

## Awareness and Knowledge about Food Spoilage and Principles of Food Preservation among Saudi Women in Jeddah

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### Abstract

Food spoilage can be defined as any sensory change of the food which becomes harmful to consumers and unsuitable to eat. Therefore, the purpose of this study was to discover the degree of awareness and understanding about food spoilage and preservation among Saudi women in Jeddah. Questionnaires were developed and distributed among female students (n=110) in King Abdul-Aziz University. The data were used to conduct frequency analysis. The results demonstrated that 84.6% ( $1.8 \pm 1.0$ ) of respondents agreed that foods spoiled by the action of microorganisms in soil, air, and water. In addition, over 90% of respondents have shown agreement on the effect of temperature on the foods spoilage, food poisoning occurs when consuming foods contaminated with bacteria or viruses and food drying is a method of food preservation. In addition, above 50% of the respondents have knowledge about eggs preservation and the practices when seeing mold on both hard and soft fruits and vegetables. Additionally, respondents have agreed (~50%) that meat should be stored from 3-5 days in the fridge. Respondents of 81.3% have agreed that dry grain stored at cool temperatures can safely increase the shelf-life. Overall, there was a high ratio of awareness among the Saudi women about the food spoilage and preservation.

**Keywords:** Food spoilage; Food preservation; Saudi women; Awareness

### Introduction

Each kind of foods is considered normal and has its natural characteristics that distinguish it from the others, such as appearance, texture, smell, taste and flavor [1]. Therefore, any change in one or more of these characteristics might make the validity of food doubtful. Spoiled foods may cause illness because of the presence of pathogenic microorganisms and their toxins, chemical contamination or pesticides which make the food unhealthy and unsuitable for human consumption [2].

There are highly perishable foods that likely to spoil, decay or become unsafe to consume if is not refrigerated at 4.4°C or frozen at -17.8°C such as greens, soft fruits, fresh meat, poultry, fish and dairy products [1]. Semi-perishable foods are containing natural inhibitors of spoilage such as eggs and foods that have been processed by a simple preservation method such as pasteurized milk, smoked fish, and pickled vegetables. Foods that did not get rotten or remain valid for human consumption for a long time if stored properly are known as stable or non-perishable foods such as cereals, sugar, flour, dry fruits and vegetables [1].

Generally, there are several reasons for foods spoilage i.e. growth and activity of microorganisms, changes in temperature, humidity, pH, and water activity [3]. Chemical reactions that cause unpleasant sensory changes in foods are occurred by a variety of microbes that use food as a carbon and energy source. Some microbes are frequently found in many types of spoiled foods whereas others are more selective in the foods. The growth of microbes such as bacteria, yeasts, and molds may relate to nutrition and environmental conditions that make them able to attack different kinds of foods whether fresh or processed, causing changes in their sensory characteristics [3].

Controlling the temperature during storage of food is one of the important factors that delay the signs of spoilage of foods [4,5]. Storage at low temperature slows the activity and growth of microbes since microorganisms have an optimal temperature for their growth causing unacceptable changes in the foods. To the best of our knowledge, No research has been conducted on awareness and knowledge of the Saudi women in Jeddah city on foods spoilage and preservation. Therefore, this study aims to identify the extent of awareness and knowledge of the Saudi women in Jeddah city on foods spoilage and preservation.

### Materials and Methods

The aim of this study was to gain an understanding of Saudi women's perceptions in Jeddah city of the foods spoilage and preservation. To capture women's perspectives of foods spoilage and practices in place to minimize the risk of food spoilage, a descriptive quantitative design was chosen. After an extensive study of the existing literature on the factors that influence foods spoilage, a questionnaire was designed to identify the extent of awareness and knowledge of the foods spoilage and preservation. The questionnaire was drafted in two languages, Arabic and English in order to avoid ambiguity and misunderstanding. Each question was given four response options, namely agree, strongly agree, disagree and strongly disagree.

