RESEARCH ARTICLE

Dietary patterns of Pakistani adults and their associations with sociodemographic characteristics-a community based study

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Abstract

Objective: To identify the dietary patterns and understand their association with sociodemographic characteristics among adults.

Methods: The community-based cross-sectional study was conducted in Islamabad, Lahore, Karachi, Peshawar and Quetta cities of Pakistan from March to November 2018, after approval from the National Bioethics Committee, Islamabad, and comprised adults of either gender. Data was collected using the food frequency questionnaire, and dietary patterns were identified using factor analysis. Multivariate regression analysis was used to assess the association of socio-demographic determinants with dietary patterns. Data was analysed using SPSS 21. Parallel Analysis criterion (Eigen values) was determined along with Monte Carlo simulation.

Results: Of the 448 subjects, 206(46%) were males and 242(54%) were females. The largest age group was 36-55 years 199(47.4%). Six dietary patterns were identified: "Vegetables", "Fruits", "Mixed Junk and Processed food", "Dairy and Fast food", "Discretionary" and "Fish". Regression analysis showed that those aged 36-55 years had higher scores for vegetables, fruit and fish pattern ($p<0.05$). Females scored more for vegetables, fish and fruits, and a significantly low score for discretionary diet pattern ($p<0.05$). Participants with high education level and socioeconomic status had raised scores for discretionary diet items ($p<0.05$).

Conclusion: Six distinct dietary patterns among Pakistani adults were identified, showing significant association with sociodemographic characteristics.

Keywords: Healthy diet, Nutrition, Factor analysis, Diet pattern, Pakistan, Unhealthy diet. (JPMA 72: 2218; 2022)

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Introduction

The pattern of dietary intake is important to one's health. The unhealthy dietary pattern leads to non-communicable diseases (NCDs), which include cardiovascular diseases (CVDs), diabetes mellitus (DM), cancers and others.[1] The global burden of NCDs is evident from 71% deaths of the total and around 85% of premature deaths were from low- and middle-income countries (LMICs). The intake of unhealthy diet along with physical inactivity and tobacco consumption are the established risk factors for the NCDs.[2]

Unhealthy diet is generally associated with less education, low profession and low socioeconomic status (SES).[3,4] The NCDs survey has revealed that overall 96.5% consumed less than five servings of fruits and vegetables per day as per the World Health Organisation (WHO) recommendations.[5]

The assessment of dietary patterns among populations carry significant importance. Studies in different parts of the world have been carried out to identify the food patterns among the population.[6-8] The developing countries have a huge burden of under-nutrition, like stunting, wasting and underweight, posing a threat to the health of children and adults.[9]

There is lack of knowledge about healthy food, and the young generation is mostly consuming junk food compared to a healthy diet.[10,11] The current study was planned to identify the dietary patterns and their association with sociodemographic determinants among Pakistani adults.

Subjects and Methods

The community-based cross-sectional study was conducted in Islamabad, Lahore, Karachi, Peshawar and Quetta cities of Pakistan from March to November 2018. After approval from the National Bioethics Committee, Islamabad, the sample size was calculated using the WHO calculator[11] at 95% confidence level, 0.05 margin of error and design effect 1.

Those included were adults of either gender living in the selected areas who furnished written informed consent to participate. Mentally disabled and non-residents were excluded.

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The sample was raised using stratified multistage random sampling technique. Firstly, three Union Councils, the lowest administrative unit in the country, were selected randomly from each city representing low, middle and high socioeconomic groups. In the second stage, households were selected within the UCs. For this purpose, a random block of 2000 population was identified and a cluster of 150 households were enumerated. Subsequently, 30 households were selected by taking every 5th household from each UC. The first household was selected from any landmark place i.e. high school, mosque or any famous place.

The Harvard Food Frequency Questionnaire (FFQ) was adapted and translated into Urdu to collect information. The data collection team comprised an enumerator and two data collectors (one male and one female) who were trained about the sampling strategy, enrollment process and proper administration and filling up of the questionnaires. The enumerator marked the houses and the data collectors interviewed the household members.

