

Food Adulteration in Pakistan: A Major Threat to Youth's Health and Life

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Abstract. The recent malpractices in the food industry is one such sad and global trend. The quantum of this menace in Pakistan is such that has given rise a situation labeled as food emergency. The increase in food adulteration coincides with an alarming increase in the number of deaths due to cardiovascular diseases, respiratory tract infections and cancer along with an increase in mental disorders, especially in youth *i.e.*, depression, frustration and lack of concentration. This study aims at establishing how various adulterants elements added erroneously or intentionally are affecting the physical and mental growth of our youth and what policy/implementation steps should be taken to safeguard the physical and psychological wellbeing of our future generations. The purpose of this study is to find out to what extent food adulteration is responsible for this trend in the disease index, especially that of the youth. Being a country where 60% of the population is below the average age of twenty five years forming the productive group, it is importance to establish as to why are we facing the challenges of food safety, is it the lack of legislation, execution of laws, lack of awareness of all of these.

Keywords: food, adulteration, health, Pakistani youth

Introduction

An increase in the number of foodborne diseases and chronic health issues gave rise to the need to identify and trace the probable cause, studies were done in the 19th century by the American chemist, Harvey Washington Wiley, who fought for a check on adulterated food which resulted in Pure Food and Drug Act. But the trend continues and is now linked with an increasing number of foodborne diseases closely monitored by world disease control and food safety watchdog like the Centre of Disease Control, CDC and Codex Alimentarius Food Safety International Food Standard (Zikankuba *et al.*, 2019), which has marked foodborne diseases as the biggest health challenge. These diseases contribute significantly to the global burden of disease and mortality. Foodborne diseases are caused by contamination of food and occur at any stage of the food production, delivery and consumption chain (Jaafari *et al.*, 2021).

The situation in Pakistan is no less alarming if not more as the population growth rate is much higher in Pakistan compared to the global average along with foodborne diseases (Book, 2018).

The literature on the issue of food adulteration and its subsequent impact on the health and safety of people

abounds the digital forums. The publications of World Health Organizations, Center of Disease Control and other watchdogs were consulted (Codex Alimentarius, International Food Standards). The data on food adulteration concerning foodborne diseases for Pakistan is very scarce owing to the non-availability of research institutes dealing with such topics. Problems faced by Bangladesh and India were analyzed as well. Articles published in Economic Times India listed an alarming 26,000 food items as adulterated or miss branded in which emphasizes the point raised earlier that the spread of this menace is global (Sally, 2013). However, on the domestic front, despite being an important issue threatening our future generations, there is no consolidated study that correlates the disease data of Pakistan with that of food safety to find out the root cause of the health emergency which needs to be taken care by researchers and National Food Security Department. The analysis of studies done in Bangladesh on the effects of additives in milk on human health especially youth showed a clear link in the presence of urea, industrial colours and detergent in milk, vegetables and fruits with the increase in incidents of upper respiratory tract infections and heart diseases (Rahman *et al.*, 2015). The need to make similar studies here in Pakistan is very urgent and must be taken up by the National Food Security Department.

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Materials and Methods

A combination of qualitative (interviews, focus group) as well as quantitative (experiments i.e. lab tests, surveys) approaches have been used to complete this research. Food samples were obtained from random shops and different areas of Lahore by the students who were already consumers. Students from the University of Home Economics were chosen for an online questionnaire/interview related to various food related ailments of different families. To put forward the results of the research in a more understandable and relatable form, the paper is organized into two main sections, the first section identifies the case of Pakistan, situation, complexity, key question and then sub-questions arising out of the second section which offers strategy options after consulting the International best practices.

Section-1. Situation in Pakistan. Several reports have been published in recent years regarding food adulteration in various parts of Pakistan (Coppin and High, 1999). The food safety department raided different facilities in 2019 and found thousands of kilos of tainted products across Pakistan ranging from tea to milk and spices to edible oil, water and even poultry. On the other hand, a rapid spread of fatal diseases like cardiovascular, respiratory tract, malignant tumors and psychosomatic disorders has been reported by health watchdogs like the CDC (The Center for Disease Control and Prevention). Various studies have been done by more health conscious countries. In this regard to establish the actual impact of food adulteration on the spread of these diseases like in Bangladesh (Nasreen and Ahmed, 2014). The situation in Pakistan is no less alarming and not serious bordering on a health emergency (PM declares emergency against food adulteration, Dunya News TV, 13 February 2020). The sample testing done by food authorities shows that raw food materials, semi-cooked items and consumable items are widely adulterated with a heavy amount of chemicals extremely hazardous to human health. In a letter to the editor "Adulteration consumption of milk in Pakistan: are we drinking milk or milk-like liquid?", Journal of Public Health and Nutrition, ranked 122 out of 190 countries in terms of healthcare and the index for youth health is much worst (Qureshi and Khan, 2018). The food safety and security position of Pakistan is 78th with only 43.6% of food being safe (Ranking and trends, Global Food Security Index, 2019).

