 8.0	g/dl	8.08±1.52	15.10±24.62
Albumin	3.5 - 5.0	g/dl	5.15±1.51	5.01±4.47
Globulin	1.8 - 3.2	g/dl	2.859±0.949	66.57±238.51
A/G Ratio	1.20 - 2.20	%	2.862±1.412	20.06±67.34
Urea	10—15	mg/dl	40.5±16.84	40.06±15.73

BUN	8—25	mg/dl	19.9±8.69	22.67±14.61
Creatinine	0.5 - 1.4	mg/dl	1.717±1.62	6.55±20.17

DISCUSSION

Based on the socioeconomic background of the homes that ate chicken meat, it was found that the majority of respondents (59.80%) were between the ages of 26 and 50, with those who were 51 years of age and above following in second (21.57%). It was 37.82 years old on average.

This shows that a sizable portion of the responders were younger than average, which is indicative of greater activity levels. About 31.37% of the respondents were female families, making up an additional 68.63% of the total. In their study [14] 329 girls and 171 males participated between the ages of 20 and 50, was done for consumers of desi chicken and poultry. There are 320 people in this who are between the ages of 20 and 30, which suggest that a sizable percentage of responders are younger. There were also 130 responders who were between the ages of 30 and 40.

Additionally, 50 of the respondents are between the ages of 40 and 50. The study's data revealed that most respondents buy and eat whole chickens that are freshly slaughtered on-site in wet markets. This may be associated with consumers' preferences for freshness and taste, as evidenced by earlier research that found positive and statistically significant correlations between white meat consumption in Sulaymaniyah City and chicken flavor. All of the study's respondents also eat fresh chicken in District Okara, and the results show that there are significant and statistically significant correlations between chicken flavor and the intake of white meat in Sulaymaniyah City. Every responder in this survey eats fresh chicken in District Okara as previously mentionshed by [15], and [16]

This study revealed that 89.4% of the participants eat chicken at home at least once a week, with most families consuming more than 1 kg of chicken per dinner. One significant protein source that is widely and regularly consumed in the KRI is chicken meat. According to this survey [17], 34 people eat chicken every day, but among females, that number jumps to 60, suggesting that females consume a higher percentage of chicken on a regular basis. Furthermore, a considerable proportion of both sexes eat chicken once a week, with approximately 180 girls and 99 males falling into this group.

The most popular ready-to-eat chicken product to buy (32%, more than five times a month) and eat (52.6, more than five times a week) was fried chicken. This might be as a result of the fact that frying increases the chicken's shelf life and facilitates a far greater range of applications. They found [18, 19] after fried chicken, the most popular ready-to-eat chicken products were chicken-in-stew (49.4%, more than five times per week), chicken-in-soup (44.5%, more than five times per week), and grilled chicken (40.6%, more than five times per week). According to this study, 31% of men and 88% of women eat fried chicken, showing that both sexes generally favor this type of cooking.

Another popular cooking choice is grilled chicken, which is preferred by 40 men and 20 women despite being a healthier choice. However, men are noticeably more likely to choose it. By contrast, just 20 men and 38 women reported eating baked chicken, suggesting that this type of chicken is less popular. A sizable portion of the poll participants roughly 88% of women and 31% of men consume fried chicken, suggesting that both sexes have a general predilection for this style of cooking.

Culture is more simply defined by sociology and ethology as "what is shared by a group of persons" and "what unifies them," that is, as knowledge that is acquired, transmitted, produced, and generated. In fact, culture is what sets individuals apart from one another and from their ancestry. [20] found that meat has important roles in special occasions and carries a far higher cultural symbolic weight than many other types of food. Furthermore, eating meat and meat products has a clear correlation with religious views and is influenced by them. Ethiopia's major faiths each have their own peculiar beliefs that dictate how its adherents should eat and behave. They [5] studied a considerable number of participants in this research, comprising roughly 79 men and 190 women, said that they felt a social connecting with chicken consumption. On the other hand, about 55 men and 78 women of the respondents claimed not to have any social bonds with chicken eaters. The research suggests that a significant percentage of respondents, comprising roughly 79 men and 190 women, stated that they felt a social affinity toward eating chicken. This implies that eating chicken is linked to social interactions, shared experiences, or cultural customs for a large number of people. Nonetheless, it's important to note that both sexes like eating chicken in traditional meals, with 184 women and 79 men enjoying chicken for cultural reasons.

