Original Article

Prevalence of inadequate fruit and vegetable consumption and associated food choice motives among adults in an urban population in Kerala

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Abstract

Background: Existing literature does not account for food choice motives associated with the non-communicable disease risk factor of an unhealthy diet, primarily characterised by inadequate fruit and vegetable consumption, among adults residing in Kochi Municipal Corporation. Our study aims to measure the prevalence of inadequate fruit and vegetable consumption in this urban population and to identify priority food choice motives among individuals at risk. **Methods:** A community-based cross-sectional study was conducted among 300 adults (mean age 46 years, men 50%) selected by cluster sampling. Information on socio-demographic variables, diet, and food choice motives was collected through a pre-tested structured interview schedule. Binary logistic regression analysis was done to identify factors associated with inadequate fruit and vegetable consumption. **Results:** In our study, 86% (95% CI: 82.07-89.93) of participants reported inadequate fruit and vegetable consumption. The food choice motives of "price" [aOR 2.99, 95% CI: 1.32–6.78], "health" [aOR 2.56, 95% CI: 1.08–6.24], and "sensory appeal" [aOR 2.20, 95% CI: 1.06–4.56] were found to be significantly associated with inadequate fruit and vegetable consumption per day ($P < 0.05$). **Conclusion:** The high prevalence of inadequate fruit and vegetable consumption in this urban community necessitates targeted and comprehensive educational campaigns that highlight the health benefits and sensory appeal of fruits and vegetables, as well as the affordability of seasonal produce, to ensure adequate intake of these foods.

Keywords: Diet, food choice motives, non-communicable diseases

Introduction

The World Health Organisation (WHO) estimates that 41 million people die yearly from non-communicable diseases (NCDs) like cardiovascular disease, diabetes, and cancer.[1] Of all NCD deaths, 77% are in low- and middle-income countries (LMICs).[1]

An unhealthy diet, usually indicated by low consumption of fruits and/or vegetables and high dietary salt, is the most common risk factor for the global burden of NCDs. Current dietary patterns in most regions are neither healthy nor sustainable.[2] Inequity restricts access to healthy diets and is associated with broad social determinants.[3]

Approximately 16 million (1.0%) disability-adjusted life years (DALYs) and 1.7 million (2.8%) of deaths worldwide are attributable to low fruit and vegetable consumption.[4] Fruit and vegetable consumption globally ranged from 36.6% (in Ghana) to 99.2% (in Pakistan) for men and from 38.0% (in Ghana) to 99.3% (in Pakistan) for women.[5]

Based on a nationally representative sample, the Indian Council of Medical Research (ICMR) estimated that 98.4% consumed less

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than the recommended fruit and vegetable intake per day and the average intake of salt was 8 grams per day, much more than the recommended 5 g/day.[6] According to a cross-sectional study, on the prevalence of risk factors of NCDs in Kerala conducted in 2016-2017, the average vegetable intake among adults was three servings per day, and the estimated salt intake was 6 g/day.[7]

Effective modification of dietary patterns depends on an understanding of the factors governing food choice.[8] Studying food choices also allows for the identification of consumer demand for supplies, consumption of nutrients, and health issues.[9]

Populations around the world are increasingly exposed to foods and diets that influence the risk of developing chronic diseases. Current literature does not account for food choice motives associated with an unhealthy diet among adults in an urban population in Kerala. The study was undertaken to determine the prevalence of fruit and vegetable consumption and associated food choice motives in this urban population.

Methods

Study design

This was a community-based cross-sectional study.

Study settings

Ernakulam is one of the 14 districts in Kerala. The urban areas of Ernakulam consist of 13 municipalities and a municipal corporation. This cross-sectional study was conducted in the only municipal corporation in the district – the Kochi Municipal Corporation, which has a population of more than 0.6 million within an area of 94.88 square kilometres and is further divided into 74 administrative divisions. Data was collected from March to April 2023.

Study participants

Adult household members between 18 and 69 years of age including those who were unemployed, retired, or engaged in unpaid work were eligible for the study.

Sampling

Cluster sampling based on the probability proportional to size strategy was adopted to identify a representative sample of eligible participants. The sample size was approximated as 300 adults based on the prevalence of inadequate fruit and vegetable consumption among adults in Kerala found by Thulaseedharan *et al.,*[10] with a margin of error of 5% and a design effect of 1.5. A total of 10 adults were then selected from 30 chosen clusters. One adult from each household was chosen using the *Kish* method.