Complications. After the 18th constitutional amendment, food became a provincial subject. The federal laws governing food safety and security were to be re-enacted by the provinces. It took an average of 3 years for all the four provinces to pass the required laws and food authorities in all provinces were established under the Provincial Food Authority act (2014-2016). The existing state of affairs has a long history of neglect and public will has a major hand to play in its weakness as the pure.

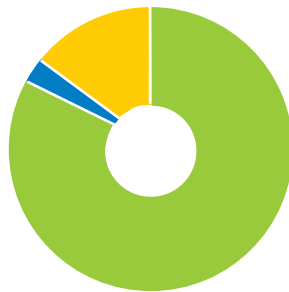
Food act was promulgated in 1960, giving legal and institutional framework for ensuring the food safety but the situation hasn't improved (Asghar, 2013). To understand and analyze the issue, food adulteration is devised into three main segments *i.e.*, Adulteration in raw food material e.g., milk, meat, vegetables, spices, oil; adulteration of semi cooked food items; adulteration of ready-to-eat food items like cooked food, juices, etc.

To establish the effects of adulterated food on health, data was collected through two main sources *i.e.* survey of food usage and testing of food samples from PCSIR, data from Punjab Food Authority was also studied to broaden the database. It is imperative to find out what type of chemicals/substances are used. Samples of 5 main food items *i.e.* cooking oil, water, milk, spices, and meat (poultry) were collected and tested.

Survey of food usage and brands. An online survey containing questions about the above mentioned food items was designed, 150 university students were randomly selected to respond to that and the results indicated that 85% of the people used cooking oil (Fig. 1), 70% used farm fresh milk (Fig. 2), 72.5% used branded and packed spices (Fig. 3), 57.5% people used bottled water, while others used filtered water (Fig. 4).

The 2nd part of the survey was designed to link any chronic disease with these food usages and it included questions about hormonal imbalance in children, respiratory tract infections, cardiovascular issues and liver disorders the results indicated that 30% reported allergic asthma (Fig. 5), 67.5% linked early puberty with the use of poultry (Fig. 6), 87.18% of people linked emotional imbalance in children with food that they are consuming (Fig. 7) and an overwhelming majority of 85% believed that hormonal issues in youth are directly linked with the food intake (Fig. 8 and 9). 95% of people believe in a link between heart & liver diseases and food adulteration (Fig. 10). The number of responses

1.Which of these do you use for cooking?

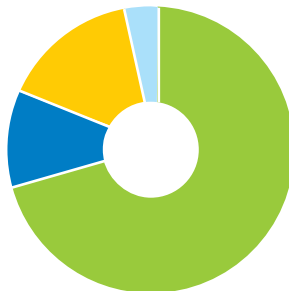


Answered: 40 Skipped: 0

■ Cooking oil	85%	34
■ Ghee	2.5%	1
■ Desi ghee	12.5%	5
□ Butter	0%	0
□ Natural oil like sarson, apricot	0%	0

Fig. 1. Type of fat used for cooking.

2.Which of these do you use for children & yourself?



Answered: 40 Skipped: 0

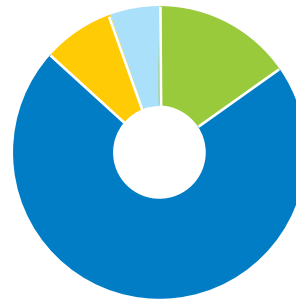
■ Farm fresh milk from market	70%	28
■ Fresh milk by any brand	12.5%	5
■ Bottled/tetrapack milk	15%	6
■ Powered milk	2.5%	1

Fig. 2. Type of milk for children.

of the survey is indicted in Table 1. The results of the survey are shown in the figures given below:

Lab tests of food samples. Five categories of food materials in daily use were selected and samples of best quality items were sent to PCSIR for chemical analysis. Reports of the sample testing done by the Punjab Food Authority were also consulted and the results were

3.Which is the source of the splces you use?