This was in line with the percentage of respondents (57.7%) who thought chicken from nearby poultry farms was safe and of high quality. Being physically involved in the preparation of the chicken may provide consumers a sense of control over the end product's state, which may account for their choice for live chicken

as the type they most connect with safety. Furthermore, according to the Netherlands Enterprise Agency, Ghanaians choose the flavor and texture of freshly killed chicken over frozen chicken that is imported. The second most trusted type of chicken by consumers in terms of both safety (22.6%) and quality (20.4%) was frozen chicken. Stores were cited by a sizable minority of customers (18.1%) as the place to get high-quality, safe chicken. Over 80% of the chicken meat consumed in Ghana, according to the FAO [9], is imported as frozen chicken, which is mostly found in supermarkets and cold storage facilities [21] .Consumer's association of frozen chicken with quality and safety may be because freezing is considered a safe and efficient means of food preservation. In this study, 79 males and 197 females expressing a preference for chicken due to its flavorful qualities, highlighting a widespread appreciation for its taste among both genders. In the survey, distinct motivations for chicken consumption were revealed, with taste being a prevalent factor among both genders, as approximately 79 males and 197 females indicated a preference for its flavorful qualities. Furthermore, roughly 24 men and 32 women gave exhilaration as their explanation, indicating that some people link eating chicken to pleasure and excitement. Additionally, roughly 45 men and 68 women recognized the health benefits of chicken, indicating that it is a nutrient-dense diet option.

For products and services to be positioned effectively in different market groups, it is crucial to comprehend what consumers want .Using standardized questionnaires, 200 chicken eaters were selected at random and questioned at different locations for purchases and consumption. The data analysis used qualitative techniques. The findings indicated that over two-thirds of consumers buy chicken less frequently after a week or longer and that most respondents prefer to purchase their chicken from roadside markets rather than other outlets, prefer local chicken to broilers, and prefer fresh slaughtered chicken over other forms, such as live or cooked. They found that [22] butcher shops in the area appear to be the most popular place to purchase chicken, as indicated by the preference of about 244 females and 100 males for this conventional form of shopping. This suggests that both sexes in the community have a high preference for chicken that is fresh and locally sourced. [23] studied that in nations where these values are not stated, more investigation into these blood biochemical characteristics is most necessary. The mean values of phosphorus, ASAT, and glucose among the blood biochemical parameters in their investigation are within the global reference ranges. Calcium, uric acid, and total protein, however, fall outside of these ranges. These blood biochemical parameters' levels deviate from global norms. Consequently, both local chickens and broilers had mean values of total protein that were higher than the upper bound of the reference standards. Local chickens have a higher value than what was found via the work of [24-28]. In a similar vein, this study's mean total protein was greater [28]. The total protein level was higher among the study's male participants, which runs counter to the findings of these other investigations. In this investigation, the subjects' lipid profiles, liver function, and endocrinology tests were among the biochemical tests examined on humans that consume chicken while they worked on the chicken biochemical analysis. Table 2 displays the biochemical analysis for this investigation.

Conclusion

It was concluded that large number of people consumes poultry chicken rather than desi (organic meat) due to availability. People used to consume chicken once a week, their consumption readily associated with cultural spicy dishes. This creates social bonding among them. For all of this they used to buy chicken mostly from local butcher shop. But they are unaware about their energy changes. By consuming chicken people showed positive response according to the effect on their behavior, but they reduce chicken consumption due to increase in chicken prices. It was suggested that people should prefer desi chicken by keeping in backyard in their houses for healthy growth rather than poultry for better health.

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Author's contribution

All authors contributed equally in the manuscript.

