ORIGINAL ARTICLE

A comparative study on prevalence of life-style diseases for National Family Health Survey five and four in Uttar Pradesh

Suneel Kumar Kaushal[1], Mohd. Maroof[2], Lal Divakar Singh[3], Sandeep Kumar Gupta[4], Navin Kumar[5]

[1,2,3,4]Department of Community Medicine, Rani Durgavati Medical College, Banda, Uttar Pradesh
[5]Department of Community Medicine, Uma Nath Singh Autonomous State Medical College, Jaunpur, Uttar Pradesh

CORRESPONDING AUTHOR
Dr. Sandeep Kumar Gupta, Junior Resident, Department of Community Medicine, Rani Durgavati Medical College, Banda, Uttar Pradesh. 210001
Email: sandeepg124@gmail.com

CITATION
Kaushal SK, Maroof M, Singh LD, Gupta SK, Kumar N. A comparative study on prevalence of life-style diseases for National Family Health Survey five and four in Uttar Pradesh. Indian J Comm Health. 2024;36(3):351-358. https://doi.org/10.47203/IJCH.2024.v36i03.005

ARTICLE CYCLE
Received: 27/12/2023; Accepted: 18/04/2024; Published: 30/06/2024

ABSTRACT

Background: The starting points that setting off the lifestyle disease come with substantial passiveness, crummy food practices, tense biorhythm, incorrect way of body gait etc. NCDs account for 41 million annual deaths, or 74% of all deaths worldwide. Due to NCDs, 86% of these premature fatalities take place annually in low- and middle-income nations. **Aim & Objective**: To compare the prevalence of obesity, high blood pressure, and diabetes in Uttar Pradesh. **Methodology:** A cross-sectional study, which was community-based, probability sampling, was employed. Each unit in the survey population had an equal chance of being chosen throughout the sampling process. The NFHS 4 and NFHS 5 surveys' publicly available data served as the study's foundation which maintain participant confidentiality and are readily available from the NFHS website. **Results**: In Uttar Pradesh, the BMI for men and women in urban areas has grown from the NFHS-4 to the NFHS-5 survey. Comparatively, the prevalence of diabetes among women is 6.3% in urban areas and 5.6% in rural ones, whilst the prevalence among males is 8.2% in urban areas and 7.5% in rural areas. In women, the prevalence of hypertension is 20.6%, whereas in men it is 30%. **Conclusions**: Lifestyle-related disorders are becoming more prevalent leads to the socioeconomic threat to population as well as nations. It is very important that drift of NCDs and their confederated risk factors play a very critical for making policies and guidelines for preventive and curative management.

KEYWORDS

NFHS (National Family Health Survey), BMI (Body Mass Index), High blood pressure

INTRODUCTION

Diseases classified as lifestyle diseases are those whose genesis is mostly attributable to an individual's daily routine and an unsuitable interaction between an individual and their surroundings. The starting points that setting off the lifestyle disease come with substantial

passiveness, crummy food practices, tense biorhythm, incorrect way of body gait etc. These lifestyle diseases have a sneaky beginning, take years to manifest, and are difficult to treat once they do.(1) Poor lifestyle choices that discourage people from exercising and lead them to become indolent can lead to a number of health problems, including chronic non-communicable diseases that eventually become almost fatal.(2)

74% of all deaths worldwide are caused by noncommunicable diseases (NCDs), which claim the lives of 41 million people annually. Eighty-six percent of the 17 million premature deaths from NCDs that occur each year occur in nations with low to middle incomes. These fatalities occur before the age of 70.(3)

In wealthy and emerging nations alike, lifestyle disorders are becoming the most serious health issues, includes India.(4) In India, the percentage of mortality from illnesses that are not communicable (NCDs) rose from 37.9% by 1990, to 61.8 percent in 2016.(5) In 2016, total deaths due to NCDs in India was reported to 63% in which 23 % deaths were early on, where by prevalence of obesity, diabetes & hypertension were found to be 4%,6% & 24% respectively.(6)

Across the globe more than 19 billion and 650 million adults were found to overweight and obese respectively, either of mentioned two approximately 2.8 million total deaths were stated.(7) 2016 saw 13% of persons over the age of 18 who were obese and 39% of overweight adults.(8) More than 135 million population were found to be obese in India. According to ICMR-INDIAB 2015 distribution of obesity ranges from 11.8%-31.3%. Being specific to central obesity it ranges from 16.9 % to 36.3%.7 With an obesity prevalence of 11% among adolescents and 20% among adults, India is reportedly ranked third among the nations with the highest obesity rates.(9)