Answered: 40 Skipped: 0

■ Un-branded sold loose	15%	6
■ Branded packed	72.5%	29
■ Organic brands	7.5%	3
■ Organics self prepared	5%	2

Fig. 3. Source of food spices.

4.De you use bottle water or water filters?



Answered: 40 Skipped: 0

■ Bottled	57.5%	23
■ Filtered	42.5%	17

Fig. 4. Types of water source.

horrific. The Table 1 given below shows the type of chemicals found in food items and their impact on health.

Translating the above tabulated information into a more comprehensible format, an analysis of what is found in 5 major food items which were included in the survey conducted for food usage reveals that milk, an everyday use item, consumed in relatively large quantities by children and youth contains urea, detergents and white flour in large quantities. Urea consumed in large

5. Do you or any member of your family suffer from any allergy related to breathing?

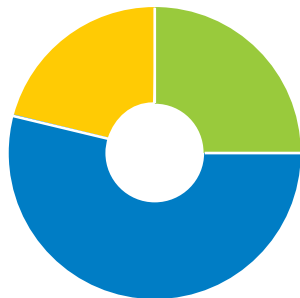


Answered: 40 Skipped: 0

■ Yes	30%	12
■ No	70%	8

Fig. 5. Susceptibility to allergies.

6. How often do you use poultry/chicken?



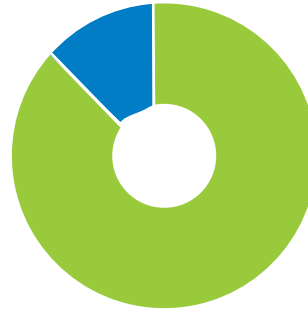
Answered: 40 Skipped: 0

■ Daily	25.64%	10
■ Twice a week	53.85%	21
■ Every fortnight	20.51%	8

Fig. 6. Frequency of chicken usage.

quantities causes failure of the excretory system and kidneys, link this information with the fact that the ratio of kidney failure patients aged under 40 is 1:1000 needing high end healthcare like dialysis. Cooking oil is found to be heavily loaded with mineral oil by-products, artificial colours and other seed oils that were not fit for human consumption and the mineral oil consumption is linked with paralysis, cardiovascular failure, increased blood LDL and gall bladder cancer. Read that fact with the number of patients suffering from hypertension and cardiovascular diseases which

7. Do you agree that children between the ages of 7 to 13 are very moody?

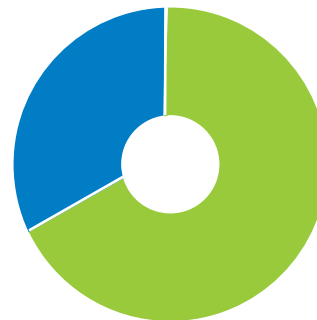


Answered: 40 Skipped: 0

■ Yes	87.18%	34
■ No	12.82%	5

Fig. 7. Emotional imbalance in children.

8. Do you think that children these days enter puberty too early (9.5 to 10.5 years)?



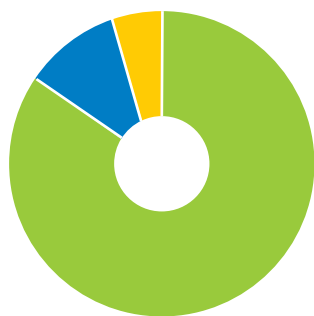
Answered: 40 Skipped: 0

■ Yes	67.5%	27
■ No	32.5%	13

Fig. 8. Early puberty in children.

have become the major cause of death by chronic diseases in a country where only 2 specialized cardiovascular care hospitals exist for a 200 million-plus population. Coming to poultry, meat, the most dangerous chemical found is growth hormones and carcinogenic organisms resulting from congealed blood mixed in the feed and it's known to cause restlessness and mental instability as well as having the danger of parasitic presence. The growth hormone not only causes stunted physical growth due to the premature start of secondary growth but has also a very taxing effect on kidneys.

