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Protective Effects of Exclusive Breastfeeding against Childhood Obesity: Finding Evidences from India

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Abstract

Treating childhood obesity is time-consuming and inconclusive exercise; children suffering dominantly in later years are more likely to grow up to be obese adults. Addressing the issue has become one of the paramount public health concerns as these children suffering from obesity will enter their teens experiencing a decade of poor health. Preceding academic discourse debate brings on the superlative benefits of breastfeeding which acts as a protective shield against the development of childhood obesity. To carry forward this proposition and fill in the lacunae in existing litarature, present study attempts investigate the association between exclusive breastfeeding and risk of childhood obesity using, nationally representative data from the third round of National Family Health Survey (NFHS-3) India. To estimate the prevalence of childhood obesity by socio-demographic characteristics bivariate analysis is carried, further to investigate the association between childhood obesity and exclusive breastfeeding along with the other socio-economic and demographic attributes binary logistic regression has been applied. An imperial observation suggests childhood obesity is predominantly an urban phenomenon in India. The states with the highest percentage of obese children come from Sikkim followed by Arunachal Pradesh, Mizoram, Maharastra, Punjab and Delhi. Findings confirm the influence of exclusively breastfed in protecting from childhood obesity as the prevalence of childhood obesity is lowest among those children who are exclusively breastfed. Children who are not exclusively breastfed are likely to develop the risk of childhood obesity. The other factors having significant influence contributing to childhood obesity are sex of the child, birth order, birth size, and obese mothers, mothers who are highly educated and working, caste, antenatal care, and wealth index. Proving evidence that breastfeeding act as a protective shield against obesity at early ages the study advocates the early initiation and exclusive breastfeeding of children.

Keywords: Exclusive Breastfeeding; Protective Effects; Childhood Obesity; India

Introduction

The next epidemic, 'the childhood obesity' has dropped anchor globally. Childhood obesity has underway become one of the most momentous public health concern of the 21st century [1]. Obesity had always been accepted as a disease of developed countries, progressively it has started developing itself in the developing countries as well. The last couple of decades a considerable increase is observed in childhood obesity. Globally the burden of childhood overweight and obesity had increased from 4% in 1990 to 7% in 2010 [2-4]. Estimates suggest the total number of overweight and obese children aged five and below were 42 million in 2015, where nearly 50% of them living in Asia and other 25% were from Africa [1]. At the current trend it shall reach its apex as the number of under-five obese children is expected to leap from 42 million in 2015 to 60 million in 2020 and 70 million in 2025 [2,5,6].

Prevalence in high-income countries like the United States of America is estimated that one-third of children and adolescents aged 2–19 are overweight and about one-sixth are obese [7]. As per estimates provided by WHO, the rate of increase in childhood obesity in developing nations has been more than 30% in developed nations [5]. Meanwhile, middle-income countries like India experience a sharp increase in childhood obesity by two folds in the present decade [8]. India contests dual challenge of under-nutrition and child obesity, where we are still wrestling with 48% of under-five children as malnourished. Regardless of these striking evidence, the childhood obesity and related non-communicable diseases have to fail to keep mention in Millennium Development Goals and were absent but are added in Sustainable development goal through Global Nutritional Targets i.e. Target 1: 40% reduction in the number of Children under-5 who are stunted, Target 4: No increase in Childhood overweight, and Target 5: Increase the rate of exclusive breastfeeding in first 6 months up to at least 50%. Hence there is an urgent need to mainstream issues, and address policy related to childhood obesity [9].

World Health Organization (WHO), United Nations Children's Fund (UNICEF) and intergovernmental stakeholders suggested that all mothers should exclusively breastfeed their children up to first 6 months for survival of neonates and attain healthy life from childhood [10,11]. The mother practicing breasting is disproportionate across geographic regions and cultures. Exclusive breastfeeding is highly prevalent in the region of South Asia (59%) followed by Eastern and Southern Africa (57%), Middle East and North Africa (35%), Latin America and the Caribbean (32%), East Asia and the Pacific (31%), West and Central Africa (29%) and Central and Eastern Europe, Commonwealth of Independent States (29%) [12]. alongside almost 46% of children under six months of age in India are exclusively breastfed [13]. It is remarkably suboptimal to what WHO/UNICEF has recommended (90%) [14-16].

