Child Obesity and Urbanisation in India: An Overview with a Focus on Delhi

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Summary

The crisis of obesity has reached epidemic proportions in several parts of the world. A rapid growth in the levels of obesity is observed among children and adolescents in developing countries. However, this challenge is often insufficiently addressed in health policies and programmes. Trends and patterns at the national, urban and Delhi levels are worrying. The overall share of overweight children shows an increasing trend primarily due to the rise in the share of obese children, especially among pre-school aged children. Apart from the directly related health related morbidities, child obesity has also important economic and social costs, with increased burdens on health systems as well as reduced economic productivity in later years. Thus, strategies to tackle this growing health crisis in urban areas have to be redirected by considering distinctive urban factors that support an obesogenic environment for children living in urban areas. The socio-economic status (SES) has also an influence on the prevalence of child obesity. Usually, in developed countries, child obesity declines with an increase in SES. In India, children from affluent families have a higher prevalence of obesity and overweight, which is influenced by the prevailing socio-cultural constructs and misconception of obese children being healthy in India. Another important factor is the place of residence of children - rural or urban. Children residing in Delhi are 5 times more likely to be obese or overweight than their rural counterparts because of different diets and lifestyles. Education in metropolitan cities is also positively associated with obesity risk. Apart from these location-specific factors, individual level factors such as children's age and the mother's education level are also positively associated with child obesity. This issue is yet to be explicitly recognised as a growing crisis at the policy level in India. The scope of existing policies and programmes can be widened. The Government of India has launched ambitious urban development schemes connected with social infrastructure such as health, education and culture, bringing urban development programmes within the larger ambit of meeting the SDGs by 2030. Linking these nation-wide programmes to location-specific issues such as obesity among children in urban areas needs direct intervention strategies included within the larger list of strategies for building sustainable and healthier cities.

About this Background Paper

Disclaimer

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List of Abbreviations

NCT- National Capital Territory

WHO- World Health Organization

SDG- Sustainable Development Goals

BMI- Body Mass Index

AMRUT- Atal Mission for Rejuvenation and Urban Transformation

SCM- Smart City Mission

NCD- Non Communicable Disease

SBM- Swaccha Bharat Mission

NFHS- National Family Health Survey

CNNS- Comprehensive National Nutrition Survey

MoHFW- Ministry of Health Family Welfare

IIPS- International Institute for Population Sciences

UNICEF- United Nations Children's Fund

1. Introduction

Obesity or being overweight is a condition of having abnormal or excessive fat accumulation in an individual's body which is both a precursor and an indicator of various lifestyle diseases. Obesity results from higher calorific intake and energy expenditure as compared to the daily calorific requirements of any person, as computed by his/her age and height. It is due to a juxtaposition of factors of additional consumption of energy dense food, coupled with sedentary lifestyle and lack of healthcare services (Ahirwar & Mondal, 2018). Currently, obesity among children is considered as the most rapidly burgeoning health crisis around the world. According to the World Health Organisation (WHO), approximately 38.2 million children aged below 5 years were found to be overweight or obese in 2020 (WHO, 2019). Additionally, the World Obesity Federation (2019) has predicted that the number of children aged 5-19 years living with obesity is expected to rise from 158 million in 2020 to 254 million by 2030. Another study estimated the global prevalence of obesity in pre-school children (0-5 years) as 5.9 percent whereas it was 20.6 percent in children aged 5-9 years (Wang & Lim, 2012). The existing literature has linked this rapid increase with multiple factors ranging from rapid urbanisation and mechanisation which has led to reduction in the energy expenditure along with an increase in energy intake due to increased purchasing power and availability of high fat, energy-dense fast food (Gopala, Misra & Jayawardena, 2018).

Increasing childhood obesity is considered to be a grave risk in developing countries because of its transitioning to adult obesity later in life. This can later lead to diseases like type 2 diabetes mellitus, metabolic syndrome, subclinical inflammation, polycystic ovarian syndrome, hypertension, dyslipidaemia and coronary artery disease. Childhood obesity is influenced by genetic and non-genetic factors, behavioural, lifestyle preferences and environmental factors (Dehgan et al., 2005). Genetic factors influence the probability of child's obesity through influence on genes for leptin deficiency, medical causes such as hypothyroidism and growth hormone deficiency. Energy intake in terms of high calorie food items, sugary drinks, and less intake of other macronutrients also determine the prevalence of obesity.

The prevalence of overweight and obesity significantly impacts individuals' physical and psychological well-being (Deghan et al., 2005). In this context, the background paper attempts to overview the issue of childhood obesity and how it relates to SDG 3 (Good health and well-being for all), SDG 11 (Make cities and human settlements inclusive, safe, resilient and sustainable) and sustainable urbanisation in India, with a focus on Delhi NCT, the capital city of India. Childhood obesity may lead to endocrine issues, congenital and acquired hypothalamic defects, genetic syndromes and adversely affects almost every organ system - leading to hypertension, dyslipidemia, insulin resistance, fatty liver disease and other psycho-social complications. Being overweight or obese among children aged 14-19 years is associated with increased adult mortality and a wide variety of ailments. Nutritional deficiencies also accompany childhood obesity, as children with higher BMI are observed to have lower Vitamin D levels and lesser iron levels as compared to those with healthy BMI. Other co-morbidities associated with childhood overweight and obesity are cardiovascular, endocrinologic, orthopaedic, gastrointestinal, neurologic, pulmonary and

psycho-social. A higher proportion of obese adolescents become obese adults and spend more years with associated morbidities and disabilities. Lastly, childhood obesity is linked with higher mortality levels than adult-onset obesity (Yoo, 2016).

Obesity and overweight were once considered issues limited to developed nations; however, the dramatic rise in the prevalence of obesity among children witnessed even in developing countries in the last few decades have pushed global and national health agencies to dispel this notion. The steep rise in the prevalence of obesity among children, especially in urban affluent groups coupled with the already existing problems of malnutrition and presence of other infectious diseases have resulted into double burden of malnutrition in the country. Globally, India is placed second after China in terms of absolute number of obese children; however, aggregate figures often mask the true extent of the obesity burden. Statistics show that between 4-10% of school going children in India suffer from some form of obesity (Sashindran & Dudeja, 2020), which is a significant public health concern. Though the trend in the prevalence rate of obesity/overweight in both total population and child population have shown a monotonically increasing pattern, it has garnered little attention among the policymakers.

