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Original Article

Public Health Section

Overweight/Obesity: An Emerging Epidemic in India

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ABSTRACT

Introduction: The nutrition, demographic, and epidemiological transition process are at a pace in most of the states of India since the 1990s. In India, the recent National Family Health Survey 4 (NFHS 2015-16) data shows commendable rise in the prevalence of overweight/obesity.

Aim: To determine the levels, trends, differentials and determinants of overweight/obesity in the states of India.

Materials and Methods: Data from rounds of the National Family Health Survey (NFHS) that is NFHS-4 (2015-16), NFHS-3 (2005-06) and NFHS-2 (1998-99) were used in the analysis of this study. To examine the effect of predictors of overweight/obesity, the multivariate logistic regression model was used in the analysis using NFHS-3 data.

Results: Results indicated that overweight and obesity have become substantial problem among different socio-economic spectrum of women and men in India, particularly in older ages, people living in urban areas, well-educated and among households of highest wealth quintile and simultaneously among people living in poorer wealth quintile, uneducated and people belonging to socioeconomically less developed states. Analysis reveals that overweight and obesity prevalence in India increased swiftly in last two decades. An alarming trend is that overweight/obese women as well as men population has been more than doubled in 2015-16 since last one and a half decade. There was a significant rise in the prevalence of overweight and obesity from 1998-99 to 2015-16 in both urban and rural areas in all the states of India. An emerging concern is that there was rise in overweight/obesity prevalence up to critical level among the states, where it was not severe earlier. It was also found that food habits did not conclude any definite effect on the prevalence of overweight and obesity. One reason may be the complex and non-uniform dietary habits across the states, and other may be the availability of nutritious and balanced food.

Conclusion: The steep emergence of overweight/obesity poses great challenge to healthcare providers and policymakers. Effective implementation of programmes is required before overweight/obesity becomes a more widespread epidemic.

Keywords: Lifestyle, Non communicable disease, Women

INTRODUCTION

Worldwide, the prevalence of overweight and obesity have become more than double since 1980, which reached to 1.9 billion overweight and 600 million obese adults in 2014. In an estimation by WHO it is predicted that around two-thirds of the global burden of disease will be accredited to chronic non communicable diseases, most of them strongly associated with diet [1].

Developing countries experienced more dramatic rise in the prevalence of obesity in recent decades [2]. Surprisingly, the problems of overweight/obesity are increasing in countries where hunger is still endemic. World Health Organisation (2006) also detected that there was higher risk of high blood pressure, heart disease, and type-2 diabetes at an earlier age among people who were undernourished in younger age and obese in adulthood [3].

During last two decades, in India, the magnitude of dual nutrition burden has escalated because of rapid nutrition, demographic, and epidemiological transition in the states of the country. With growing prevalence of overweight and obesity there is a dearth of studies for India, partly because of the persisting high prevalence of undernutrition. In this study, the levels, trends, and differentials of overweight and obesity were examined and the association of demographic and socioeconomic determinants of overweight and obesity was also assessed in India and its states for both genders.

MATERIALS AND METHODS

The present study was cross-sectional descriptive study conducted in International Institute for Population Sciences, Mumbai, Maharashtra, India, from January 2017 to February 2018 in which the analysis was performed using secondary data obtained from publicly available sources provided by Ministry of Health and Family Welfare, Government of India that is NFHS-4 (2015-16), NFHS-3 (2005-06) and NFHS-2 (1998-99) [4-6].

NFHS-4 data provides information on men and women's background characteristics e.g., age, literacy, schooling, religion, caste/tribe, etc. It also provides information on nutritional status, maternal factors of fertility, marriage, family planning, and women's empowerment, HIV/AIDS etc. The Clinical, Anthropometric, and Biochemical (CAB) component of NFHS-4 is designed to provide vital estimates of the prevalence of malnutrition. NFHS-4 contains information from 699,686 women aged 15-49 years, and 112,122 men age 15-54 years, from all 29 states of India.

The third National Family Health Survey (NFHS-3), conducted in 2005-06 provides information on nutritional status of adult men, women and children, and essential aspects of health, fertility, mortality, family planning, and healthcare. About 124,385 women of age 15-49 years and 74,369 men of age 15-54 years were interviewed in NFHS-3 from all the states of India.