9. Do you think food habits are responsible for the early puberty and hormonal issues?

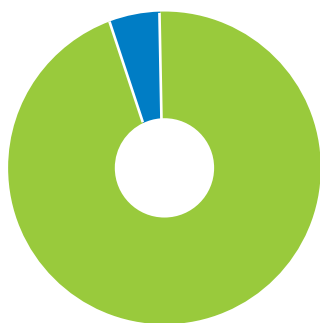


Answered: 40 Skipped: 0

Yes	85%	34
No	10%	4
Other (please specify)	5%	2

Fig. 9. Hormonal issues in children.

10. Do you think that current increase in heart and liver diseases is linked with adulterated food?



Answered: 40 Skipped: 0

Yes	95%	38
No	5%	2

Fig. 10. Adulterated food and health issues.

Emotional and psychological balance is linked with growth hormone and premature puberty is a cause of many Freudian disorders. Not only does it increase the number of patients suffering from depression but is also related to social callousness and abnormal emotional behaviours. Fruits and vegetables were found to be washed with heavy mineral oil products like wax and diesel, formalin and industrial dyes which is a recipe for respiratory tract infection.

Table 1. Number of responses of the survey.

Active survey		
Food usage & brands		
	150	150
	Total Responses	Completed Responses
Completion rate		100%
Last Entry		07/15/2020
Created		07/14/2020

Identifying food adulteration. The Codex Alimentarius Commission of the Food and Agriculture Organization of the United Nations and the World Health Organization (WHO) sets standards to protect the health of people by ensuring fair practices in the food industry along with Food and Agriculture Organization and the WHO by capacity building to implement food safety systems following the belief that improving food safety leads positively to trade, employment and poverty reduction. In developing countries, a lack of technical expertise and infrastructure to conduct a risk assessment is the main constraint for such a system. Risk assessment is the main component of risk analysis. WHO requires members to conduct science based risk assessments which are a process for estimating the probability and severity of associated risks to human health resulting from exposure to biological, chemical or physical hazards in food. Risk assessment needs to note uncertainties due to the limitation of available data or its interpretation. Risk assessment results are important for making risk management decisions (policy, standards, legislation, etc. Dong risk assessment needs the effort of multidisciplinary experts. Risk assessment consists of four components, as shown in Fig. 11.

Results and Discussion

Consumer as stakeholder most important factor.

The food industry is seeing a large shift due to consumer consciousness, although the political factor is not very active in the food industry and economic factor rules the roots diminishing the positivity of technology but the social factor seems to be over riding all, leading towards awareness of food safety and health hazards hence being the factor on which policy makers should focus.

Table 2. Food item adulterants found plus detection techniques and effect on health

Food items	Adulterant found	Effect on health	Biochemical	Molecular
Cooking oil	Large polymers found in petroleum by products animal body fat argemone seed	Clogging of vessels Glaucoma dropsy	MIR spectroscopy	Real-time PCR
Milk	Detergent urea	Failure of kidneys	ELISA, Fourier transform infrared spectroscopy and multivariate analysis, pulsed-field gel electrophoresis, MIR and NIR	PCR based method, ribotyping real-time PCR
Water	Bacteria <i>E.coli</i> waste material	Intestinal infections		
Spices	Industrial dyes	Respiratory tract infections	Near infrared hyperspectral near infrared hyperspectral imaging (NIR HSI) midinfrared spectroscopy (MIR)	SCAR
Poultry (Broiler)	Growth hormones congealed blood & dead animal waste added in feed leaves carcinogenic organism in meat	Early puberty and hormonal imbalance. Increased risk of cancer	ELISA	PCR-RFLP
Tea	Artificial colouring agents.	Liver disorders.	GC-MS	Species-specific PCR its of 5S rRNA
Sugar	Chalk powder, washing soda, urea, etc.	Stomach disorders and kidney failure.		
Pepper	Dried papaya seeds and blackberries.	Severe allergic reactions including stomach and skin irritations.		
Ghee, cheese, and butter	Mashed potatoes, vanaspati and starch powder	Gastro-intestinal disturbances and other stomach disorders.	MIR spectroscopy	SCAR AFLP/RAPD
Grains	Dust, pebbles, stones, straw, weed, seeds, damaged grain, etc.	Liver disorders toxicity in the body, etc.	TLC, HP-TLC	Real-time PCR
Pulses	Dyes, chemicals and lead chromate.	Stomach disorders		
Coffee powder	Chicory, tamarind seeds powder	Diarrhea.	MIR spectroscopy	Real-time PCR
Mustard seeds	Argemone seeds	Abdominal contractions, sluggishness and increased excretion.	TLC, HP-TLC	Real-time PCR
Edible oils	Mineral oil, Karanja oil, castor oil and artificial colours	Gallbladder cancer, allergies, paralysis, cardiac arrest and increased LDL cholesterol.		
Turmeric powder	Pesticide residues, sawdust, chalk dust, industrial dyes, meta nil yellow dye arsenic, lead metal, etc.	Cancer and stomach disorder	TLC, HPLC	RAPD
Chilli and coriander powder	Redbrick powder, rhodamine B dye, red lead, dung powder, soluble salts, water-soluble synthetic colours and other common salts.	Metal toxicity, cancer, lead poisoning, tumor, variations in blood pressure and other stomach-related disorders	-	-
Cinnamon	<i>Cassia</i> bark	Liver damage, low blood	Near-infrared hyperspectral	SCAR

