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Impact of Skipping Breakfast and Choosing Calorie-Dense Foods in Obesity Development

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ABSTRACT
Obesity emerges as a major health concern in India, with one in four people being overweight or obese. The study conducted with 50 samples from Northern and Southern states of India to determine which region had a higher prevalence of obesity and to identify the dietary factors leading to obesity. Waist circumference or waist hip ratio was more effective indicators of obesity in which breakfast skipping and dietary preferences were prevalent factors leading to obesity. Breakfast skipping was particularly common among middle-aged people in North India, largely due to lifestyle influences, work agendas, and urban living settings. Skipping leads to overeating later in the day and a tendency to consume energy-dense, nutrient-poor foods, which can exacerbate weight gain and undermine overall health. Preferences for both vegetarian and non-vegetarian foods, high in calories, contribute to increasing obesity rates among South Indians. Therefore, efforts should be taken in promoting balanced diets and regular physical activity through public health education at the government level to alleviate the rising obesity epidemic.

Keywords: obesity, breakfast, skipping, calorie dense, diet

INTRODUCTION

Obesity is a medical disorder characterized by an additional body fat, typically resulting from an inequality between calories consumed and calories consumed. It is commonly evaluated using the body mass index (BMI), which considers a person's weight and height. Lifestyle factors such as diet, physical activity, and genetics can contribute to the development of obesity. According to the WHO, obesity is a major risk aspect for no communicable diseases such as stroke, heart disease, type 2 diabetes, certain cancers (endometrial, breast, ovarian, prostate, liver, gallbladder, kidney, and colon) and osteoarthritis[1]. Obesity is also associated with unemployment, social disadvantages, and reduced socioeconomic productivity[2].

Unhealthy eating habits including excessive junk food intake, lack of exercise, prolonged screen time, excessive sugar consumption, inadequate sleep, rapid urbanization, poor digestion, and genetic factors contributed to the sedentary life style trend. Adults and adolescents are particularly affected by obesity, with many missing awareness of their Body Mass Index (BMI) and complete health status. Parents preferences prevalent for a chubby figure, often related with beauty ideals, while slim figures are sometimes perceived as less attractive. A chubby appearance in the children is always appreciated by the parents without considering the health implications.
National Family Health Survey (NFHS) 2015, conducted a study in association with the Indian Institute of Population Sciences (IIPS) showcased Andhra Pradesh as ranked highest in the prevalence of obesity at 36.04%, followed by Kerala at 30.6%, Tamil Nadu at 29.45%, Telangana at 26.95%, and Karnataka at 23.5% among the southern states of India[3]. The estimated incidence of obesity-related cancers is substantial, encompassing common cancers such as pancreatic, colorectal, breast, and endometrial cancers[4,5]. Overweight and obesity are identified as risk factors for numerous chronic medical conditions such as cancer, diabetes, and heart disease, which are primary drivers of healthcare expenditure, disability, and mortality.

According to a renowned article in The Times of India, based on findings from the National Family Health Survey 5 (2019-2021), it is described that women in India are experiencing higher rates of obesity compared to men, with approximately 50% of women being classified as obese. The study further highlights a regional difference, indicating that South Indian women exhibit a higher prevalence of central obesity in comparison to their counterparts in the North[6].
The dietary habits of North and South Indians display notable differences, which in turn impact the prevalence of obesity in these regions. Obesity is a mounting concern in India, with provincial dietary patterns playing a substantial role in influencing health consequences.

Moreover, fashion trends also pay to the prevalence of obesity, as they influence body image and dietary choices. The prominence of screen time is another crucial factor; many youths opt for indoor activities such as binge-watching movies, mobile gaming and cartoons, over outdoor pursuits. Encouragingly, engagement in outdoor sports like cricket, football and volleyball not only reduces screen time but also improves physical fitness, social skills, cognitive abilities, and the spirit of cooperation and sharing.

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North Indian diets conventionally comprise a mix of vegetarian and non-vegetarian foods, with a significant proportion of the population consuming both. The preference for white rice is higher among North Indians, which can contribute to higher caloric intake and obesity risk. North Indians tend to eat more sugary beverages and have an increasing tendency towards unrestricted eating habits. The region also shows a higher daily consumption of fast and processed foods equated to South Indians. Despite the tendencies, a significant number of North Indians maintain a balanced diet.
South Indian diets are also mixed, but a larger share of the population (82%) consumes both vegetarian and non-vegetarian foods. South Indians generally consume traditional meals more frequently and have a lower consumption of junk and fast foods. The fondness for brown rice is higher in the region, reflecting a greater awareness and adherence to healthier dietary practices. South Indians are less likely to consume sugary beverages every day and tend to have more organized eating habits. However, the occurrence of conditions such as PCOD and thyroid matters is stated to be higher among South Indian women, contributing to obesity despite their healthier dietary patterns.