NFHS-2, conducted in 1998-99, provides information on nutritional status of adult women and children, and essential aspects of health, fertility, mortality, family planning, and healthcare from a nationally representative sample. More than 90,000 ever-married women of age 15-49 years were included in the sample.

Trend analysis was undertaken first by background characteristics then states-wise. For trend analysis, Body Mass Index (BMI) has been used as primary study variable to measure the nutritional status among men and women. More than 25 kg/m^2 BMI were considered as indicator of overweight/obesity. The following socioeconomic and demographic background variables have been used in the study. Place of residence: Rural, and urban; Religion:

Hindu, Muslims, and others; Caste: SC, ST, and others; Education level: No education, primary, secondary and higher; Marital status: Currently married, and never married; Wealth index: Poorest, poorer, middle, richer and richest; Age group: "15-24", "25-34" and "35-49" years; Working status: Currently working, and not currently working; Parity: ≤2, and >2; Household structure: Nuclear, and joint; Food consumption pattern: Daily, weekly, and occasionally.

Among women, levels and trend analysis was assessed using NFHS-4, NFHS-3, and NFHS-2 data (from 1998-99 to 2015-16) while among men it is limited to NFHS-4, and NFHS-3 data (from 2005-06 to 2015-16), as NFHS-2 provides nutritional information about women and children only.

Levels and trends in overweight/obesity prevalence were analysed by socioeconomic and background variables and state-wise for both rural and urban areas separately. All the states of India were included in the analysis. Urban-rural differentials in overweight/obesity were assessed by urban-rural gap. The urban-rural gap in the prevalence of overweight and obesity has been measured by the difference of overweight/obesity prevalence between the urban and rural areas.

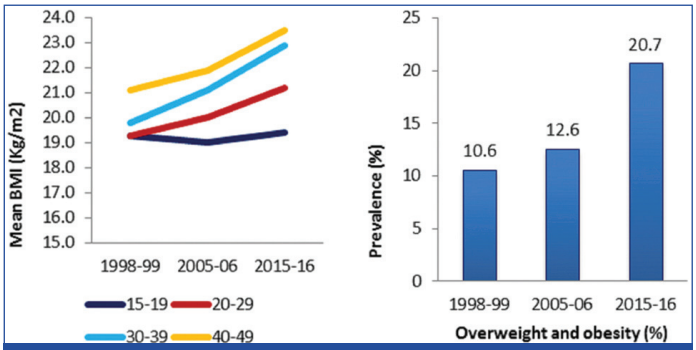
STATISTICAL ANALYSIS

To examine the effect of predictors of overweight/obesity, the multivariate logistic regression model was used in the analysis using NFHS-3 data. The statistical analysis was performed by SPSS version 20.0.

RESULTS

Trends in Mean Body Mass Index among Women

Change in mean Body Mass Index (BMI) shows the deviation from undernutrition to over nutrition or vice versa over the time. It was observed that from 1998-99 to 2015-16, the mean BMI was increased to 21.9 kg/m^2 from 20.3 kg/m^2 [Table/Fig-1], which



[Table/Fig-1]: Mean BMI and prevalence (%) of overweight/obesity among women by year, India, 1998-99, 2005-06, and 2015-16.

indicates the swift rise in overweight/obesity in the last two decades with a significant proportion of the women suffering from malnutrition. Mean BMI has increased in all ages; however, it increased steeply for the women aged 30-39 and 40-49 years.

There was significant increase in the mean BMI among currently married women while never married women did not show significant transformation of body mass towards overweight/obesity from NFHS-2 to NFHS-4. By residence, it was found that both rural and urban areas witnessed rise in mean BMI in 2015-16. Effect of education was observed prominently among women with illiterate women and educated women (up to primary).

Muslims women showed highest change in the mean BMI compared to Hindu women and others. Caste wise, there was highest change among Scheduled caste women. The mean BMI of Scheduled caste women was 21.8 kg/m^2 in 2015-16 compared to 20.1 kg/m^2 in 1998-99. Women from upper wealth quintiles also showed significant change in mean BMI in 2015-16.

