

# Knowledge Status of Dietary Guidelines and Portion Sizes in Saudi Arabian Mothers; A Cross-Sectional Study

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**Abstract** Currently there is little research investigating awareness or use of dietary guidelines in Saudi Arabia. This study aims to investigate Saudi Arabian mother's knowledge of current dietary guidelines regarding food groups and portion sizes and to investigate its relation to the sociodemographic factors. This cross-sectional study used community-based family events to recruit mothers and children. Health stands offering nutrition information and advice were used at these events for study recruitment and nutritional advices to attract them. A short online questionnaire was used to interview mothers during the events to measure their knowledge of dietary guideline and portion sizes. The questionnaire included questions to assess knowledge of dietary guidelines and portion sizes. Questions about the serving size of each food groups and the dietary guideline 'MyPlate' were included; the study recruited a convenience sample of 101 participants. Quantitative analysis using Chi-square and Kruksan-Wallis tests. We found 29.1 % of the participants were aware of the MyPlate guidelines and 51.5 % said that they are affected by healthy plate choices. Being married was significantly associated with knowing about the MyPlate Image (P= 0.004). Correct identification of food groups on the MyPlate Image and correct identification of serving sizes of food group was less than 50% for most food groups. A significantly greater percentage of those with a postgraduate education were accurate about the correct servings of fruit, vegetables and grains (P=0.049). Nutrition knowledge of food groups and serving sizes was poor in the sample of Saudi Arabian women. This research provides evidence that nutrition education is needed in the Saudi Arabia and the finding are relevant for future health promotion strategies. The study has also identified sociodemographic groups that possibly may need to be targeted with more attention in future nutrition education programs such as those with low income, lower education level and unmarried women.

**Keywords:** mother and child diet, portion size, healthy eating habit, dietary guidelines, knowledge background

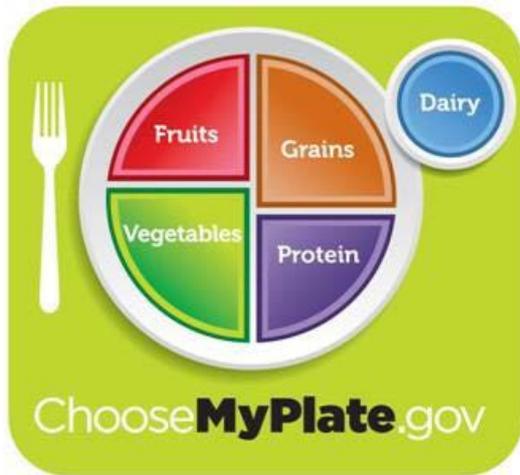
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## 1. Introduction

Knowledge and awareness of dietary guidelines has been linked to having a healthier diet and better diet quality [1,2,3,4]. Nutrition knowledge is also an important factor in overall health literacy where low health literacy is linked to unhealthy outcomes [5]. Although there are some basic dietary guidelines on the website of the Ministry of Health since 2012-these are not widely disseminated and there is no data showing implementation or results of implementation of these guidelines [6]. There is high quality research (a cohort study of 10 735 nationally representative participants) indicating that only a small percentage of the Saudi population meet the dietary recommendations (2% for fruit and 7.5% for vegetables for example) and thus there is an urgent need for programs to improve dietary behavior to reduce the

burden of disease [7]. This study intends to design a nutrition education program for mothers as it has been shown that mothers can influence children's food intakes through shopping, feeding practices and attitudes [8,9]. Before designing such a program, we wanted to characterize the current level of knowledge so that we could target where to focus our efforts in future educational interventions. The American 'MyPlate' guidelines developed by the United States Department of Agriculture (USDA), which is a nutrition guide include 5 food groups with different colours and sizes developed in 2011. It is well known and user friendly [10]. It is the image of a plate with food groups on it, as shown in Figure 1. The Saudi guidelines are a one-page written description of what people should eat, as they have not been disseminated, we chose to use the more accessible MyPlate image to investigate knowledge and awareness of dietary guidelines. This image has also been successfully used in nutrition education and therefore will be of use in