The head of house or elder person living in the household was interviewed. In case, where no person was available, the next house was sampled.

Demographic data included gender, age, occupation, marital status and education. The Harvard Food Frequency Questionnaire (HFFQ) was used after adaptation to the local context.[12]. The food listed in FFQ were categorised into i) Meats ii) Milk and derivatives iii) Grains (Cereals), iv) Fruits v) Vegetables vi) Oil and spreads vii) Discretionary food items. For each food item, the subjects were asked how frequently they consumed the food without specifying the portion size. There were total 72 items in all categories. The participants were asked to recall the food intake pattern and their options were given Daily (once a day, 2-3 per day, 4-5 per day), Weekly (once a week, 2-4 per week, 5-6 per week) and Monthly (never or less than once/month, 1-3 per month).

Data was analysed using SPSS 21. Frequencies and percentages were calculated for categorical variables. Exploratory factor analysis (EFA) was used to classify dietary patterns on the basis of various food groups' servings. The Bartlett's Test of Sphericity (BTS) and the Kaiser-Meyer-Olkin (KMO) were done to estimate the appropriateness for factor analysis. Parallel Analysis criterion (Eigen values) was determined along with Monte Carlo simulation. Factors were retained with factor Eigen value >1.70, as cumulative variability accounted for 48% food consumption which showed in the scree plot as the breaking point. The association between dietary pattern and food groups was described through rotated factor loading matrix. Items with factor value >0.5 were considered. Multivariate logistic regression technique was used to assess the association between demographic factors and various food groups, and odds ratios (ORs) were calculated. The regression coefficients were reported with 95% confidence intervals (CIs). P<0.05 was considered statistically significant.

Results

Of the 448 subjects, 206(46%) were males and 242(54%) were females. The largest age group was 36-55 years

Table-1: Demographic features of the subjects (n=448).

Variables	n (%)
Age (years)	
18-35	177 (42.14)
36-55	199 (47.38)
≥56	44 (10.48)
Gender	
Male	206 (45.98)
Female	242 (54.0)
Occupation	
Civil servant	84 (18.75)
Private job	125 (27.90)
Own business	66 (14.73)
Student	20 (4.46)
Retired	15 (3.34)
Unemployed	19 (4.24)
Housewife	118 (26.3)
Education	
Illiterate	74 (17.09)
Primary or less	51 (11.78)
Intermediate or less	180 (41.57)
Graduate or more	128 (29.56)
Socioeconomic	
Low	145 (33.64)
Middle	147 (34.11)
High	139 (32.25)
Marital status	
Married	369 (82.3)
Single/divorced/widowed	79 (17.63)

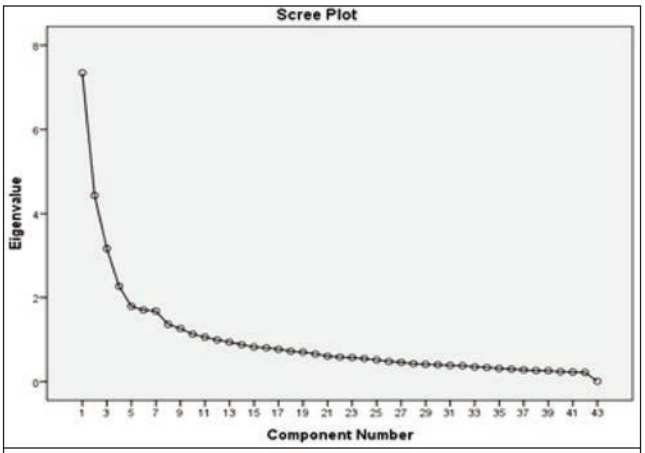

Figure: Scree plot in factor analysis. The vertical axis is showing the Eigen values while the horizontal axis is showing factors (component numbers).

Table-2: Factor loadings for six dietary patterns identified by factor analysis.