Trends in the Prevalence of Overweight/Obesity among Women by Background Characteristics

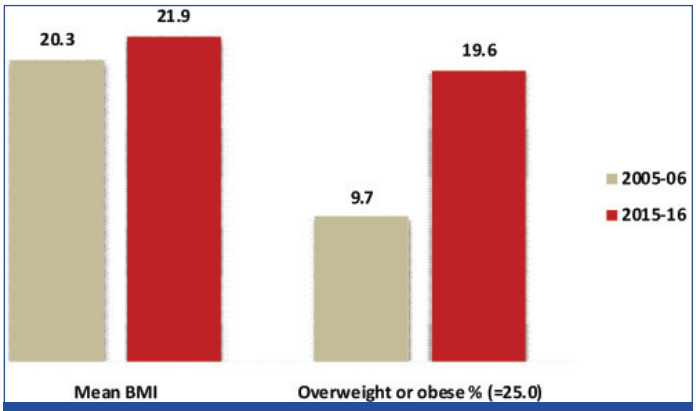
The proportion of overweight/obese women population has doubled in 2015-16 since 1998-99. In 2015-16, more than 20% women were found to be overweight/obese compared to 10.6% in 1998-99 which was a substantial increase in less than two decades [Table/Fig-1]. Overweight/obese women in age group of 30-39 years observed increase from 7.3% in 1998-99 to 27.7% in 2015-16 which was highest compared to increase in other age groups. The prevalence of overweight/obesity has increased among currently married women while there was marginal decrease in the overweight/obesity prevalence among never married women.

Among both urban and rural women, there was the significant increase in the overweight/obesity prevalence in 2015-16 from 1998-99. Education depicted a positive association with the prevalence of overweight/obesity, however higher increase in the levels of overweight/obesity was observed among illiterate women and up to primary educated women over the time.

Both Hindus and Muslims overweight/obese women population was doubled in last two decades. There was significant rise of prevalence of overweight/obesity among Others caste women however, among Scheduled tribe, Scheduled caste, and Other backward caste women it was tripled in 2015-16 compared to 1998-99.

Change in the Mean BMI and Prevalence of Overweight/Obesity among Men by Background Characteristics over Time

Mean BMI also increased to 21.9 kg/m^2 in 2015-16 compared to 20.3 kg/m^2 in 2005-06 [Table/Fig-2]. The prevalence of overweight/obesity among men increased 2.8 times in 2015-16 in the age



[Table/Fig-2]: Mean BMI and Prevalence (%) of overweight and obesity among men, India, 2005-06, and 2015-16.

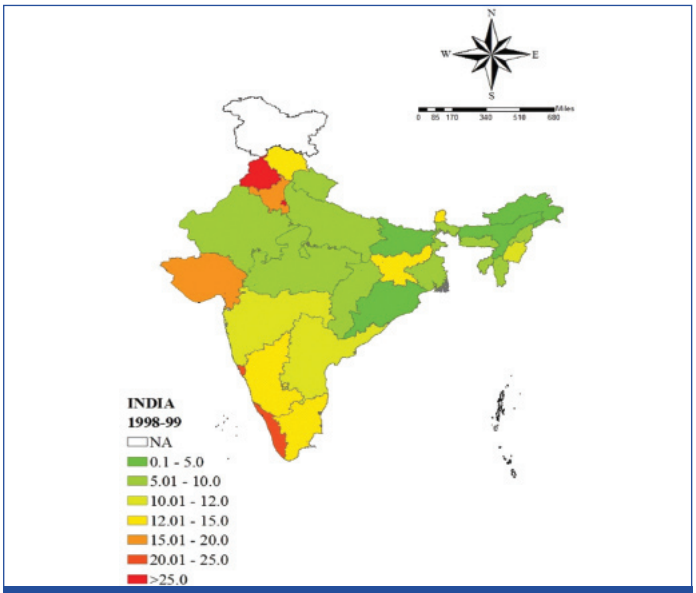
group of 15-19 years, which was comparatively higher to increase in the other age groups. From 2005-06 to 2015-16, among currently married men significant rise in the prevalence of overweight/obesity was observed while overweight/obesity prevalence declined among never married men in the same time.

Overweight/obesity rose to 26.6% among men in urban areas in 2015-16. Illiterate men and men educated up to primary level of education observed a higher increase in overweight/obesity level compared to men educated up to higher level. The increase in the overweight/obesity prevalence was also seen comparatively higher among Muslim men, Scheduled Caste and Other backward class men and men belonging to upper wealth quintiles.

