

# Regional Differential in Diet Diversity Consumption and its Association with Adult Nutrition Status in Urban Areas

Baldev Singh Kulaste<sup>1</sup>, Bal Govind Chauhan<sup>2</sup>

<sup>1</sup>Research Scholar, Gokhale Institute of Politics and Economics, Pune, <sup>2</sup>Assistant Professor, Gokhale Institute of Politics and Economics, Pune

## Abstract

**Background:** The demographic and economic transition that many developing countries are undergoing is producing important changes in diet and lifestyle that greatly impact on diet related disease risks. Therefore, evaluating the association between diet diversity and obesity would be interesting for the adult population of urban areas.

**Objective:** This study deals with the consumption of different food items in the region of Maharashtra and its association with adult nutritional status.

**Material & Method:** This study used the National Family Health Survey (NFHS -4) data which was collected during 2015-16. Multiple logistic regression analysis has been done to fulfill the objective of the study using software STATA version 14.

**Result:** The present study found that the overweight and obesity situation among the adults of urban Maharashtra is alarming. This study also shows that the consumption of the Non-veg food (Fish, Eggs, chicken or meat) higher in Konkan and Pune region.

**Conclusion:** Based on the study findings, it is essential to address the present scenario of its increasing prevalence of overweight/obesity not only in the state but also at the national level.

**Keywords:** Food Consumption, Obesity, WHO, NFHS, BMI

## Introduction

Variety of food consumption has long been recognized as key elements of high-quality diets. A diverse diet increases the probability of nutrient adequacy among people and leads to positive health outcomes<sup>1,2</sup>. Lack of diversity is a particularly severe problem among poor populations in developing countries. Changing from a monotonous diet to one with varied food types

has been shown to improve energy and nutrient intakes in the people from the developing world<sup>3,4</sup>.

The demographic and economic transition that many developing countries are undergoing is producing important changes in diet and lifestyle that greatly impact on disease risks. Notwithstanding malnutrition and nutrient deficiencies were important distress in the developing world, recent dietary shift and changes in the physical activity patterns, diet-related metabolic problems have arisen as a disturbing public health puzzle in many developing nations predominantly among urban inhabitants<sup>5,6</sup>. Therefore, this study deals with the consumption of different food items in the region of Maharashtra. It has also described the pattern and level of food group consumption by socio-economic characteristics of the respondents across all five regions

---

### Corresponding Author:

**Baldev Singh Kulaste**

Research Scholar

Gokhale Institute of Politics and Economics

Pune – 411004

Email – baldeviips@gmail.com

of the state. As India has an interesting socio-economical relationship with obesity. For instance, higher wealth and education is positively associated with obesity among Indian adult <sup>7</sup>. Therefore, evaluating the association between diet diversity and obesity would be interesting for the adult population of urban Maharashtra.

## Material and Method

### Data Source

This study used the fourth round of National Family Health Survey (NFHS-4) conducted in India during 2015 – 16. The NFHS-4 is a large scale, household-based survey and collected information spanning across the districts of state and the union territories of India. The main purpose of the survey was to provide reliable estimates of fertility and family planning, infant and childhood mortality, utilization of maternal health care services, maternal and childhood nutritional status etc. The survey adopted a multistage sampling design – two stage sampling design in most of the urban area and three stage design in most of the rural areas. The survey collected information using household schedules, individual/women's schedule and men schedule. The household and individual response rates were >95%. The details about the sampling design, sample size response rate and content of the schedules are given in the national report of NFHS-4

### Assessment of Nutritional Status and dietary diversity consumption

Assessment of nutritional status of a community is one of the first steps in the formulation of any public health strategy to combat malnutrition. The principal aim of such an assessment is to determine the type, magnitude and distribution of malnutrition in different geographical areas to identify at-risk groups and to determine the contributory factors. In the assessment of the nutritional status of individuals and communities, anthropometric measurement plays a very important role for the following reasons; departures from normal can be often detected earlier, by anthropometry than by clinical examination; and anthropometric figures are more objective than clinical assessments <sup>8</sup>.

