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HEALTH CAMPAIGNS INTERVENTION TO IMPROVE FOOD POISONING RISK BEHAVIOURS DURING HAJJ PILGRIMAGE: A PROSPECTIVE, COHORT STUDY

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Abstract:

Objective: *The study aims to evaluate the efficacy of health campaigns to minimize the incidence rate of food poisoning cases by comparing cohort and control group in getting food poisoning symptoms, knowledge, and hospitalization.*

Methods: *A cohort-based study has been conducted by undertaking 2446 Hajj pilgrims divided into control and cohort groups. Data collection form containing questions on demographics, medical conditions, influenza vaccination history for the first interval, and document for the development of any reported food poisoning cases for the second interval in both groups was used as a tool for collecting data.*

Results: *Majority of the participants (95.6%) were not aware about the health-related problems in control group. In contrast, in cohort group, around 99.9% of the Hajj pilgrims were aware about Hajj health problems before performing Hajj pilgrimage. There was no significant difference in the level of hygienic practices between the control and cohort groups (p-value = 0.712). The level of food poisoning among the participants revealed 93.4% Hajj pilgrims were not suffering from food poisoning.*

Conclusion: *The level of awareness among the control group regarding food poisoning was low and there was increased incidence of food poisoning in the control group.*

Keywords: *Health Campaigns, Intervention, Food Poisoning, Risk Behavior, Hajj Pilgrimage.*

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INTRODUCTION:

Food poisoning is a cluster of illnesses acquired by consumption of foods contaminated with different types of pathogenic organisms, which secrete toxins and chemical contaminants. [1] In recent years, public concerns on food safety have increased in developed countries, following a series of contaminations including dioxin contamination of European food products and the emergence of Listeriosis as a foodborne disease of some significance. [2] A national policy for reporting incidents of bacterial food poisoning in Saudi Arabia was established in 1984. Since then, food poisoning outbreaks exhibiting seasonal and regional variations have been reported from different regions of the Kingdom. [3-6]

In a review of 781 events of foodborne diseases reported to the Ministry of Health, Riyadh, KSA involving 6,052 cases, reported that Staphylococcus aureus was responsible for 41% of events followed by Salmonella. Salmonella is responsible for 33% of the food poisoning outbreaks in the Eastern province during the period 1991-1996. [7,8] The main source of Salmonella infection was found in the chicken meat and eggs. In USA, one out of every 4 chickens have been found to be infected with Salmonella.[7,9] High number of reported outbreaks are in the Hajj and Umrah seasons in Makkah, KSA. The number of reported cases of food poisoning has ranged from 44-132 in each Hajj season. [7] This is because too many factors including different cultures, beliefs, and behavior, present the problem of food handling and food hygiene standards leading to risks of foodborne pathogens. [10]

Food handlers are known to play an important role in food safety and in the transmission of foodborne infections since they are likely to introduce pathogens into foods during production, processing, and distribution. [11] In fact, asymptomatic food handlers have been incriminated in many food poisoning outbreaks. [12] In 2011, a foodborne study among food handler during hajj season showed 129 Staphylococcus aureus isolates from 1516 clinical specimens from different nationalities food handlers in Makkah. [13] The results showed that 45 produced one or more enterotoxins. Most strains produced only one type of enterotoxin but few produced two enterotoxins, simultaneously. [14]

There is a need to hold campaigns before hajj pilgrimage and aware pilgrims with many important topics including food poisoning because many studies among food poisoning during hajj conclude that there is a need to aware pilgrims with preventive methods and risk of food poisoning. Therefore, the present study aims to evaluate the efficacy of health campaigns in minimizing the incidence rate of food poisoning cases. The study has also determined the self-reported food poisoning at Hajj pilgrimage and compared cohort and control group in getting food poisoning symptoms, knowledge, and hospitalization. The study tends to divide the infected pilgrims according to scoring system of symptoms and identify the main risk factor of cause food poisoning symptoms and hospitalization. Moreover, it has also determined the barriers that stop the pilgrims from dealing with the precautions to prevent infectious diseases.

MATERIAL AND METHODS:

Study Design

A cohort study has been conducted to compare the efficacy of health campaigns including health promotion during hajj season between two groups of pilgrims, the cohort group include pilgrims who got the awareness about food poisoning by zmzm awareness campaigns, control group include pilgrims who not getting the awareness about food poisoning by zmzm awareness campaigns.

Inclusion and Exclusion Criteria

The inclusion criteria for participants inclusion was 18 years and that the participants should be able to provide verbal consent and perform hajj pilgrimage. However, participants greater than 60 years of age were excluded from the study. The participants, who refused or were unable to give verbal consent and were suffering from GIT chronic diseases were excluded from the study, regarding to participants from control group should not include pilgrims who got the awareness about food poisoning topic from our campaign. Ethical approval was obtained from institutional ethical committee of ZMZM volunteering commission ; reference number was HAPO-02-K-012-2017-03- 356.

