

The Impact of Food Delivery Applications on Food Consumption, A Cross-Sectional Online Survey in Saudi Arabia

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ABSTRACT

Background: Food delivery applications (FDAs) have been linked to poor food choices. Considering the massive demand for these applications, we aimed to investigate the pattern, attitude and predictors of using FDAs on consuming fast food.

Methods: A randomized cross-sectional study using an online survey was conducted in Saudi Arabia including participants aged 18 years and older. A convenience sample of eligible participants was used to recruit the study participants. Participants were invited to participate in this study through social media (Facebook, Twitter, Snapchat, and Instagram) using a survey link. Data were analysed using Statistical Package for Social Science (SPSS) software. Categorical variables were reported as frequencies and percentages. A binary logistic regression determined significant predictors using of food delivery services and consuming fast food. A confidence interval of 95% ($P < 0.05$) was applied to represent the statistical significance of the results, and the level of significance was predetermined as 5%.

Results: A total of 989 individuals participated in this study. Most of them are using FDAs (87.5%), most likely to order fast food (86.6%). Binary logistic regression analysis identified that males, those who are aged above 46 years, retired, married, and widowed were less likely to use food delivery services. Males were 157% more likely to consume fast food compared to females. Consuming fast food is 360% more likely among the users of food delivery services.

Conclusion: This study found that unhealthy eating habits is common among people using FDAs and living in Saudi Arabia. Future studies to investigate the impact of FDAs on non-communicable diseases and obesity are warranted.

Keywords: Food delivery applications; Food consumption; Obesity; Saudi Arabia

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INTRODUCTION

Food consumption is a fundamental part of life, providing essential nutrition and energy to the human body¹. It is necessary for our health and well-being, as it helps us maintain a healthy weight, build strong bones and muscles, and protect us from diseases¹. There is a variety of factors that trigger food consumption throughout the day, including time of day, need state, sensory stimulation, and social context². The quality of food can be affected by other factors, such as income level, personal goals, health conditions, dietary control, and food accessibility³. Over the last decade, Saudi Arabia has experienced dietary transitions due to economic development and globalization⁴. Consequently, many people in Saudi Arabia have replaced traditional foods with fast foods due to their convenience⁵, which leads to a decrease in food quality, an increase in the quantity of food, and a rise in obesity⁶.

Saudi Arabia is experiencing an increase in the prevalence of overweight and obesity⁷. World Health Survey data for the country show a prevalence of overweight and obesity of 38 and 20 percent, respectively⁸. In addition, being overweight and obese have major risks for the development of many non-communicable diseases including diabetes, cancer, and other abnormalities related to the cardiovascular system, and neurodegeneration⁹. Besides their health burdens, being overweight and obese also have an impact on society in terms of human capital and healthcare costs⁷. Many factors contribute to overweight and obesity, including unhealthy diets, insufficient physical activity, sedentary lifestyle behaviours, genetic predisposition, and environmental influences. However, unhealthy diets and insufficient physical activity remain the most significant contributors to overweight and obesity¹⁰. Unhealthy diets are characterized by an excessive intake of energy-dense foods high in fat and sugar combined with a lack of nutrient-dense foods such as fruits and vegetables¹⁰. According to a recent study, food delivery applications (FDAs) have influenced low-quality food choices¹¹.

FDAs are third-party platforms that provide an online mobile service, which displays available restaurants close to the customer, typically via a mobile application, providing a convenient and efficient way to order and receive goods and services online¹². Saudi Arabia's FDAs market is forecast to reach over \$2 billion by 2024, with over 8 million users. This shows how important it is to thoroughly test the FDAs market¹³. Considering the massive demand for these applications and the evidence linking them to poor food choices, we need to investigate the pattern, attitude and predictors of using FDAs on consuming fast food.

MATERIALS AND METHODS

Study design and study population: A randomized cross-sectional online survey was conducted during the period of 24 October 2021 to 24 March 2022. Adults (18 years and above) and living in the Kingdom of Saudi Arabia were invited to participate in the study.