continued on next page

sticks		sugar, mouth sores and increased risk of cancer	imaging (NIR HSI) Midinfrared spectroscopy (MIR)	
Cumin seeds	Coloured grass seeds, sawdust and charcoal dust	Stomach disorders.	-	-
Jam, Juice and candies	Non-permitted dyes including meta nil yellow and other artificial food dyes	These dyes are highly carcinogenic that have the potential to cause different types of cancer.	Proton NMR spectroscopy LC-MS FT- IR	-
Jaggery	Washing soda, chalk powder	vomiting and other stomach disorders		
Honey	Molasses, dextrose, sugar and corn syrups	Stomach disorders	-	-
Fruits/ Vegetables	Chemical dyes, malachite green, calcium carbide, copper sulfate, and oxytocin saccharin	Stomach disorders, vomiting, and dyes used are highly carcinogenic	-	-
Tomato sauces	Pumpkin pulp, non-edible artificial colours and flavours.	Gastritis and inflammation of vital organs	-	
Ice cream	Pepper oil, ethyl acetate, butyraldehyde, nitrate, washing powder. The kind of gum is added which is prepared by boiling different animal parts including the tail, udder, nose, etc;	Dreadful diseases that affect organs	-	



Fig. 11. Components of risk assessment.

Relating the available data of rampant food adulteration with health conditions requires the analysis of health data, unfortunately, health is not a priority subject for administration, legislature or even researchers here. Disease-wise data is collected from international watchdogs but no analytical work is available for

Pakistan to establish the effects of diseases with causes. The studies done in Bangladesh and India were consulted having almost the same socio-cultural and culinary dynamics. The fact that a rapid spread of these chronic diseases is linked with food consumption further gives credence to the hypothesis that the introduction/addition of harmful chemicals in food results in an unnatural increase in disease indices.

Correlation of food adulteration and rise in chronic diseases. To understand the relationship between food adulteration and the rise in certain diseases, organic food consumption was determined using a self reported food frequency questionnaire/survey was being conducted to establish a link between food habits, type of food used as well as well-being history of a selected group of people. A propensity score matching procedure was then used to obtain two similar subsets of 150 participants, differing mostly by the organic valence of their diet (mean age was 58.5 years and 70% of participants were women). Differences in distributions across groups were tested using Wilcoxon signed-rank test for matched data. Significantly lower urinary levels of phosphates and free 3-phenoxybenzoic acid were observed among organic consumers compared to

conventional consumers (Baudry *et al.*, 2019). It is pertinent to mention here that from the data of chemicals being added in food at various levels of production/consumption and only a select few are chosen due to clinical evidence of their impact on health. *i.e.*, urea, aflatoxin (in poultry), mineral oil, diesel to polish pulses and fruit/vegetables etc, increased use of growth hormones in milk production, poultry and its impact on youth mental growth and development is yet another important factor. The increase in the number of patients with mild to acute depression, frustration and even suicidal behaviour can be linked with evidence of hormones in food materials as clinical data of such experiments on animals shows the positive impact of these hormones on mental disorders. This established the fact that there exists a direct relationship between deaths by chronic diseases and mental illnesses with that of food adulteration.

Section-2. How to handle the hazardous practices of food adulteration?. After establishing the fact that food adulteration is by far the most dangerous malpractice by producers, the point comes to mind as how to handle it? Is the public aware of the dangers posed by food adulteration? Do we have legal framework for that?. Are there state institutions for Effective implementation?. How are the public managers dealing with it. What are the international best practices in this regard.

