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A Mixed-Method Study of Chicken Meat Safety in Iran during the COVID-19 Pandemic: SWOT Analysis

Azizollah Zargaraan[1] Fatemeh Mohammadi Nasrabadi[1] Azadeh Rashidi Mehr[2] Soheyl Eskandari[3,4,5] Yeganeh Salmani[1] Fatemeh Esfarjani[1]

[1]Food and Nutrition Policy and Planning Research Department, National Nutrition and Food Technology Research Institute (NNFTRI), Faculty of Nutrition Sciences and Food Technology, Shahid Beheshti University of Medical Sciences, Tehran, Iran
[2]Food Hygiene Department, Faculty of Veterinary Medicine, Lorestan University, Khorram-Abad, Lorestan
[3]Food and Drug Laboratory Research Center (FDLRC), Food and Drug Administration (IR-FDA), Ministry of Health and Medical Education (MOHME), Tehran, Iran
[4]Zoonotic Diseases Research Center, Department of Food Hygiene and Safety, School of Public Health, Shahid Sadoughi University of Medical Sciences, Yazd, Iran
[5]Nutrition and Food Sciences Research Center, Tehran Medical Sciences, Islamic Azad University, Tehran, Iran

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Corresponding author
Fatemeh Esfarjani
fesfarjani@hotmail.com
f.esfarjani@sbmu.ac.ir

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Abstract

Chicken meat is one of the main sources of cheap, great quality, and nutritious protein. The purpose of this study was to analyze the strengths, weaknesses, opportunities, and threats (SWOT) chicken meat safety for practical solutions during the COVID-19 pandemic. A cross-sectional mixed-method study was designed. First, semi-structured, face-to-face interviews were conducted with 14 experts in the chicken meat industry. They were selected through purposive sampling. Then, an online questionnaire with the characteristics of participants in knowledge, attitude, and practice about the safety of chicken meat during the COVID-19 pandemic was sent through WhatsApp Messenger to 179 households in Tehran, Iran. The quantitative data were analyzed by the SPSS, and then SWOT analysis was done based on both qualitative and quantitative findings. Five categories and eight themes with 35 subthemes were extracted about safety challenges in the chicken meat industry according to the views of stakeholders. In the second phase, the majority of participants had moderate knowledge (65.5%), a positive attitude (64.8%), and acceptable practice (67%) toward the safety of chicken meat. The SWOT analysis showed the up-to-date strategy and regulations (S), mismanagement (W), privatization and export of chicken (O), and sanctions (T) as the most important factors influencing the safety of chicken meat from production to consumption in Iran. The chief weaknesses of the poultry industry are mismanagement and lack of policy and planning in all sectors. The government must sustain a continuous plan for the allocation of poultry inputs. This will assist the associated supervisors in designing and offering strategies to develop the chicken meat industry. Policymakers can use the SWOT analysis results for practical solutions and potential future strengthening actions of chicken meat safety to increase public health during the COVID-19 pandemic.

Introduction

Sustainable development is measured by a set of social and economic indicators, the most important of which are indicators related to the food and nutrition security of the community. In all definitions of sustainable development, food security is considered as one of the main outcomes; in other words, it leads to a healthier and producing generation as a necessity

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of sustainable development. Food security has a multidisciplinary concept and different dimensions, including availability, access, utilization, and stability (United Nation, 2007).

Poultry products are among the main sources of cheap, great quality, and nutritious protein and its' industry activities are highly dependent on the agricultural and economic policies of the government. Business advancement is a precondition for the sustainable economic development of every country, and poultry can be assumed a crucial part in this regard (Hassan, 2019). Chicken meat is one of the most well-known animal food products worldwide, and its remarkable necessity has increased continually along with the growth of population rate such that it could improve nutritional status, decrease food insecurity, and improve the economic and political situation (Ampofo, 2013; Nazli *et al*., 2019).

In the livestock sector, poultry is emerging as the most efficient sub-sector in its utilization of natural assets and providing protein to meet the growing interest around the world. Poultry is especially significant for smallholders, developing countries, and metropolitan communities (Mottet and Tempio, 2017).