The study was conducted between February and March 2016. 120 Saudi women were randomly selected from King Abdulaziz University, Jeddah. The questionnaire consisted of two sections. Section A is a series of demographic questions to obtain sufficient information about the participant's background such as age, educational background (diploma, bachelor, master, and Ph.D.). Section B asked a series of questions regarding foods spoilage and preservation and evaluate the hygiene practiced in handling food stored at home. 120 questionnaires were received and 10 dropped out due to incomplete demographic data and other factors leaving. Participants varied greatly in the educational

background between diploma (2), bachelor students (97), Masters (3) and Ph.D. (8) aged less than 20 to 39 (Table 1).

Data obtained from this study were analyzed using descriptive statistic. Statistical analyses was done using the SPSSV20 statistical software.

## Results

Table 2 shows the frequency, percentage (%), mean, and the standard deviation of the responses to the questions, which measured the description of Saudi women's perceptions in Jeddah city of the foods spoilage and preservation. The results showed that approximately all the respondents 92.7% agreed that awareness about food spoilage and preservation with the mean score of 1.65 and Std. Dev.=0.77. In addition, more than half of the respondents (58.9%) agreed that should not wash eggs before storing in the fridge with the mean score of 2.5 and Std. Dev.=1.07, while 25% disagreed. The lowest percentage of respondents (28.5%) disagreed that white cheese should be saved in food storage containers with mean and Std. Dev. 2.2 and 1.06 respectively. Furthermore, about 84.6% ( $1.8 \pm 1.0$ ) of respondents agreed that foods spoiled by the action of microorganisms in soil, air, and water. Similarly, 81.3% of respondents have agreed that dry grain stored at cool temperatures can safely increase the shelf-life Table 2. Almost more than half of the respondents have agreed that meat should be stored from 3-5 days in the fridge and the moldy part in both hard and soft fruits and vegetables can be removed and use the rest Table 2. Nearly full respondents have agreed about temperature have a significant effect on the spoilage of foods, any sensory changes in the food might make it unsuitable to eat, food poisoning occurs when consuming foods contaminated with bacteria or viruses and food drying is a method of food preservation Table 2.

## Discussion

Most raw foods contain a diversity of bacteria, yeasts, and molds. Usually, either one or more types of this microorganism are able to grow rapidly in particular environmental conditions and cause food spoilage [1,6]. One of the most important factors of microbial growth in food or its surface is the available moisture content ( $a_w$ =water activity). Yeast and molds need lower  $a_w$  than bacteria which make food with low  $a_w$  such as bread contaminated mostly with yeast and molds [1].

The acidity (pH) of the food is also an important factor of food spoilage. Most molds can grow over a wide range of pH while yeasts

are favored by the low pH [7]. In addition, neutral or slightly alkaline conditions favored bacterial growth.

Temperature as one of the environmental factors plays a significant role in microbial growth in food. Every microorganism has an optimal temperature for growth, thus avoiding food storage at this temperature or close to it decreases the rate of spoilage [1,4,7,8]. Moreover, some molds are aerobic microorganism which requires oxygen for growth so, they cannot grow under anaerobic conditions. The spoilage microorganism may also found in the air, dust, and water. Therefore, the types and numbers of microorganism will determine the extending shelf-life and keep quality of the food.

Packaging process and the quality of packages are also one of the important factors in order to delay the spoilage of foods [3,9]. This is because some packages cause moisture on the surface of the product which leads to quick spoilage. Moisture loss in frozen food leads to the appearance of dry areas and spots on the surface known as 'freezing burns', which affects the characteristics of food [9].

The main processes of food spoilage are the activity of microorganisms which can be reduced or prevented by using food preservatives methods [6,9-12]. The most widely used methods of food preservations include drying (removal of the water content) and storage at low temperature i.e. chilling and freezing that used to delay chemical reactions, the action of food enzymes and slow or stop microbial growth [4,11].

Some molds cause allergic reactions and respiratory problems. When the environmental conditions suitable, a few types of mold can produce "mycotoxins," poisonous substances that can cause food poisoning to people [5]. Hard fruits and vegetables with low water content can prevent the mold from penetrating deeply inside therefore, the mold can be trimmed by cut off at least 1 inch around and below the moldy and the other parts can be used. On the other hand, moldy soft fruits and vegetables should be discarded since high water content make the mold easily penetrate into these fruits and vegetables [5].