Food adulteration, popular perception. In Pakistan, the study has established the sorry fact that the food is adulterated with extremely dangerous chemicals at all levels. Raw materials like bottled water, cooking oil, raw milk even spices are contaminated with chemicals like urea, detergents, diesel, industrial colour even broken bricks. Unfortunately, the public response is extremely callous. Even when the information is made public by media or government agencies, people tend to continue using such brands and products. The reason is, the full information is not shared. It is informed that such and such products have harmful chemicals but what are these chemicals?. How are they dangerous?. What is the impact of continuous use?, such information is not made public owing to various pressure groups even in developed countries.

Legal framework, food safety laws. Five laws are being utilized to ensure that standards are maintained concerning the quality of food sold at eateries. These include the Punjab Animal Slaughter Act 1963, sections

269, 278 and 290 of the Pakistan penal code, the price control and prevention of profiteering and hoarding ordinance, food adulteration and spurious drugs act, while the main law being cited in these cases is the pure food ordinance, 1960, revised in 2011. After the 18th constitutional amendment, food along with its regulation became a provincial subject. Punjab and Sindh food authorities are actively monitoring food business and have a data bank, KPK and Baluchistan food authorities established under respective acts in 2014 are still struggling with infrastructure though and data from these two is not forthcoming. Food safety and security being a provincial subject under the 18th amendment, there are complimenting laws at the provincial level and the institutional framework as well. In Punjab, having a very active food authority, under the Punjab Food Authority act 2011, the pure food Ordinance of 1960 and Punjab Foodstuff Control Act 1958 along with the Drug Regulatory Act are being implemented quite well. The situation is quite the same at Islamabad Territory and Sindh however; the remaining part of the country seems to be working on autopilot and divine protection.

However, the strong cartels remain the more powerful element in the food domain. The government tests the foodstuff from time to time but the loop holes in the legal system and courts provide enough space for the culprits to evade legal action. Several milk brands and cooking oil were tested and found containing extremely hazardous to public health especially that of children but the food authority could only manage to publish their names and a notice to be careful in newspapers. No action was taken against any firm.

The same has been happening in poultry and meat industry. The producers are found to be adding industrial grade hormones and chemicals in the feed as well as dead and decaying animal and surgical waste, however, no action has been taken against the culprits. Cartels and Mafias are a bitter reality of third world countries and only public pressure can save the people if they want to be saved. How it remains to be seen and other parts of the world are dealing with this issue?.

International best practices. Effective food safety system around the world is based on prevention. Several organizations around the globe help various stakeholders to develop systems and procedures to ensure food safety and security some note worthy examples are; in west Africa, Lao, the locals were helped by FAO to develop

programs for effective use of pesticides by revising the curriculum of field and farming courses for farmers. Quality improvement is also ensured through a partnership with private sector investors in the case of the China seafood industry, improving fish safety and quality requires interventions at various stages of the value chain. Fisheries and food safety experts are involved to assist in developing the capacities of fish Inspection and food safety authorities to ensure that good practices are applied by all operators in the Fisheries sector: fisherfolk, fish farmers, fish handlers and processors. They use participatory approaches to assess training needs and to design and implement training of trainer programs to ensure that individual actors in the public and private sectors have the skills required to effectively perform their roles. Shared responsibility, involving stakeholders and the private sector are some of the approaches used around the world to ensure that safe and free of contaminants food is available to people. Pakistan despite having public safety and market monitoring committees under the local bodies ordinance lags in public involvement due to the non-implementation of the laws and procedures.

Stakeholder management approach in food risk management. Traditionally, in many societies, policies are determined by accountable agents (e.g., politicians and policymakers), often with the aid of expert advice. The resulting decisions are then generally communicated to the wider community, including the public, in a one-way direction, under the assumption that the communication recipients will understand and believe the information and think and behave appropriately in response (i.e. as the policymakers want). It is apparent, however, that in contemporary societies this model has to some degree failed: a loss of trust in decision makers and their advisors has led to public and stakeholder skepticism in policy maker communications and even non-compliance. Studying the food management scenario, it can be stated that the demand for local food is challenging food hub management to know what growth is positive and when growth supersedes the values associated with local food. Consequently, the inseparability between the momentum of the local food movement and the growth of food hubs is clear. Therefore, using a framework for the local food movement as a social movement, combined with a stakeholder approach to identifying who and what counts within food hubs, the relative salience of stakeholders can help to address this gap in management strategy.