Both North and South Indians exhibit a strong adherence to a balanced diet, but regional differences in definite dietary habits significantly impact obesity rates. North Indians' higher consumption of sugary beverages and fast foods, combined with unrestricted eating habits, heightened the risk of obesity. In contrast, South Indians' preference for old-style meals and healthier rice options, along with lower junk food consumption, may mitigate some obesity dangers. However, health conditions like PCOD and thyroid issues current additional challenges in dealing obesity in the South Indian population. Understanding these regional dietary patterns is crucial for developing targeted nutritional interventions and public health policies to combat obesity in India. The objective of the study was to find out the prevalence of obesity and its related factors among North Indians and South Indians.

METHODOLOGY

The area selected for the study included North Indians and South Indians. The places covered were Delhi, Punjab, Gujarat, Himachal Pradesh, Kerala, Tamil Nadu, Andhra Pradesh, Bangalore, and Mangalore. Sample were selected randomly from the target population, within the age group of 18-64 years. It ensures the representation of different subgroups within the population. A total of 100 sample were selected, with 50 samples from each region to determine which region had a higher prevalence of obesity and to identify overweight individuals. The diverse selection aims to capture a broad range of dietary habits and lifestyles from various cultures, societies, traditions, and habits to provide comprehensive insights into the factors influencing obesity.

The sample were designated through simple random sampling technique. When simple random sampling is used, each element in the population has an equal chance of being selected. The survey method was used to conduct the study. A structured questionnaire was developed to collect data on demographic information, socioeconomic status, lifestyle, dietary habits, and anthropometric measurements (with specifications to take the measurements). Through the questionnaire, obtained data from participants was assessed for further evaluation.
The questionnaire was distributed with friends, relatives, groups and colleagues to gather information from various parts of India. The questionnaire was developed to gather information on various features, such as demographic details, socioeconomic status, lifestyle patterns, dietary habits, and anthropometric measurements. Participants were requested to complete the questionnaire, and their responses were collected and tabulated.

Anthropometric Indices

In the anthropometric measurements, height, weight, waist circumference, and hip circumference were included. Using the given data of height and weight, BMI is calculated using the formula recommended by WHO and NIH classification of Body Mass Index; BMI = Weight in kilograms (Kg) / Height in meter square (m^2). Under Weight: < 18.4, Normal Weight 18.5 -24.9, Over Weight: 25.5-30, Obese Category: > 30.

Waist circumference based on WHO, men greater than 90 cm and women greater than 80 cm belonged to high risk. Waist-hip ratio was assessed with the WHO classification using the formula: WHR = Waist circumference / Hip circumference**.** Low risk: Men -0.90 or lower, Women - 0.80 or lower; Moderate risk: Men- 0.90-0.99, Women- 0.81-0.85; High risk: Men- 1.0 or higher, Women- 0.86 or higher.

The data collected were analysed, interpreted, and presented. The results were calculated and the information was consolidated by considering the number of sample from both regions. The factors leading to obesity were then analysed based on the consolidated data.

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RESULTS

Participant demographics

The demographics of the study includes age, gender, mode of work style.

Table 1: Participant demographics N=100

Particulars	Category	North Indians (N=50)	South Indians (N=50)
Age (years)	18-25 (young adults)	4 (8%)	3 (6%)
	26-44 (adults)	25(50%)	28(56%)
	45-59 (middle age adults)	21(42%)	19(38%)
Gender	Male	12(24%)	8(16%)
	Female	38(76%)	42(84%)
Mode of work style[7]	Sedentary	40(80%)	42(84%)
	Moderate	9(18%)	8(16%)
	Heavy Work	1(2%)	0

Table 1 describes that, the age group selected from 18-59 years included 50 sample each from both North Indians and South Indians. The data from the study indicated that among North Indians, 8% were young adults aged 18-25 years, while 50% were adults aged 26-44 years, and 42% were middle aged adults aged 45-59 years. Similarly, among South Indians, 6% were young adults, 56% were adults and 38% were middle age adults. Table describes that 24% of males from North India and 16% from South India participated, while females accounted for 76% from North India and 84% from South India. The majority of participants were females from both regions. 80% of North Indians and 84% of South Indians had a sedentary work style. 18% of North Indians and 16% of South Indians had a moderate work style.

Anthropometric Indices

Anthropometric measurements refer to the systematic measurement of various dimensions and proportions of the human body. The measurements include weight, height, waist circumference and hip circumference.

