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Review

Prevalence of obesity in India: A systematic review

Rajeev Ahirwar, Prakash Ranjan Mondal*

Department of Anthropology, University of Delhi, Delhi, India



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ABSTRACT

Recent studies have reported that globally, more than 1.9 billion adults are overweight and 650 million are obese. Approximately 2.8 million deaths are reported as a result of being overweight or obese. Due to the consumption of energy dense food (i.e. unhealthy food habits), sedentary life style, lack of health care services and financial support, the developing countries are facing high risk of obesity and their adverse consequences (i.e. diabetes, ischemic heart disease, etc). In India, more than 135 million individuals were affected by obesity. The prevalence of obesity in India varies due to age, gender, geographical environment, socio-economic status, etc. According to ICMR-INDIAB study 2015, prevalence rate of obesity and central obesity are varies from 11.8% to 31.3% and 16.9%–36.3% respectively. In India, abdominal obesity is one of the major risk factors for cardiovascular disease (CVDs). Various studies have shown that the prevalence of obesity among women were significantly higher as compared to men. Obesity is one of the main medical and financial burdens for the government. This problem of obesity can be preventable by spreading public awareness about obesity and its health consequences. Governmental agencies should promote the benefits of healthy life style, food habits and physical activity. The aim of this article is to report the prevalence of obesity in different regions of India and highlight the problem areas.

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1. Introduction

Body mass index (BMI) is a ratio of weight in kilograms divided by height in metres squared (Kg/m²). It is good a predictor for overall health and nutritional status. Obesity is one of the most neglected health problems which lead to the diabetes and cardiovascular disease [3]. More than 1.9 billion adults are overweight and 650 million are obese. Approximately 2.8 million deaths are reported as a result of being overweight or obese. Overweight and obesity have become a major public health problem in both developing and developed countries.

India is a developing country which is in a transitional state of under nutrition due to poverty and obesity due to the industrialization and rapid urbanization. In India, more than 135 million individuals were affected by obesity. Previously, different studies were reported which after using different methodologies and cut

off points for defining obesity that created complications in comparison. Presently there is no collective data of prevalence of obesity in India. So, that the present study represents the prevalence of general obesity in India on the basis of studies reported during last 20 years.

2. Methodology

- i) **Search strategy-** A literature search was conducted in the electronic databases (Google Scholar and Pub Med) and was limited to article published in English. The search words included “body mass index”, “Underweight”, “Obesity” and “India” in combination with “risk factors”, “outcomes” “prevention” and “cures”. This process yielded 65 references, including reports from national and international organizations, government reports, review articles and research studies.
- ii) **Criteria for screening obesity:**

- a) **WHO criteria for screening obesity for Asian population** [24]- Men WC = 85 cm; WHR = 0.90; and Women WC = 80 cm; WHR = 0.80
BMI (Kg/m²): Underweight = <18.5; Normal = 18.5–22.9; Overweight = 23.0–24.9; Obesity I = 25.0–29.9; Obesity II ≥ 30.0.

Abbreviation: M, Male; F, Female; WC, Waist circumference; WHR, Waist-hip ratio; BMI, Body mass index; WHO, World health organization; NFHS-4, National Family Health Survey- 4; NHLBI, National heart, lung and blood institute; GERD, Gastroesophageal Reflux Disease.

* Corresponding author.

E-mail addresses: rajeevhari87@yahoo.co.in (R. Ahirwar), prmondal1@rediffmail.com (P.R. Mondal).

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Table 1

Represents the prevalence of obesity in India (1998–2018).