Furthermore, a deeper understanding of how the relative salience of various stakeholders affects the local food movement has been assessed. The study is meant to serve as an introspective tool for food hub managers to better formulate their unique strategic objectives. Themes in the findings suggest that food hubs currently favour internal and customer stakeholders more heavily with some potentially dangerous relationships between particular customers. In addition, food hubs could work more strategically to engage regulatory stakeholders to facilitate some of the shared strategic objectives between most local food system stakeholders. This research has demonstrated that food hubs engage multiple stakeholders in their operationalization of local food distribution, However, there is a deficiency in the representativeness of stakeholders from the system approach. This reduces their ability to effect change at the systems level through favourable policy for their small and mid-sized producers or advocacy which could empower equity in the food system rather than create inequity and dependency programs. While the community approach is represented, the data is insufficient to account for the variety of ways in which this approach is operationalized. In the absence of data, food hubs should rely on the aspects of the community approach to be introspective in their operations. The need for case based research will help to facilitate this understanding externally. In summary, the implications for local food and the LFM are mixed. Food hubs are certainly having an additional effect by taking local food further than what has been achieved in alternative markets. In doing so, they are strengthening regional food systems through the incubation of new and small farmers and the diversification of the mid-sized farm. However, local food has not yet reformed the conventional food system which may be due to a lack of engagement in the systems approach. Past social movements have shown that a localized approach is a stepping stone to success. If food hubs can continue their growth and establish themselves as definitive stakeholders from the food system perspective, they may be better positioned to demand the change they need. Until then, they should work through a multi-stakeholder approach to construct and further advocate the value of locality's involvement in food management.

How Bangladesh controlled the menace of adulteration. In 2014, Bangladesh was facing serious issues of consumption of adulterated food items which was causing asthma, sore throat, larynx constriction,

bronchitis, skin infections, allergic reactions, diarrhea, hematuria, circulatory failure, numbness, dizziness, kidney failure, stomach cancer, liver cancer, nervous disorders and many other diseases (Nath, 2014).

Research revealed that the consumption of formalin directly through food was causing different types of cancers, especially lung cancer. After the consumption of adulterated food items, thousands of people were becoming sick. Children were the worst victims, about three million people suffered from diarrhea during 2005-2009 and 15% of children died in 2011 as reported by the Directorate General of Health Services (Nath, 2014). The long term effects were also feared to be very severe, especially the incidence of renal failure, liver damage and cancer which were increasing alarmingly in Bangladesh. Heavy metals, such as lead, chromium and arsenic accumulating in the body were thought to be causing kidney and liver damage and developing abnormalities among children. Textile dyes for short-term use caused diarrhea and gastrointestinal problems but in the long run, these materials were reported to accumulate in the body with serious health hazards. The burnt oil developed after repeated cooking severely affected the digestive system. In the case of very young children, the liver, not matured enough to metabolize and break down the toxins, affected the development of the immune system. So, children were reported to be at high risk due to such adulteration. According to the general information regarding food risk published by WHO, human exposure to chemicals at toxic levels, as well as nutritional imbalances are known or suspected to be involved in causing cancer, cardiovascular diseases, kidney and liver dysfunctions, hormonal imbalance, reproductive disorders, birth defects, premature births, immune system suppression. How did they handle these challenges? Once public and administrations were sensitized on the issues, many suggestions emerged in curbing adulteration of foods but following concerted efforts proved to be beneficial for preventing food adulteration.

- a. Sustainable development of mass awareness among people against the consequence of food adulteration on long-term health.
- b. Severe and exemplary punishment to the food contaminators. Life imprisonment or capital punishment were suggested for consideration depending upon the degree of offenses and ultimate effect.
- c. Strengthening food inspection service with skilled

manpower and valid analytical instruments as well as proper enforcement of relevant laws in a sustainable manner.