1.1 Childhood Obesity and its links with SDG3, SDG11 and sustainable urbanisation

Increasing economic development and the accompanying urbanisation is often associated with rising obesity among the population. In India, the issue of obesity is too often conceptualised as a straight-laced issue linked with personal or household level behaviour and choices, while ignoring the effect of macro or meso level factors on childhood obesity. Over the last few decades, the unprecedented

transformation of the urban landscape in the form of concretisation, high concentration of skyscrapers, limited open spaces and parks, congestion etc. has led to a complexity of social, nutritional, infrastructural and health systems that work in tandem to sustain urban life. However, these systems have also given rise to multiple health and environmental issues and inequities that need immediate attention. For instance, the issue of food security in the middle- and low-income countries can be tackled by promoting innovative policies for more sustainable food and dietary systems. For that to happen, we first need to conceptualise food security not as an independent issue but as an interplay of the varied economic, geographical, climatic and demographic settings of the afflicted countries.

In this context, the Sustainable Development Goals play an essential role. They are crucial in mainstreaming the idea that urban policies are also vital public health intervention strategies to a large extent. Additionally, the New Urban Agenda adopted in the United Nations Conference on Housing and Sustainable Urban Development (United Nations, 2016) built a consensus for the first time that urban planning and governance are key components of health besides health system factors to realise the goal of health for all.

In contemporary times, it has been increasingly realised that an individual's environment and related choices impact their well-being to a great extent. For children especially, their behavioural decisions are even more deeply associated with their environment, including infrastructure, community behaviour and household characteristics. Such factors that promote sedentary lifestyles and poor behavioural choices are known as 'obesogenic' factors. Prominent environmental obesogenic factors identified are urban layout and sprawl, access to healthy food, access to green and

open space and community social environment (Maes, Neale & Eaves, 1997; Dunton et al., 2009; Wen & Kowaleski, 2012, Nesbit et al., 2014). Thus, the future roadmaps, especially those related to children and ensuring healthier and skilled future generations, will have to acknowledge the indivisibility of SDGs while formulating any health policies and programmes (Figure 1).

The SDGs acknowledge and address the indivisibility of three dimensions of sustainable development: social, economic and environmental development. However, government priorities often remain deeply rooted in an earlier view of development, focussed more on communicable diseases: as a small share of budget for health is allocated to non-communicable diseases (NCDs). NCDs and obesity are no longer a challenge only for high-income regions: most of the world's population now live in countries where overweight/obesity is responsible for more deaths than underweight. Although NCDs are the focus of SDG, obesity is not explicitly

alluded to these targets, making it even less likely to receive policy attention. Notably, obesity is not only an NCD itself but also a catalyst for many other physical and mental illnesses. However, obesity prevention and control are often insufficiently prioritised within health systems and fails to curb the onset of other related conditions. The National Health Policy of India and other flagship health protection programmes will have to play an instrumental role in achieving significant progress in this area.

Obesity is also closely linked with SDG 11 and the need to build inclusive, safe, resilient, and sustainable cities. Promoting sustainable urban planning can directly influence obesity, such as increasing availability of fresh food, reshaping ordinances and changing tax codes to make it easier to create and sustain the production and sale of local, affordable and nutritious food, encouraging physical activity by making it easier and safer for people to recreate, walk, bike and take public spaces, etc.

Source: Adapted from World Obesity Federation, 2019

Figure 1: Linking SDGs to Obesity
Note: The thickness of the arrows indicates the strength of the relationship between each goal and obesity

2. Overview of the Situation in India and Delhi

2.1 Levels & Patterns of Obesity in India

Results from Figure 1 indicate that obesity in urban areas is higher than the national average throughout the study period (2005-06 to 2015-16) for all the observed indicators.[1] The prevalence of obesity was 1.54% in 2005-06 (Weight for height), whereas the corresponding estimate was 2.51% for urban areas. A similar trend is seen for the later period too. Another significant finding is that the level of obesity across all the indicators have witnessed an increase, albeit with varying growth rates in the study period. Since our study focuses on childhood obesity, especially in urban areas, Figure 2 illustrates the share of obesity in total overweight children aged below five years in urban India in 2005-06 and 2015-16. Results suggest that the share of overweight to total overweight and obese children has decreased from 68.42% in 2005-06 to 66.72% in 2015-16. However, the percentage of obese children has increased from 31.58% to 33.28% between the two time periods. A similar exploration for adolescent children reveals that the prevalence of obesity/overweight is much higher in this age group compared with all age groups. Secondly, the prevalence of overweight male and female adolescents increased at national and urban levels during 2005-06 to 2015-16 (Figure 3). It is interesting to note that overweight children have increased from 1.9% in 2005-06 to 8.7% in 2015-16 in Delhi with a marginal increase in the share of obesity.

2.2 Urban District size class and Obesity in India

It is important to understand how overweight and obesity among children varies across city size class[2]. The objective of taking districts size class was to capture and address the debate of size of urban settlements and child overweight and obesity in urban India. Both overweight and obesity increase as the urban district size increases (NFHS 4 2015-16) (Figure 4). The trend in male overweight and obesity is similar except for largest district size class. A sudden dip in the male overweight is seen in the 5 million plus district size class. Also, a slight drop is observed in childhood overweight and obesity between the urban district size classes of 0.5-1 million and 1-5 million. Such a pattern might be explained by understanding the constitution of the latter urban district class, i.e., districts with a population of 1-5 million.

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[1] One of the major issues in estimating the levels and trends of obesity is the lack of standardisation in definitions of child overweight and obesity. For instance, the two datasets adopted in this study has two different definitions for defining child overweight and obesity. For a more detailed information on the concepts and definitions related to measurement of obesity and overweight among children, refer to the WHO definitions & guidelines (WHO, 2008; Onis et al., 2007) as well as the guidelines adopted for NFHS-4 (IIPS & MoHFW, 2015-16) & CNNS (MoHFW, UNICEF & Population Council, 2019). Both descriptive and multivariate analyses have been carried out to explain the association between children's obesity and urbanisation in India, and more specifically in Delhi. The analysis is divided into two sections starting with understanding trends and patterns of childhood overweight and obesity from recent two rounds of the NFHS at the National, urban and Delhi level. Due to the absence of data on children aged 5-14 years in NFHS, a significant proportion of the estimation was worked out using the CNNS data. Independent measures are based on the literature survey.