Shifts to sustainable diets must be affordable and desirable for consumers (Aleksandrowicz *et al*, 2016; Galanakis, 2020). However, foodborne diseases as a major problem in the world are on the rising. Contamination of chicken by salmonella spp. is an important issue both in the field of public health and in the poultry industry (Soltan Dallal *et al*., 2007).

In 2019, the spread of the coronavirus (COVID-19) led to disappointments among poultry farmers and turned poultry production into a risky activity. In addition to the market risk, manufacturers faced a variety of risks, including diseases and losses in production units. There is clear evidence that heating chicken meat, over 70°C inactivates the virus. However, it has been seen that the virus remains stable at -20°C or less (Feng, 2020; Jain, 2020; WHO, 2020a).

In the last ten years, the amount of chicken meat production has doubled in Iran, and so amount of imports has decreased to more than half, whereas the amount of export has not changed. Among the animal protein sources, chicken meat consumption has grown significantly because of the short production time and the high cost of other animal foods. The consumption of chicken meat per capita in Iran is twice the global level (Moradi and Avazipoor Rafsanjani, 2018). A SWOT analysis is a technique for generating strategic alternatives from situation analysis. SWOT stands for Strengths, Weaknesses, Opportunities, and Threats (Stolovitch and Keeps, 2006). SWOT matrix helps managers or policymakers to develop four types of strategies and provides a framework for identifying and formulating strategies in order to achieve any specific goals. This tool is quite effective and efficient and is able to observe any possible upcoming changes through a systematic approach within the process of introspection (Dahlan *et al*., 2020; Unakitan and Abdikoglu, 2016). This is the first mixed-method study with the aim of highlighting the SWOT analysis of chicken meat safety to identify practical solutions were proposed for the development of the chicken meat industry during the COVID-19 pandemic.

Materials and Methods

Study design

This study was conducted in three phases: 1) Qualitative study, 2) Quantitative study, and 3) SWOT analysis.

Phase I: Qualitative study

The qualitative semi-structured study was run by two members of the research team, one led the discussion using open-ended questioning (Table 1) to get the experiences and opinions of the participants, and the second researcher tape-recorded the interviews, and then wrote down them verbatim (Pope and Mays, 2020).

Table 1. Interviews guide protocol

Questions
1) In your opinion, what are the safety challenges of the chicken meat industry during the COVID-19 pandemic?
• Chicken feed
• Poultry farming
• Slaughterhouse
• Transportation
• Trade
2) In your opinion, what are the strengths and weaknesses of the chicken industry during the COVID-19 pandemic?
3) In your opinion, what are the threats and opportunities in this industry during the COVID-19 pandemic?

Stakeholders

The snowball sampling method achieved for participants selection. It is continued until getting theoretical saturation and duplication of information provided by the participants in the study. In other words, the interviews keep going until the researchers came to believe that comments on the subject and purpose of the research had become uniform and repetitive and that further research would not lead to new data. This is termed

theoretical saturation index in qualitative research (Guest *et al*, 2006).

Overall 14 stakeholders were recognized and prioritized from the governmental, non-governmental, and private sectors as follows: 1) two members of the Office of Planning, Budget and Economic Studies of Iran Veterinary, 2) three academic members of poultry diseases, 3) one member of the Ministry of Health and Medical Education (Poultry Section), 4) one member of the Ministry of Trade (Poultry Feed), 5) two food quality control inspectors of the Organization of Industrial Slaughterhouses, 6) one member of Food and Drug Administration, 7) two members of the Office of Supervision on Public Health and Foodstuff of Iran Veterinary Organization, 8) one veterinary specialist working in poultry farms, and 9) one member of the Ministry of Agriculture.

Data collection

Responses of the stakeholders to the open-ended interview questions were used to identify the challenges in the chicken meat industry (Pope and Mays, 2020). The duration of each interview session was 45 to 55 minutes. The questions were then evaluated by two experts to examine their content.