| S.No | Author | Year Of Study Reported | State | Age (Yrs) | No. Of Individuals | | BMI Criteria for General obesity (kg/m ²) | Prevalence Of Obesity (%) | |
|------|---|------------------------|--|-----------|---|--|---|--|--|
| | | | | | Male | Female | | Male | Female |
| 1 | Mishra et al. [8,22] | 2018 | Rajasthan | 25 –65 | Urban:57 Rural:89 | Urban:92 Rural:194 | ≥27.5 | Rural: 20.78 Urban:37.5 | |
| 2 | Ningombam et al. [17] | 2018 | Manipur | 18 –60 | 258 Liangmai; 263 Mizo | >25 | 42* Liangmai 51* Mizo | | |
| 3 | Kandpal et al. [5] | 2016 | Uttarakhand | 20 –60 | 104 | 184 | >25 | 54.8 | 57.6 |
| 4 | NFHS-4 [14] | 2015–16 | Bihar Goa Haryana Karnataka Madhya Pradesh Meghalaya Tamil Nadu West Bengal Uttarakhand Uttar Pradesh Tripura Telangana Sikkim Rajasthan Puducherry Punjab Odisha Nagaland Mizoram Manipur Maharashtra Lakshadweep Kerala Jharkhand Jammu & Kashmir Himachal Pradesh Gujarat Daman & Diu Dadra & Nagar Haveli Delhi NCT Chhattisgarh Chandigarh Assam Arunachal Pradesh Andhra Pradesh Andaman & Nicobar Island | 15 –49 | 5433 767 3381 3760 9496 1144 4795 2402 1994 12,939 821 1,054 801 5892 610 3027 4209 1440 1617 1747 4455 156 1864 3820 5584 2185 5574 432 206 672 3529 120 3860 1930 1399 411 | 45,812 1696 21,652 26,291 62,803 9201 28,820 17,668 17,300 97,661 4804 7567 5293 41,965 4012 19,484 33,721 10,790 12,279 13,593 29,460 1070 11,033 29,046 23,800 9929 22,932 1393 796 5914 25,172 746 28,447 14,294 10,428 2811 | ≥25 | 12.6 32.6 20 22.1 10.9 10.1 28.2 14.2 17.7 12.5 15.9 24.2 34.8 13.2 37.1 27.8 17.2 14.0 21.0 19.8 23.8 24.6 28.5 11.1 20.5 22.0 19.7 34.2 22.9 24.6 10.2 32.0 12.9 20.6 33.5 38.2 | 11.7 33.5 21 23.3 13.6 12.2 30.9 19.9 20.4 16.5 16.0 28.1 26.7 14.1 36.7 31.3 16.5 16.2 21.1 26.0 23.4 41.4 32.4 10.3 29.1 28.6 23.7 29.0 19.1 34.9 11.9 41.5 13.2 18.8 33.2 31.8 |
| 5 | ICMR-INDIAB (Urban & Rural) [18] | 2015 | Tamil Nadu Maharashtra Jharkhand Chandigarh | ≥20 | Rural: 2800/state Urban: 1200/ state | | ≥25 | 20.6 15.7 11.5 24.2 | 28.4 17.6 12.1 38.7 |
| 6 | Mungreiphy et al. [11] | 2011 | Tangkhuil Naga | 20 –70 | 257 | – | ≥25 | 17.6 | |
| 7 | NCD risk factor surveillance 2003–2005 [10] | 2008 | North India -(Delhi) Ballabgarh- (Haryana) South India -Chennai, Tamil Nadu Trivandrum (Kerala) East India -Dibrugarh (Assam) West India - Nagpur (Maharashtra) | 15 –64 | 5103 7990 7847 7537 8365 7661 | | ≥25 | 23.8* 27.2* 15.9* 15* | |
| 8 | Das M & Bose K [2] | 2006 | West Bengal (Marwaris) | >20 | 110 | 110 | ≥25 | 44.5 | 71.8 |
| 9 | Sidhu & Kaur [21] | 2005 | Punjab | 20 –45 | – | 1700 (Urban:900; Rural: 800) | ≥25 | – | Urban: 43.88; Rural: 22.26 |
| 10 | Shukla et al. [20] | 2002 | Mumbai | ≥35 | 40,071 | 59,527 | ≥25 | 19 | 30 |
| 11 | Yajnik [25] | 2002 | Pune, Maharashtra | >40 | 159 | 162 | ≥25 | 1.8 | 9.8 |
| 12 | Misra et al. [9] | 2001 | Delhi NCT (Slum) | >18 | 170 | 362 | >25 | 13.3 | 15.6 |
| 13 | Zargar [26] | 2000 | Kashmir Valley | ≥40 | 2496 | 2587 | ≥25 | 7.01 | 23.69 |
| 14 | Reddy [19] | 1998 | Andhra Pradesh | 18 –75 | 456 | 663 | ≥25 | 6.6 | 10 |

b) **NHLBI Obesity Education Initiative, 2000** [15]- BMI (Kg/m²): Underweight <18.5; Normal = 18.5–24.9; Overweight = 25–29.9; Obesity I = 30–34.9; Obesity II = 35–39.9; Extreme obesity III ≥40