[2] In India, data on children and adolescent anthropometric measurements are not available at the city level. As a proxy, classification of the districts was done on the basis of population size class. All 640 districts (Census of India, 2011) were classified into five population size classes based on their urban population, viz. 'less than 0.1 million, '0.1-0.5 million', 0.5-1 million', 1-5 million' and '5 million and above'. Further, these districts were matched with the NFHS-4 data and categorised into the five size classes. Districts with 0.1 million population, 1 to 5 million and 5 million-plus population are recognised as small, medium and large size classes. Importantly, the latter two districts together constitute more than 50% of the total urban population of the country.

Such urban agglomerations are generally formed due to a high number of census towns which are newly designated urban centers by the Census but are still primarily under rural governance within the districts. Therefore, the spatial infrastructure often reflects rural or semi-urban characteristics with availability of open spaces for physical activity. Therefore, people residing in such areas are more likely to be physically active and as a consequence less likely to be overweight/obese. Further, if the share of obese adolescents is disaggregated from total number of overweight adolescents across the urban district size classes, we find that an overwhelming 27% of female adolescents and 53.0% male adolescents are obese among all those who are overweight in urban districts with more than 5 million population as compared to 13.0% and 15% obese female and male adolescents and in urban districts with less than 0.1 million population (Figure 5). This indicates that surbanisation and urban environments promote the adoption and continuation of environmental as well as lifestyle choices that in turn promote obesity.

2.3 Levels, Patterns & Correlates of Obesity in Delhi

Figures from CNNS (2016-18) indicate that overweight and obesity was 1.2% and 1.4% among 0-4 years aged children at the national level and 1.6% and 2.3% in urban areas. Conspicuously, children overweight is seen to increase with increase in the age of children for both urban India and Delhi. The corresponding estimates from Delhi reveal a significant proportion of overweight children in the 10-19 years age group (6.6%). For obesity, a considerable variation is observed in the age-wise prevalence between the national and Delhi-specific estimates. At the national level, obesity seems to decline as age increases; however, obesity among children in Delhi

appears to be higher in children aged 5-9 years (3.2%) which declined in age group 10-19 (2.1%).

The share of obesity in total overweight children within each age group is also compared to present the intra-age differences at national, urban and Delhi levels (Figure 7). At the national level, one observes that the highest share of obese children is found in 0-4 years compared to other age groups. In urban areas specifically, the percentage of obese children is significantly high in both 0-4- and 5-9-years aged children. The corresponding figures for Delhi also show a higher proportion of obese children in 0-4 years aged children with a sudden dip in the age group 5-9 and 10-19 years. Still, one in every three overweight children in Delhi is obese in age group 5-19 years. Thus, it may be concluded that obese children are more concentrated among the younger age groups at the national level, urban India and Delhi.

2.4 Correlates of overweight and obesity in India, Urban India and Delhi

The findings from multivariate analysis suggest that the chances of children aged 0-4 years and 5-19 years becoming obese increases significantly for male children compared to female children at both national and Delhi level; however, the overall share for Delhi is higher than at the national level. Interestingly, Table-2 demonstrates findings contradictory to the results obtained in descriptive estimates for Delhi (Figure 6). Evidently, age has a positive effect on the likelihood of obesity and overweight in Delhi, i.e. higher the age, more likely are the individuals to be obese or overweight. For Delhi, we observe that the likelihood of moving from overweight to obese is higher for those who belong to the wealthiest income-class compared to the poorest one. This indicates that there is a socioeconomic

interdependency in the problem of obesity in India. Residing in urban areas is highly associated with transitioning from overweight to obese. The incidence of children transitioning to obese from overweight for those who live in urban areas compared to their rural counterparts is almost five times higher in Delhi. Other than these, factors such as region and mother's education (higher than secondary) are also associated with children being overweight and obese at both national and urban India. Particularly, children with mothers who are highly educated are at greater risks for obesity/overweight. This is due to the higher share of educated mothers who get absorbed in the job market which keeps them away from their children. Long hours of absence of working mothers from home and their inability to cook healthy food due to time constraint encourages children to depend on junk food. Similar associations are also reflected in the statistical findings specific to Delhi. As educated mothers are more likely to be engaged in some form of employment, the nutritional needs of such children might be more often derived from junk and energy dense food than freshly home-made food, thus increasing their chances of being overweight/obese. It is noteworthy to mention that children getting education in Delhi have a higher probability of being overweight and obese.

Statistical evidence of children overweight and obesity obtained from two different data sources in this study supports a strong causality between worsening children anthropometric measures and urbanisation and other related factors[3]. Some of the observations corroborate with the previous studies. At the same time, some have added insights to the growing challenges of childhood obesity in India, especially at urban centres and metropolitan cities like Delhi. A systematic increase in obesity among children across urban district size classes suggests worsening of childhood anthropometric measures. This could be because of the low level of physical activity promoted by dense built environment in highly urban districts leading to a higher prevalence of obesity among children. It suggests that several features of the urban built environment such as unplanned settlements, poor street connectivity and the lack of sidewalks are associated with decreased physical activity and an increased risk of being overweight (Lopez & Hynes, 2006). Also, in cities, school going children remain occupied with tutorials and coaching assignments that restrict them from engaging in physical activities and outdoor games. High vehicular congestion leading to unsafe streets, high crime rates in cities with the absence of parks and open spaces restricts physical activities for children and adolescents. Similar observations are also observed from CNNS unit-level data, suggesting that obesity is highly likely among male children aged 0-4 and 5-19 years in Delhi. A significantly higher probability of overweight and obesity is noted among children who are taking school education. Similar findings were also observed in a school children based study, which elucidates that for children residing in metropolitan cities, the