Validity and reliability

To ensure the accuracy of the data and continuous comments, the validation of the subject should be considered by the researchers during the planning, data analysis, and evaluation of the quality of the research. In the present study, triangulation was done by the requirement gathering process through the convergence of data from the participants in the veterinary and food industries.

The results were checked and validated by two stakeholders that met the inclusion criteria but did not participate in the research. For reliability confirmation, two researchers checked the findings again. The results were then shared and summarized after the discussion to improve accuracy, validity, credibility, and transferability.

Data Analysis

The recorded audio of the interviewees was transcribed and the notes were used to resolve possible differences. The transcripts were examined precisely based on the codes set for the data section, which was examined by highlighting the exact words of the text that were developed to record significant ideas for providing the initial coding framework.

The transcripts were analyzed precisely then, based on the similarities, the codes were classified into relevant categories. In addition, the data helped to draw a SWOT matrix (Charmaz, 2006).

Phase II: Quantitative study

This cross-sectional phase was conducted among the household members (aged 20 years and above), who were responsible for home purchases, cooking and had access to WhatsApp. 250 samples from Tehran City (North, East, West, South, and Center districts) randomly were selected. The districts were divided based on socioeconomic status (Tajali-Pour and Alikhani, 2012). The online questionnaire link was sent to the Health Centers by the "WhatsApp" messenger (Facebook, Inc., California, USA). A staff of each health center invited 50 consumers to participate in this study by phone call and aware them of the aim of the research based on their consent. Then, 250 persons were contacted; 185 of them admitted to collaborating and the questionnaires' link was sent to them. All of the subjects filled out the form, and 6 of them were excluded because of the technical problem of the platform.

Data collection

Due to the lockdown and social distancing of all citizens during data gathering and to limit the spread of the disease, we preferred to run the study through an online portal. The questionnaire took approximately 15 minutes to complete on 1-15th August 2020. The questionnaire with 134 scores was classified into four sections about the safety of chicken meat during the COVID-19 pandemic:

1)Characteristics section includes four socio-demographic questions (gender, age, occupation, and educational status).

2) Knowledge section includes ten questions with a score range of 0-10 with "True", "False" and "I don't know" answers. Each correct answers weights 1 point, and incorrect responses and "I don't know" weight zero which classifies the scores as *Weak* (0-5), *Sufficient* (5-8), *Good* (8-10).

3) Attitude section include eleven Likert questions with the answers of *Strongly disagree*, *Disagree*, *No idea*, *Agree* and *Strongly agree*, each weighing 1–5 scores, respectively, which classifies the scores as *Strongly negative* (<15), *Negative* (15-25), *Positive* (25-35) and *Strongly positive* (35-44).

4) Practice section include sixteen 5 Likert type questions with the answers of *Always*, *Often*, *Sometimes*, *Rarely*, and *Never*, each weighing 0–5 scores, respectively, which classifies the scores as *Weak* (45>), *Acceptable* (45-60), and *Desirable* (60-80).

- Also, a single question to achieve participants' opinions for building consumer trust about the safety of chicken meat during the COVID-19 pandemic was asked.

Validation and pilot study

Based on the World Health Organization (WHO)and Centers for Disease Control and Prevention) CDC guidelines and other reports on COVID-19, the questions were developed (CDC, 2019; Dyal, 2020; WHO, 2020b). Then the questions were modified. Afterwards, three experts in the field of veterinary and food sciences revised the questions. Finally, four questions were removed from the final version. The next step was pre-testing the last version of the questionnaire on 10 individuals, who did not participate in the study. They filled out the questionnaire twice a month. The data were used to determine internal consistency using Cronbach's alpha, and test-retest reliability using the intra-class correlation coefficient. The findings indicated sufficient internal consistency and reliability of the questionnaire (with Cronbach's alpha=0.73 and intra-class correlation coefficient=0.97).