Body Mass Index

Table 2: Body Mass Index[8] N=100

BMI (kg/m^2)	North Indians (N=50)	South Indians (N=50)
Under Weight	6 (12%)	8(16%)
Normal	32(64%)	21(42%)
Over Weight	7(14%)	17(34%)
Obese	5(10%)	4(8%)

Table 2 depicts that 12% of North Indians and 16% of South Indians were underweight. 64% of North Indians were of normal weight compared to 42% of South Indians. In the overweight category 14% of North Indians were overweight, while 34% of South Indians were overweight. Obesity prevalence was similar, with 10% of North Indians and 8% of South Indians classified as obese.

Waist Circumference

BMI was not a sufficient tool to assess the health risks associated with disorders caused by the increased adiposity. Waist circumference is an important tool to critically evaluate and manage the overweight and obesity. More than obesity related disorders waist circumference and Waist Hip Ratio are active surrogate pointers of visceral obesity to predict morbidity and mortality[9]. Table 3 describes about the waist circumference of the sample.

Table 3: Waist Circumference N=100

Gender	Waist circumference (cm)	North Indians (N=50)	South Indians (N=50)
Men	**>90cm** (High risk)	3 (6%)	2 (4%)
	<90cm (Low risk)	9 (18%)	9 (18%)
Women	**>80cm** (High risk)	26 (52%)	24 (48%)
	<80cm (Low risk)	12 (24%)	15 (30%)

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Waist –Hip-Ratio

The Waist hip ratio classification[10] provided insights into the prevalence of central obesity and associated health risks among different demographic groups in India. Some women with healthy BMI also experience abdominal obesity. The score forecasts the probability of getting numerous health problems due to the accumulation of abdominal fat. High prevalence rates were observed in southern states such as Kerala (65.4%) and Tamil Nadu (57.9%), as well as in northern states like Punjab (62.5%) and Delhi (59%). Conversely, low prevalence rates were found in states such as Jharkhand (23.9%) and Madhya Pradesh (24.9%)[11]. Table 4 explains about the Waist Hip ratio of sample.

Table 4: Waist- Hip Ratio N=100

Health risk	Waist-Hip ratio	North Indians (N=50)	South Indians (N=50)
Low	**Men** (0.90 or lower)	4(8%)	4(8%)
	Women (0.80 or lower)	5(10%)	7(14%)
Moderate	**Men** (0.91-0.99)	5(10%)	1(2%)
	Women (0.81-0.85)	6(12%)	4(8%)
High	**Men** (1.0 or higher)	3(6%)	3(6%)
	Women (0.86 or higher)	27(54%)	31(62%)

The classification of waist-to-hip ratio (WHR) and associated health risks across North and South Indians showed varying distributions in different risk categories. In the low-risk category (men with a ratio of 0.90 or lower and women with a ratio of 0.80 or lower), 8% of both North Indian and South Indian men fell into this category, while 10% of North Indian women and 14% of South Indian women were classified here. In the moderate-risk category (men with a ratio of 0.91-0.99 and women with a ratio of 0.81-0.85), 10% of North Indian men and 2% of South Indian men, along with 12% of North Indian women and 8% of South Indian women, were categorized. In the high-risk category (men with a ratio of 1 or greater and women with a ratio of 0.86 or greater), the distribution was equal among men at 6% for both North Indians and South Indians, while 62% of South Indian women and 54% of North Indian women fell into this category.

Food Consumption Frequency

The influence of meal frequency per day was always associated with overweight/obesity and diseases. Figure 1 explains about the frequency of intake of meals among Indians.

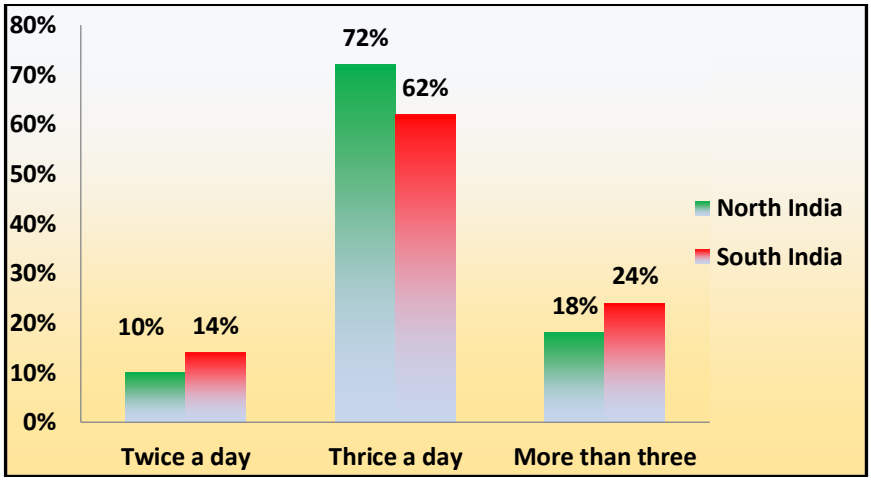

Figure 1: Food Consumption Frequency

The results indicated the frequency of consumption of meals in a day. About 14% of South Indians and 10% North Indians consumed twice a day. Most people consumed three times a day, with 72% of North Indians and 62% of South Indians falling into the category. Comparatively, 24% of South Indians and 18% of North Indians consumed more than three times a day.