Food Groups	Dietary patterns (Factor loading)					
	Vegetable	Fruit	Junk/processed	Dairy/Fast	Discretionary	Fish
Fish	-0.087	0.067	0.377	-0.010	-0.080	**0.602**
Mutton	0.074	0.469	0.423	0.190	0.039	0.177
Open yoghurt	0.105	0.098	-0.081	**0.642**	-0.053	0.183
Packed yoghurt	0.047	0.074	**0.606**	0.064	0.159	-0.299
Open lassi	0.168	0.152	-0.038	**0.717**	0.011	0.049
Packed cream	0.088	0.016	0.442	0.336	0.344	-0.359
Chakki atta	-0.139	-0.076	0.343	0.375	-0.142	0.053
Basmati rice	0.125	0.184	0.075	-0.122	0.247	0.360
Pulses lentils	-0.009	-0.023	-0.068	0.009	0.153	0.306
Desi ghee	-0.125	0.151	0.156	0.092	0.019	0.356
cucumber	0.338	0.083	0.268	0.439	0.129	0.238
Onion	0.327	-0.146	-0.019	0.113	0.096	0.235
Saag	**0.608**	-0.040	0.054	0.123	0.025	-0.178
Bean	**0.595**	0.227	0.019	-0.041	0.107	-0.260
Ladyfinger	**0.730**	0.017	0.007	0.180	-0.119	0.052
Brinjal	**0.594**	0.200	0.036	0.006	0.077	-0.180
Cabbage	**0.508**	0.038	-0.002	-0.018	-0.030	0.099
Pumpkin	**0.745**	0.153	-0.029	0.190	0.018	0.017
Radish	**0.559**	0.224	-0.040	-0.172	0.241	0.038
Turnip	**0.775**	0.147	-0.017	0.000	0.004	0.018
Spinach	**0.743**	0.121	0.028	0.084	-0.024	0.093
Bitter gourd	**0.717**	0.101	0.046	0.364	0.008	-0.003
Fruit juice	0.030	0.026	0.030	0.058	**0.698**	0.188
Roohafza drinks	0.028	0.024	0.113	0.066	**0.730**	0.074
samosa	0.082	-0.046	0.175	**0.690**	0.027	-0.015
halwapuri	0.032	-0.059	0.372	0.471	0.119	-0.124
Pakoras	0.207	-0.129	0.221	**0.651**	0.044	0.008
Pizza	-0.113	0.071	**0.660**	0.053	0.152	0.164
Ice cream	-0.040	0.139	0.232	**0.591**	0.310	-0.067
Burger	-0.106	0.099	**0.579**	0.088	0.076	0.020
Nuts	0.119	-0.080	**0.552**	0.165	-0.171	0.202
Nuts unsalted	0.064	-0.020	**0.690**	-0.021	0.013	0.072
Dried Fruits	0.057	0.254	0.396	0.293	0.197	0.212
Honey	0.202	-0.034	**0.549**	0.370	0.008	0.027
Soft Drinks	0.048	-0.078	0.018	0.127	0.221	0.528
Mango	0.126	**0.605**	0.088	0.026	-0.060	0.363
Peaches	0.407	**0.634**	0.069	0.149	-0.092	0.177
Pineapple	-0.088	**0.568**	.258	0.090	-0.046	-0.150
Cherries	0.172	**0.754**	.032	0.097	0.066	-0.064
Pomegranate	0.217	**0.787**	-.171	-0.013	0.099	0.085
Pears	0.082	**0.571**	-.028	-0.133	-0.005	-0.151
Apricot	0.162	**0.772**	-.023	-0.020	0.146	0.094

199(47.4%). There were 90(20.08%) subjects each from Islamabad, Lahore, Peshawar and Quetta, while from Karachi there were 88(19.6%). Overall, 369(82.3%) subjects were married, 125(27.9%) were doing private jobs and 180(41/6%) had education level of intermediate or less (Table 1).

Factor analysis indicated suitable dependability with KMO 0.802 and BTS being significant (p<0.001). The scree plot for Eigen values were drawn for each factor and 10 factors were identified for more than 60 variables from food frequency data that accounted for 49.9% of the variability of food consumption within the sample (Figure).