Sampling strategy: To recruit the study population, we used a convenience sampling technique. Participants were recruited by sending to a link through social media (Facebook, Twitter, Snapchat, and Instagram) using a survey link. The link was circulated every beginning of the week for 4 consecutive weeks to help in reach the general population. All participants voluntarily participated in the study and were thus considered exempt from written informed consent. The study aims and objectives were clearly explained at the beginning of the invitation letter of the survey.

Sample size: The target sample size was estimated based on the World Health Organization (WHO) recommendations for the minimal sample

size needed for a prevalence study¹⁴. Using a confidence interval of 95%, a standard deviation of 0.5, and a margin of error of 5%, the required sample size was 385 participants.

Questionnaire tool: This study adapted and used a previously validated questionnaire and was also constructed by performing an extensive literature review. Then, experts in nutrition and medicine reviewed and modified the survey to meet the aims of our study. Then a native Arabic speaker and expert in the Arabic language reviewed the questions for Arabic language errors, and a pilot study of 20 volunteer participants was conducted to ensure that the study's questions were clear and understandable. To achieve the study's aim, a 33-item questionnaire was distributed. It is comprised of three sections. The first section asked the participants about their sociodemographic characteristics. The second section utilization pattern of FDAs. The third section involved asking the participants about their attitude and satisfaction with FDAs.

Ethical statement: The Research Ethics Committee approved this study at Umm Al Qura University, College of Medicine (HAPO-02-K-012-2023-03-1524).

Statistical analysis: Data were analysed using Statistical Package for Social Science (SPSS) software, version 27 (IBM Corp, Armonk, NY, USA). Categorical variables were reported as frequencies and percentages. A binary logistic regression determined significant predictors using of food delivery services and consuming fast food. A confidence interval of 95% ($P < 0.05$) was applied to represent the statistical significance of the results, and the level of significance was predetermined as 5%.

RESULTS

Participants' sociodemographic characteristics: A total of 989 individuals participated in this study and completed the survey. Participants were predominantly women; the sample included 548 (55.4%). The majority of the study sample was from the age group of 18 to 30 years old (69.9%). Around half of the study sample had a bachelor's degree (52.0%). More than 80% of the study sample were either students or employees. The majority of the study sample was single 63.5%, while 31% of the study sample was married. A large proportion of the study sample answered that they usually consume fast food (72.0%). Details of the study characteristics are listed in Table 1.

Table 1. Participants' sociodemographic characteristics (N= 989)

Variable	Frequency	Percentage
Gender		
Female	548	55.4%
Age		
18-30 years	691	69.9%
31-45 years	160	16.2%
46-60 years	114	11.5%
>61 years	24	2.4%
Height mean (SD) (cm)	164.1 (16.4)	
Weight mean (SD) (kg)	72.5 (28.4)	
BMI (n= 985)		
Underweight	95	9.6%
Normal weight	386	39.2%
Overweight	274	27.8%
Obese	230	23.4%
Education level		
High school	318	32.2%

Diploma	78	7.9%
Bachelor degree	523	52.9%
Post-graduate degree	70	7.0%
Occupation		
Student	421	42.6%
Self-employed	53	5.4%
Employee	381	38.5%
House wife	71	7.2%
Retired	63	6.4%
Monthly income		
Less than 5000 SAR	538	54.4%
5000-15000 SAR	276	27.9%
More than 15000 SAR	175	17.7%
Marital status		
Single	628	63.5%
Married	312	31.5%
Divorced/separated	35	3.5%
Widowed	14	1.4%
Do you consume fast food?		
Yes	739	74.7%
Do you have any of these health conditions? (More than one answer could be chosen)		
Diabetes	2	0.2%
Heart disease	21	2.1%
Other	24	2.4%

FDAs utilization pattern: A large number of the study sample are using FDAs (87.5%), with (47%) using them on regular basis. Interestingly, dinner meal order through these applications was more frequent (70.7%), than lunch meal. In addition, regarding the type and quality of food ordered online, the majority of participants chose fast food (86.6%). Table 2 shows the details of usage patterns for the FDAs.