Studies investigating the association between breastfeeding and childhood obesity establishes a significantly lowered likelihood of overweight among children were breastfed [17,18]. Furthermore, studies predict exclusive breastfeeding for the first six months of life, and its prolongation of breastfeeding reduces the risk of obesity in children [19,20].

The forefront explanations exploring pathways to breastfeed and childhood obesity suggest it prevents early initiation of complementary foods that are high in protein, consequently prevents children from unhealthy weight gain. Protein and total energy consumption are higher among infants who are formula fed as compared to infants who are exclusively breastfed. This gives rise to increased body weight during the earliest months of life indicated that higher protein consumption and unhealthy weight gain is positively linked with the risk of developing childhood obesity [21,22]. There are differences in the release of insulin and other pancreatic and gut hormones between breastfed and formula-fed infants. Infants who are formula fed have higher plasma levels of insulin. It would encourage early development of adipocytes, which stores fat among children [23]. Breast milk itself contains hormones and other biological factors that are important for the regulation of food intake and energy balance. It may help to develop long-term physiological factors responsible for maintaining energy balance [24].

India, on one hand, experiences increasing the prevalence of childhood obesity, while on the other hand is challenged by a situation where the problem of under-nutrition among children is still so prevalent. In both, the cases promotion of exclusive breastfeeding is the only possibility was to overcome the duel risk. It is essential and interesting to study the association between exclusive breastfeeding and risk of childhood obesity using nationally representative data and also to fill the dearth of studies on childhood obesity and its determinants and investigating the association between these two in India.

The third round of National Family Health Survey has disclosed the fact that one in every two children under five years of age is malnourished in India. Concurrently, during the last decade the prevalence of childhood obesity has significantly increased. What makes the scenario worse is that the disease of childhood obesity, primarily known as a disease of developed countries, has arrived in a situation where we are still in the grip of under-nutrition. Added to that weight control programs show little success among children and the treatment of childhood obesity is time-consuming and inconclusive [25]. Therefore, as the years go by, these children are more and more likely to grow up to be obese adults. If proper action is not taken, they will enter their teens having already suffered from over a decade of poor health. Also, obesity in childhood has both immediate and long-term health effects. According to the World Health Organization, the long-term health hazards of childhood obesity often do not become apparent until adulthood. Prevention of this problem, therefore, has become an utmost important public health concern.

According to the World Health Organization, exclusive breastfeeding can protect the children against childhood obesity. Studies conducted in other countries have shown an association between these two. Nevertheless, there are also some studies, which have refuted this association completely making it difficult to draw any valid conclusion from those studies. It is a matter of concern that although the benefit of exclusive breastfeeding is now well realized all over the world, still it is not highly practiced in India, which is also known to be a breastfeeding country.

The investigation holds importance in the sense that during the last decade there has been a considerable rise in the prevalence of childhood obesity in India, there is also a situation where we are still in the grip of under-nutrition which is a clear forewarning of the dual burden of malnutrition. It is, therefore, essential to find out a way to prevent the problem of childhood obesity before it spread its roots. World Health Organization suggests that exclusive breastfeeding can prevent childhood obesity. However, barely any study has been carried out to investigate the association between exclusive breastfeeding and the risk of developing childhood obesity among children using large-scale nationally representative data in our country.

Until now, no study has been done in India to check whether exclusive breastfeeding protects the child against childhood obesity. In the past couple of decades, increased rate of childhood obesity all over the world including India and inconclusiveness of earlier evidence have made it necessary to study in greater depth to assess the relationship between exclusive breastfeeding and childhood obesity before it reaches to the epidemic proportion in India.

Data Source and Methodology

Data Collection

This study banks on the secondary data collected in the third round of National Family Health Survey which was conducted in the year 2005-06, earlier two were conducted in 1992-93 and 1998-99 [26]. National Family Health Survey is a large-scale multi-round

survey conducted in a nationally representative sample of households throughout India. The survey is conducted under the guidance of the Ministry of Health and Family Welfare, Government of India and coordinated by the International Institute of Population Sciences, Mumbai. The third round of National Family Health Survey collects data on children in the age group zero to five years of age.

Description of Response/ Dependent Variable

The dependent variable for the study "Exclusive Breastfeeding" is created with two categories- children who are exclusively breastfeeding are categorized in the group "Yes=1" and children who are not exclusively breastfeeding are categorized in the group "No=0".

The response variables used in determining the association between exclusive breastfeeding and childhood obesity controlling various socio-economic and demographic risk factors is childhood obesity, i.e., "Yes=1" "No=0" otherwise.