Globally, 1.28 billion adults between the ages of 30 and 79 are estimated to have elevated blood pressure; these individuals are mostly from low- and middle-income nations. Estimated 46% of adults were found to be unaware of their raised blood pressure. Less than half of adults (42%) with hypertension are diagnosed and treated. One in five persons (21%) who have hypertension are able to control it. When it comes to premature deaths worldwide, hypertension is the main cause.(10)

In India, 20.6% of men and 20.9% of women had high blood pressure in 2005, and by 2025, that number was expected to rise to 22.9% of men and 23.6% of women, according to Global Burden of Diseases.(11) According to recent studies, 10% of India's rural population and 25% of its urban population suffer from HTN.(12)

It is estimated that 537 million adults (20–79 years old) would have diabetes in 2021; by 2030, that number is expected to rise to 643 million, and by 2045, it will reach 783 million. Approximately 240 million persons with diabetes do not have a diagnosis. 6.7 million deaths were related to diabetes. Economically low and middle countries have 75% of adult population living with diabetes.(13) In India, the prevalence of diabetes increased from 7.1% to 8.9% between 2009 and 2019. Adults with impaired glucose tolerance now number 25.2 million, and by 2045, that number is expected to rise to 35.7 million. In India, 43.9 million persons (approximately57%) do not have a diabetes diagnosis.(14)

Based on their living conditions and work-related practices people are prone to number of diseases. With food choices, behavior-related, and changes in the environment, they might be reduced and are avoidable.(1) When it comes to the prompt identification and management of lifestyle diseases, the fundamental healthcare approach is beneficial.(2) Family practitioners play a critical role in managing lifestyle disorders including diabetes and hypertension by implementing alternatives to drugs management strategies such as nutrition, exercise, stress management, and so forth.(15) To determine the present state of these disorders, the prevalence of lifestyle diseases such as obesity, diabetes, and hypertension among adults in Uttar Pradesh was compared between the NFHS-5 and NFHS-4 surveys. We examined the publicly accessible data on adult high blood pressure, diabetes, and obesity prevalence in Uttar Pradesh from the NFHS-5 Survey.

Aim & Objective: To compare the adult prevalence of obesity, high blood pressure, and diabetes according to the Uttar Pradesh NFHS-5 and NFHS-4 surveys.

Material & Methods

Study type & study design: Descriptive, Cross sectional. The study's foundation is secondary data from the NFHS 4 and NFHS 5 surveys, which are openly accessible from the NFHS website.

Study setting: The Ministry of Health and Family Welfare (MoHFW) oversaw the International Institute of Population Sciences (IIPS), Mumbai, which supervised the National Family Health Surveys 4 and 5.The survey was conducted in all 29 states and seven union territories (UTs) of India in order to be representative of the population at the federal, state, and district levels.

Information on population, health, and nutrition, as well as numerous other significant variables, is provided by the National Family Health Survey 5 and 4 surveys for India and each state/UT. Recent additions to the NFHS-5 survey include clinical, anthropometric, and biological measures such as height, weight, hip and waist circumferences, blood pressure, and random blood glucose for both sexes over the age of 15.

Study population: NFHS-5 includes information from 12,043 males and 93,124 women living in 70,710 homes. NFHS-4 Information was gathered for Uttar Pradesh from 76,233 households, 13,835 men and 97,661 women between the ages of 15 and 49 (including 15,387 women who were questioned in PSUs for the state module).

Study duration: NFHS-5 fieldwork for Uttar Pradesh was conducted in two phase. First phase, conducted by Academy of Management Studies (AMS) and Research and Development Initiative (RDI) Pvt. Ltd; from January 13, 2020, to March 21, 2020, before the lockdown; second phase, conducted from November 28, 2020, to April 19, 2021, after the lockdown. Three waves of NFHS-4 fieldwork were carried out in all 71 districts of Uttar Pradesh. The Goa Institute conducted research in the Eastern region from January 27 to July 1, 2015; Bundelkhand and Development & Research Services Pvt. Ltd. (DRS) conducted research in the Central region from February 5 to September 17, 2016; and the Population Research Centre (PRC) of Lucknow University's Department of Economics conducted research in the Western region from February 3 to August 4, 2016.