Table 2. FDAs utilization pattern (N= 989)

Variable	Frequency	Percentage
Do you use food delivery services?		
Yes	865	87.5%
Do you order food delivery on a frequent basis?		
Yes	462	46.7%
How many times do you order through FDAs per week?		
Less than 3 times per week	781	79.0%
3-6 times per week	179	18.1%
More than 6 times per week	29	2.9%
Which days of the week are you likely to order food delivery? (More than one answer could be chosen)		
Weekdays	404	40.8%
Weekends	415	42.0%
Weekdays and weekends	170	17.2%
Which meal do you typically order using food applications? (More than one answer could be chosen)		
Breakfast	34	3.4%
Lunch	206	20.8%
Snacks	50	5.1%
Dinner	699	70.7%
What type of food do you usually order using food applications?		
Coffee/juice	35	3.5%
Healthy meals	42	4.2%
Sweets/pastry	47	4.8%

Fast food	856	86.6%
How much do you spend per week on food delivery?		
Less than 100 SR	467	47.2%
100 – 200 SR	336	34.0%
More than 200 SR	186	18.8%
Which of these meal options is the most important to you?		
Low-calorie meals	117	11.8%
Nutritious meals	110	11.1%
Delicious meals	672	67.9%
Cheap meals	88	8.9%
Other	2	0.2%
I order food when I am		
Home alone	392	39.6%
With the family	359	36.3%
With friends	238	24.1%

Predictors of using food delivery services and consuming fast food:

Binary logistic regression analysis identified that males, those who are aged above 46 years, retired, married, and widowed were less likely to use food delivery services ($p \leq 0.05$). On the other hand, those who reported that they consume fast food were three times more likely to use food delivery services compared to others ($p \leq 0.001$) (Table 3).

Table 3. Attitude and satisfaction with delivery applications (N= 989)

Variable	Frequency	Percentage
Do you watch the menu and food pictures before you order food using FDAs?		
Yes	894	90.4%
Are you satisfied when you order food from food applications?		
Highly satisfied	184	18.6%
Satisfied	373	37.7%
Neutral	317	32.1%
Not satisfied	71	7.2%
Not satisfied at all	44	4.4%
Which of these factors are influential when you are ordering food? (More than one answer could be chosen)		
Bloggers	135	13.7%
Online reviews	380	38.4%
Traditional advertising (e.g. TV ads, print ads and radio ads)	120	12.1%
Social media advertising by brands	341	34.5%
Recommendations / social media posts from your friends	505	51.1%
What is the main factor affecting your usage of the food applications? (More than one answer could be chosen)		
Speed of delivery	372	37.6%
Easy-to-use applications	267	27.0%
Promotions	301	30.4%
Ordering from multiple restaurants at the same time	21	2.1%
Price	57	5.8%
When ordering food, I am influenced by mood		
Yes	732	74.0%
When ordering food, I am influenced by hunger		
Yes	862	87.2%
When ordering food, I am very careful about the health effects of the food product		
Yes	367	37.1%

What is your family opinion when you order food using FDAs?		
My family support ordering through delivery applications	340	34.4%
My family prefer eating food prepared at home	649	65.6%
Do you think preparing food at home		
Expensive	28	2.8%
Exhaustive	194	19.6%
Taking long time	459	46.4%
I am busy and I don't have time	308	31.1%

Table 4. Binary logistic regression analysis (N= 989)