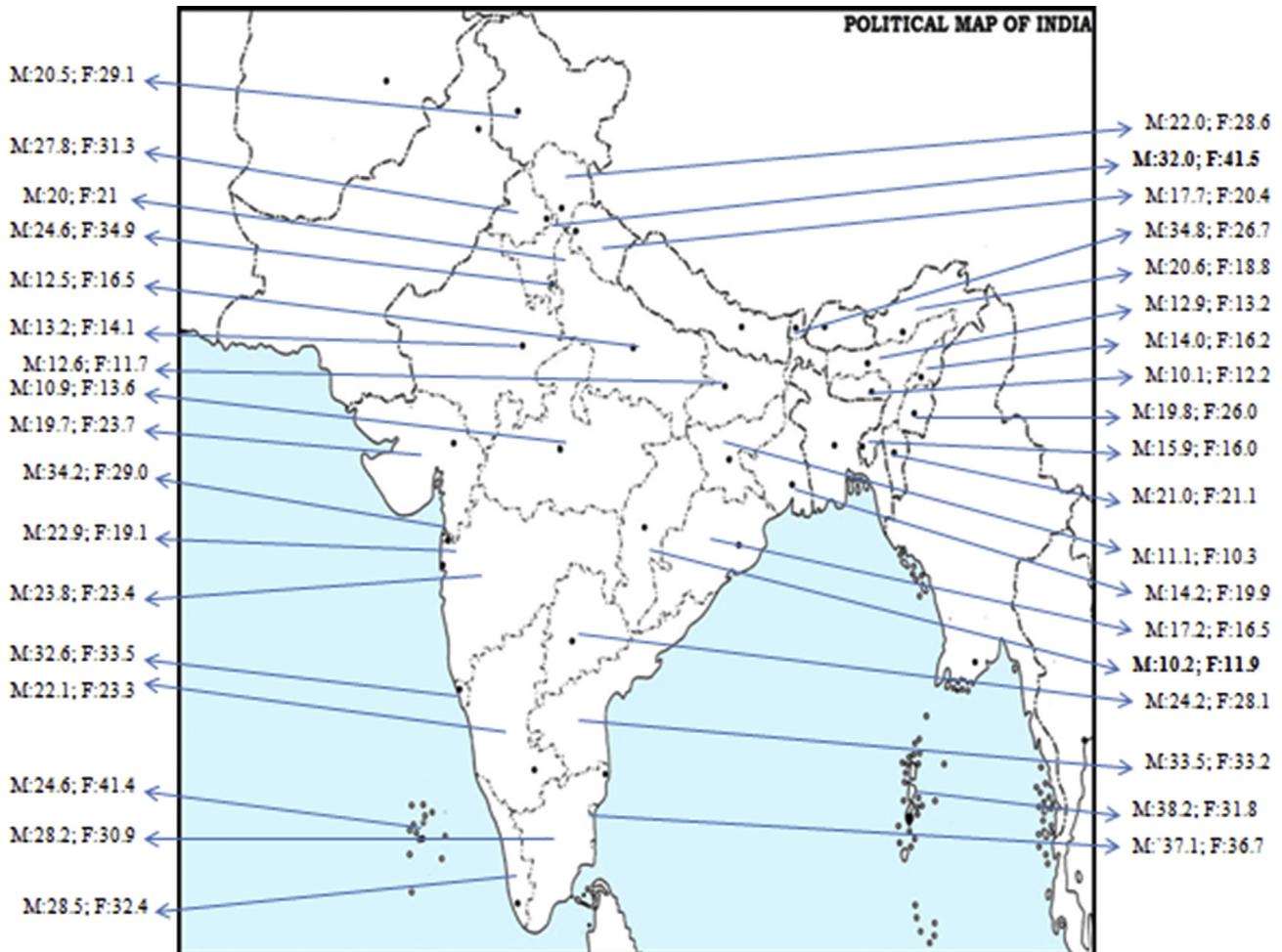
3. Results

Major national survey i.e. national family health survey-4 (NFHS-4) [14] reported that socioeconomically backward states (i.e. Jharkhand, Bihar, Madhya Pradesh and Chhattisgarh) having low rate of prevalence of obesity as compared to higher socioeconomic states (i.e. Punjab (Chandigarh), Goa, Delhi, Andhra Pradesh, Telangana, Puducherry and North east states) (Table 1). Mishra et al. [8] revealed that the urban population were at higher risk of obesity as compared to rural population. Ningombam et al. [17] studied on tribal population reported higher risk of obesity. Kandpal et al. [5] in Uttarakhand region reported more than 50% obesity in both the sexes which is higher than the previous NHFS-4 [4,6] reported. ICMR INDIAB, 2015 [18] studied among rural and urban populations of four major states (i.e. Chandigarh, Maharashtra, Tamil Nadu and Jharkhand) and reported high obesity rate in Chandigarh and lowest in Jharkhand. Das & Bose [2] reported high prevalence of obesity more than 40% among Marwari community which is a socioeconomically well established community. NCD risk factor surveillance reported that the obesity in South India were higher (i.e.

27.2%) followed by North India (i.e. 23.8%) and lowest in West India (i.e. 15%) [10]. In 1998, Reddy reported 10% of prevalence of obesity in Andhra Pradesh which is increased to more than 33% (NFHS-4) among both the sexes indicating that with the modernization the prevalence of obesity is also increased more than 3 times. There is huge evidence of literature which indicated that women were prime victim of obesity as compared to men.

4. Discussion

The prevalence of obesity in India is varying from rural to urban and state-wise also (Fig. 1) which is due to various factors. The main factors for variation in obesity are geographical condition, life style and dietary pattern. For example, population in high socioeconomic states (like Chandigarh and Goa) where the sedentary life style and high calories food intake are the main reason for higher frequency obesity (i.e. more than 30% in both the sexes) as compared to lower socioeconomic states (like Jharkhand, Chhattisgarh, Madhya Pradesh