any future nutrition education interventions that might be designed. The image represents dietary guidelines in a meal setting that is helpful to for meal composition that has been used by products manufacturers for food promotion, and by nutrition educators to improve eating habit of children and adults [2]. They are also used in research studies and clinical settings as a teaching tool, and guidance for assessing diet quality [11,12,13,14]. In addition, many registered dietitians/nutritionists use this tool in delivering information to patients [15]. The main aim of the image when it was developed was for it to be a usable tool for consumers [16].



Adapted from United States Department of Agriculture, C.f.P.a. and Promotion., Development of 2010 Dietary Guidelines for Americans

**Figure 1.** The MyPlate Image

Currently there is little research investigating awareness or use of dietary guidelines in Saudi Arabia. The novelty of this research is measuring the nutritional knowledge of Saudi mothers and testing their background of MyPlate and serving sizes guidelines. In addition, we wanted to investigate if knowledge and awareness was linked to the socioeconomic factors of income, education, employment and marital status in the Saudi population. This study will allow us to understand the level of awareness of dietary guideline in Saudi Arabian mothers. This information could help the community to target different population groups when implementing future educational programs. This study was therefore designed to assess how aware Saudi mothers were of current dietary guidelines regarding food groups and portion sizes and to investigate if this awareness was related to sociodemographic factors.

## 2. Material and Methods

### 2.1. Data Collection

All subjects were recruited from local community events such as fairs or social events at schools targeted at middle to high income. At these events a stand was held where activities and games were present for children. Mothers were attracted by health advices and opportunity to answer their question related to nutrition and health. Mothers were interviewed to answer online questionnaire

to fill in on a tablet. The investigator team helped mothers to explain anything unclear in the survey. For this study we used a convenience sample of 101 women as there was no previous research in Saudi Arabia but also because this study was considered to be pre-liminary and as a precursor for larger more complex studies. Ethical approval from the University's ethical committee have been approved prior to the study conduction and consent forms have been signed by the mothers prior to the survey responses.

### 2.2. Measurements

The study questionnaire was designed for the purpose of the study although some items were adapted from previous study [18]. The knowledge of dietary guideline questionnaire consists of two sections: demographics which include educational background, marital status and income level and dietary guidelines & portion size questions. The survey contains questions asking about subject's knowledge of the recommended serving amount of each food group based on US recommendation for healthy adults which is supposed to be grain 6-11, vegetables 3-5 serving, fruit 2-4, meat and milk groups 2-3 serving per day based on 2000 calories need per day. Subjects have been asked if they know MyPlate and if they follow it for their dietary intake, colorful picture of the plate have been provided in the survey and finally subjects have been tested their knowledge to recognize MyPlate with appropriate food group. These questions have been adapted form USDA choose my plate quiz to test the knowledge how much of the person's plate should be each food group [16].

### 2.3. Statistical Analysis

Analyses were conducted using IBM SPSS Statistics 21.0 (Armonk, NY, USA). Associations between sociodemographic variables and correct identification of the food groups on My Plate and correct knowledge of recommended of food servings of food groups and whether or not the MyPlate image affected eating choices were examined using the Chi-square statistic. The association between socioeconomic factors and the response to "Do you know about MyPlate" was tested using the Kruksan-Wallis test as there were three possible responses (yes, No or Maybe). For all analyses, significance level was set at alpha level  $\leq 0.05$ .

## 3. Results

Sample characteristics are shown in Table 1. The mean age of participants was 33 years old. 70% of the mothers had a college education or higher but only 32% were employed. 41.4% had an income of 10 000 SAR and 58.5 had an income of 10 000 or more. 72.3 % of the women were married. Only 29.1 % of people were aware of the MyPlate guidelines with 41.7 % responding "maybe" they were aware of the guidelines. 51.5 % said the healthy plate always or mostly affected their eating choices.