Statistical analysis

The Questionnaires were completed by participants. Then, drawn out from Google Forms and exported to SPSS software ver. 22 for data cleaning and analyzing. Numerical and categorical data were summarized as means (±standard deviations) and frequencies, respectively. To specify the relationship between knowledge and attitude scores with socio-demographic variables, Chi-square and Fisher exact tests were used.

Ethical issues

This study was accepted by the Ethics Committee of National Nutrition & Food Technology Research Institute (NNFTRI), Shahid Beheshti University of Medical Sciences, Tehran, Iran (Grant no. IR.SBMU.RETECH.REC.1399.125). All participants were anonymity and codded, and they provided aware consent.

Phase III: SWOT analysis

SWOT will always be the starting point. The organization can be assessed at each level of any department, division, or entire company. SWOT analysis is an instrument to identify strengths, weaknesses, opportunities, and threats to devise an approach to analyze the situation and new strategies (Stolovitch and Keeps, 2006).

In the present study, using the SWOT technique, the potentials and limitations of the region were identified and practical solutions were proposed for the development of the chicken meat industry during the COVID-19 pandemic.

Results and Discussion

Phase I: Qualitative study

The majority of participants (n=14) were male (93%). Eighty six percent of the participants were 30-50 years of age and all of them had a master degree and above (Table 2).

Table 2. Socio-demographic characteristics of the participants in the qualitative and quantitative phases of the study

Variables	Phase I n= 14(%)	Phase II n= 179(%)
Gender		
Male	13(93)	66(37)
Female	1(7)	113(63)
Age (year)		
20-30	0	18(10)
30-50	12(86)	92(51)
50≤	2(14)	69(39)
Occupation		
Employed	14(100)	95(53)
Retired	0	40(22)
Unemployed	0	44(25)
Education		
≤Diploma	0	28(16)
BSc degree	0	93(52)
MSc degree	7(50)	42(23)
PhD	7(50)	16(9)

Safety challenges in the chicken meat industry before and during the COVID-19 pandemic

According to the results, five categories and eight themes with 35 sub-themes were explored based on the perspectives of the participants (Table 3).

Table 3. The most important concepts extracted from the views of stakeholders based on open coding results of Phase I

Category	Theme	Sub-theme
Chicken feed	Seed	• Low quality of imported seed due to imports from the developing countries • Poor maintenance of health conditions • High waste • Poor poultry diet due to lack of feedstuffs • Lack of related knowledge • Traditional feeding
Poultry farming	Chicken	• Imported ancestral chickens
	Broilers	• Unauthorized poultry farms • Lack of awareness to control the disease during the COVID-19 outbreak • Unauthorized markets supplying live chicken
Slaughterhouse	Structural	• Incomplete slaughter line • Lack of planning to establish slaughterhouses • Using a water chiller • Lack of development of rankings in all slaughterhouses in terms of health facilities • Lack of up-to-date equipment • Not observing appropriate temperature
	Inspection	• Financial dependence of veterinary technical-health attendants • Lack of attention to pre-slaughter inspection in the poultry farm • Failure to provide the breeding history before slaughter to the veterinarian of the slaughterhouse • Failure to observe the withdrawal time of medicines used during the breeding period • Non-observance of food abstinence before being sent to the slaughterhouse
	Packaging	• The fade production and expiration dates • Blood clots in the packaging
Transportation	Trucks	• Lack of equipped and special trucks for transporting day-old chicks • Long transport of live chickens • Thermometer failure and failure of the cold distribution chain • Regular contamination • Failure of using pallets during carcass transportation
Trade	Import & export	• Sanctions • Exchange rate fluctuations • Inability to comply with the health protocols or preconditions of the importing country • Lack of timely supply of the product and fulfillment of obligations under the contract • Export taxes • Mismanagement and lack of government planning • Delays in clearance from ports and customs

Chicken feed

Seed

The majority of the interviewees stated that the most massive challenge for chicken feed was "A significant portion of corn, soybean meals, and micronutrients like methionine is imported, and any change in political and economic equations and sanctions will make it difficult to feed 30,000 poultry farms".