and Bihar) (NFHS-4). In South India (i.e. Andhra Pradesh, Kerala and Pondicherry), populations were having higher prevalence (i.e. more than 25%) of obesity as compared to other states. Mishra et al. [8] in one of the recent studies reported high prevalence of obesity (i.e. 37.5%) due to urbanization of Bhil and their sedentary life style and dietary pattern as compared to rural Bhil population (i.e. 20.78%). Das & Bose [2] studied prevalence of obesity in Marwari population (i.e. high socioeconomic status)



reported more than 40% in both the sexes. Sindhu & Kaur [21] reported high prevalence of obesity in urban population (i.e. 43.88%) as compared to rural (i.e. 22.26%). From 1998 to 2015, it was observed that the prevalence of obesity is three fold increases in Andhra Pradesh which is due to changes in dietary pattern and lifestyle variables ([19,4,6]).

Pros: Its compile the last twenty years research studies (i.e. 1998 to 2018) of prevalence of obesity in India.

Cons: India is having numerous ethnic groups. These groups are having different culture, diet habit, life style and geographical variations. But previously reported studies were used western and Asian cut off for the obesity classification which is unscientific and unethical.

5. Conclusion

The prevalence of obesity is higher among the urban populations, high socioeconomic states and also in South India. From 1998 to 2018, the prevalence of obesity is rapidly spurring due to sedentary life style and consumption of high calories food. Obesity results into various health problems which are having direct link to cardiovascular disease (CVDs). So, that it's time to focus on the problem and take necessary steps to overcome the problem.

6. Suggestions

The authors suggest that there is a need to have cut-offs for obesity in the country and there should be public awareness programs regarding obesity and its consequences. Health agencies should promote the healthy dietary habits and active lifestyles. They should also teach people about the bad effect of high calories food i.e. fast food on health.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.dsx.2018.08.032>.

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