Sample Size

Selection randomization to each group was in a 1:1 ratio and was conducted according to residency of pilgrims in Makkah city. The randomization was stratified by gender and country of residence to ensure a balanced and proportionate recruitment. A total of 2446 participants were included in the study

Data Collection

A group of research team members was held responsible for data collection and campaign holding within the residence of each pilgrim, these residences include 20 hotels on Makkah city, divided to half for each group cohort and control. The cohort group determined by that group who got awareness about

food poisoning by our campaign team and the control group is that group who not get the awareness by our campaigns. The data was collected in two different intervals of times for the exposed group. The first interval was conducted from 31 August 2017 to 5 September 2017 before pilgrims expose to the health campaigns. The second interval post-Hajj was conducted from 15 to 17 September 2017. The data collection in both intervals was performed by using a data collection form containing questions on demographics, medical conditions, influenza vaccination history for the first interval, and document for the development of any reported food poisoning cases for the second interval in both groups. The second control group was not provided with any health campaigns.

Statistical Analysis

The collected data was gathered in a single document and rechecked by the researcher to ensure the presence of missing, unneeded, or mixed data. Statistical Package for the Social science (SPSS) version 20.0 was used for conducting statistical analysis.

RESULTS:

The study had recruited a total of 2446 Hajj pilgrims during the study period in Hajj season 2017. The results showed that the highest percentage (34.5%) of the participants were aged >60 years; whereas, 31.2% of the participants from cohort group aged >60 years. Other demographic details of the participants including; gender, nationality, frequency of performing Hajj, and details about suffering from any disease has been presented in table 1. The frequency of participants from control group suffering from various diseases and their percentage in order of frequency was; diabetes (7.8%), hypothyroidism (9.9%), chronic infectious diseases (1.2%), renal failure (0.5%), cardiovascular diseases (1.8%), CNS disorders (0.4%), skin diseases (0.7%), immobility (1.1%), GIT diseases (1.2%), and multiple diseases (4.4%). The frequency of participants from cohort group suffering from various diseases and their percentage in order of frequency was; diabetes (9.7%), hypothyroidism (9.7%), chronic infectious diseases (0.4%), renal failure (0.2%), cardiovascular diseases (1.4%), CNS disorders (0.3%), skin diseases (0.2%), immobility (0.6%), GIT diseases (0.8%), and multiple diseases (3.9%) (Table 1).

[Insert Table 1 here]

Table 2 has depicted the awareness about Hajj related problems faced by the pilgrims. The results showed that in control group, majority of the participants (95.6%) were not aware about the health-related problems. In contrast, in cohort group, around 99.9% of the Hajj pilgrims were aware about Hajj health problems before performing Hajj pilgrimage (Table 2). Table 3 has illustrated the hygiene related practices among the pilgrims that include cleaning of vegetables before consumption, washing hands before having meals, drinking unpasteurized milk, consuming uncooked foods or kept in improper temperature, consuming pure water or water direct from the tap, verifying expiry date of products, eating uncovered food, using paper plates and cups, keeping uncooked food in the room temperature for more than two hours (Table 3).

[Insert Table 2 here]

[Insert Table 3 here]

The level of hygienic practices among both the groups showed that majority of the participants (53.43%) had high level, 34.22% had average level; while, 12.33% had weak level of hygienic practices (Figure 1). There was no significant difference in the level of hygienic practices between the control and cohort groups (p-value = 0.712) (Table 4). Figure 1 has also shown the level of food poisoning among the participants, revealing that majority of them (93.4%) were not suffering from food poisoning. The results showed no significant difference between control and cohort groups regarding the level of food poisoning scoring (p-value = 0.18) (Table 5).

[Insert Figure 1 here]

[Insert Table 4 here]

[Insert Table 5 here]

DISCUSSION:

The occurrence of food poisoning among the Hajj pilgrims is common caused by the toxins that are produced by *Staphylococcus* and *Bacillius cereus.* The spread of gastrointestinal diseases increases during Hajj because of consuming contaminated food prepared unhygienically, food stored for long time, consuming contaminated water, and not washing hand before consuming water. A study has shown that risk of developing gastrointestinal infection increases, when Hajj occurs during summers as climate in extremely hot in Saudi Arabia.[15] Another study conducted by Al Masud et al. [16] ranked gastroenteritis on the 5th number for causing health burden and hospital admissions during Hajj.