Strategy for data collection: The NFHS used a two-stage stratified random sampling method that used probability proportionate to population size in the first stage of the sampling process using primary sample units (PSUs) villages in rural regions and census enumerated blocks (CEBs) in urban areas. The equal number of homes from each of the chosen PSUs are sampled systematically and randomly in the second stage. Through computer assisted personal conducting interviews, information has been gathered in indigenous languages according to the four survey schedules: Household, Woman, Man, and Biomarker.

Ethical issues: The study was ethically approved by the Institute's Ethical Committee, Rani Durgavati Medical College, Banda, Uttar Pradesh (IEC/RDMC/Cert/15).

Informed consent: For this survey written informed consent were taken from interviewee both male and female while maintaining the anonymity of the participants.

Results

Table 1 (a): From the NFHS-4 to the NFHS-5 survey, BMI increased in urban areas for both men and women (from 20.6% to 24.9%) and for both genders (from 27.1% to 30.6%). The BMI of men and women in Uttar Pradesh varies significantly overall. Urban women (30.6%) have highest BMI in Uttar Pradesh. Greatest change in BMI among rural men (9.0% to 16.2%).

Table 1 (b) depict: The prevalence of high Body Mass Index (BMI) across different age groups and genders based on data from the National Family Health Survey (NFHS) 4 and 5. There is an overall substantial increase in BMI prevalence from NFHS-4 to NFHS-5 across all age groups and genders.Women consistently have higher BMI rates compared to Men in both survey periods. However, the increase in prevalence is significant in both genders.Older

age groups exhibit higher BMI prevalence, with the highest rates observed in the 30-39 and 40-49 age groups.Notable increases in BMI prevalence are observed across all age groups, with the most dramatic rise seen in the 20-29 and 30-39 age groups.

Table 1 (a) Percentage of women and men aged 15-49 with specific Body Mass Index (BMI) > 25 kg/mt² in NFHS-4 and NFHS-5 Survey in Uttar Pradesh

BMI	NFHS-5			NFHS-4		
	Urban	Rural	Total	Urban	Rural	Total
> 25 women	30.6	18.3	21.3	27.1	12.6	16.5
> 25 men	24.9	16.2	18.5	20.6	9.0	12.5

Table 1 (b) Percentage of Women and men aged 15-49 with specific Body Mass Index (BMI) ≥ 25 kg/mt² in NFHS-4 and NFHS-5 Survey in Uttar Pradesh

Age	NFHS-5			NFHS-4		
	Urban	Rural	Total	Urban	Rural	Total
15-19	3.5	3.3	6.8	7.3	7.8	15.1
20-29	11.5	13.5	25	32.6	30.7	63.3
30-39	20.2	30.6	50.8	55.8	62.5	118.3
40-49	22.7	38.5	61.2	53	63.6	116.6

Table 2 (a): demonstrates that, overall, from the NFHS-4 to NFHS-5 survey, there was an increase in blood sugar level (BSL) >140 mg/dl and 2.1% to 2.4% >160 mg/dl among women and from 4.0 to 4.2% in BSL >140 mg/dl and 3.1% to 3.5% >160 mg/dl among males. Urban areas have greater RBS > 160 mg/dl than rural ones. The percentage of men and women in RBS in rural areas has increased from NFHS-4 to NFHS-5, ranging from 141 to 160 mg/dl. The percentage of women in urban areas is greater (2.7% to 3.4%) than that of men (4.3% to 3.9%) in NHSF 5 compared to NFHS 4.

Table 2 (b): The prevalence of diabetes (defined as blood sugar levels greater than 140 mg/dL) across different age groups and genders based on data from the National Family Health Survey (NFHS) 4 and 5.

Table 2(a) Percentage of women and men aged 15-49 with random blood glucose level (mg/dl) in Uttar Pradesh

Random blood glucose (mg/dl)		NFHS-5			NFHS-4		
		Urban	Rural	Total	Urban	Rural	Total
Men	141-160	3.9	4.3	4.2	4.3	3.9	4.0
	>160	4.3	3.2	3.5	3.4	2.9	3.1
Women	141-160	3.4	3.3	3.3	2.7	2.8	2.8
	>160	2.9	2.3	2.4	3.0	1.9	2.1

Table 2 (b) Percentage of Women and men aged 15-49 with random blood glucose level >140mg/dl in Uttar Pradesh