Calculation of BMI

For the calculation of body mass index for the children in the age group two to five years, heights and weights were measured in the NFHS3 survey. Then using the following formula, we calculate BMI for children in the age group two to five years.

$$Body \text{ Mass Index (BMI)} = \frac{weight \text{ (in kg)}}{(Height \text{ in meter})*(\text{Height in meter})}$$

Body Mass Index is a long-established measurement for population assessment of overweight and obesity. Since computation involves only height and weight, it is inexpensive and easy to use for clinicians and for the general public and is widely used for collecting information in large scale surveys. Body Mass Index is measured by weight in kilograms divided by the square of height in meters.

The estimated BMI is divided into obese and non-obese categories according to International Obesity Task Force (IOTF) criteria. IOTF categorizes BMI cut points by age and sex for obesity for children age 2 to 18(52). As NFHS provides information for children less than 5 years of age, we have to set our target age group from 2 to 5 years. Moreover, in NFHS-3 mothers were asked to report the baby's birth size. The responses were categorised into large, larger than average, average, smaller than average and very small. The babies reported as 'very large' or 'larger than average' were grouped as 'larger.' The babies reported as 'smaller than average' or 'very small' were grouped as 'smaller' and babies reported as 'average' were kept as 'average.'

Statistical Analysis

Bivariate and multivariate analyses have been used to fulfill the study objectives. Prevalence of childhood obesity is estimated by the socio-demographic and background characteristics such as maternal body mass index, the age of the mother, the order of the birth, etc. To test whether there exists a statistically significant association between childhood obesity and each of the socio-economic and demographic characteristics; chi-square test for independence of attributes has been carried out.

To evaluate the association between childhood obesity and exclusive breastfeeding along with the other socio-economic and demographic attributes we have applied binary logistic regression which arises when the response variable is dichotomous in nature, i.e., yes/no.

Here, the response variable is an estimated probability that a child in the age group two to five years with a specified level of predictors (e.g., children living in urban area, female children) is obese. For each of the predictors, reference categories have been created. The odds ratios are compared for one category relative to the reference category.

Results

Imperial observations suggest around 7.0% of the children in the age group two to five years are dealing with childhood obesity in India. Investigating prevalence by place of residence, we can say obesity is more of an urban phenomenon where 8.2% of children are suffering from childhood obesity compared to 6.0%in rural areas [27-30].

The preponderance of childhood obesity has already started to spread its deep roots in the states Sikkim 27% followed by Arunachal Pradesh 16.2% and Mizoram 16%. On the other end, states like Jharkhand 2.3% Madhya Pradesh 2.8% and Bihar 2.8% are still far from the consternation of the diseases. Among the Empowered Action Group states (EAG), Uttar Pradesh 9.3% has the highest prevalence of childhood obesity followed by Uttaranchal 7.9% and Rajasthan 6.4%. On the other hand, Jharkhand 2.3% has the lowest burden of childhood obesity followed by Madhya Pradesh and Bihar, each with prevalence of 2.8% among the EAG states.

By urban place of residence when we observe that the states of residence, Meghalaya 21.8% has the highest urban prevalence of childhood obesity followed by Mizoram (21.4%) and Sikkim 20.7%. In the other end of the scale, lowest prevalence of childhood obesity by urban place of residence has been observed in Jharkhand 2.3% followed by Bihar 2.8% and Haryana 3.2% (Figure 1).