Preference of type of diet

The fifth round of National Family Health Survey[12] (i.e., NFHS-5) reveals the food preferences of the people of India. The country-level report during National Family Health Survey-5 (2019-21) disclosed that in the age group 15-49 years, men were ahead of women in consuming non-vegetarian food. On daily and weekly basis, a greater proportion of men as well as women consumed non-vegetarian food[13]. The dietary patterns identified in India shows a positive association with obesity and central obesity among non-vegetarian consumers. The strong relationship between the animal food dietary

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pattern and obesity among Indian population strengthens the evidence for the pivotal role of high intake of animal-source diet, as part of the nutrition transition, found to be a reason for high prevalence of obesity in India[14].

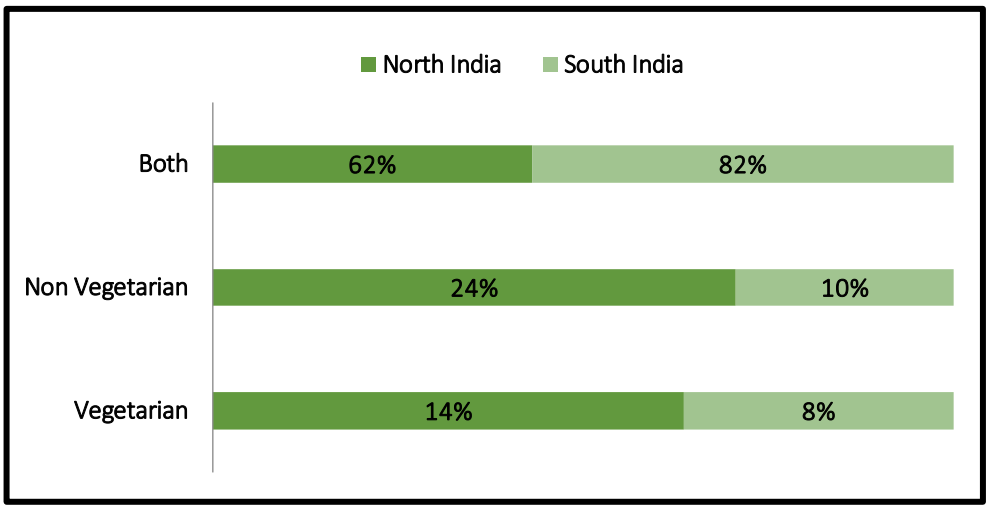

Figure 2: Preference of type of diet

The results underscored the mode of dietary intake. Fourteen percent of North Indians and 8% of South Indians preferred vegetarian diet. Twenty-four percent of North Indians and 10% of South Indians preferred non-vegetarian food items. Many preferred both vegetarian and non-vegetarian diets. Comparatively, 82% of South Indians preferred both, compared to 62% of North Indians.

Unrestricted Eating Habits

Urbanisation and changes in social and cultural practices has changed the dietary patterns of Indians a lot. Among Indian adults aged 20–69 years[15] assessed that between 2010 and 2040 the probability of occurrence of overweight will more than twofold, while the incidence of obesity will triple.

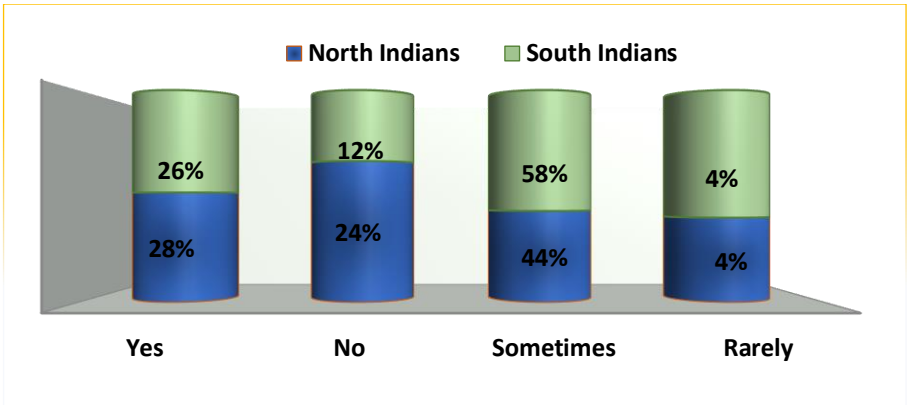

Figure 3: Unrestricted eating habits

The results showed the habit of eating whatever and whenever one wanted. Among North Indians, 28% had the habit of unrestricted eating, compared to 26% of South Indians. Additionally, 24% of North Indians and 12% of South Indians did not have the habit of unrestricted eating. Mostly, 58% of South Indians sometimes ate whatever and whenever they wanted, compared to 44% of North Indians.