The nutritional assessment may require encompassing nations, communities, vulnerable

segments of communities or individuals. It may be done as a part of an exercise to document current status as compared with past status or as a specific attempt to evaluate the impact of an intervention program.

### Anthropometric Measurement

Anthropometry is the study of the measurement of the human body in terms of the dimensions of bone, muscle, and adipose (fat) tissue for the assessment of growth, development and health parameters. Anthropometric measurements, including length or height, weight, and head circumference, help to determine if a child is growing properly and can indicate when the child's health and well-being are at risk <sup>9</sup>. The 2015-16 NFHS collected anthropometric data on the height and weight of women age 15-49 and men age 15-54 years. These data were used to calculate several measures of nutritional status such as body mass index (BMI) of the respondents.

### Body Mass Index (BMI)

We used Body Mass Index (BMI) as an indicator of nutritional status of the respondent. BMI is defined as the ratio of weight (in kgs) and square of heights (in meters) of a person. The National Institute of Health (NIH) has defines the normal weight, overweight and underweight in terms of BMI rather than tadeonal weight/height chart. It is categorized as underweight (BMI<18.5 kg/m<sup>2</sup>), normal (18.5 to 24.9) overweight (BMI 25- 29.9 kg/m<sup>2</sup>) and obese (>29.9 kg/m<sup>2</sup>).

### Dietary Diversity (Food Intake)

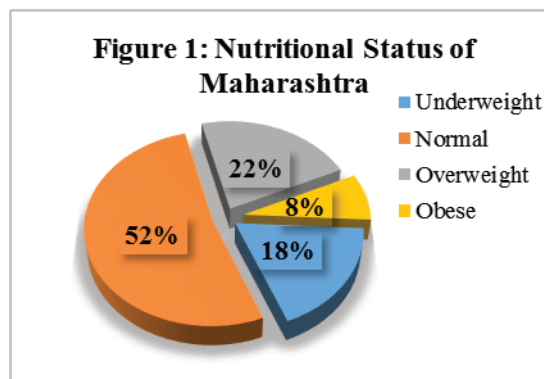
The consumption of a wide variety of nutritious foods is important for the health of the population. A well-balanced diet is required for adequate amounts of protein, fat, carbohydrates, vitamins, and minerals. The 2015-16 NFHS asked women and men how often they consume various types of food (daily, weekly, occasionally, or never). In the survey, consumption of selected foods group was assessed by asking, 'How often do you yourself consume the following items: daily, weekly, occasionally or never?' related to fish consumption, milk or curd, pulses and beans, green leafy vegetables, other vegetables, fruits, eggs, chicken or meat, fried food and aerated drinks. However, NFHS-4 data do not contain consumption data for some of WHO

food group (e.g. grain, roots and tubers). Although, for analysis purpose, we have collated daily or weekly into one and coded as ‘1’, and ‘0’ code was given to those who consumed any food item occasionally or never. It means if a respondent consumed any food from any of the above-mentioned categories, he would get one point in that food category. Simple counting of food items was done to arrive at individual food scores, which ranged from 0 to 9. After that this score has been divided into three food group categories as low ( $\leq 3$  FG), Medium (4 FG) and High ( $\geq 5$  FG).