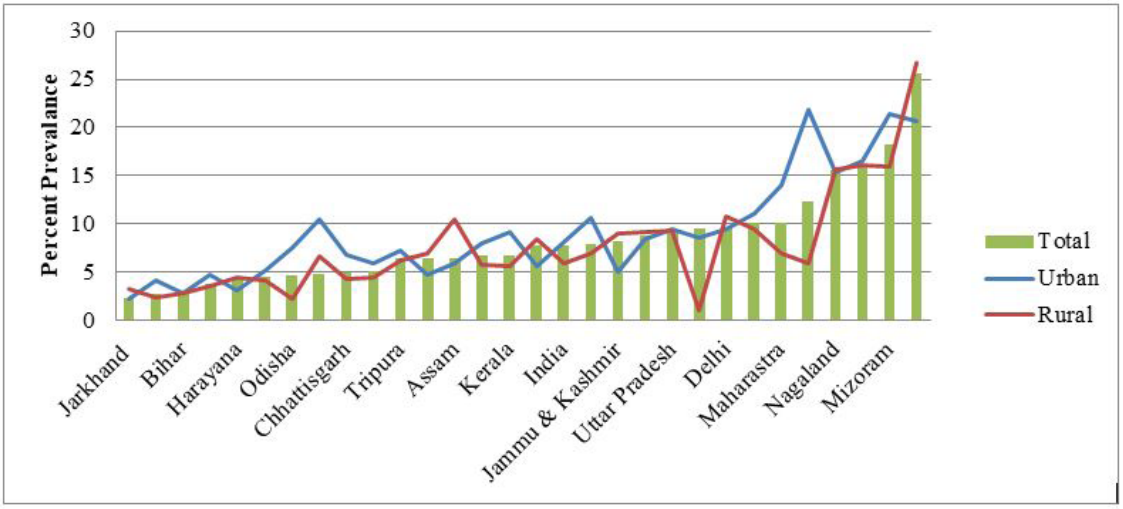

Figure 1: Prevalence of Childhood Obesity in Major States of India, 2005-06

Observing the states by rural place of residence, we find that another north-eastern state Sikkim has topped the table of the highest rural prevalence of childhood obesity with prevalence 26.7%. Following Sikkim, Arunachal Pradesh 16.1% and Mizoram 15.9% has acquired the second and third position respectively. On the contrary, Jharkhand 2.3% has the lowest prevalence of childhood obesity by rural place of residence followed by Madhya Pradesh 2.4% and Bihar 2.8%.

The states with having the widest rural-urban disparity in childhood obesity are Meghalaya 16%, Andhra Pradesh 7.6%, Maharashtra 7.1%, Mizoram 5.5%, and Odisha 5.2%. It also noted that the highest prevalence of childhood obesity is concentrated in four of the seven North Eastern states and Sikkim. Besides, the states with most urban influence, i.e., Maharashtra, Delhi, and Punjab precede the above. There are also some states which show higher childhood obesity in rural areas. Child obesity in rural area is highest in the states of Sikkim, Assam, Manipur, Rajasthan, Haryana, Jharkhand, and Delhi respectively (Table 1).

CHARACTERISTICS	CHILDHOOD OBESITY	
	YES (%)	CHI-SQUARE VALUE
Exclusive breastfeeding		
Yes	5	13.8*
No	6.7	
Sex of the child		
Male	6.1	4.4*
Female	7	
Age of the children		
24-41	7.3	17.4*
42-59	5.8	
Birth size		
Small	6	7.8*
Average	6.6	
Large	6.7	
Maternal obesity		
No	6.2	59.4*
Yes	10.8	
Educational status		
No education	6.3	11.8*
Primary	6	
Secondary	6.9	
Higher	8.5	
Working status		
Working®	5.8	0
Not-working	6.9	

Exposure to mass media		
No	6.1	8.5*
Yes	6.7	
Religion		
Hindu	6.1	259.5*
Muslim	7.5	
Others	10.3	
Caste		
ST	5.8	99.7*
SC	6.5	
OBC	6.3	
Others	7.3	
Wealth index		
Poorest	6.3	27.6*
Poorer	5.7	
Middle	6.2	
Richer	7	
Richest	8	
Place of residence		
Rural	5.9	21.8*
Urban	8.2	
Total	7	**29,161**

NOTE: *- Significant (p<0.05). NA- Not Applicable. Total may not match for each factor due to missing cases.
Table 1: Prevalence of childhood obesity by various socio-economic and demographic risk factors India, 2005-06, (N=29161)

A number of potential socioeconomic and demographic risk factors affect the occurrence of childhood obesity. Also, there are genetic factors which act as an essential cause of developing childhood obesity. Due to the limitation of data, it is not possible to assess the effect of genetic factors on the occurrence of childhood obesity. Therefore, knowing our restrictions, in the following section we have explored childhood obesity by various socio-economic and demographic characteristics associated with the mother and children. To determine the association between childhood obesity and each of these factors we resort to the chi-square test of independence of attributes.

The association between covariates of socio-economic, demographic factors and the childhood obesity consistently found that the prevalence of childhood obesity is lowest among those children who are exclusively breastfed 5.0% as compared to those children who are not breastfed (6.7%). Sex of the children is also an important predictor to childhood obesity, as the highest prevalence of childhood obesity has been found among female children 7.0% as compared to the male children 6.1%. Age of the children is also playing an essential role as we can observe that in the age group between 24-41 months 7.3% have a higher prevalence of obese children as compared to the age group 42-59 months 5.8%. The childbirth size further has paramount importance in childhood obesity. The prevalence of childhood obesity is highest among children who had large size at birth 6.7% and lowest among children who had small birth size 6.0%.