Skipping Breakfast

Breakfast skipping is found to be a regular pattern among middle aged Indians especially among working people without knowing the adverse health effects. Regular breakfast skipping has been linked with adverse metabolic outcomes. For instance, research indicates that among middle-aged adults irregular breakfast consumption was associated to higher risks of metabolic abnormalities such as obesity, increased waist circumference and elevated blood pressure[16]. Regular breakfast eaters were less likely to be overweight or obese compared to those who skipped breakfast occasionally or never which was correlated in a dose-dependent manner[17]. Table 5 reveals the habit of skipping breakfast.

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Table 5: Skipping Breakfast N=100

Frequency	North Indians (N=50)	South Indians (N=50)
Yes	25(50%)	20(40%)
No	13(26%)	21(42%)
Rarely	12(24%)	9(18%)

The table presented data on the habit of skipping breakfast among North and South Indians. Fifty percent (50%) of North Indians and forty percent (40%) of South Indians skipped breakfast. Twenty-six percent (26%) of North Indians and forty-two percent (42%) of South Indians did not have the habit of skipping breakfast. Twenty-four percent (24%) of North Indians and eighteen percent (18%) of South Indians rarely skipped breakfast.

Skipping Supper

Skipping dinner trigger increased hunger and cravings later in the evening, leading to overeating or unhealthy food choices. It damages weight loss efforts and contribute to a cycle of binge eating and restriction, which is detrimental to both physical and mental health. Skipping meals (particularly dinner) decreases everyday energy intake, but the decrease in day-to-day diet quality may influence health adversely over period Skipping a meal had a negative result on diet value. It may be due to the fact that certain wholesome foods are more likely to be expended at certain meals (such as dairy and whole grains at breakfast, and vegetables and protein at dinner) or that peak hunger made people to opt variety foods at mealtimes subsequent to a skipped[18]. Table 6 describes the habit of skipping breakfast.

Table 6: Skipping Supper N=100

Frequency	North Indians (N=50)	South Indians (N=50)
Yes	33(66%)	41(82%)
No	8(16%)	4(8%)
Rarely	9(18%)	5(10%)

The results indicated the habit of skipping supper. Comparatively, 66% of North Indians and 82% of South Indians did not skip supper. Daily dinner or supper was skipped by 16% of North Indians and 10% of South Indians as part of weight management. About18% of North Indians and 10% of South Indians had reported that they skipped supper rarely.

Waist hip ratio and dietary habits

Abdominal obesity was prevalent in the country about 40% in women and 12% in men. The results of a study[11] displayed that 5–6 out of 10 females between the ages of 30–49 were abdominally obese. The relation of abdominal obesity in women was higher among older age groups, wealthier groups, non-vegetarians and urban inhabitants. The waist hip ratio and dietary habits plays a significant role among the factors responsible for obesity. It is reported that eating more than six meals per day decreases the risk of obesity compared to less than three meals daily, after adjustment for diet and lifestyle and frequent eaters had lower waist circumference[19]. Table 7 explains about the association of dietary habits and waist hip ratio among Indians.

Table 7: Association of Waist Hip Ratio with dietary habits

	North Indians (n=50)		South Indians (n=50)	
Dietary habits	**Chi Square test score**	***p* value**	**Chi Square test score**	***p* value**
Food Consumption frequency	2.515	0.642	4.951	0.2923
Preference of type of diet	2.2038	0.699	9.5042	0.0496*
Unrestricted eating habits	5.860	0.4391	3.8952	0.6909
Skipping Breakfast	9.951	.041*	.7429	0.1015
Skipping Supper	0.3064	.9894	2.257	0.6885

**significant at 5% level*

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Th statistical significance of dietary habits of Indians in association with the waist hip ratio is given in the table. The preference of type of diet among south Indians had a significant association (Chi-square test score = 9.5042 p=.0496) with waist hip ratio. The dietary habits of South Indians, particularly the high intake of non-vegetarian foods, have been associated to higher waist-to-hip ratios. The habit of skipping breakfast among North Indians was found to be a risk factor for obesity among them. Skipping breakfast among North Indians had a significant association (Chi-square test score = 9.951 p=.041) with waist hip ratio.