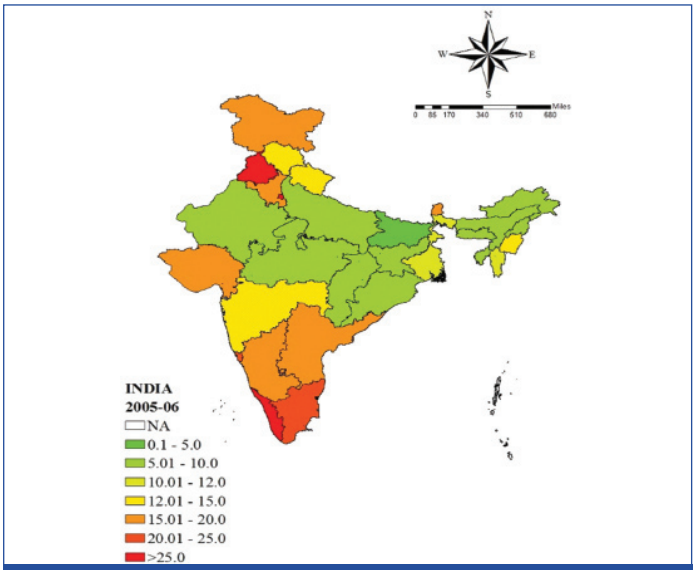
State-wise Levels and Trends in the Prevalence of Overweight and Obesity among Women

The Indian states are in the different stages of demographic, epidemiological and nutritional transition. The state-wise scenario of increase in the prevalence of overweight/obesity also was not uniform.

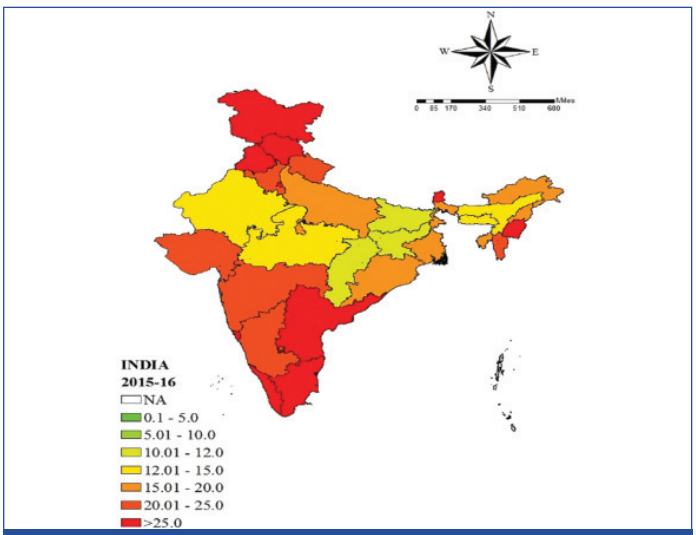
[Table/Fig-3-5] presents the variation in the prevalence of overweight/obesity among women in 1998-99, 2005-06, and 2015-16. In 1998-99 only six states of Punjab, Haryana, Delhi, Gujarat, Kerala, and Goa had more than 15% overweight/obesity prevalence which increases to 11 states in 2005-06 and there were 20 states in India in 2015-16 where prevalence of overweight/obesity among women was more than 15%. It is evident that overweight/obesity is an epidemic which is rapidly spreading in all the states of India. Much higher prevalence of overweight/obesity in Delhi, Goa, Andhra Pradesh, Kerala, Punjab, and Tamil Nadu in 2015-16 raises serious concerns where more than 30% women were overweight/obese.



[Table/Fig-3]: Prevalence (%) of overweight and obesity among women in the states of India, 1998-99.



[Table/Fig-4]: Prevalence (%) of overweight and obesity among women in the states of India, 2005-06.



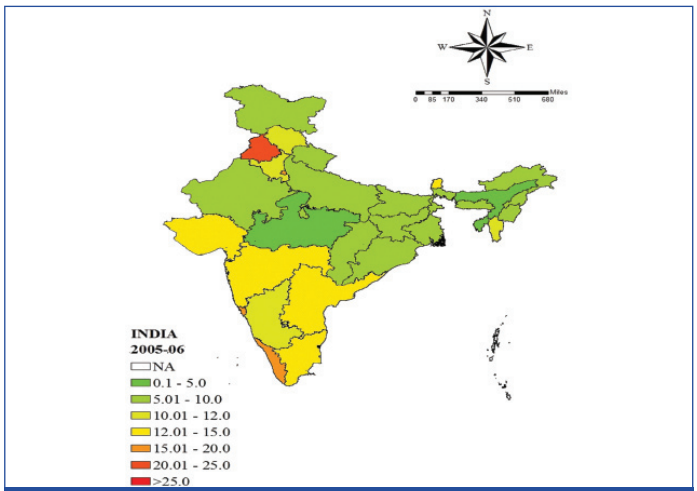
[Table/Fig-5]: Prevalence (%) of overweight and obesity among women in the states of India, 2015-16.