### Statistical Analysis

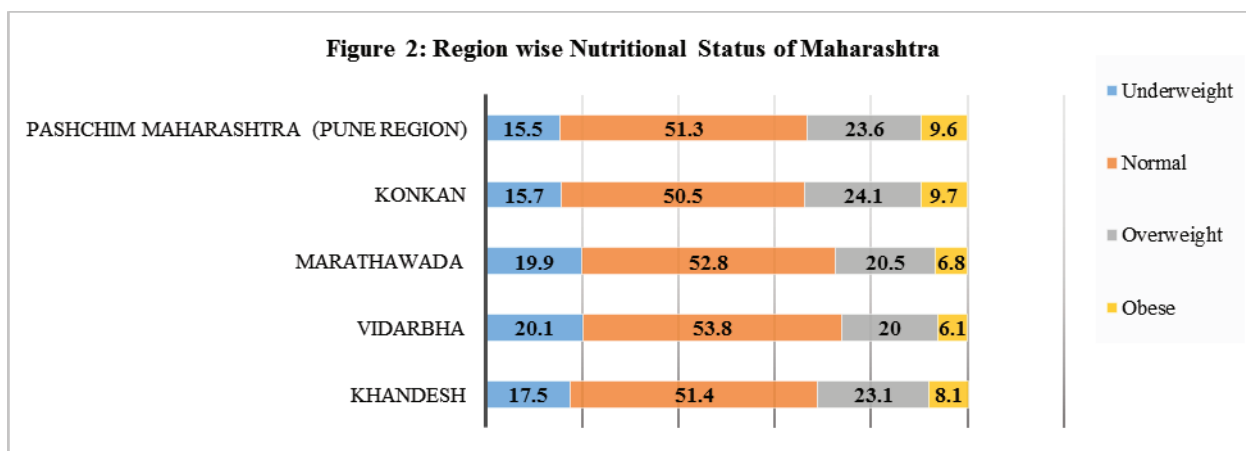
Bivariate and multivariate techniques are used to analyze the data. Descriptive statistics and multivariate technique are used to find out the significant association between predictor and outcome variables. In Descriptive statistics, chi-square test is used, and in multivariate technique binary logistic regression has been used to find out the significant effect of the predictor variables on outcome variables.

### Result



Nutritional Status of Maharashtra and its region

Figure 1 shows the prevalence of underweight, overweight and obesity among the adult’s population of urban Maharashtra. Overall 8% of the respondents were obese while 22% were overweight. Most of the respondents were accounting for normal BMI classification (52%). Respondents from the Konkan region were more overweight and obese as the prevalences were high in this region (24.1% and 9.7% respectively) (Figure 2).



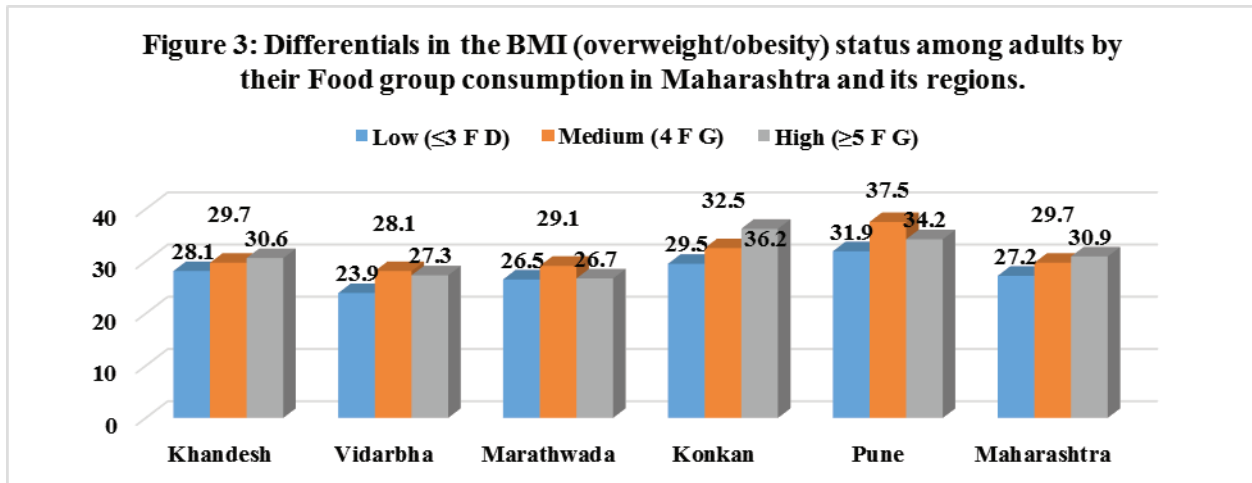
Differential in dietary intake in Maharashtra and its region