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[3] This background paper uses recent data from two national surveys in India, namely the National Family Health Survey (NFHS) and the Comprehensive National Nutrition Survey (CNNS). The fourth round of NFHS (NFHS-4) was conducted on children aged below five years and females and male aged 15-49 and 15-54 years between 2015-16 (IIPS & ICF, 2017). CNNS, on the other hand, was carried out on children and adolescents aged below 19 years in India during 2016-18. Both the surveys were conducted under the aegis of the Ministry of Health Family Welfare (MoHFW) with reputed nodal agencies such as IIPS, UNICEF and Population Council (MoHFW, 2019). For analysis, overweight and obesity were estimated for children below five years from NFHS and CNNS. Since NFHS provides biomarker information for children aged 0-4 years and 15-19 years only and does not consider children of age cohort 5-14 years, we have used CNNS data to bridge the knowledge gap through a comprehensive analysis of children aged 0-19 years.

degree of school attendance is positively associated with a higher risk of overweight/obesity. Children schooled in private schools from the economically better-off sections have a higher incidence of obesity than those studying in public schools[4]. Factors like availability of domestic help, going to school by vehicle rather than walking and cycling that support sedentary lifestyle termed as obesogenic factors are more likely to affect children in higher SES households. Usually children from high SES backgrounds also spend major part of pocket money on junk food. Contrarily, for children from lower SES backgrounds, factors such as contribution to a considerable portion of housework, walking to schools and consumption of home-made or lower energy-dense foods have made them less prone to be overweight. In fact, among children residing in urban areas, those living in metropolitan cities have a higher incidence of obesity as compared to those in non-metropolitan cities (Misra et al., 2011). In non-metropolitan or smaller cities, the availability of open green spaces is likely to be more than metropolitan cities due to lower population density and relatively cheaper land. Also, the highly developed and overlapping network of transportation in metropolitan cities ensures availability of vehicles even for smaller distances which might not be the case in non-metropolitan cities (Lee et al., 2019).

3. The Way Forward

Understanding and addressing the prevalence of obesity is of prime importance to achieving SDG Goals 3 and 11, particularly targets on reducing mortality from non-communicable diseases. Obesity plays a vital role in major health and development issues; hence it must be made relevant and an essential component of the global development agenda and prioritised to successfully achieve targets related to non-communicable diseases induced morbidity and mortality.

This background paper highlights that children from wealthier families and educated mothers are more susceptible to become overweight and obese in cities. This could be due to the fact that urban areas have a higher share of affluent population with sedentary lifestyles and who can afford fast food. [5] Lack of open spaces in the neighbourhoods further aggravate this problem. A high level of unhealthy food consumption and limited physical activity leads to overweight and obesity. Conversely, less urbanised areas having lower purchasing power and limited access to fast food chains and restaurants tend to spend on essential food items, mainly following traditional nutritional diet and healthy lifestyle practices. The growing socioeconomic inequalities encourage diverse health challenges for children living in urban areas and pose a challenge for sustainable urbanisation.

In order to address these challenges, behavioural change among mothers and care-givers is the need of the hour. They need to be sensitised through campaigns targeted at tackling the misconceptions like obese children are healthy. Also, cycling and outdoor sports activities need to be promoted at

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[4] Government aided.
[5] In India, fast food is expensive and affordable by the richer segment of the population.

schools. Moreover, since schools serve as a major source of information for adolescents, dedicated curriculum for healthy practices and activities need to be institutionalised. Further, ensuring supply of fresh and nutritional food in the school canteens are also some of the ways of tackling this issue.

The evidence connecting social and environmental factors to obesity are often unacknowledged. Factors such as food availability, purchasing capacity indicated by the level of SES, proliferation of high calorie, energy dense food option and reductions in occupational and transportation related physical activity contribute to an obesogenic lifestyle. As witnessed in the western societies, as economic development progresses in India, an increase in obesity might also be witnessed among the low income communities as well. This may be promoted by unhealthy food habits and more sedentary life styles among the poor in future with increasing urbanisation. Thus, addressing the complexity of the issue of obesity as just not a health issue but a multifactorial challenge needs to be addressed urgently. Moreover, sensitising parents belonging to higher SES can help in identifying, counselling and treating those who are at risk of obesity.

In this perspective, SDGs play an important role in contextualising urban environments to control obesity among children. One of the ways to integrate SDGs 3 and 11 is through educating, encouraging and empowering city administrators and planners to recognise obesity as an emerging health crisis. As a part of mitigation strategy, appropriate guidelines for promoting safe, sustainable and healthy neighbourhoods which can promote healthy lifestyles should be developed at the city level. Besides, an effort should be made to protect and promote green spaces in cities, including community gardens, orchards and parks, to enable children and adolescents to play outdoor games and carry out physical activities. Child-friendly city planning including inclusive street designing with open spaces and parks and safe neighbourhoods are factors promoting healthy cities.

Reduction in crime rates and increasing trust in city governments is also a crucial factor in ensuring that children are allowed to access open spaces without any fear for their security. Moreover, urban development schemes in India need to prioritise establishing infrastructure that could ensure adequate availability and access to basic amenities. Improving the quality of public spaces in urban areas will also indirectly encourage a greater convergence between adoption of a sustainable healthier lifestyle at the individual level while also strengthening other environmental determinants such as pollution, cleanliness and decluttering of pavements and sidewalks. Importantly, the current development programmes (AMRUT & Smart City Mission) in India and Delhi have mandatory provisions of developing green spaces/parks for creating child-friendly cities. These efforts need to be upscaled and promoted across all cities and towns to universalise access to open spaces for children and adolescents.