DISCUSSION

The research suggests a notable demographic variance between North and South Indians in terms of age distribution. A major group of young adults in both regions highlights the importance of targeting health interventions and policies towards the young age group. Further search into regional differences in lifestyle issues and health consequences could provide valued insights into public health policies tailor-made to various age demographics.

A Lancet Global Health research exposed that half of the adult Indian people did not meet WHO's physical activity rules. The physical inactivity prevalence flowed from 22.3% in 2000 to 49.4% in 2022, with 42% of men and 57% of women being inactive. The prevalence reasons were credited to sedentary life activities, suitable transportation, and screen-based relaxation doings. About 60% of India's population could have been unfit by 2030 without intervention, increasing the risk of illnesses associated to physical inactivity[20].

The results of high BMI pointed that North Indians had an advanced proportion of normal weight people, while South Indians had a higher occurrence of overweight people, with similar obesity rates amid the groups. In the Waist hip ratio evaluation most of the women in North and South India belonged to high risk category of obesity.

Majority of the North Indians and South Indians consumed three meals per day. A high risk in diseases was reported[21] with a high meal frequency (more than 6 meals per day) when compared with less meal frequency (less than two meals per day). Eating three meals per day is considered to be the better healthy choice which is a mix of cultural heritage[22]. A high frequency intake of meals (more than four times per day) causes lower risk of obesity when compared to a lower frequency intake of meals (less than three times per day), even after adjustment for age, total energy intake, physical activity and sex[23].

The National Family Health Survey (NFHS) designates that a significant majority of the population in the southern states of Kerala regularly consumes meat, fish, and eggs. The trend is affected by geographical factors, cultural dietary habits and socioeconomic conditions. A growth in expenditure on animal-based diets, showing a wider national trend towards higher meat ingesting[24] was reported by The All-India Household Consumption Expenditure Survey. Overall India, vegetarianism is often emphasized in the national account, data specifies that around 80% of the Indian population eats some type of non-vegetarian food, with provincial variations playing a substantial role in dietary preferences [25,26].

A similar habit of unrestricted eating habits was seen among North Indians and South Indians which they had sometimes during the life time. Study[27] states that the rise in obesity is particularly pronounced in areas where lifestyle changes, including increased snacking and reduced physical activity, play a significant role. Comparatively, 58% of South Indians sometimes ate whatever and whenever they wanted, compared to 44% of North Indians. The literature review on obesity roots highlights that nibbling between meals, predominantly on calorie-dense and low nutritious snacks, leads to a positive energy balance, thereby paying path to weight gain and obesity. The alteration towards a more inactive lifestyle and the accessibility of processed foods have aggravated the matter[28].

Skipping breakfast was seen among majority of Indians not only among adolescents but also among adults due to the lack of time and work pressure. While many people had a habit of skipping supper as a weight loss strategy, the study found that a few people only skipped supper. A virtuous steady food habit comprises breakfast, lunch, evening snacks and dinner which includes sufficient number of calories essential by the body in the form of carbohydrates, proteins, lipids, vitamins and minerals. But due to the modern life style changes people has gone through a lot of deviations especially they have unbalanced dietary practices[29,30].

Waist circumference was an important target for decreasing the adverse health disorders for both women and men[31]. The association of Waist Hip Ratio and the dietary factors showed the factors like skipping breakfast and preferring calorie dense foods, both vegetarian and non-vegetarian were found to contribute to obesity. Among non-vegetarian consumers the dietary patterns recognized in India shows a positive relation with obesity and central obesity. Changes in the life style, dietary pattern along with vitamin D deficiency were found to be the main factors which could lead to life style disease like cancer[32]. The research directing on breakfast skipping, among Indian adults is particularly common among the middle-aged population in North India due to the busy lifestyles and work pressures. A systematic review emphasized that skipping breakfast was connected with deprived dietary quality and high risk of obesity and metabolic illnesses. The trend was also noted in children and adolescents but was widespread among adults in North India[33,34].

CONCLUSION AND RECOMMENDATIONS

People with obesity had distinct dietary and meal patterns and that it differentially associates with energetic intake and anthropometric measures. The patterns of breakfast skipping were particularly prevalent among middle-aged individuals in North India, often due to work schedules, urban living conditions and to lifestyle factors. The consequences of the pattern were significant, as breakfast was an essential meal that can influence overall dietary quality and energy balance

throughout the day. Skipping meal can lead to overeating later in the day and a preference for energy-dense, nutrient-poor foods, further contributing to weight gain. The preferences to vegetarian and non-vegetarian foods, often rich in calories and fats, contribute to rising obesity rates among South Indians.