To the best of our knowledge, No research has been conducted on awareness and knowledge of the Saudi women in Jeddah city of the foods spoilage and preservation. Overall, there was a high ratio of awareness among the Saudi women about the food spoilage and preservation, this is main that when food is kept from spoilage, it maintains its nutritive value. It also ensures food is available for use even during lean season and it prevents illness and in severe cases [13]. In addition, it could lead to money saved when food commodities are kept from spoilage.

Questions	Variables	Frequency	Percentage (%)	Mean	Standard dev.
Awareness about food spoilage and preservation	Awareness			1.65	0.77
	1. Strongly agree	53	48.2		
	2. Agree	49	44.5		
	3. Strongly disagree	2	1.8		
	4. Disagree	6	5.5		
Should not wash eggs before storing in the fridge	Eggs preservation			2.46	1.07
	1. Strongly agree	22	19.6		

	2. Agree	44	39.3		
	3. Strongly disagree	16	16.1		
	4. Disagree	28	25		
White cheese should be saved in food storage containers	White cheese preservation			2.2	1.06
	1. Strongly agree	32	28.6		
	2. Agree	48	42.9		
	3. Strongly disagree	8	8.9		
	4. Disagree	22	19.6		
Foods spoiled by the action of microorganisms in soil, air and water	Foods spoilage			1.84	1
	1. Strongly agree	50	45.5		
	2. Agree	43	39.1		
	3. Strongly disagree	2	1.8		
	4. Disagree	15	13.6		
Meat should be stored from 3-5 days in the fridge	Meat storage			2.47	1.04
	1. Strongly agree	20	17.9		
	2. Agree	45	40.2		
	3. Strongly disagree	21	18.8		
	4. Disagree	24	23.2		
Dry grain should be stored at cool temperatures	Dry grain storage			1.93	1.05
	1. Strongly agree	47	42		
	2. Agree	44	39.3		
	3. Strongly disagree	3	2.7		
	4. Disagree	16	16.1		
Temperature have a significant effect on the spoilage of foods	Temperature			1.21	0.41
	1. Strongly agree	88	79.3		
	2. Agree	22	20.7		
	3. Strongly disagree	0	0		
	4. Disagree	0	0		
Any sensory changes in the food might make it unsuitable to eat	Sensory changes			1.36	0.54
	1. Strongly agree	73	65.8		
	2. Agree	36	33.3		
	3. Strongly disagree	0	0		
	4. Disagree	1	0.9		
Food drying is a method of food preservation	Food drying			1.61	0.84
	1. Strongly agree	61	55		
	2. Agree	39	36		

	3. Strongly disagree	2	1.8		
	4. Disagree	8	7.2		
Food poisoning occurs when consume foods contaminated with bacteria or viruses	Food poisoning			1.23	0.54
	1. Strongly agree	89	80.9		
	2. Agree	19	17.3		
	3. Strongly disagree	0	0		
	4. Disagree	2	1.8		
Moldy part in both hard and soft fruits and vegetables can be removed and use the rest	Moldy fruits and vegetables			2.38	1
	1. Strongly agree	25	22.7		
	2. Agree	34	30.9		
	3. Strongly disagree	35	31.8		
	4. Disagree	16	14.5		

**Table 2:** Frequency and descriptive of participants' responds.

## Conclusion

The present study indicated that almost all respondents have shown agreement on the effect of temperature on the foods spoilage, food poisoning occurs when consuming foods contaminated with bacteria or viruses and food drying is a method of food preservation. In addition, half of the respondents have knowledge about eggs preservation and the practices when seeing mold on both hard and soft fruits and vegetables. This study indicated that there was a high level of awareness among the Saudi women about the food spoilage and preservation. In addition, the researcher recommends future research on a large scale with substantial proportions of respondents selected across Saudi Arabia. Further study is needed to carry out on Saudi men in Jeddah to determine the differences in awareness of food spoilage and preservation between both genders.

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