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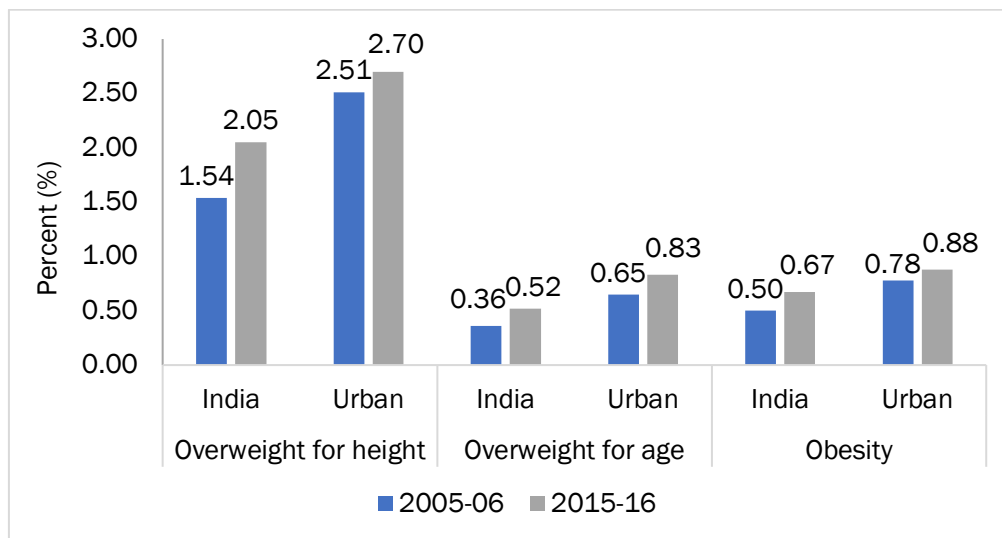
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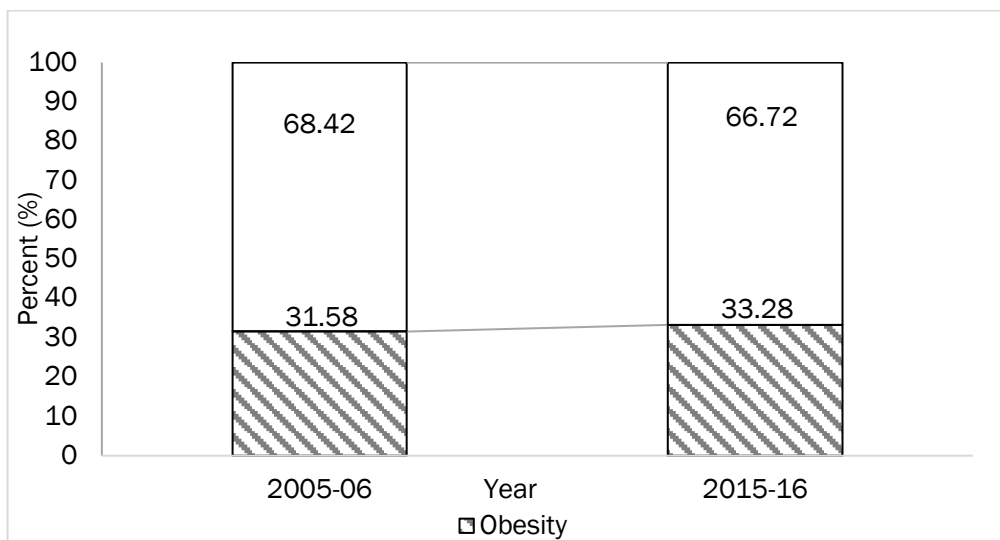
List of Figures & Tables

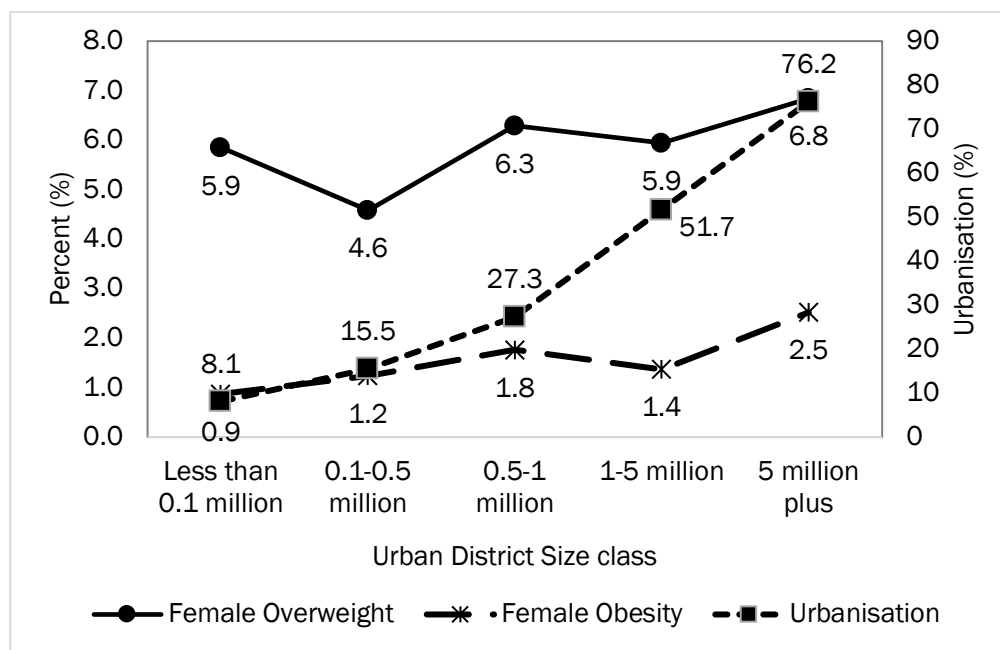Source: Authors' estimation from NFHS-3 and NFHS-4