Prevention is likely to be the most efficient and cost-effective strategy to manage obesity. The importance of balanced diet and physical activity should be ensured in the community groups for a better healthier India.

REFERENCES

1. WHO. (2024, March 1). https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight
2. Bluher, M. (2019). Obesity: Global epidemiology and pathogenesis. *Nature Reviews Endocrinology, 15*, 288–298.
3. National Family Health Survey (NFHS-4) 2015-16 India. (2015). Retrieved from http://www.rchiips.org/nfhs (accessed September 12, 2020).
4. Polednak, A. P. (2008). Estimating the number of U.S. incident cancers attributable to obesity and the impact on temporal trends in incidence rates for obesity-related cancers. *Cancer Detection and Prevention, 32*(3), 190-199.
5. Sturm, R., & Wells, K. B. (2001). Does obesity contribute as much to morbidity as poverty or smoking? *Public Health, 115*(3), 229-235.
6. The Times of India. (2023, May 13). https://timesofindia.indiatimes.com/life-style/health-fitness/health-news/study-claims-50-women-in-india-between-30-49-years-of-age-suffer-from-abdominal-obesity-things-they-can-do-to-fight-it/photostory/100244938.cms
7. Global Recommendations on Physical Activity for Health. Geneva: World Health Organization; 2010. 1, EXECUTIVE SUMMARY. Available from: https://www.ncbi.nlm.nih.gov/books/NBK305060/
8. WHO (2010). A healthy lifestyle – WHO recommendations. https://www.who.int/europe/news-room/fact-sheets/item/a-healthy-lifestyle---who-recommendations
9. Zazai R, Wilms B, Ernst B, Thurnheer M, Schultes B. Waist circumference and related anthropometric indices are associated with metabolic traits in severely obese subjects. , 2014; 24(5): 777–82. doi: 10.1007/s11695-013-1141-6
10. Kurpad, S. S., Tandon, H., & Srinivasan, K. (2003). Waist circumference correlates better with body mass index than waist-to-hip ratio in Asian Indians. *The National medical journal of India*, *16*(4), 189–192.
11. Chaudhary, M and Sharma, P. (2023). Abdominal obesity in India: analysis of the National Family Health Survey-5 (2019–2021) data, The Lancet Regional Health - Southeast Asia, Volume 14: 100208, ISSN 2772-3682, https://doi.org/10.1016/j.lansea.2023.100208.
12. Sharma, P and Choudhary, M. (2023). Abdominal obesity in India: analysis of the National Family Health Survey-5 (2019–2021) data. The Lancet, Regional Health South East Asia. Vol:14. P: 100208
13. Inclusive Media for Change Jul 19, 2022. Consumption of Non-Veg Food Items Has Risen Since 2015-16, Points Out Nfhs-5 Data
14. Satija, A., Hu, F. B., Bowen, L., Bharathi, A. V., Vaz, M., Prabhakaran, D., Reddy, K. S., Ben-Shlomo, Y., Davey Smith, G., Kinra, S., & Ebrahim, S. (2015). Dietary patterns in India and their association with obesity and central obesity. *Public health nutrition*, *18*(16), 3031–3041. https://doi.org/10.1017/S1368980015000312
15. Luhar, S., Mallinson, P. A. C., Clarke, L., & Kinra, S. (2018). Trends in the socioeconomic patterning of overweight/obesity in India: A repeated cross-sectional study using nationally representative data. *BMJ Open, 8*(10), e023935. https://doi.org/10.1136/bmjopen-2018-023935
16. Kang, Y., Kang, M. & Lim, H. (2024). Age-specific association between meal-skipping patterns and the risk of hyperglycemia in Korean adults: a national cross-sectional study using the KNHANES data. *BMC Public Health* 24, 1697. https://doi.org/10.1186/s12889-024-18762-w.
17. Arora, M., Nazar, G.P., Gupta, V.K. *et al.*, (2012). Association of breakfast intake with obesity, dietary and physical activity behavior among urban school-aged adolescents in Delhi, India: results of a cross-sectional study. *BMC Public Health* 12, 881. https://doi.org/10.1186/1471-2458-12-881.
18. Zeballos, E., & Todd, J. E. (2020). The effects of skipping a meal on daily energy intake and diet quality. Public Health Nutrition, 23(18), 3346–3355. doi:10.1017/S1368980020000683
19. Holmback I., Ericson U., Gullberg B., Wirfalt E. A high eating frequency is associated with an overall healthy lifestyle in middle-aged men and women and reduced likelihood of general and central obesity in men. *Br. J. Nutr.* 2010; 104:1065–1073. doi: 10.1017/S0007114510001753.
20. Mascarenhas, A. (2024, June 27). Lancet study says half of Indians physically unfit: What should you do to get off the mark now? *The Indian Express*. Retrievedfrom9415383/#:~:text=More%20women%20(57%20per%20cent,49.4%20per%20cent%20in%20202https://indianexpress.com/article/health-wellness/indians-physically-unfit-lancet-study
21. Paoli, A., Tinsley, G., Bianco, A., & Moro, T. (2019). The Influence of Meal Frequency and Timing on Health in Humans: The Role of Fasting. Nutrients, 11(4), 719. https://doi.org/10.3390/nu11040719
22. Mattson M.P., Allison D.B., Fontana L., Harvie M., Longo V.D., Malaisse W.J., Mosley M., Notterpek L., Ravussin E., Scheer F.A., et al. Meal frequency and timing in health and disease. *Proc. Natl. Acad. Sci. USA.* 2014; 111:16647–16653. doi: 10.1073/pnas.1413965111.