Factor analysis using principal component analysis (PCA) method was run for six factors with 42 variants. These six retained factors were identified as six dietary patterns and were labelled, Vegetable, Fruits, Fish, Mixed Junk and Processes food, Dairy and Fast food, and Discretionary food, according to the results obtained from the factor loading matrix, where a higher factor loading of a given food group indicated a greater contribution of that food group to the specific pattern (Table 2).

The 36-55 years age group and female gender scored high for vegetable and fish patterns. Being single, high SES and high education were associated with more intake of discretionary items. Fruit intake was higher in the middle-age and high SES groups. Low intake of fruits and vegetable was associated with high education and being single (Table 3).

Discussion

The study identified six dietary patterns in the population and contributed to future epidemiological research on nutrition. The six dietary patterns were Vegetable, Fruit, Fish (healthy) as well as Junk, Dairy and Discretionary (unhealthy).

The female gender was found to be associated with more intakes of discretionary items, which is similar to earlier findings from India[13] and Brazil.[14] However, a study from Iran reported that females mostly took discretionary food less than the males.[14] In the current study, high level of education was significantly associated with healthy diet intake (fish pattern) and more likely to take vegetable diet and Junk/processed food which is in agreement with earlier studies done in Iran,[15] Australia[16] and Pakistan[17].

The first two dietary patterns, vegetable and fruit, were

Table-3: Association of demographic features with dietary patterns.

Demographic features	Vegetables	Fruits	Junk	Dairy	Discretionary	Fish
Age Group (years)						
18-35	1	1	1	1	1	1
36-55	0.5 (0.0,1.0)	0.2 (-0.2,0.7)	-0.7* (-1.2, -.3)	0.0 (-0.4,0.4)	0.1 (-0.3,0.5)	0.2 (-0.2,0.7)
>=56	0.2 (-0.2,0.6)	0.0 (-0.3,0.5)	-0.3 (-0.7,0.1)	0.0 (-0.4,0.4)	0.1 (-0.2,0.6)	0.1 (0.3,0.6)
Gender						
Male	1	1	1	1	1	1
Female	0.2 (-0.1,0.5)	0.1 (-0.2,0.4)	0.0 (-0.3,0.3)	0.0 (-0.3,0.3)	-0.3* (-0.7, -.02)	0.2 (-0.0,0.6)
Education						
Illiterate	1	1	1	1	1	1
Primary or Less	-0.2 (-0.7,0.2)	-0.0 (-0.4,0.4)	-0.0 (-0.5,0.4)	0.0 (-0.4,0.4)	0.1 (-0.4,0.6)	-0.2 (-0.6,0.2)
Middle to Intermediate	0.0 (-0.4,0.5)	0.1 (-0.3,0.0)	-0.3 (-0.8,0.1)	-0.2 (-0.7,0.2)	-0.2 (-0.8,0.2)	-0.6 (-1.1, -.1)
Graduate/Postgraduate	-0.3 (-0.8,0.1)	-0.3 (-0.9,0.1)	-0.1 (-0.6,0.3)	0.1 (-0.3,0.6)	0.4 (-0.0,0.9)	-0.5 (-1.0,0.0)
Marital Status						
Married	1	1	1	1	1	1
Single/Divorced/Widow	-0.2 (-0.5,0.0)	-0.0 (-0.3,0.2)	0.0 (-0.2,0.3)	-0.1 (-0.4,0.2)	0.2 (-0.0,0.6)	0.0 (-0.2,0.3)
Socioeconomic Status						
Low	1	1	1	1	1	1
Middle	0.2 (-0.2,0.6)	0.1 (-0.3,0.5)	0.3 (-0.0,0.8)	0.1 (-0.2,0.5)	0.4 (-0.0,0.9)	0.0 (-0.3,0.4)
High	-0.0 (-0.4,0.3)	0.1 (-0.3,0.5)	-0.1 (-0.5,0.3)	0.0 (-0.3,0.5)	0.6 (0.1,1.1)	-0.1 (-0.5,0.2)
Occupation						
Civil Servant	1	1	1	1	1	1
Private Job	0.2 (-0.4,0.9)	-0.3 (-1.0,0.3)	-0.1 (-0.9,0.5)	0.5 (-0.1,1.2)	-0.7 (-1.5,-0.0)	-0.1 (-0.8,0.6)
Businessman	-0.0 (-0.6,0.5)	-0.0 (-0.7,0.5)	-0.4 (1.1,0.2)	0.0 (-0.8,0.7)	-0.1 (-0.7,0.3)	-0.9 (-1.8,-.1)
Student	0.0 (-0.6,0.7)	-0.2 (-0.9,0.4)	-0.5 (-1.2,0.1)	0.0 (-0.7,0.8)	-0.3 (-0.9,0.3)	-0.0 (-0.7,0.7)
Retired	0.1 (-0.4,0.8)	-0.2 (-1.0,0.4)	-0.3 (-1.0,0.3)	0.1 (-0.5,0.9)	-0.1 (-0.7,0.4)	-0.0 (-0.7,0.7)
Unemployed	0.1 (-0.5,0.8)	-0.1 (-0.9,0.5)	-0.3 (-1.0,0.3)	0.1 (-0.6,0.8)	-0.5 (-1.2,0.1)	-0.1 (-0.9,0.6)
Housewife	1.5 (0.8,2.2)	0.0 (-0.5,0.6)	-0.7 (-1.4,-.0)	-0.0 (-0.7,0.6)	-1.3 (-2.0,-0.5)	0.4 (-0.1,1.0)
Province						
Punjab	1	1	1	1	1	1
Federal	0.3 (-0.4,1.0)	-2.7 (-4.7,-0.8)	0.1 (-0.4,0.7)	0.3 (-1.1,1.7)	-0.0 (-0.9,0.8)	-0.2 (-1.6,1.1)
Sindh	1.8 (0.2,3.6)	-0.1 (-2.6,2.3)	0.1(-1.3,1.6)	1.1(-1.0,3.3)	0.8(-1.1,2.7)	1.0(-0.9,3.0)
KPK	0.2 (-0.4,1.0)	-2.6 (-4.6,-.6)	0.3 (-0.3,1.0)	1.3 (-0.1,2.8)	0.4 (-0.5,1.3)	-0.1 (-1.6,1.2)
Baluchistan	12.6 (7.0,18.2)	3.3 (1.0,5.6)	2.7 (-0.2,5.7)	1.9 (-0.5,4.5)	1.6 (-0.3,3.7)	3.3 (1.1,5.5)