Source: Authors' estimation from NFHS-3 and NFHS-4

Figure-3: Trends in Overweight Obesity among male and female children aged 15-19 years in India, 2005-06 – 2015-16
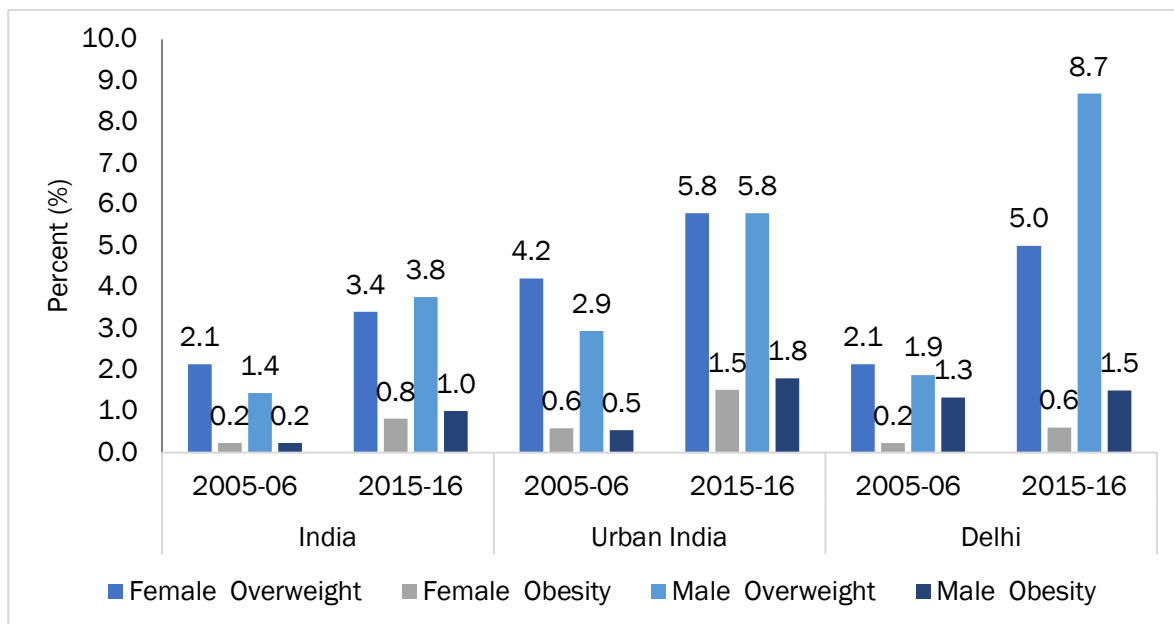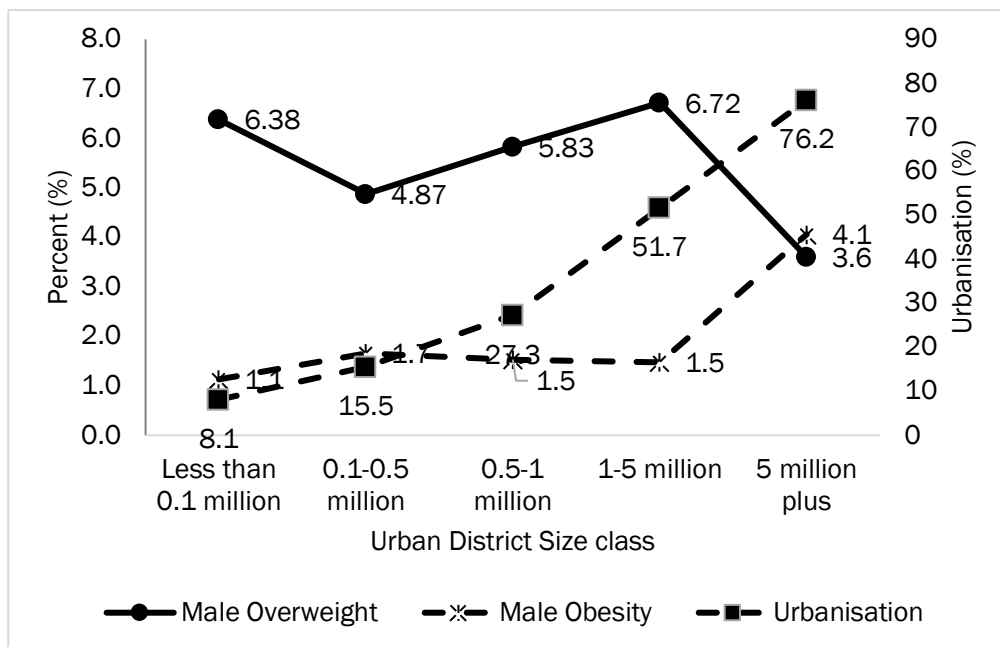

Source: Authors' estimation from NFHS-3 and NFHS-4

Figure-4(a): Overweight and obesity among female children aged 15-19 years across urban district size class in India, 2015-16
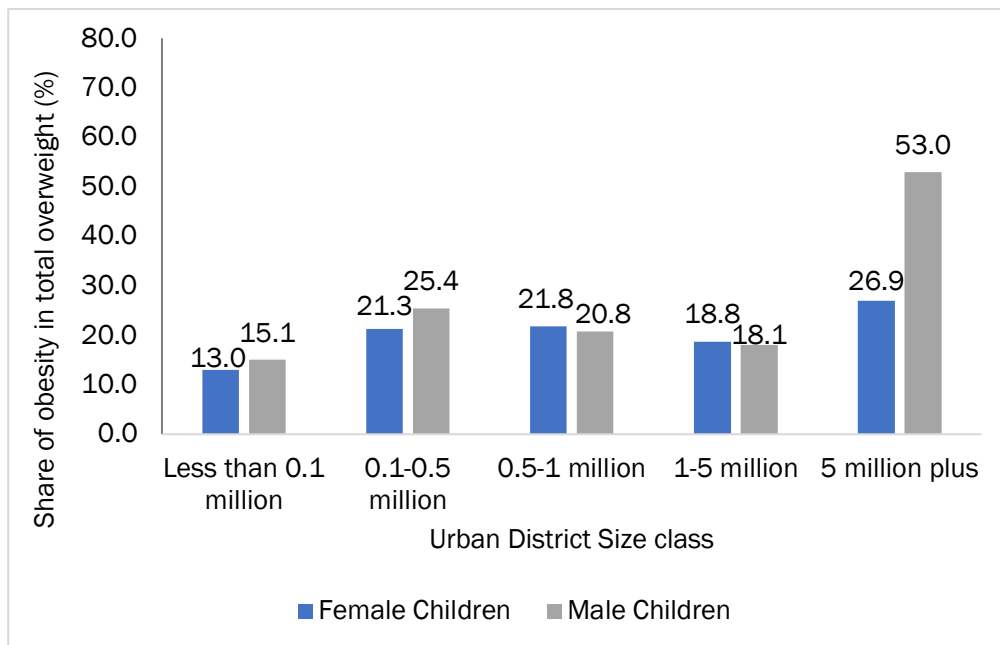