Maternal obesity of the child has a statistically significant association with child obesity; Prevalence of childhood obesity is highest among those children whose mothers are obese with prevalence 10.8% and lowest among those children whose mothers are not obese with prevalence 6.2%. Educational status of the mother in India plays a role in contributing to Childs obesity status. Childhood obesity ranges from children belonging to the highly educated mothers 8.5% to mothers with primary education 6.0%. Working status of mothers has a significant to overall child development. Children of non-working mothers 6.9% have higher childhood obesity prevalence as compared to the children of working mothers 5.8%.

Compelling observations of the variables like; mothers exposure to mass media, religion, cast, wealth index and place of residence suggests there is a significant association between these and childhood obesity. Prevalence of childhood obesity is highest 6.7% among those children whose mothers are exposed to mass media and, the lowest prevalence of childhood obesity is observed among those children whose mothers are not exposed to mass media 6.1%. Whereas the prevalence of childhood obesity is lowest among children belonging to Hindu religion 6.1% followed by Muslim 7.5% and Others 10.3%.Cast-wise children belonging to Schedule Tribe (ST) category 5.8% were least affected by childhood obesity whereas, children from Other category are profoundly affected by childhood obesity 7.3%. The highest rate of obesity in childhood has been observed among children belonging to the richest wealth index of 8.0% as compared to the children from poorer wealth index of 5.7%. Children living in urban areas 8.2% are highly affected by childhood obesity as compared to children living in rural areas 5.9% (Table 2).

Predictors	MODEL1			MODEL2			MODEL3		
	A.O.R	95% C.I.		A.O.R	95% C.I		A.O.R	95% C.I	
		LL	UL		LL	UL		LL	UL
Exclusive breastfeeding									
No®									
Yes	0.7*	0.6	0.9	0.7*	0.6	0.9	0.8*	0.7	0.9
Birth size									
Small®									
Average	1.2*	1	1.3	1.1*	1	1.3	1.2*	0.9	1.3
Large	1.2*	1.1	1.4	1.2*	1	1.3	1.3*	0.9	1.4
Age of the child									
24-41®									
42-59	0.8*	0.8	0.9	0.8*	0.8	0.9	0.8*	0.8	0.9
Sex of the child									
Male®									
Female	1.1*	1.1	1.2	1.1*	1	1.2	1.1	1	1.2
Maternal obesity									
No®									
Yes				1.6*	1.4	1.8	1.5*	1.3	1.8
Educational status									
No education®									
Primary				1	0.8	1.1	0.9	0.8	1.1
Secondary				1	0.9	1.1	0.9	0.8	1.2
Higher				1.1	0.9	1.3	1	0.8	1.2
Working status									
Non-working®									
Working				1.1	1	1.2	1	0.9	1.1
Exposure to mass media									
No®									
Yes				1.1	1	1.2	1	0.9	1.1
Religion									
Others®									
Hindu							0.5*	0.4	0.5
Muslim							0.4*	0.4	0.6
Caste									
ST®									
SC							0.8*	0.7	0.8
OBC							0.8*	0.6	0.9
Others							0.8*	0.7	0.9
Wealth index									
Poorest®									
Poorer							1	0.9	1.2
Middle							1	0.9	1.2
Richer							1.1	0.9	1.3
Richest							1.2	0.9	1.4
Place of residence									
Rural®									
Urban							1.2*	1.1	1.3

Note: * Reference category. * Significant (p<0.05).

Table 2: Results of binary logistic regression showing the risk of childhood obesity for children in the age group two to five years, India, 2005-06

Bivariate analysis helps to establish a relationship between factors of exclusive breastfeeding and, birth size, the age of the children, sex of the children, maternal obesity, educational status of the mother, exposure to mass media, religion, caste, wealth index, place of the residence are significantly associated with childhood obesity. Here the results of the binary logistic regression are interpreted using three models. In the first model, along with exclusive breastfeeding, the socio-demographic characteristics associated with the children. In the second model, along with the characteristics in model one, the socio-economic and demographic characteristics associated with the mothers is controlled. Finally, in the third model, in addition to the characteristics associated with the mother and the children, the household characteristics are controlled.