Variable	Odds ratio of using food delivery services (95% confidence interval)	Odds ratio of consuming fast food (95% confidence interval)
Gender		
Female (Reference group)	1.00	1.00
Male	0.58 (0.40-0.85)* *	1.57 (1.17-2.11)**
Age		
18-30 years (Reference group)	1.00	1.00
31-45 years	0.78 (0.48-1.26)	0.78 (0.54-1.14)
46-60 years	0.43 (0.26-0.69)**	0.32 (0.22-0.48)***
>61 years	0.34 (0.14-0.83)*	0.39 (0.17-0.88)*
BMI		
Underweight (Reference group)	1.00	1.00
Normal weight	1.40 (0.94-2.09)	0.99 (0.74-1.33)
Overweight	0.78 (0.52-1.17)	0.93 (0.68-1.28)
Obese	0.85 (0.55-1.32)	0.92 (0.66-1.29)
Education level		
High school (Reference group)	1.00	1.00
Diploma	0.75 (0.39-1.43)	0.67 (0.40-1.10)
Bachelor degree	1.08 (0.74-1.57)	0.90 (0.67-1.20)
Post-graduate degree	1.12 (0.52-2.40)	0.98 (0.56-1.70)
Occupation		
Student (Reference group)	1.00	1.00
Self-employed	1.13 (0.47-2.70)	1.48 (0.73-3.00)
Employee	0.92 (0.63-1.35)	1.27 (0.94-1.71)
House wife	1.60 (0.68-3.77)	0.56 (0.34-0.93)*
Retired	0.39 (0.21-0.71)**	0.20 (0.12-0.33)***
Monthly income		
Less than 5000 SAR (Reference group)	1.00	1.00
5000-15000 SAR	0.98 (0.65-1.49)	0.77 (0.56-1.05)
More than 15000 SAR	0.74 (0.47-1.18)	0.84 (0.58-1.22)
Marital status		
Single (Reference group)	1.00	1.00
Married	0.67 (0.45-0.99)*	0.53 (0.39-0.71)***
Divorced/separated	1.55 (0.47-5.14)	0.56 (0.28-1.13)
Widowed	0.18 (0.06-0.54)**	0.33 (0.12-0.96)*
Do you consume fast food?		
No (Reference group)	1.00	-
Yes	3.60 (2.45-5.31)***	-

*p<0.05, **p<0.01, ***p<0.001

Those who are aged above 46 years, housewives, retired, married, and widowed were less likely to consume fatty food compared to others (p<0.05). On the other hand, males were 157% more likely to consume fast food compared to females (p<0.01). Also, consuming fast-food is 360% more likely among the users of food delivery services (see Table 4).

DISCUSSION

To date, the impact of FDAs and the type of food ordered through them is not fully studied in Saudi Arabia. The behaviour of people living in Saudi Arabia and how they use these applications have changed dramatically, making them an integral aspect of food consumption in the country⁶. This change in the way Saudis is ordering food is posing effects on health and wellness yet to be measured to assess whether they are positive or negative effects. Having some insight into the population that uses FDAs, their sociodemographic characteristics and utilization pattern is important to build knowledge on how healthcare professionals should manage the change of behaviour in food consumption patterns and the possible, related health issues.

Considering the ease of ordering fast-food through applications, it will exacerbate the adverse effect of fast-food on health that are scientifically studied. Fast-food is related to higher BMI, lower HDL-cholesterol^{15,16}, and higher triglycerides¹⁷. There is a significant increase in energy, sugar, saturated fat and Na intake associated with fast-food and restaurant meal consumption in adults¹⁸.

The current study findings show that the prevalence of FDAs usage is 87.5%, of which 46.7% use the applications on a consistent basis. In addition, a major concerning finding of this study is that 86.6% of the participants usually order fast-food. These results are also consistent with a previous study in Kuwait. The study used an online survey and included more than 1000 participant, and the reported that most participants in their study have also order fast food through FDAs¹¹.

In our study, the highest prevalence was found in the age group between 18 to 30 years (69.9%) of which 52.9% hold a bachelor's degree as their highest educational level. This was also consistent with a previous study that was conducted in Saudi Arabia. the authors of the study concluded that most Saudi female users of FDAs were aged between 18–24 years with 64.9%, 91.5% being single and 37% ordering food online within one to two days a month. However, it is important to mention that their study included only female patients, while our study was on the general population. similarly, another study in Australia were the authors reported that Younger respondents, those with a higher BMI, and those with higher education and income levels were more likely to order fast food and use FDAs¹⁹.