The present study has clearly depicted that level of awareness among the participants was low. Similar to this result, a study conducted by Shafi et al. [17] discussed the factors reducing the health risks based on the Hajj guidelines provided by different centers in Saudi Arabia, America, and England for prevention

and control. The type of diseases and health guidelines have been concerned accordingly on the basis of pre-Hajj, during Hajj, and post-Hajj risk factors. Another study conducted by Shujaa and Alhamid [18] showed that the only way of preventing the spread of infectious diseases like gastrointestinal illness and respiratory infection is the use of vaccines and healthcare regulations. Moreover, there is also need of proper crowd management and control, scheduling of the pilgrims, and proper grouping to minimize the spread of these diseases.[18][8]

In consistent with the present study results regarding food poisoning, Raja et al. [19] stated that food poisoning was the most common gastrointestinal problem that is encountered during Hajj. Literature has stated that salmonella species is the most common cause of developing gastrointestinal infection. However, new pathogens have also been identified (as Escherichia coli (E. coli) and Norwalk) by the health authorities for preventing and eradicating communicable diseases. [10] There is continuous surveillance for threat of food poisoning and spread of pathogens as an important part of public health response for Hajj. A study conducted by Memish et al. [20] revealed that gastrointestinal infections are mostly caused as a result of poor personal hygiene, improper standard of food preparation, asymptomatic carriers of pathogens, consuming contaminated water, and inadequate storage of food. [20]

It is important to focus on the public health measures during Hajj regarding the provision of food and water supplies, vector control, and sanitation. Inspection of the quality drinking water is performed by a committee for security control of main water resources in Makkah. [20] Moreover, assurance of proper chlorine pumping equipment's function is likely to be performed through daily inspection tour of water treatment plants. There is strong enforcement of a precaution that the pilgrims would not be allowed to bring any sort of fresh food or agricultural products into Saudi Arabia. In the similar context, a study conducted by Bakhsh et al. [21] evaluated the pattern of disease among pilgrims attending Hajj. However, the results revealed that around 13.2% of the pilgrims were likely to suffer from gastrointestinal infections. [21]

CONCLUSION:

The study has depicted low level of awareness and knowledge about food poisoning in control group. There was increased incidence rate of food poisoning in the control group. Whereas, the results showed high level of knowledge and satisfaction among food poisoning in cohort group. This clearly depicts that the traditional concepts related to control of disease during Hajj is not satisfactory and does not address the complexity of health-related problems, adequately. It is important to organize efficient medical information and communication technology for ensuring real-time medical facilities during pilgrimage in Hajj. This organization of prevention is likely to help in monitoring pilgrims' physiological conditions and to deliver health-related information to the healthcare stations.

The health system of the host country that is Saudi Arabia is compromised significantly as a result of spread of infectious diseases at large gatherings like Hajj. Moreover, the spread of infectious diseases poses a great threat in the global health security at the religious events. Therefore, the study recommends formation of Global Center for Mass Gathering Medicine, which would serve as a platform to provide knowledge regarding improvement of health of the pilgrims. The study results are limited because some of pilgrims in control group got awareness about food poisoning by certain organizations in their countries.

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Tables

Table 1: Demographic details of the participants

		Control		Cohort		Total	
		N	**%**	**N**	**%**	**N**	**%**
Age	<40	146	14.2%	217	15.3%	363	14.8%
	40-50	230	22.4%	342	24.1%	572	23.4%
	50-60	297	28.9%	417	29.4%	714	29.2%
	>60	355	34.5%	442	31.2%	797	32.6%
Gender	Male	817	79.5%	1221	86.1%	2038	83.3%
	Female	211	20.5%	197	13.9%	408	16.7%
Nationality	Jordanian	17	1.7%	17	1.2%	34	1.4%
	Egyptian	329	32.0%	297	20.9%	626	25.6%
	Algerian	335	32.6%	652	46.0%	987	40.4%
	Tunesian	2	.2%	0	0.0%	2	.1%
	Sudanese	345	33.6%	452	31.9%	797	32.6%
Hajj for	First time	874	85.0%	1185	83.6%	2059	84.2%
	Second time	87	8.5%	158	11.1%	245	10.0%
	Third time	29	2.8%	27	1.9%	56	2.3%
	More than three	38	3.7%	48	3.4%	86	3.5%
Years of education	No	238	23.2%	253	17.8%	491	20.1%
	<12	264	25.7%	369	26.0%	633	25.9%
	12-18	468	45.5%	704	49.6%	1172	47.9%
	>18	58	5.6%	92	6.5%	150	6.1%
Home country	Big City	641	62.4%	935	65.9%	1576	64.4%
	Small city	198	19.3%	264	18.6%	462	18.9%
	Village	163	15.9%	188	13.3%	351	14.3%
	Rural	26	2.5%	31	2.2%	57	2.3%
Suffering from any sort of disease	non	732	71.2%	1033	72.8%	1765	72.2%
	Diabetes	80	7.8%	137	9.7%	217	8.9%
	HT	102	9.9%	137	9.7%	239	9.8%
	Chronic Infectious diseases (HIV-Hib)	12	1.2%	6	.4%	18	.7%
	Renal failure	5	.5%	3	.2%	8	.3%
	Cardiovascular diseases	18	1.8%	20	1.4%	38	1.6%
	CNS disorder	4	.4%	4	.3%	8	.3%
	Skin diseases	7	.7%	3	.2%	10	.4%
	Immobility	11	1.1%	8	.6%	19	.8%
	GIT diseases	12	1.2%	11	.8%	23	.9%
	multiple	45	4.4%	56	3.9%	101	4.1%