Table 1. Sample Characteristics

	n =101 <sup>a</sup>
Age (mean (SD))	33 (±11)
<b>Education</b> n=101	n (%)
High School	25(24.8)
Bachelors	41(40.6)
Postgraduate	29.7(30)
<b>Married</b> n=101	
yes	73(62.3)
No	28.8(28)
<b>Employment</b> n=100	
Yes	32 (32)
No	36 (36)
Student	32(32)
<b>Monthly income (SR)</b>	
5000	14 (14.8)
5,000 - 10,000	25 (26.6)
10,000 to 20,000	34 (36.2)
> 20,000	21 (22.3)
<b>Marital Status</b>	
Married	73 (72.3)
Not Married/other	28 (27.7)
<b>Do you know about “My Plate” or Healthy Plate?</b>	
Yes	30 (29.1)
No	43 (27.2)
Maybe	28 (41.7)
<b>Does the healthy plate affect your eating choices?</b>	
No effect at all	25 (24.3)
Rarely affect	12 (11.7)
Affect most of the time	41 (39.8)
Always affect	12 (11.7)
Not applied	7 (6.8)

<sup>a</sup> Where numbers in each category do not sum to the totals for the column it is due to incomplete data for that characteristic/question.

Table 2 shows the amount of people that correctly identified food groups on the MyPlate image. Figure 1 represent the image that were represented without showing the name groups. Vegetables and milk were food groups that were identified well (58.4 and 61.8 respectively). The other 3 groups were poorly identified (33% or less).

Table 2. Number and percentage of people correctly identifying food groups on the MyPlate logo:

Food group	n (%)
Fruit (n=98)	33 (32.4)
Vegetables(n=92)	49 (58.4)
Grains (n=91)	31 (30.4)
Meat-protein (n=92)	23 (22.5)
Milk (n=88)	63 (61.8)

The number of people correctly identifying serving sizes was also low as shown in Table 3. Fruit was the food group that had the highest percentage of people responding correctly (59.8%) and grains was the food group the most poorly identified (8.5 %).

Table 3. Number and Percentage of correctly answering the question of recommended servings per day:

Food group	n (%)
Fruit (n=92)	55 (59.8)
Vegetables (n=90)	41 (45.6)
Grains (n=94)	8 (8.50)
Meat-protein (n=94)	35 (37.2)
Milk (n=92)	46 (50.0)

Table 4 - Table 6 show the associations between socioeconomic actors and the knowledge and awareness questions. Education was associated with whether or not MyPlate affected eating choices with those who educated much more likely to have healthy plate influence their eating choices compared to those not college educated. (P=0.001 for Bachelors and above and P = 0.011 for Postgraduate). A significantly greater percentage of those with a postgraduate education were accurate about the correct servings of fruit, vegetables and grains compared to those without a postgraduate education. (P=0.049).

Married women were much more likely to know what MyPlate was (P=0.004) and for it to affect their eating choices compared with unmarried women (P=0.000). There was a significant association between being married and correctly identifying the food group vegetables on the MyPlate image and a significantly greater number of married women also had correct knowledge of the serving size for fruit and milk compared to unmarried women. Having a high income was significantly associated with MyPlate influencing food choices (P=0.053) but otherwise was not associated with any other of the knowledge questions.

A significantly higher percentage of employed people said that healthy plate affected their eating choices compared to unemployed people (P=0.039). Employment did not make a difference to correctly identifying food groups on the MyPlate image or to correctly identifying the serving sizes for food groups apart from the food group protein/meat where a higher percentage of employed people correctly identified serving sizes compared to unemployed people (P=0.059).