Table 1 depicts the variation in the dietary intake in the region of Maharashtra. In Maharashtra, 48.9% of the respondents were consuming milk or curd daily and 57.7% were consuming pulses or beans daily. Only 2.6 percent of the adults consuming the chicken or meat daily, however, a large proportion (43.3%) of respondents were consuming chicken or meat weekly. From the table it can also depict that the daily Consumption of milk or curd was high (59%) in Pune region followed

by Konkan (50%), Khandesh (44.2%) Vidarbha (41%) and least in Marathwada region (40.1%). In term of daily consumption of pulses and beans, it was highest in Vidarbha and least in Marathwada (49%). Again, the daily consumption of green leafy vegetables is higher (59%) and least in the Marathwada region (41%). Moreover, very less proportion of adult daily consuming chicken or meat in all the region, however, the proportion of weekly consumption of chicken or meat is higher (52%) in Khandesh region.

After accessing the food consumption patterns, we have also checked its relationship with the overweight/obesity. For that purpose, the all 9-food item merge into one index and categories it into three categories namely;  $\leq 3$  Food Group, 4 food group and  $\geq 5$  and more food group (the details methodology given in chapter 2). The bivariate analysis of food group consumption and BMI status is given in **figure 3**. Results show that the about 31% of the respondents were overweight/obesity among

those who consumed five and more group of food in a week in Maharashtra and it is 27.2 % among those who were consuming less than or 3 food group in a week. A similar finding has been also obtained in Konkan region. However, results from Vidarbha, Marathwada and Pune show that the prevalence of overweight/obesity is higher (28.1%, 29% and 37% respectively) among those who are consuming at least four good groups in a week.



### Determinant of overweight/obesity in Maharashtra and its regions

Results of the multivariate analysis reiterate that respondent age, Religion, type of occupation, marital status and wealth index are the significant determinants of overweight and obesity among the adults of urban Maharashtra as shown in **table 2**. The risk of being overweight/obese was higher among those who consumed five or more food group in a week compared to those who have less than or equal to three food group in a week, however, this relationship is not significant. Age group of the respondents emerged as a vital determinant of overweight and obesity. The risk of becoming overweight or obese increased with the increase in age. Respondents in the 45-54 age group are 3.9 ( $p < 0.001$ ) times more likely to be overweight or obese than respondents from younger age group (aged 15-24 years). The risk of overweight and obesity was higher among Muslim respondents ( $OR = 1.5$ ;  $p < 0.001$ ) compared with respondents belonging to the Hindu religion.

As expected, the risk of overweight/obesity is less among those who are working in the agriculture sector and working as manual skilled and unskilled labour. The risk of overweight/obesity was 1.7 times ( $p < 0.001$ ) higher among married respondents compared to never married respondents. The wealth index has a strong significant impact on the overweight or obesity status among adults' population of urban Maharashtra. The odds for overweight or obesity increased with the increase in household wealth status. Respondents from the richest wealth index are 2.9 times ( $p < 0.001$ ) more likely to be overweight and obese compared with respondents from the poorest wealth quintile. The odds ratio of overweight/obesity was higher among the respondents from Konkan and Pune region compared to Khandesh region, but the relationship was not significant.

### Summary and Conclusion

The main purpose of our study was to examine the prevalence of overweight and obesity among adults in the urban area of Maharashtra. As well as to access the dietary intake and its association with overweight/

obesity among the adult.

The present study found that the overweight and obesity situation among the adults of urban Maharashtra is alarming. Many adults are either overweight or obese in the state. This condition could well be related to many other developed nations where the prevalence of overweight and obesity is accumulating steadily<sup>10,11</sup>.

Further, Pune and Konkan region of the state having the higher burden of overweight/obese population. Both regions are more urbanized, and their dietary patterns are also different from the other region of the state. All coastal belt of the state knows as the Konkan region and the consumption of the non-vegetarian food (Fish, Eggs, chicken or meat) in the region is very high compared to other region of the state. At a state level, one-third of the population daily or weekly having fruits. It is also found that the prevalence of overweight/obesity varies with consumption of food group. The risk of overweight/obesity is higher among those who were having five or more food group in a week than those who are consuming less than or three food group in a week. However, the relationship is not statistically significant. The multivariate analysis of this study shows that age, marital status and wealth status of the household are the main significant risk factor of the overweight/obesity.