Study measurements

Interview schedule: A structured interview schedule comprising questions related to diet and dietary salt consumption adapted from the WHO STEPwise approach to non-communicable disease risk factor surveillance (STEPS) instrument[11] and a short form of the standardised Food Choice Questionnaire (FCQ) (containing 25 items measuring 8 factors validated by the work of Verain *et al.,*[12]) was translated into the local language and used to quantify fruit and vegetable consumption, salt consumption, and the importance attached to eight food choice motives for choosing food eaten on a typical day. (The "health" factor rated the importance participants attached to general nutrition [foods rich in nutrients dominantly found in fruits and vegetables, i.e., vitamins, minerals, and fibre] and well-being. The "sensory appeal" factor consisted of statements rating the importance of taste, texture, aroma, and appearance of food. The "natural content" factor consisted of items related to the importance given to food devoid of artificial ingredients. The "familiarity" factor enquired about how important it is for the study participants to eat the food they are used to. The "mood" factor consisted of items related to food's effect on stress control, relaxation, and mood. The "convenience" factor consisted of items concerning the preparation of food. The "weight control" factor rated the importance of consuming food low in calories and fat.)

Definitions

Inadequate fruit and/or vegetable consumption: This was defined as mean servings less than the WHO recommendation of five servings of fruits and/or vegetables per day.

Statistical analyses

Data were collected using the mobile data-gathering platform, Epicollect5, and linked to a Microsoft Excel spreadsheet. Analysis was carried out using the statistical software IBM Statistical Software for Social Sciences, SPSS®, version 21.

Results

The socio-demographic profile of the study participants is shown in Table 1.

The mean age of the study participants was 46.29 years (SD = 12.65). About 35% of the study participants were middle-aged adults, with an equal representation of women and men. Half of the study participants acquired a secondary level of education or below. About three-fifths of the participants were involved in paid work, and almost 67% of the participants lived above the poverty line. Nearly 68% did not have existing chronic conditions and most were non-vegetarians.

Inadequate fruit and vegetable consumption was reported in 86% (95% CI: 82.07-89.93) of the study group [Table 2].

The mean fruit and/or vegetable intake was 2.71 (IQR = 2.07) servings per day. Around 70% of the participants infrequently or never consumed processed foods high in salt. Less than one-fifth (18.0%) of the participants reported the consumption of too much salt in their diet. Only 33% of the participants did

not emphasise lowering salt in their diet. About 27% of the participants did not think consuming too much salt could cause serious health problems. Almost three-fourths (74.7%) of the participants avoided eating foods prepared outside of a home regularly to control their salt intake.

Adjusted odds ratios of food choice motives associated with inadequate fruit and vegetable consumption per day are shown in Table 3.

Table 1: Socio-demographic profile of study participants (*n*=300)

Variable	Number (*n*)	Percentage (%)
Age in years		
18–44	136	45.4
45–69	164	54.6
Gender		
Women	150	50
Men	150	50
Highest level of education		
≤10th grade	153	51.0
>10th grade	147	49.0
Marital status		
Currently married	254	84.7
Others	46	15.3
Employment status		
Employed	175	58.3
Unemployed	125	41.7
Socio-economic status		
Below poverty line	98	32.7
Above poverty line	202	67.3
Existing chronic conditions		
Yes	95	31.7
No	205	68.3

Table 2: Gender-disaggregated prevalence of inadequate fruit and vegetable consumption in the study group (*n*=300)

Variable	Total *n* (%)	Women *n* (%)	Men *n* (%)
Fruit and vegetable consumption per day			
<5 servings (inadequate)	258 (86.0)	132 (88.0)	126 (84.0)
≥5 servings (adequate)	42 (14.0)	18 (12.0)	24 (16.0)

Variables included in the model but not found to be significant: education, food choice motive of "weight control".

The socio-demographic variable of education, and the food choice factors of "health", "price", "sensory appeal", and "weight control" ($R^2 = 0.147$), account for about 15% of the variance in fruit and/or vegetable consumption per day.

Discussion

This community-based cross-sectional research study aimed to assess the magnitude of one of the major behavioural risk factors for non-communicable diseases, namely, unhealthy diet, and its independent predictors, among residents in an urban community in the district of Ernakulam, Kerala, India.