- d. Lowering the safety limit of the amount of pesticide and other toxicant residues in food items as per international guidelines.
- e. Educating the primary and secondary level students regarding the fatal impacts of food adulteration through academic curriculum.
- f. Training of farmers on the use of alternative and safe chemicals by the zonal agricultural department.
- g. Promotion of ethical practices among the business community with direct participation of the business leaders.
- h. The active role of the consumer rights groups against this menace.
- i. Implementation of all international agreements and protocols on safe food by the government through concerned ministries.
- j. Involvement of the health-related scientists from all universities and institutes to cross-check the market products from time to time through laboratory analysis by independent research with the help of governmental support and grant.
- k. Declaration of reward by the government for providing information regarding food adulteration syndicate, factory, selling points, supply chain, etc

Conclusion

The above discourse proves our point that food safety remains the most challenging aspect of governance and social security in the times to come, Pakistan is facing a serious threat to its youth's health due to continuous exposure to extremely hazardous chemicals through adulterated food. Despite having good laws, the weakness of implementation has exposed the ineffectiveness of governance strategy. The institutions and infrastructure are not as inadequate as it is projected, the issue lies in the capacity and skill of the officials involved in monitoring and implementation. As a result of this, the alarming increase of incapacitating diseases hitting the most productive segment of our society, our youth is projecting health to become the main challenge for governance and if steps are not taken now to control and curb this menace, it might be difficult in future to handle it. Public and raw food material producers as primary stakeholders are the key players in effective control of this problem. Learning from how other countries have similar demographic profiles has

overcome this problem and taking a clue from international best practices, following recommendations:

Recommendations

- a. Involving stakeholders both primary and secondary at all levels of implementation and monitoring of food safety, from farm to table by sensitizing the public on the importance of the issue through regular sharing of health and food safety data on social and electronic media.
- b. Encouraging self-sufficiency through kitchen gardening and simple/fresh produce
- c. through introducing programs providing seeds, technical support to women entrepreneurs.
- d. Marketing through dedicated expo of these products.
- e. Capacity building of regulatory bodies and producers is needed to improve monitoring and production to meet the demands sponsored by major producers of food items under Corporate Social Responsibility initiatives and by introducing specialized training courses.

Conflict of Interest. The authors declare they have no conflict of interest.

References

- Asghar, M. 2013. Food examples of past 10 years found adulterated, published in Dawn 11-06-2003
- Baudry, J., Debrauwer, L., Durand, G., Limon, G., Delcambre, A., Vidal, R., Hercberg, S. 2019. Urinary pesticide concentrations in French adults with low and high organic food consumption: results from the general population-based NutriNet-Santé. *Journal of Exposure Science and Environmental Epidemiology*, **29**: 366-378.
- Book, P.S.Y. 2018. *Pakistan Bureau of Statistics: Government of Pakistan*. URL: <http://www.pbs.gov.pk/sites/default/files//PAKISTAN%20STATISTICAL%20YEAR%20BOOK,202018>.
- Coppin, C.A., High, J.C. 1999. The Politics of Purity, p. 232, Harvey Washington Wiley and the Origins of Federal Food Policy: University of Michigan Press, <http://doi.org/10.3998/mpu3.16349>
- Dunya News TV, 13 February, 2020. *PM Declares Emergency Against food Adulteration*, <https://dunyanews.tv/en/Pakistan/532464-PM-declares-emergency-against-food-adulteration-> (accessed 12 July, 2020)
- Jaafari, Z., Abdolahinia, Z., Torkian, S., Khanjani, N., Esmaeilpour, A., Shafiei, B. M. 2021. Surveillance of foodborne and waterborne disease outbreaks in kerman province from 2015 to 2019. *Health and Development Journal*, **10**: 187-195.
- Nasreen, S., Ahmed, T. 2014. Food adulteration and consumer awareness in Dhaka city, 1995-2011. *Journal of Health, Population, and Nutrition*, **32**: 452-464
- Nath, D. 2014. Food or poison? bdnews24.com, May 9, 2014. URL: bdnews24.com/2014/05/09/food-or-poison.
- Ranking and trends, Global Food Security Index. 2019. Covid-19 and Global Hunger, (accessed 14 July 2020). <https://foodsecurityindex.eiu.com/Index>
- Rahman, M.A., Sultan, M.Z., Rahman, M.S., Rashid, M.A. 2015. Food adulteration: a serious public health concern in Bangladesh. *Bangladesh Pharmaceutical Journal*, **18**: 1-7. doi:103329bps.v18il.23503
- Sally, M. 2013. Increase in consumption of organic food products: ASSOCHAM survey. The economic Times (ET). (economictimes.indiatimes.com)
- Zikankuba, V.L., Mwanyika, G., Ntwenya, J.E., James, A. 2019. Pesticide regulations and their malpractice implications on food and environment safety. *Cogent Food and Agriculture*, **5**: 1601544. Article