Another challenge was the quality of the imported inputs. Under the influence of being imported, quality is equally affected. In addition to relying on the certificate of importing countries, poor storage conditions can equally affect the quality and increase the waste. Imported livestock inputs have extremely diminished quality as they are often moldy and contain an excessive microbial load.

Most of the interviewees stated that there was no scientific problem with feed conversion ratio (FCR) and that there were qualified experts in this field; however, the chicken feed is unprepared through the animal feed factories because it is imported raw to poultry farms and formulated by farmers. Chicken feed challenges mostly exist in traditional poultry farms but not in industrial units.

Poultry farm

Broiler

Challenges such as whether the hall has been disinfected, how long the hall has been empty and observing the synchronization of breeding with the surrounding halls were the main problems in the broiler part. Most of the interviewees agreed that the construction of the units was not evaluated in terms of the type of breeding, climate, area, and distance between the units. The problem was identified as inefficient management.

Slaughterhouse

Structural

All participants mentioned that chicken slaughterhouses are magnificent structurally in the region. The Veterinary Organization has sought to convert traditional slaughterhouses into industrial ones, but just recently, it has sought to grade abattoirs, such that industrialists can invest more and more equipment with higher scores. During the coronavirus, the slaughterhouses were divided into three groups: A+, A, and B. Coronavirus is physically important because the disease is not transmitted through the chicken meat, and in these slaughterhouses, physical contact is minimized because they are fully mechanized. The announced grading has led to competition and health promotion.

Some of the interviewees (40%) stated the reason as the proper entry of the private sector and the investment dimension in this sector. Some slaughterhouses (26%) do not have a complete chain line like an internal evacuation. However, all of the studied slaughterhouses contained a minimum of chains, but in principle, it should be an automatic evacuation.

Another challenge was transporting live chickens to all provinces. This may cause health damage like thinning of the intestinal wall and transmission of infection and disease to other provinces. The principle is to slaughter the chickens and pack them in the relevant province and then transfer to other provinces. Reduced capacity and low working hours have led to insufficient incomes in the slaughterhouses.

Since chicken slaughterhouses grades A+, A, and B were developed for export, they must have complete chains as well as an internal unloading device. The slaughterhouses were first audited and received an IR code. They are then allowed to export for sustainable exports while capturing regional markets. The complete production line must have a pre-cooler, internal drain, and room chiller, and do not use a water chiller. In terms of safety, the products should not be ranked and must have high health quality. In the case of slaughterhouses grades A+, A, and B, it should make a difference, but in practice, it has not been significant. The disadvantage of this grading is that it only focuses on the slaughterhouse facilities, without paying due attention to laboratories, sterilizers, and adequate training of the working personnel.

Inspection

Most of the interviewees (65%) stated that it is not possible in principle to obtain a sanitary product without inspection. In the Veterinary Organization, there are particular instructions for all stages of inspection, but supervisors must be capable to apply these instructions firmly and have job security. Another challenge in this area was the pre-slaughter inspection on the poultry farm.

In addition, drugs withdrawal time has not been observed, and the records of the herd should be provided to the slaughterhouse inspector 24 hours before slaughter so that the veterinarian can decide on emergency slaughter and non-slaughter based on the records and inspections. Note that this protocol is not followed. Because of the financial dependence of the technical manager on the slaughterhouse, there are many defects in the inspections, and they are neglected in the inspections. Furthermore, the organization has extremely few staff to do monitoring duties. More supervision and enforcement can be done with the help of inspectors affiliated with the Veterinary Organization. It seems that the instructions are appropriate in the inspection section and will be shared instantly, but more implementation needs to be done.

Packaging

The majority of the interviewees (73%) stated that packaging presents a challenge and should be controlled more carefully. There are problems of blood clots in the packaging due to non-standard packaging, the type of cooling, and the use of water chillers; therefore, more work must be done on the packaging. Another problem is in the packaging labels and inks; sometimes, the production and expiration dates are faded and erased, so the packaging labels such as manufacturing series, barcodes, nutritional value, etc. must be more complete. Specifications must be printed and barcoded so that the distributor cannot change the production and expiration date.