Source : Authors' estimation from NFHS-4

Figure-4(b): Overweight and obesity among male children aged 15-19 years across urban district size class in India, 2015-16
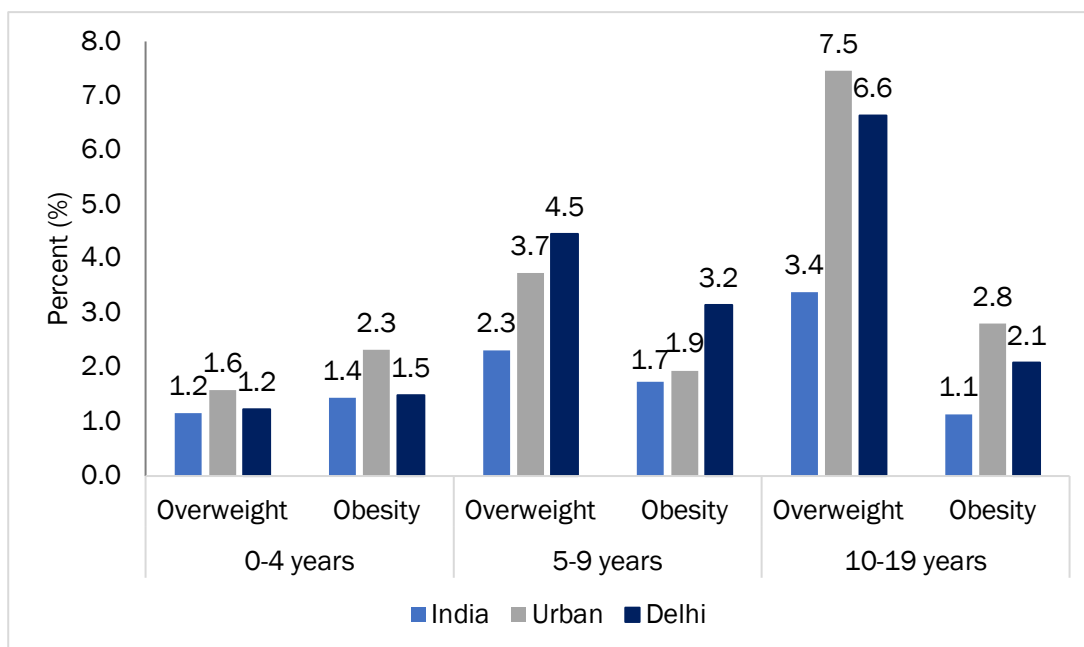

Source: Authors' estimation from NFHS-4

Figure-5: Share of Obesity in total overweight among male and female children aged 15-19 years across urban district class size, 2015-16
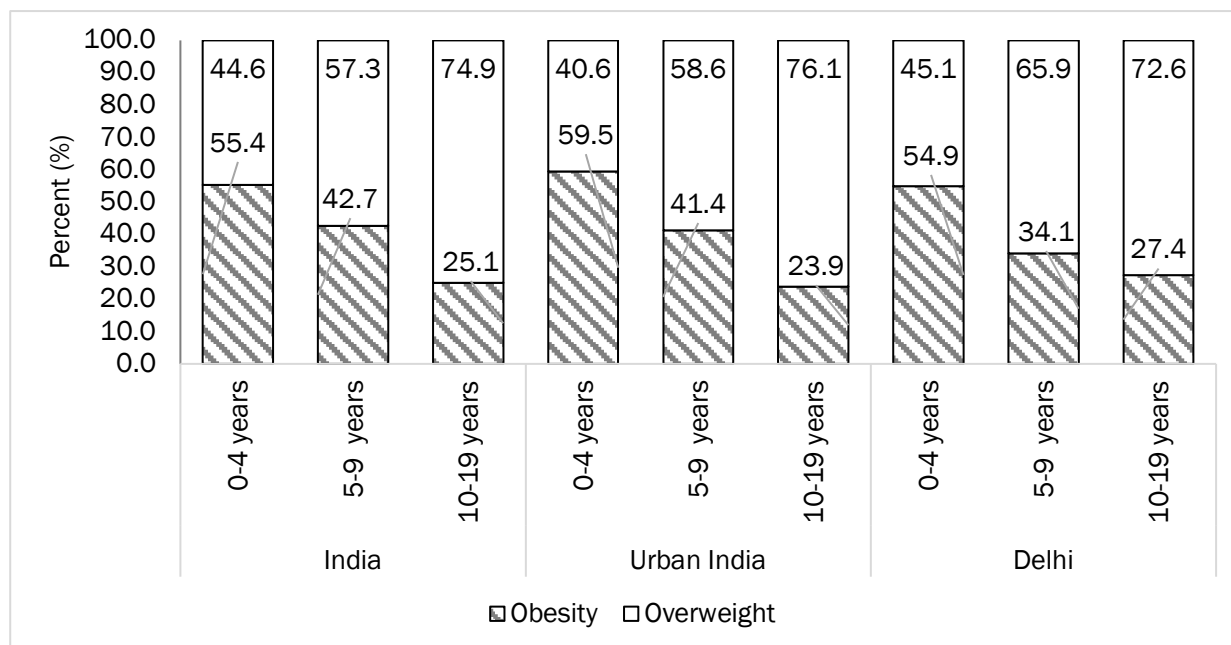

Source: Authors' estimation from NFHS-4

Figure-6: Overweight and obesity across children's age groups in India and Delhi, 2016-18

Source: Authors' estimation from CNNS, 2018

Figure-7: Share of Obesity in total overweight children across different age-groups, 2016-18

Source: Authors' estimation from CNNS, 2018

Table-1: Order logistic regression: Odds ratios of children becoming overweight or obese among children below aged 5 years in India, Urban India and Delhi, 2016-2018