Model 1

In the first model, in addition to exclusive breastfeeding, various socio-demographic characteristics associated with the children are controlled.

In comparison to the children who are not exclusively breastfed, the children who are exclusively breastfed are 30% less (AOR 0.7, 95% CI 0.6-0.9) likely to have the risk of developing childhood obesity. Relative to the children who had small size at birth, children who had average size at birth are 20% more likely (AOR 1.2, 95% CI 1.0-1.3) and children who had large size at birth are also 20% more likely (AOR 1.2, 95% CI 1.1-1.4) to have the risk of developing childhood obesity. Children in the age group 42-59 months are 20% less likely (AOR 0.8, 95% CI 0.8-0.9) to have the risk of developing childhood obesity as compared to those children belonging to the age group 24-41 months. The risk of developing childhood obesity for female children is 1.1 times more (AOR 1.1, 95% CI 1.1-1.2) than the male children.

In sum, there exists a significantly negative association between exclusive breastfeeding and the risk of developing obesity in childhood after controlling the socio-demographic characteristics associated with the children.

Model 2

In the second model, in addition to the characteristics in the first model, the socio-economic and demographic characteristics associated with the mothers are controlled to examine the association between exclusive breastfeeding and childhood obesity

In comparison to the children who are not exclusively breastfed, children who are exclusively breastfed are 30% less (AOR 0.7, 95% CI 0.6-0.9) likely to develop the risk of childhood obesity. The risk of developing childhood obesity for children who had average and large birth size is 1.1 times more (AOR 1.1, 95% CI 1.0-1.3) and 1.2 times more (AOR 1.2, 95% CI 1.0-1.3) than the children who had a small size at birth respectively. Children in the age group 42-59 months are 20% less likely (AOR 0.8, 95% CI 0.8-0.9) to develop the risk of childhood obesity relative to the children in the age group 24-41 months. Female children are 1.1 times more (AOR 1.1, 95% CI 1.0-1.2) likely to have the risk of developing childhood obesity as compared to male children. As compared to the children of the non-obese mothers, children of obese mothers are 60% more (AOR 1.6, 95% CI 1.4-1.8) likely to have the risk of developing childhood obesity.

In sum, the second model confirms the existence of a significant negative association between exclusive breastfeeding and childhood obesity even after controlling the effect of the socio-economic and demographic characteristics associated with the mother and children. Again, education status and working status of the mother and her mass media exposure do not have a significant impact on childhood obesity.

Model 3

In the third model, in addition to the characteristics in the second model, the household characteristics are controlled to examine the association between exclusive breastfeeding and childhood obesity.

Children who are exclusively breastfed are 20% less (AOR 0.8, 95% CI 0.7-0.9) likely to develop the risk of childhood obesity. In comparison to the children in the age group 24-41 months, the children in the age group 42-59 months are 20% (AOR 0.8, 95% CI 0.8-0.9) less likely to have the risk of developing childhood obesity. Children who had average and large size at birth are 1.2 times (AOR 1.2, 95% CI. 0.9-1.3) and 1.3 times (AOR 1.3, 95% CI 0.9-1.4) more likely to develop the risk of childhood obesity relative to the children who had small birth size. Likewise, children of obese mothers are 1.5 times (AOR 1.5, 95% CI 1.3-1.8) more likely to develop the risk of childhood obesity compared to the children of non-obese mothers.

In comparison to the children belonging to the other religion, children belonging to the Hindu and Muslim religions are 50% (AOR 0.5, 95% CI 0.4-0.5) and 60% (AOR 0.4, 95% CI 0.4-0.6) less likely to have the risk of developing childhood obesity. Relative to the children belonging to Schedule Tribe (ST) category, children belonging to Schedule Cast (SC), Other Backward Classes (OBC), and Other Category are 20% (AOR 0.8, 95% CI 0.7-0.8), 20% (AOR 0.8, 95% CI 0.6-0.9) and 20% (AOR 0.8, 95% CI 0.7-0.9) less likely to develop the risk of childhood obesity. Similarly, in comparison to the children living in rural areas, children living in urban areas are 20% more (AOR 1.2, 95% CI 1.1-1.3) likely to develop the risk of childhood obesity.