Table 2: Awareness about Hajj related problems faced by pilgrims

		Control		Cohort		Total	
		N	**%**	**N**	**%**	**N**	**%**
Awareness about hajj health problems before performing hajj pilgrimage	Yes	45	4.4%	1416	99.9%	1461	59.7%
	No	983	95.6%	2	.1%	985	40.3%
Source of awareness	Zmam charity health campaigns	5	11.1%	395	28.0%	400	27.5%
	Hajj company	12	26.7%	431	30.6%	443	30.4%
	Airport	2	4.4%	46	3.3%	48	3.3%
	TV	1	2.2%	190	13.5%	191	13.1%
	Health campaigns	6	13.3%	223	15.8%	229	15.7%
	Hospitals	0	0.0%	88	6.2%	88	6.0%
	Don’t know	18	40.0%	15	1.1%	33	2.3%
	multiple	1	2.2%	22	1.6%	23	1.6%
Topics on which awareness was provided	Hypertension	1	2.2%	89	6.3%	90	6.2%
	Diabetes	2	4.4%	44	3.1%	46	3.1%
	Heat stroke	2	4.4%	138	9.7%	140	9.6%
	Asthma	0	0.0%	10	.7%	10	.7%
	Respiratory infectious diseases	7	15.6%	389	27.5%	396	27.1%
	Food poisoning	2	4.4%	21	1.5%	23	1.6%
	Vaccination	0	0.0%	36	2.5%	36	2.5%
	Foot and other Injuries	11	24.4%	11	.8%	22	1.5%
	Skin diseases	0	0.0%	5	.4%	5	.3%
	Don’t know	17	37.8%	25	1.8%	42	2.9%
	Multiple	3	6.7%	648	45.8%	651	44.6%

Table 3: Hygiene related practices among the pilgrims

	Control		Cohort		Total	
	N	%	N	%	N	%
Cleaning vegetables before having them	824	80.2%	1131	79.8%	1955	79.9%
washing hands before preparing (or having) food	906	88.1%	1211	85.4%	2117	86.5%
Drinking unpasteurized milk	139	13.5%	239	16.9%	378	15.5%
Eating some foods uncooked (such as eggs)	105	10.2%	174	12.3%	279	11.4%
Eating some foods kept in improper temperature	149	14.5%	271	19.1%	420	17.2%
Using pure water for drinking and cooking.	784	76.3%	993	70.0%	1777	72.6%
Drink water from taps or unclean ice cubes.	200	19.5%	284	20.0%	484	19.8%
Verify of the expiry date of products.	414	40.3%	690	48.7%	1104	45.1%
Eating uncovered foods or those prepared long time ago.	125	12.2%	211	14.9%	336	13.7%
Using Paper plates and cups	666	64.8%	984	69.4%	1650	67.5%
keeping uncooked food in the room temperature for more than two hours	149	14.5%	218	15.4%	367	15.0%

Table 4: Comparative analysis of level of hygiene related practices between control and cohort groups

		Groups				Total		chi-square	
		Control		Cohort					
		N	%	N	%	N	%	X^2	P-value
Practices	Weak	121	11.8%	181	12.8%	302	12.3%	0.680	0.712
	Average	350	34.0%	487	34.3%	837	34.2%		
	High	557	54.2%	750	52.9%	1307	53.4%		
Total		1028	100.0%	1418	100.0%	2446	100.0%		

Table 5: Comparative analysis of level of food poisoning scoring between control and cohort groups

		Groups						Chi-square	
		Control		Cohort		Total			
		N	%	N	%	N	%	X^2	P-value
Food poisoning scoring	Negative	968	94.2%	1316	92.8%	2284	93.4%	1.795	0.18
	Positive	60	5.8%	102	7.2%	162	6.6%		
Total		1028	100.0%	1418	100.0%	2446	100.0%		