Conflict of interest

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References

1. Cooreman-Algoed, M., et al., *Impact of consumer behaviour on the environmental sustainability profile of food production and consumption chains–a case study on chicken meat.* Resources, Conservation and Recycling, 2022. **178**: p. 106089.
2. Govoni, C., et al., *Global assessment of natural resources for chicken production.* Advances in Water Resources, 2021. **154**: p. 103987.
3. Zaheer, K., *An updated review on chicken eggs: production, consumption, management aspects and nutritional benefits to human health.* Food and Nutrition Sciences, 2015. **6**(13): p. 1208.
4. Sadef, S., M. Khan, and M. Rehman, *Indigenous chicken production in Punjab: a detailed survey through participatory rural appraisals.* JAPS: Journal of Animal & Plant Sciences, 2015. **25**(5).
5. Seleshe, S., C. Jo, and M. Lee, *Meat consumption culture in Ethiopia.* Korean journal for food science of animal resources, 2014. **34**(1): p. 7.
6. Srinivas, T., *Exploring Indian culture through food.* Education about Asia, 2011. **16**(3): p. 38-41.
7. Afolabi, K.D., *Local or Indigenous Chicken Production: A Key to Food Security, Poverty Alleviation, Disease Mitigation and Socio-Cultural Fulfilment in Africa.* Sustainable Food Security in the Era of Local and Global Environmental Change, 2013: p. 217-229.
8. Chera, M., *Country chicken and multiple knowledges: Foucauldian resistance in young Tamil women's cultural critique of globalized food.* Food, Culture & Society, 2020. **23**(2): p. 209-228.
9. Sampers, I., et al., *Survey of Belgian consumption patterns and consumer behaviour of poultry meat to provide insight in risk factors for campylobacteriosis.* Food Control, 2012. **26**(2): p. 293-299.
10. Mohammadbeigi, A., et al., *Fast food consumption and overweight/obesity prevalence in students and its association with general and abdominal obesity.* J Prev Med Hyg, 2018. **59**(3): p. E236-e240.
11. Liu, T.-S., *Custom, taste and science: raising chickens in the Pearl River Delta Region, South China.* Anthropology & Medicine, 2008. **15**(1): p. 7-18.
12. Memon, A., et al., *Consumption and cooking patterns of chicken meat in Hyderabad district.* Pakistan Journal of nutrition, 2009. **8**(4): p. 327-331.
13. Littell, R.C., *Statistical analysis of experiments with repeated measurements.* HortScience, 1989. **24**(1): p. 37-40.
14. Yakubu, A., et al., *Tobit Analysis Of Socio-Economic Factors Affecting Chicken Meat Consumption Due To Avian Influenza Outbreak In Nasarawa State, Nigeria.* Philippine Journal of Veterinary and Animal Sciences, 2009. **35**(2): p. 188-196.
15. Neima, H.A., K. Sirwan, and K. Hameed. *Consumers choice and preference for chicken meat in Sulaymaniyah*. in *IOP Conference Series: Earth and Environmental Science*. 2021. IOP Publishing.
16. Abdalla, N.R., M. Bavorova, and S. Gruener, *Meat consumption in transition: The case of crisis region of Iraqi Kurdistan.* Journal of International Food & Agribusiness Marketing, 2023. **35**(1): p. 45-65.
17. Neima, H.A., K. Sirwan, and K. Hameed, *Consumer Purchasing Intention and Behaviour Toward Chicken Meat in Sulaymaniyah City: Empirical Evidence from a Field Survey.* Journal of Agribusiness and Rural Development, 2023. **68**(2): p. 169–178-169–178.
18. Ankar-Brewoo, G.M., et al., *Health risks of toxic metals (Al, Fe and Pb) in two common street vended foods, fufu and fried-rice, in Kumasi, Ghana.* Scientific African, 2020. **7**: p. e00289.
19. Mead, G.C., *Poultry meat processing and quality*. 2004: Woodhead Publishing.
20. Asif, M., et al., *Chinese Food Culture in Pakistan: Analysis of Chines Food culture within the Framework of the CPEC Project.* International Journal of Instructional Technology and Educational Studies, 2023. **4**(1): p. 16-57.
21. Ovai, B., et al., *Food safety risk factors associated with chicken consumption and chicken handling practices in Accra, Ghana.* Scientific African, 2022. **16**: p. e01263.
22. Otieno, D.J. and D.M. Kerubo, *Characterization of consumers' purchase and consumption behaviour for chicken in Nairobi, Kenya: Targeted insights for value chain positioning.* 2016.
23. Husak, R., J. Sebranek, and K. Bregendahl, *A survey of commercially available broilers marketed as organic, free-range, and conventional broilers for cooked meat yields, meat composition, and relative value.* Poultry Science, 2008. **87**(11): p. 2367-2376.
24. Ibrahim Albokhadaim, I.A., *Hematological and some biochemical values of indigenous chickens in Al-Ahsa, Saudi Arabia during summer season.* 2012.
25. Henuk, Y.L. and D. Bakti. *Benefits of promoting native chickens for sustainable rural poultry development in Indonesia*. in *Talenta Conference Series: Agricultural and Natural Resources (ANR)*. 2018.
26. Kokore, B.A., et al., *Blood biochemical parameters exploration in broilers and local chickens in Korhogo, Côte d'Ivoire.* American Journal of Food and Nutrition, 2021. **9**(2): p. 82-86.

27. Bora, S., et al., *Effect of Sex on Hemato Biochemical parameters of indigenous chicken breeds in Telangana state.* International Journal of Livestock Research, 2017. **7**(10): p. 231-237.
28. Abdi-Hachesoo, B., A. Talebi, and S. Asri-Rezaei, *Comparative study on blood profiles of indigenous and Ross-308 broiler breeders.* Global Veterinaria, 2011. **7**(3): p. 238-241.