The findings of this study add to a growing body of evidence suggesting a steadily low consumption of fruits and vegetables among the majority (86%) of the population with a mean intake of 2.8 servings per day. Similarly, in a representative sample of adults from all 14 districts in Kerala, 86.1% participants did not consume the recommended level of fruits and vegetables, and the average reported consumption of fruits and vegetables was 1.5 servings per day.[10] Based on a nationally representative sample, the Indian Council of Medical Research (ICMR) estimated that 98.4% of adults consumed less than the recommended five servings of fruits and vegetables per day, and the average reported consumption of fruits and/or vegetables was 2 servings per day.[6] The results of a systematic review and meta-analysis of data published on fruit and vegetable intake among South Asian countries between the years 1999 and 2019, found that Indians (2007) had the lowest reported intake of vegetables (0.9 servings/day).[13]

The consistency of results in India across different studies over the years is undeniably a matter of concern. Despite the global recommendation, individuals and families in urban households do not consume enough, let alone on a daily basis. In their predominantly non-vegetarian diets, fruits and vegetables are simply not the main component of a meal.

This study also identified the motives underlying food choices among the majority who consumed inadequate servings of

Table 3: Binary logistic regression analysis of factors associated with inadequate fruit and/or vegetable consumption per day

Variable	Total (*n*)	Fruit and/or vegetable consumption per day		Adjusted OR (95% CI)	*P*
		<5 servings *n* (%)	≥5 servings *n* (%)		
Health as a food choice motive					
Less important	104	96 (92.3)	8 (7.7)	2.60 (1.08–6.24)	0.033
More important	196	162 (82.7)	34 (17.3)	Reference	
Sensory appeal as a food choice motive					
More important	211	186 (88.2)	25 (11.8)	2.20 (1.06–4.56)	0.035
Less important	89	72 (80.9)	17 (19.1)	Reference	
Price as a food choice motive					
More important	113	104 (92.0)	9 (8.0)	2.99 (1.32–6.78)	0.009
Less important	187	154 (82.4)	33 (17.6)	Reference	

fruits and vegetables to possibly explain the reasons for low consumption. Our study revealed that those who overemphasised the price of food as a factor influencing their food choices were more likely to miss the recommended intake for a healthy diet than those who underemphasised price. Furthermore, those who prioritised the sensory appeal of food in this study were two times more likely to consume inadequate servings than those who did not prioritise this factor as much.

Among the minority who consumed adequate servings of fruits and vegetables in the present study, health was found to be a priority motive for their food choices. This finding is comparable with the results of a study that investigated motivations for fruit and vegetables among females aged 35-69 years participating in the UK Women's Cohort Study for whom health was one of the strongest motivations affecting fruit and vegetable intake.[14] In our study, participants who did not prioritise health in their food choices were approximately three times more likely to consume inadequate servings of fruits and/or vegetables.

The evidence suggests that insufficient awareness about the health benefits of consuming fruits and vegetables, coupled with inadequate knowledge on how to appealingly incorporate them into daily meals on a budget, can contribute to suboptimal intake.

Strengths and limitations of the study

Primary data for this study was collected by a single guided principal investigator. However, only self-reported responses were recorded and analysed for the measurement of the behavioural risk factor of an unhealthy diet. Also, a biochemical measurement could not be performed to accurately determine salt intake.

Although the study design did not permit establishing the temporality of the associations found, it still offered insights into the differing food choice motivations among individuals who consumed enough fruits and vegetables and those who did not.

Considering the urgent need for a shift in our food production and consumption patterns towards greater sustainability, this study can be expanded to explore sustainability motives in food choices. A valid and reliable instrument like the sustainable food choice questionnaire (SUS-FCQ), recently developed by Verain *et al.*,[12] can be used as an addition to the short form of the questionnaire (originally developed by Steptoe and colleagues in 1995) used here.

Conclusion

The urban population is often typified by their unhealthy food choices and dietary patterns. Thus, they need to be supported by the right resources to make the right choices. Our health promotion strategies can be directed towards accommodating prevailing preferences and circumstances, particularly in these communities. This includes effectively addressing the health risks and sustainability concerns related to diets favoured by urban culture.

Ethical considerations

The study protocol was reviewed and received ethical approval from the Research Ethics Review Committee of Amrita Institute of Medical Sciences, Kochi (Letter No.: ECASM-AIMS-2023-113, dated 24-02-2023). Informed consent was taken from the participants preceding the administration of the interview schedule.

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Conflicts of interest

There are no conflicts of interest.

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