	India	Urban	Delhi
Sex of child			
Female®			
Male	1.14[1.03,1.27]**	1.16[1,1.34]	1.24[0.64,2.41]**
Religion			
Hindu®			
Others	1.18[1.04,1.33]**	1.14[0.95,1.36]	1.73[0.82,3.64]
Caste			
SC & ST#			
SC®			
ST	1.25[1.03,1.51]**	1.31[0.98,1.76]**	
OBC	0.97[0.82,1.14]	1.06[0.83,1.34]	1.32[0.44,3.94]
Others	1.13[0.95,1.35]	1.2[0.94,1.52]	1.21[0.43,3.38]
Don't know	0.76[0.51,1.13]	1.04[0.64,1.68]	2.77[0.82,9.36]
Wealth Index			
Poor®			
Middle	0.93[0.78,1.12]	0.81[0.53,1.23]	0.94[0.1,8.94]
Rich	0.97[0.82,1.16]	1.17[0.8,1.7]	1.25[0.15,10.37]**
Mothers' education			
No education®			
Up to primary	0.99[0.8,1.22]	0.73[0.5,1.08]	0.99[0.26,3.7]
Up to secondary	1.13[0.94,1.37]	0.94[0.69,1.29]	1.33[0.42,4.2]
Up to higher secondary	1.11[0.93,1.33]	1.01[0.77,1.34]	0.72[0.22,2.3]
Higher than secondary	1.62[1.33,1.97]***	1.36[1.01,1.82]	1.42[0.44,4.55]***
Mother's age			
10-24 years®			
25-34 years	0.98[0.86,1.1]	0.97[0.81,1.16]	0.88[0.41,1.9]
>35 years	0.99[0.83,1.18]	0.98[0.76,1.26]	0.88[0.23,3.39]
Don't know/died	1.31[0.76,2.25]	1.7[0.8,3.62]	….
Type of area			
Rural®			
Urban	1.16[1.04,1.3]***		5.5[1.27,23.76]***
Region			
North®			
Central	0.62[0.48,0.8]**	0.73[0.5,1.07]	
East	0.74[0.59,0.91]**	1.2[0.92,1.58]	
West	1.25[1.02,1.51]**	1.35[1.04,1.76]	
South	0.93[0.76,1.12]	1.12[0.86,1.46]	
North-East	2.18[1.85,2.59]**	2.25[1.75,2.88]**	
Intercept1	3.63[3.38,3.87]	3.64[3.19,4.1]	5.94[3.34,8.53]

| Intercept 2 | 4.32[4.07,4.57] | 4.31[3.85,4.77] | 6.68[4.06,9.29] |

Note: p-value I<0.05=** and p-value=0.01=***; ®- reference category. #-reference category for caste groups in Delhi

Table-2: Order logistic regression: Odds ratios of children becoming overweight or obese among children aged 5-19 years in India, Urban India and Delhi, 2016-2018

	India	Urban	Delhi
Age of child			
5-9 years®			
10-19 years	1.1[1.03,1.17]***	1.1[1.02,1.2]**	1.68[1.25,2.24]***
Sex of child			
Female®			
Male	1.17[1.1,1.24]***	1.2[1.11,1.29]***	1.3[1,1.68]
Religion			
Hindu®			
Others	1.1[1.03,1.18]***	1.02[0.93,1.11]	0.93[0.67,1.28]
Caste			
SC®			
ST	1.12[1,1.25]**	0.93[0.79,1.09]	2.06[0.68,6.26]
OBC	0.99[0.9,1.08]	0.97[0.86,1.08]	1.35[0.88,2.05]
Others	1.34[1.22,1.47]***	1.27[1.13,1.42]	1.73[1.18,2.54]***
Don't know	0.98[0.78,1.24]	0.96[0.73,1.28]	2.00[0.99,4.06]
Wealth Index			
Poor®			
Middle	1.27[1.11,1.44]***	1.4[1.03,1.91]	0.73[0.24,2.2]
Rich	1.99[1.77,2.24]***	2.76[2.09,3.64]	0.77[0.29,2.04]***
Child Education			
No®			
Yes	1.11[0.95,1.31]	1.26[0.98,1.61]	1.87[0.56,6.23]**
Mothers' education			
No education®			
Up to primary	1.09[0.97,1.21]	1.02[0.87,1.21]	1[0.57,1.77]
Up to secondary	1.34[1.21,1.48]***	1.31[1.14,1.52]	1.08[0.63,1.86]***
Up to higher secondary	1.67[1.53,1.84]***	1.6[1.41,1.82]***	2.5[1.63,3.81]***
Higher than secondary	2.74[2.46,3.04]***	2.71[2.37,3.11]***	5.25[3.4,8.1]***
Mothers Age			
10-24 years®			
25-34 years	1.12[0.94,1.35]	1.33[1.01,1.74]	4.31[0.58,31.81]**
>35 years	1.26[1.04,1.51]**	1.5[1.14,1.97]	4.71[0.63,35]**
Don't know/died	1.09[0.85,1.4]	1.33[0.93,1.9]	1.58[0.14,18.25]
Type of area			
Rural®			
Urban	1.38[1.29,1.47]***		1.73[1.2,2.5]***
Region			
North®			
Central	0.59[0.51,0.68]***	0.66[0.54,0.79]***	
East	1.46[1.31,1.61]***	1.72[1.52,1.95]***	
West	1.37[1.24,1.52]***	1.17[1.04,1.33]	
South	1.54[1.4,1.69]***	1.47[1.3,1.65]***	

North-East	1.67[1.51,1.84]***	1.49[1.31,1.7]***	
Intercept1	4.24[3.98,4.5]	4.39[3.95,4.84]	6[3.56,8.43]
Intercept 2	5.43[5.16,5.69]	5.57[5.13,6.02]	7.28[4.84,9.72]

Note: p-value l<0.05=** and p-value=0.01=***; ®- reference category.

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Dr Debolina Kundu is a Professor at the National Institute of Urban Affairs, India and has over 25 years of professional experience in the field of development studies. She is the Chief Editor of Journals - Environment and Urbanisation, Asia (SAGE) and Urban India (NIUA). Her areas of interest are urbanization, migration, urban development policies, municipal finance, SDGs, governance and exclusion. She is the Country Investigator - India for the GCRF Centre for Sustainable Healthy and Learning Cities and Neighbourhoods, which is supported by UK Research and Innovation. A member of the Fifth Delhi Finance Commission, she has several articles published in books and journals. Her recently edited book is on National Urban Policies (Springer). She is currently working on Urbanisation and Urban Policies in the Global South.

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