Although packaging workers at the end of the job can physically transmit the disease, due to disinfection and washing of equipment, it is still exceedingly unlikely.

Transportation

All of the interviewees stated: "Transportation trucks maintain international standards in terms of structure, but the problem is in the refrigerator thermometer of the trucks that are not working most of the time. Another weakness is that due to poor supervision of

the Veterinary Organization in this field, the thermograph is not evaluated at the end of the route. Also the trucks are contaminated and not disinfected regularly. Transporting the day-old chicks from the northernmost point to the southernmost point of the country requires special trucks equipped with incubators to control CO_2, O2, and humidity. Therefore, the trucks are not standard, and despite efforts made, a developed policy is required.

Trade

Imposed sanctions are a significant challenge. Sanctions on the chicken industry and fluctuation in the currency rate have caused an increase in prices. Due to the considerable impact of the world prices and exchange rates on the domestic prices of the inputs, it is vital to pay due attention to the fluctuations in the world prices and exchange rates in the formulation of trade policies (Ghahremanzadeh *et al*., 2020).

Another challenge is the reduced quality of the products because producers intend to reduce the production costs. Inability to comply with the health protocols or preconditions of the importing country, lack of timely supply of the products, lack of fulfillment of obligations under the contract, export taxes, mismanagement. Lack of government planning and delays in clearance from the ports and customs were the main reasons for exporting chicken meat.

Phase II: Quantitative study

The majority of participants (n=179) were women (63%). About 50% of the participants were 30-50 years of age and 84% had a bachelor's degree and above. About half of the subjects (53%) were employed (Table 2).

Figure 1 shows that the majority of the participants had moderate knowledge (65.5%), positive attitude (64.8%), and acceptable practice (67%) toward the safety of chicken meat during the COVID-19 pandemic.

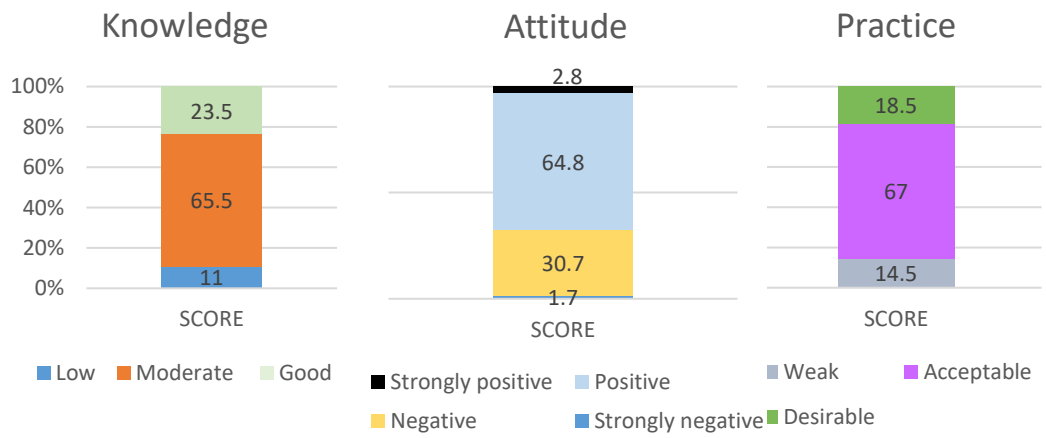

Figure 1. The knowledge, attitude and practice scores' classification (%) of the participants about the safety of chicken meat during the COVID-19 pandemic (Phase II).

The mean±SD of the knowledge, attitude and practice scores of the participants was 7.36±1.5, 27.36±4.7, and 54.15±6.6, respectively. This shows that the majority of them had sufficient knowledge, a positive attitude, and acceptable practice toward the safety of chicken meat during the COVID-19 pandemic. Only the relation of participants' practice scores was significant ($P < 0.05$) to the educational level, but gender, age, and occupation were not significant according to the Chi-square and Fisher exact test results.