In urban areas, the prevalence of overweight/obesity among women has reached an alarming level. In 1998-99, 13 states had more than 20% overweight/obesity prevalence which increasesd to 14 states in 2005-06 (with 10 states had more than 25% prevalence) and there were 28 states in India in 2015-16, where prevalence of overweight/obesity among urban women was more than 20%. In 2015-16, more than quarter urban women population was overweight/obese in 21 states of India.

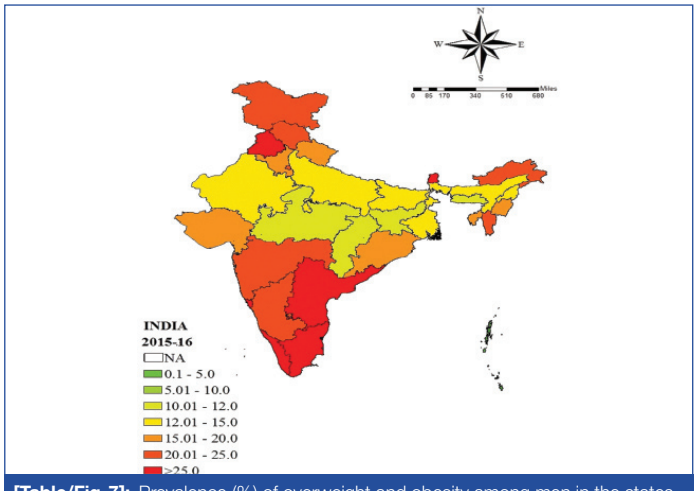
In rural areas also, the prevalence of overweight/obesity among women increased substantially. In 1998-99, only four states had more than 15% overweight/obesity prevalence which increasesd to more than 20% in 2005-06 and there were 14 states in India with more than 15% prevalence of overweight/obesity among rural women in 2015-16. Among nine states, at least every fourth women in 15-49 years' age group were overweight/obese in 2015-16. Kerala (30.5%), and Punjab (30.6%), found with alarming rates of overweight or obesity among rural women in 2015-16.

State-wise Levels and Trends in the Prevalence of Overweight and Obesity among Men

[Table/Fig-6,7] presented the variation in the prevalence of overweight/obesity among men in India in 2005-06, and 2015-16. The severity could be understood by the results that in 2005-06,



[Table/Fig-6]: Prevalence (%) of overweight and obesity among men in the states of India, 2005-06.



[Table/Fig-7]: Prevalence (%) of overweight and obesity among men in the states of India, 2015-16.

only three major states had more than 15% overweight/obesity prevalence which increasesd up to 19 states in 2015-16 among whom prevalence of overweight/obesity was more than 25% in six states which indicated sudden rise in the overweight/obese men population in last decade.

In 2015-16, Sikkim, Andhra Pradesh, and Goa were in the top with more than 30% men overweight or obese.

In urban areas, the prevalence of overweight/obesity has reached an alarming level. In 2005-06, 14 states showed more than 15% overweight/obesity prevalence which increased to all 29 states in 2015-16 (22 states had more than 20% prevalence), where prevalence of overweight/obesity among men was more than 15%. In 2015-16, every fourth man in 15-54 years' age group in India was overweight or obese. Andhra Pradesh (44.4%) and Sikkim (41.5%) had critical level of prevalence of overweight/obese men population in 2015-16.

In rural areas also, the rapid increase in overweight/obesity was observed in 2015-16 from 2005-06. The rural areas of 14 states were found with more than 15% prevalence of overweight/obesity among men in 2015-16 while there were only two states in 2005-06 where overweight/obesity prevalence was more than 15% among rural men. Sikkim followed by Goa and Andhra Pradesh were in top with 29.7%, 28.2% and 28.0% overweight/obesity prevalence respectively among rural men in 2015-16.

Multivariate Logistic Regression Analysis of the Prevalence of Overweight and Obesity

Results showed that the likelihood of overweight/obesity was three times higher among men and women of age more than 35 years compared to those in age group of 15-24 years. Parity was found as significant predictor of overweight/obesity among women but not among men. Lower parity women were found 29% less likely to be overweight/obese compared to women with more than two parity.