In the end, we have found that there exists a significantly negative association between the practice of exclusive breastfeeding and risk of developing childhood obesity after controlling all the socio-economic, demographic, and household characteristics of

the children and mother. The variables sex of the children, educational and working status of mother, wealth index, mass media exposure do not have any significant association with childhood obesity.

Discussion

This study has confirmed that there exists a significant relationship between exclusive breastfeeding and childhood obesity. Children who are exclusively breastfed by their mother are less likely to become obese as compared to those children who are not breastfed exclusively. Higher prevalence of childhood obesity is observed in the Northern states of India, and it could be related to higher engagement of female work participation, wherein the mothers are burdened duel work obligation [31-35].

This finding is consistent with the findings from the previous studies [36-40]. Probably early introduction of foods such as eggs, meat, milk other than breast milk, that are high in protein leads to unhealthy weight gain in early life. Studies have found that higher protein consumption early in life is positively linked with the risk of developing childhood obesity [21]. In addition, infants who are formula fed have higher plasma levels of insulin. It would encourage early development of adipocytes, which stores fat [23]. However, this result is inconsistent with the studies [41-44].

Studies confirm that sedentary lifestyle increase the risk of developing obesity, outdoor activity like playing running is essential to burn calories [45-49]. The study confirms that children of obese mothers are at a greater risk of developing childhood obesity as compared to the children of non-obese mothers. In addition to these, genetic susceptibility of the children will increase the risk of developing obesity in early life. This result is consistent with the studies [50,51].

This study further confirms that children living in urban areas are at higher risk of developing childhood obesity than the children living in rural areas. This result is similar to the studies in Latin America and India [28,30]. Rapid urbanization has reduced the playing and walking areas, and as a result, mother in urban areas prefer their children to stay inside their home. Also, children in urban areas are exposed to various junk foods such as pizza, burger, soft drinks, which often attract children. Whereas, population living in rural areas are less exposed to such an environment. A study conducted in Vietnam shows that children from rural areas have less sedentary time as compared to their urban counterpart [27]. Therefore, they can involve rigorous physical activities every day. Likewise, children belonging to the age group 42-59 months are at a lower risk of developing childhood obesity. Probably, as a child grows, he starts involving in more and more physical activities such as playing, cycling, and running. This may lessen their risk of developing childhood obesity. This result is consistent with the study [28].

There are studies on adult and the dietary intake of fat consumption and, macronutrients; but studies pertaining to children are more scarce, and that too especially limited on developing countries. There are restrictions on secondly analysis as there is not many surveys collect information on children. There is a lack of data on diet, diet composition energy intake, physical activities, and genetic analysis.

Conclusion

The study attempts to investigate the relationship between exclusive breastfeeding and childhood obesity. From the findings, the protective effect of exclusive breastfeeding against childhood obesity has been established. In addition to exclusive breastfeeding, it has been established that childhood obesity is determined by various socio-demographic risk factors associated with the mothers and children, such as birth size, maternal obesity, place of residence, etc. Although the importance of exclusive breastfeeding is now well realized in our country, the magnitude of exclusive breastfeeding practice is not up to the mark.

Healthcare personals and NGOs should promote exclusive breastfeeding and provide counseling to support mothers regarding their numerous benefits. This has been highlighted in various policies such as the "Infant Milk Substitutes, Feeding Bottles and Infant Foods (Regulation of Production, Supply, and Distribution) Act 1992 and Young Child Feeding Practices issued by the Ministry of Health & Family Welfare (MoHFW). Treatment of childhood obesity is time-consuming, expensive and also inconclusive. Therefore, considering the prevention of childhood obesity, there requires a continuous political dedication and collaboration of various NGOs for creating an environment that promotes healthy dietary choice, involvement in everyday outdoor activities like running, playing etc. especially for the children living in urban areas and most importantly practice exclusive breastfeeding, because prevention is always better than treatment.

Ethical Statement

This article is not simultaneously submitted to any other journal for review and/or publication. The present scholastic examination is negated of any conflicts of interest, and the authors have been involved in substantive work leading to the manuscript and shall hold themselves responsible for its content. No financial support or sponsorship was financed for the research work. The present study is based on NFHS-3, India. The data and materials related to the national survey can be acquired online from International Institute for Population sciences website. The analysis presented in this study is based on secondary analysis of existing survey data with all identifying information removed. The survey received ethical reverence from the International Institute for Population Science's Ethical Review Board and the Indian government. Participation of individuals in the survey was voluntary. Prior informed written consent was obtained from each respondent.

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