Building consumer trust about the safety of chicken meat during the COVID-19 pandemic

Most of the participants (72%) preferred to buy packed chicken meat from the chicken shops that observed all the health and safety protocols. However, some of them (36%) said that many meat shops did not observe that.

Phase III: **SWOT analysis of the chicken meat safety from farm to table**

The SWOT analysis was done based on the experiences of authors through the study, the stakeholders' views developed during the discussion, as well as the available literature on the subject (Paliwal, 2006). In addition, quantitative results were used for the enrichment of SWOT analysis. The strengths, weaknesses, opportunities, and threats of the chicken meat industry during COVID-19 are drawn in Table 4.

Table 4. SWOT matrix of the chicken meat at the industry and consumer levels

Internal factors	
Strengths	
Industry	• Up-to-date instructions and regulations • Multilateral expertise and technical knowledge • Low prices compared to the other meat products
Consumer	• Classified (A+, A, and B) chicken meats based on their safety in the slaughterhouses • The educability of the family • Consumption of chicken meat
Weaknesses	
Industry	• Mismanagement and lack of policy and planning in all sectors of the chicken industry • Lack of appropriate policy program for poultry breeding in terms of geographical climate • Weak implementation of instructions and regulations • Lack of traceability from farm to consumer • Lack of self-sufficiency in feedstuffs • Lack of accurate division of duties and parallel work between regulatory and organizations • Financial dependence of veterinary technical officials on the private sector • Lack of chicken inspection before entering the slaughterhouse • The Ministry of Agriculture cannot monitor poultry farms online • Lack of sufficient currency allocation to the chicken feed • Market price fluctuations • No separation of native and farmed chickens • Lack of disease prevention programs and organization of public chicken vaccination • Lack of chicken flu vaccine due to sanctions • Lack of time control between the vaccine and drug injection until slaughter • Low capability of technology • Failure of the cold distribution chain • Inadequate training at all levels • Lack of marketing ability • Lack of industrial slaughterhouses in all provinces • Lack of improper packaging • Lack of eco-friendly technology • Lack of knowledge toward observing chicken safety
Consumer	• Inadequate food safety training at the level of consumer
External factors	
Opportunities	
Industry	• Privatization of the chicken industry • Setting up a traceability system that covers the whole supply chain • Export of chicken carcasses to the marketing improvement • Increasing the specialized training programs for managers and workers in the media • Smart packaging • Media activities in raising public awareness
Consumer	• Virtual food safety training in the health centers
Threats	
Industry	• Sanctions • Excessive dependence on imports of inputs, poultry feed, and vaccines from abroad • Currency fluctuations • Prevalence of poultry diseases like highly pathogenic avian influenza • Presence of native chicken breeding in the vicinity of industrial production and poultry farms and transmission of acute diseases • Low production efficiency due to native chicken breeding
Consumer	• Lack of knowledge about safe purchases

- **Strengths:** The most important strengths enabling the development of the chicken industry are the up to dated technology and technical knowledge. Comparing to other meat products, the low price of chicken meat carries out a critical role in increasing the market share. On the other hand, the COVID-19 pandemic appears to have had no effect on household consumption and their trust, as many media outlets and other educational programs have confirmed the non-transmission of Coronavirus through food during this time.
- **Weaknesses:** One of the main weaknesses of this industry is the lack of proper policymaking in the chicken industry. Another important weakness that needs to be controlled by special measures is lack of supporting rules and regulations. One of the most critical factors affecting the increase of meat cost is

the livestock feed, which has caused the price of this product to rise considerably. Due to the role of livestock inputs in the production of protein products and food security as well as the insufficient domestic production of these inputs, on the one hand, and the severe sensitivity of import demand of these inputs to the exchange rate fluctuations, on the other, authorities should adopt appropriate policies and effective measures. The traceability of feed, food-producing animals, and any other substance intended to be or expected to be incorporated into a food or feed shall be established at all stages of production, processing, and distribution; so, lack of traceability is one of the important weaknesses. A study in Hamadan City, Iran (2013) revealed the following factors as weak points of poultry raising: old equipment, lack of freezer to keep the productions, imbalance between cost and sale price, high cost of machinery, lack of capitals, lack of a comprehensive plan for exportation, and not using full potentials (Latifi *et al*., 2013).