Table 4. Association between socioeconomic factors and knowledge on MyPlate and its influence on eating choices

Socioeconomic Factors	Do you know about MyPlate (yes, No or Maybe)		Does MyPlate affect your eating choices? (Yes or No)	
	$\chi^2$	P	$\chi^2$	P
<b>Education</b>	(n=101)		(n=90)	
Bachelors and above	3.803	0.149	10.527	0.001
Postgraduate and above	(n=101)		(n=90)	
	4.229	0.121	6.504	0.011
<b>Marital status</b>	(n=101)		(n=90)	
	10.963	0.004	13.731	0.000
<b>Income (high vs low)</b>	(n= 94)		(n=83)	
	0.460	0.794	3.746	0.053
<b>Employed vs Unemployed</b>	(n=68)		(n=61)	
	2.539	0.281	4.263	0.039

**Table 5. Association between socioeconomic factors and correct identification of the food groups on My Plate**

	Education Bachelors and above		Education Postgraduate and above		Marital status		Income (high vs low)		Employed vs Unemployed	
	X <sup>2</sup>	P	X <sup>2</sup>	P	X <sup>2</sup>	P	X <sup>2</sup>	P	X <sup>2</sup>	P
Fruit	n=98 4.550	0.103	n=98 13.55	0.001	n=98 3.762	0.152	n=91 6.652	0.036	n=65 0.626	0.429
Veg	n=92 0.174	0.186	n=92 11.54	0.001	n=92 4.041	0.044	n=85 3.298	0.069	n=59 0.761	0.383
Grains	n=91 0.176	0.675	n=91 0.049	0.825	n=91 0.009	0.924	n=84 0.940	0.332	n=58 0.207	0.649
Protein	n=92 0.017	0.895	n=92 0.274	0.601	n=92 0.017	0.895	n=85 0.284	0.594	n=59 0.005	0.942
Milk	n=88 0.101	0.751	n=88 1.873	0.171	n=88 0.029	0.866	n=81 1.211	0.271	n=55 0.334	0.563

**Table 6. Association between socioeconomic factors and correct knowledge of recommended of food servings of food groups (n=101)**

	Education Bachelors and above		Education Postgraduate and above		Marital status		Income (high vs low)		Employed vs Unemployed	
	X <sup>2</sup>	P	X <sup>2</sup>	P	X <sup>2</sup>	P	X <sup>2</sup>	P	X <sup>2</sup>	P
Fruit	n=92 0.753	0.385	n=92 3.877	0.049	n=92 4.796	0.029	n=86 0.304	0.582	n=59 0.575	0.448
Veg	n=90 1.013	0.314	n=90 3.766	0.052	n=90 0.119	0.730	n=85 0.360	0.549	n=57 0.028	0.866
Grains	n=94 0.059	0.808	n=94 4.106	0.043	n=94 0.096	0.757	n=88 2.938	0.087	n=61 0.976	0.323
Protein	n=94 2.554	0.110	n=94 0.308	0.579	n=94 0.540	0.463	n=89 0.726	0.394	n=61 3.574	0.059
Milk	n=92 0.052	0.819	n=92 1.295	0.262	n=92 7.393	0.007	n=87 0.119	0.730	n=59 0.761	0.388

## 4. Discussion

This sample of Saudi mothers was young and highly educated with almost 60 % having a high household income and over 70 % were married. The knowledge and awareness of MyPlate was low with only 29.1 % saying they were definitely aware of MyPlate and a further 41.7 responding that they were “maybe” aware of MyPlate. Only 11.2 and 39.8 % of the women said that MyPlate always or mostly affected their eating choices respectively. The number of women correctly identifying food groups on the plate and correctly identifying serving sizes was also low-under 50% for most of the food groups. These finding are in line with the literature [2,10] including the findings of Schwartz et al who found only 29.6 % of the population in the US was using MyPlate [3]. These finding are also in line with the finding that only a very small percentage of Saudi people follow dietary guidelines [7].