The present study shows a high prevalence of Overweight/obesity and hypertension in adults of Urban Maharashtra affecting the both-poor and the wealthier. It is essential to address the present scenario of its increasing prevalence not only in the state but also at the national level. The growing demand which appears before the Government is to address these increasing epidemics with equal importance. Timely prevention of these two will reduce the burden of many associated chronic co-morbidities. It can be accomplished either through undertaking separate urban health programme or including a particular clause in the ongoing National Health Mission programme, citing the importance of a healthy diet and physical exercise.

#### **Limitation of the study**

The survey considered only the weight and height of respondents to measure the prevalence of overweight/obesity in India, however there is a different approach/cut-point, which is appropriate to measure

the BMI, particularly for the Asian region. NFHS has collected limited information on food items. Although the demographic, socioeconomic and diet factors incorporated in this study may capture much of the variation.

#### **Abbreviations**

WHO – World Health Organisation

NFHS – National Family Health Survey

BMI – Body Mass Index

NIH – National Institute of Health

#### **Consent to publish**

Not Applicable

#### **Availability of data and materials**

The datasets used during the current study are available from the corresponding author upon reasonable request.

Authors Contribution: All authors have made equal contribution on conceptualization, analysis and in writing the paper.

**Competing Interests:** The authors declare that they have no competing interests.

**Funding:** No funding is provided.

#### **References**

1. Jayawardena R, Byrne NM, Soares MJ, Katulanda P, Yadav B, Hills AP. High dietary diversity is associated with obesity in Sri Lankan adults: An evaluation of three dietary scores. *BMC Public Health*. 2013. doi:10.1186/1471-2458-13-314
2. Foote JA, Murphy SP, Wilkens LR, Basiotis PP, Carlson A. Dietary Variety Increases the Probability of Nutrient Adequacy among Adults. *J Nutr*. 2004. doi:10.1093/jn/134.7.1779
3. Popkin BM. Nutrition in transition: the changing global nutrition challenge. *Asia Pac J Clin Nutr*. 2001;10 Suppl:S13-8. <http://www.ncbi.nlm.nih.gov/pubmed/11708577>. Accessed August 7, 2019.
4. Ruel MT. Operationalizing Dietary Diversity: A Review of Measurement Issues and

- Research Priorities. *J Nutr.* 2018. doi:10.1093/jn/133.11.3911s
5. Caballero B, Rubinstein S. Environmental factors affecting nutritional status in urban areas of developing countries. *Arch Latinoam Nutr.* 1997;47(2 Suppl 1):3-8. <http://www.ncbi.nlm.nih.gov/pubmed/9659409>. Accessed July 29, 2019.
  6. Sen J, Mondal N, Dutta S. Factors affecting overweight and obesity among urban adults: A cross-sectional study. *Epidemiol Biostat Public Heal.* 2013. doi:10.2427/8741
  7. Rengma MS, Sen J, Mondal N. Socio-Economic, Demographic and Lifestyle Determinants of Overweight and Obesity among Adults of Northeast India. *Ethiop J Health Sci.* 2015;25(3):199-208. doi:10.4314/ejhs.v25i3.2
  8. Bailey K V, Ferro-Luzzi A. Use of body mass index of adults in assessing individual and community nutritional status. *Bull World Health Organ.* 1995;73(5):673-680. <http://www.ncbi.nlm.nih.gov/pubmed/8846494>. Accessed August 7, 2019.
  9. NATIONAL FAMILY HEALTH SURVEY (NFHS-3) INDIA VOLUME I.; 2005. <http://www.mohfw.nic.in>.
  10. Gruebner O, Khan MMH, Lautenbach S, et al. A spatial epidemiological analysis of self-rated mental health in the slums of Dhaka. *Int J Health Geogr.* 2011. doi:10.1186/1476-072X-10-36
  11. World Bank World Development Report 2011. 2011. doi:10.1596/978-0-8213-8439-8