The type of food usually ordered using food applications was fast-food compared to healthy meals, with 86.6% and 4.2% respectively. The majority of participants (79.0%) order food through applications less than three times per week, followed by 18.1% ordering 3 to 6 times per week and only 2.9% ordering more than 6 times per week. Recorded findings show that there was a positive association between eating fast-food more than twice a week and weight gain and insulin resistance²⁰.

Pursuing to develop an understanding of inclination toward FDAs use in Saudi Arabia, we must look at the reasons behind the use of those applications. The main factor affecting the usage of food applications was the speed of delivery with 37.6%, which might be related to students making up the majority of the sample group with 42.6%, followed by employees with 38.5% and that time management is crucial for these two groups. At no surprise, our results were also similar to the previous study conducted in Kuwait¹¹.

Moreover, the ease of application use (27.0%) is alarming since no effort is required when ordering the food, and the convenience of ordering food anywhere/anytime with minimal physical movement, unlike the traditional method of going to restaurants to order take-out. Looking at the influential factors when ordering food, 51.1% of people are affected by recommendations from friends and social media²¹. Many studies have been documenting the negative effects of social media on diet urging the implementation of serious solutions. A study's finding reported that one-fifth of the study population was influenced by social media²².

In this study, when participants were asked about their attention regarding the health effects of the food ordered, only 37.1% had a positive response which is clear evidence of the lack of awareness in the population of the impact of food on health. Nevertheless, when ordering food, participants were influenced by mood (74.0%) and by hunger (87.2%). Lastly, over 90% of participants looked at the menus and pictures of the food before ordering. Studies have shown that descriptive food names and pictures influence people and their willingness to purchase food online^{23,24}.

While the results of this study showed a high percentage of people using FDAs and ordering fast food, the relationship and impact of this behaviour remain unclear in terms of health outcomes and future studies to investigate the relation of obesity and chronic non-communicable diseases are needed. In addition, the Saudi government and policy makers are encouraged to review their regulation regarding the advertisement process of FDAs, consider imposing taxes and restriction of the use of FDAs.

Our study has several strong points. First, to the best of our knowledge, this is the first study to investigate the pattern, attitude and predictors of using FDAs in the general population. In addition, we used a previously validated assessment tool.

However, this study has some limitations. First, this study was cross-sectional in study design. Therefore, we could not confirm any association between the use of FDAs and consuming fast food. In addition, a self-administered questionnaire through an online platform could be biased. However, owing to the nature of the objective of this study and the distribution of the survey in Widley used online platforms, we assume that we targeted a well-representative sample.

CONCLUSION

This study found that unhealthy eating habits is common among people using FDAs and living in Saudi Arabia. future studies to investigate the impact of FDAs on non-communicable diseases and obesity are warranted.

Author Contributions: Conceptualization, Hassan Alwafi, Mutaz Fakeerh and Abdallah Naser; Data curation, Abdallah Naser and Hassan Alwafi; Formal analysis, Abdallah Y Naser; Investigation, Abdallah Naser and Hassan Alwafi; Methodology, Abdallah Naser, Mutaz Fakeerh and Hassan Alwafi; Project administration, Mutaz Fakeerh and Hassan Alwafi; Resources, Mutaz Fakeerh and Hassan Alwafi; Supervision, Hassan Alwafi; Validation, Mutaz Fakeerh and Hassan Alwafi; Writing original draft, Mutaz Fakeerh, Reham Alwafi, Abdallah Naser, Rakan Ekram, Emad Salawati, Abdulelah Aldhahir, Daniah Bondagji and Hassan Alwafi; Writing – review & editing, All authors.

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and ethical approval

was obtained from the Research Ethics Committee at Umm Al Qura University (HAPO-02-K-012-2023-03-1524).

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