already described in a study[18] This pattern has been reported to be the desirable dietary pattern and is also associated with decreased risk of DM, CVDs and cancer.[19-21] The intake of healthy diet, especially fruits, reduces the risk of depression.[22] The 3rd identified healthy diet pattern was fish which was predominantly in highly educated participants. This was reported from Canada as well.[23] The reason for this pattern in the highly educated may be due to the awareness about the benefit of fish diet as well as affordability.

The other three dietary patterns identified were junk/processed, fast and discretionary. A systematic review showed that unhealthy diet is reported to be linked with poor mental health and depression.[24] A study in Iran reported that adherence to unhealthy diet led to 2-fold increase in the risk of metabolic syndrome.[25] In the current study, the unhealthy dietary patterns were less common in female gender, high SES groups and unmarried individuals. It has been reported that marketing of unhealthy and low nutrition food and beverages increased consumption and preference.[26] A comparative study from Eastern Mediterranean Region countries showed that fruit and vegetable consumption was the lowest in Pakistan compared to the other 11 countries.[27] A study from South Asian countries reported consumption of junk food as significant risk factor for overweight and obesity[28]

Due to urbanisation and cultural shift, there is increasing trend towards the intake of fast/junk and processed food.[29] There is a need to conduct promotional campaigns to create awareness among the public regarding the benefits of taking healthy diet. Educational intervention can be done in schools and colleges to raise awareness among the students for promoting healthy lifestyle.

The current study has some potential limitations, including a small sample size and study settings where the areas were selected from the urban areas (cities). The findings, as such, cannot be generalised.

Conclusion

Six dietary patterns were identified which showed significant association with sociodemographic characteristics of the sample. The findings will help in updating information related to the dietary patterns in the country.

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