Results show that the risk of overweight/obesity was 18% lower among men and 51% lower among women living in rural areas compared to those living in urban areas. The increase in unadjusted prevalence of overweight/obesity was found more among illiterates and men and women with lower level of education, the adjusted effect of education demonstrated reverse results. It was found that risk of overweight/obesity was increased with upper level of education among men and women.

Men and women belonging to Others caste were more likely to be overweight/obese compared to Scheduled Caste men and women however the association was not statistically significant. Muslim men were found to be 15% more likely to be overweight/obese compared to Hindu men and Muslim women had two times higher likelihood of overweight/obesity compared to Hindus.

Men belonging to richest wealth quintile were found 12 times and richer wealth quintile men were 5 times more likely to be overweight/obese compared to men in poorest wealth quintile. Among women, the likelihood of being overweight/obese was seven times more among richest wealth quintile followed by four times more among richer wealth quintile women compared to women in poorest wealth quintile.

The risk of overweight/obesity was 50% lower among working women and it was 18% lower among working men compared to non working women and men.

Higher age at marriage also had negative relationship with the likelihood of overweight/obesity. Association of food habits with overweight/obesity, did not reflect any stable pattern among men and women in the analysis, possibly due to complex and non uniform food patterns across the Indian states.

DISCUSSION

The double burden of under nutrition and overnutrition is recognised worldwide. However, the determinants of the rise of overweight or obesity have not been systematically investigated in India. The study found that the risk of overnutrition at the individual level tended to be particularly high in states with a higher level of socio-economic development however the recent significant rise in the prevalence of overweight and obesity was observed in states of lower socio-economic development also.

It was found that overweight and obesity have become substantial problems among different socio-economic spectrum of women and men in India, particularly in older ages, people living in urban areas, well-educated and among households of highest wealth quintile and simultaneously among people living in poorer wealth quintile, uneducated and people belonging to socioeconomically less developed states. The age had significant effect on obesity as it affects health according to the timing of beginning [7]. The relationship between BMI and body fat is age-dependent and the discrepancies are accentuated after middle age and during the menopause in women [8].

Some studies suggest that economic development may not reduce urban poverty but in fact may increase economic disparities [9,10]. Overweight and obesity are posing a growing threat to the health of the people of India in both urban and rural areas as with increasing industrialisation and urbanisation, the standards of living also rise, which results in weight gain [11]. The rapid rise in the prevalence of obesity can also be credited to the use of mechanical transport, availability of ready to eat and fast foods, modern ways of entertainment like smart phones and smart TVs, adoption of sedentary lifestyles and intake of more energy-dense diets [12-14]. This is exemplified by the higher prevalence of overweight/obesity in the urban population where the above factors are more common. In addition, present study results support prior research findings that overweight/obese people are more likely to be female, and less educated compared to non-obese people [15].

It was also found that food habits did not conclude any definite effect on the prevalence of overweight and obesity. One reason may be the complex and non uniform dietary habits across the states, and other may the availability of nutritious and balanced food. Therefore, while interpreting, the overall prevalence of overweight and obesity require extra cautiousness in the context of wide disparities with respect to diet, physical activity and life-styles in general among the people of India [16].

LIMITATION

In view of unavailability of the data for men in NFHS-2 (1998-99), only two-point levels (2005-06, and 2015-16) in the prevalence of overweight/obesity have been shown in the results. This may also be due to the limitation that many lifestyle factors cannot be fully explored using the NFHS 3 and NFHS 2 data. The NFHS survey did not collect information about either energy intake or expenditure. The availability of nutritional food or imbalanced diet may also diminish the impact of food habits on the overweight/obesity.

CONCLUSION

The prevalence of overweight/obesity among men and women has doubled in last two decades from 1998-99 to 2015-16 in India. A swift increase in the overweight/obesity has been observed in all the states of India in both urban and rural areas. On one side, the prevalence of overweight/obesity has become epidemic in urban areas, the burden of overweight/obesity is increasing at an alarming rate in rural areas. Among Indian states, where overweight/obesity was not severe earlier, rise in overweight/obesity prevalence has

become an emerging concern. In this context, effective policy making and programmes implementation are indispensable before overweight/obesity becomes a more widespread epidemic.

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