23. Ma Y., Bertone E.R., Stanek E.J., 3rd, Reed G.W., Hebert J.R., Cohen N.L., Merriam P.A., Ockene I.S. 2003.Association between eating patterns and obesity in a free-living us adult population. *Am. J. Epidemiol.*158:85–92. doi: 10.1093/aje/kwg117.
24. India Today, Mar 11, 2024. Veg or non-veg? Are Indians settling the debate through their wallet? https://www.indiatoday.in/sunday-special/story/veg-food-indians-non-veg-food-protein-cereals-protein-carbohydrates-debate-2507466-2024-03-10
25. Nagavarapu, S. Jan 30, 2024. https://scroll.in/article/1062719/how-i-became-a-non-vegetarian-lessons-from-indias-diverse-food-systems
26. Rediff.com, February 23, 2024. India Is A Meat-Eating Country
27. Singh, G., Agrawal, R., Tripathi, N., & Verma, A. (2023). Overweight and obesity, the clock ticking in India? A secondary analysis of trends of prevalence, patterns, and predictors from 2005 to 2020 using the National Family Health Survey. *International Journal of Noncommunicable Diseases*, *8*(1), 31–45. https://doi.org/10.4103/jncd.jncd_58_22
28. Rai, R. K., Kumar, C., Singh, L., Singh, P. K., Acharya, S. K., & Singh, S. (2021). Rising burden of overweight and obesity among Indian adults: empirical insights for public health preparedness. Journal of Biosocial Science, 53(5), 709–723. doi:10.1017/S0021932020000486
29. Conzuelo F, Gamella M, Campuzano S, Ruiz MA, Reviejo AJ, Pingarrón JM (2010). An Integrated Amperometric Biosensor for the Determination of Lactose in Milk and Dairy Products. *J Agric Food Chem*. Jan-Apr;33(1):35-42.
30. Lowden A, Moreno C, Holmbäck U, Lennernäs M, Tucker PSc. (2010) Eating and shift work – effects on habits, metabolism and performance. *J Work Environ Health*. Mar;36(2):150-62. Epub 2010 Feb 9.
31. Ross, R., Neeland, I. J., Yamashita, S., Shai, I., Seidell, J., Magni, P., Santos, R. D., Arsenault, B., Cuevas, A., Hu, F. B., Griffin, B. A., Zambon, A., Barter, P., Fruchart, J. C., Eckel, R. H., Matsuzawa, Y., & Després, J. P. (2020). Waist circumference as a vital sign in clinical practice: a Consensus Statement from the IAS and ICCR Working Group on Visceral Obesity. *Nature reviews. Endocrinology*, *16*(3), 177–189. https://doi.org/10.1038/s41574-019-0310-7.
32. Thampy, M & Kavita, M S. (2019). Effect of Vitamin D and associated nutritional factors on mammographic density of newly diagnosed Breast Cancer subjects. P:165 http://hdl.handle.net/10603/365571
33. Ricotti R, Caputo M, Monzani A, Pigni S, Antoniotti V, Bellone S, Prodam F(2021). Breakfast Skipping, Weight, Cardiometabolic Risk, and Nutrition Quality in Children and Adolescents: A Systematic Review of Randomized Controlled and Intervention Longitudinal Trials. *Nutrients*,13(10):3331. https://doi.org/10.3390/nu13103331
34. Monzani A, Ricotti R, Caputo M, Solito A, Archero F, Bellone S, Prodam F (2019). A Systematic Review of the Association of Skipping Breakfast with Weight and Cardiometabolic Risk Factors in Children and Adolescents. What Should We Better Investigate in the Future? *Nutrients*: 11(2):387. https://doi.org/10.3390/nu11020387