Education was not associated with knowledge of Myplate, this may be because overall the Saudi population is not familiar with the MyPlate image. However, educated mothers were much more likely to say that dietary guidelines influenced their choices and a significantly greater percentage of those with a postgraduate education were accurate about the correct servings of fruit, vegetables and grains compared to those without a postgraduate education. Our finding indicate that education is an important factor and merits further exploration. It is well known that education and other socio demographic factors affect health outcomes though less is known about specific nutrition education versus general education level. One study has found that nutrition knowledge was

important for healthy food intake independently of education level [19] and some studies have found educated people to have healthier dietary behaviors [20,21,22].

Married women were much more likely to know what MyPlate was and for it to affect their eating choices. There was a significant association between being married and correctly identifying the food group vegetables on the MyPlate image and a significantly greater number of married women also had correct knowledge of the serving size for fruit and milk compared to unmarried women. This is consistent with studies that show that being married is linked to eating more fruit and vegetables [22,23]. It has been shown that marriage positively affects health outcomes over the life course [24,25]. The protective effects of marriage include availability of partner's support; better regulation of health-related behaviors, which may be particularly important for men; and economic benefits, such as partner's resources support, which may be particularly important for women or pooling of resource [26,27]. It is inconclusive how diet changes with marriage and what effect marriage and having children has on diet and how diet may mediate the protective effects of being married [28,29]. As a high proportion of this sample was married (72%) and the percentage of women married in Saudi Arabia is not known our findings cannot be generalized to the general population; however further research should include marital status, marital history and changes in marital status and investigate how this impact dietary intake and health so that educational programs can be designed effectively.

Having a high income was significantly associated with MyPlate influencing food choices but otherwise was not

associated with any other of the knowledge questions. Some studies have found higher income to be associated with healthier diets [30] and healthier diets cost more. Being able to afford a healthier diet has been shown to be an independent predictor of eating a healthier diet, [21] this may be one reason why those with a higher income were more likely to say MyPlate influenced their food choices; they may have healthier diets and their dietary voices reflect the guidelines presented in MyPlate. It has also been shown that those on welfare in the US would find it hard to afford the diet recommended by MyPlate [31].

Being employed was also significantly associated with MyPlate influencing their eating choices compared to unemployed people; it was also significantly associated with correctly identifying the serving size for the food groups Protein Meat. This may be a chance finding and needs to be replicated in future studies. Employment is associated with income and also with socioeconomic class therefore our findings regarding food choices is consistent with the literature. It has been shown that unemployed people, people on benefits/welfare and those of a lower socioeconomic class have a lower intake of fruit and vegetables [23] and less healthy diets overall and worse health related behaviors [32,33,34]. Furthermore, it has been shown that maternal employments are linked to better infant and young child feeding [35].

One limitation of this study is the low sample size, future studies with a larger sample size can provide greater statistical power and reduce likelihood of type 2 error. Another weakness is the narrow age range and over 70 percent of the women were married so these findings cannot be generalized to the whole Saudi population. Future studies should have a sample that is nationally representative and include different population groups, with diverse sociodemographic characteristics. Another limitation is the use of the American MyPlate logo which Saudi nationals may not be familiar with therefore the assessment of their knowledge of food groups may not be accurate; although using the Saudi written guidelines may have yielded the same results as these are not widely disseminated. A major strength of this study is that is the first study investigating nutrition knowledge in the Saudi population and therefore is highly original research.

## 5. Conclusions

In summary, in this sample of Saudi women, nutrition knowledge of food groups and serving sizes was poor. Being educated and being married were associated with greater knowledge. Being married, highly educated, having a high income or being employed were all associated with women saying the MyPlate image influenced food choices. This research provides evidence that nutrition education is needed in the Saudi Arabia and the finding are relevant for future health promotion strategies. The study has also identified sociodemographic groups that possibly may need to be targeted with more attention in future nutrition education programs such as those with low income, lower education level and unmarried women. This study needs to be replicated in a larger sample size in a more nationally representative

sample. Future research needs to focus on implementation of nutrition education programs and measuring their effectiveness as well as investigating further the barriers to adopting healthy eating habits in Saudi Arabia.

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## Statement of Competing Interests

The authors have no competing interests

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