Export-related problems are among the other weaknesses of the chicken industry. The outbreak of infectious diseases (such as Avian Influenza) has a negative impact on the poultry industry. While most of the consequences of outbreaks subside after one to two years, other endemic diseases may cause a lasting effect on this exchange (Dyck & Nelson, 2003).

- **Opportunities**

Self-sufficiency in the production of livestock inputs and vaccines, liberalization of the poultry industry, and privatization are the main opportunities. Developments in this field can help create new investment opportunities and reduce unemployment. Also setting up a traceability system that covers the whole supply chain, identifying suppliers, and putting in place a traceability system that should be systematically reported back to the competent authorities can improve the supply chain. Chicken meat, which is placed on the market or is likely to be placed on the market in the community, shall be adequately labeled or identified to facilitate its traceability through relevant documentation or information in accordance with the relevant requirements of more specific provisions in order to increase consumer building trust. At consumer level, the media activities and virtual food safety training in the health centers are promising opportunities to increase public awareness.

- **Threats:** One of the critical threats in this industry is chicken diseases like bird flu. High interest rates, fluctuations in the prices of imported livestock inputs, and fluctuations in the price of chicken meat are other threats to the industry. Chicken meat prices and currency fluctuations have been increased unbelievably in recent years because of the lack of government livestock inputs and the high cost of non-government inputs. Imposed sanctions have pushed up the prices of protein products, including chicken. Furthermore, the decline in imports of livestock inputs and their improper distribution have led to a sharp rise in poultry prices. A study in Iran (2020) showed that asymmetric price transfer in the poultry industry has led to a reduction in the poultry farmers' profit margins and is one of the factors threatening production in this industry. It is recommended to design the market price stabilization policies of inputs (Ghahremanzadeh *et al*., 2020).

Table 5. Strategies for the development of the chicken meat industry during the COVID-19 pandemic

	Invasive strategies (SO)	**Conservative strategies (WO)**
Industry	• Implementation of traceability in whole supply chain • Increasing public awareness by campaign	• Using modern technology and new regulation • A thorough inspection from farm to consumer • Using eco-friendly technologies
Consumer	• Increasing packed chicken meat with proper health and safety protocols	• Self-sufficiency for chicken feed in poultry systems • Food safety training in the health center
	Competitive strategies (ST)	**Defensive strategies (WT)**
Industry	• More interaction with the government to benefit of the chicken meat industry	• Supporting feed production of modern technology domestically
Consumer	• Increasing knowledge about safety purchases	• Strengthen public information infrastructure on food safety

Practical solutions and changes recommended for the future

Finally, based on the SWOT analysis results, Table 5 reveals appropriate strategies and practical solutions for the development of the chicken meat industry as priorities during the COVID-19 pandemic.

Also a general strategic plan to improve the productivity index by implementing the Hazard Analysis and Good Manufacturing Practices in poultry farms in order to reduce foodborne diseases and food security is another priority.

Limitation

The main limitation of the present study was the time during the COVID-19 pandemic. Another limitation was the lack of access to all parts of the poultry

industry such as the trends in the prices of feed inputs as well as chick placements. Further studies can focus on the other parts of the poultry industry recommended.

Conclusion

The chief weaknesses of the poultry industry are mismanagement and lack of policy and planning in all sectors. Lack of self-sufficiency for chicken feed in poultry systems in another weakness in this industry. The government must sustain a continuous plan for allocation of poultry inputs. Also the research findings revealed important concerns about the sufficient knowledge, positive attitude, and acceptable practice of consumers about the safety of chicken meat. Therefore, it is recommended to increase public awareness by campaign and also, implementation of traceability in whole supply chain. Policymakers can use the SWOT analysis results to offer directions for potential future strengthening actions of chicken meat safety to increase public health during the COVID-19 pandemic.

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