Age	NFHS_4			NFHS_5		
	Men	Women	Total	Men	Women	Total
15-19	3.4	2.3	5.7	2.9	2.1	5
20-24	3.5	2.6	6.1	5	2.8	7.8
25-29	5.5	3.5	9	6	3.7	9.7
30-34	8.4	4.9	13.3	7.9	5.8	13.7
35-39	8.8	6.8	15.6	11.2	7.4	18.6
40-44	12.9	9.7	22.6	13.7	11.6	25.3
45-49	14.2	11.8	26	15.8	14.2	30

Diabetes prevalence shows an overall increase from NFHS-4 to NFHS-5 across most age groups and genders. Men generally have higher diabetes rates compared to Women, though the increase in prevalence is more pronounced among Women in some age groups. Older age

groups exhibit higher diabetes prevalence, with the highest rates observed in the 45-49 age group for both genders. Notable increases in diabetes prevalence are seen in the 35-39 and 45-49 age groups, particularly among Men in the former and Women in the latter.

Table 3(a): indicates the proportion of women and men in Uttar Pradesh who, according to NFHS surveys, had Stage-2 (SBP 160-179 mmHg or DBP 100-109 mmHg) and Stage-3 (SBP >180 mmHg or DBP > 110 mmHg) hypertension. Women with Stage 2 and Stage 3 hypertension made up 1.4% and 0.6%, respectively, more of the NFHS-5 sample than the NFHS-4.

Men's Stage-2 and Stage-3 hypertension percentages were found to range from 0.5 percent to 0.8 percent and 1.4 percent to 2.1%, which is respectively. Compared to NFHS-4, stage 2 and stage 3 hypertension was more common in urban and rural areas (almost twice as high in rural men).

Table 3 (b): In this table the prevalence of hypertension (HTN) taken as a SBP ≥140 mmHg or DBP ≥ 90 mmHg, across different age groups and genders based on data from the National Family Health Survey (NFHS) 4 and 5.

Table 3(a): Percentage of women and men aged 15-49 with Blood pressure (mmHg) in Uttar Pradesh

Blood pressure (mmHg)		NFHS-5			NFHS-4		
		Urban	Rural	Total	Urban	Rural	Total
Men	SBP 160-179 or DBP 100-109	2.1	2.1	2.1	1.9	1.2	1.4
	SBP >180 or DBP > 110	0.9	0.8	0.8	0.6	0.4	0.5
Women	SBP 160-179 or DBP 110-109	1.7	1.3	1.4	1.3	1.0	1.1
	SBP >180 or DBP > 110	0.8	0.7	0.7	0.7	0.6	0.6

Table 3 (b): Percentage of Women and men aged 15-49 with Blood pressure SBP ≥140 or DBP ≥ 90 mmHg in Uttar Pradesh

Age	NFHS_4			NFHS_5		
	Men	Women	Total	Men	Women	Total
15-19	2.8	2.1	4.9	4	3	7
20-24	5.7	2.9	8.6	9	4.3	13.3
25-29	8.2	5.2	13.4	11.2	6.1	17.3
30-34	12.6	8.5	21.1	17	10.6	27.6
35-39	14.9	12	26.9	19.3	14.3	33.6
40-44	16.9	16.3	33.2	25.7	19	44.7
45-49	21.8	19.3	41.1	27.1	13	40.1

There is an overall increase in hypertension prevalence from NFHS-4 to NFHS-5 across most age groups and genders. Men consistently show higher hypertension rates compared to Women in both survey periods, with the gap widening in the NFHS-5.

Older age groups have a higher prevalence of hypertension, with the highest rates observed in the 45-49 age group for both Men and Women. The most increases in hypertension prevalence are seen in the 30-34 and 40-44 age groups, particularly among Men.

Table-4 illustrates the proportion of men and women in Uttar Pradesh's urban and rural districts that have a higher waist-to-hip ratio. Compared to rural areas (55.1% and 50.6%), the prevalence of increased waist-hip ratio is higher in urban areas (61.6%) among women and 56.2% among males. Table 5 Diabetes prevalence among women is 6.3% in urban areas and 5.6% in rural ones, while among men it is 8.2% in urban areas and 7.5% in rural areas. Men and women had different rates of hypertension (20.6% and 30.0%, respectively).

Table 4: Percentage of women and men with increased waist hip ratio in urban and rural area of Uttar Pradesh NFHS-5

Waist Hip ratio	Urban	Rural
Women > 0.85	61.6	55.1
Men > 0.90	56.2	50.6

Table 5: Total prevalence of BSL >140 mg/dl and BP >140/90 mmHg among of population of Uttar Pradesh

Variables		Urban	Rural	Total
BSL >140 mg/dl	Women	6.3	5.6	11.9
	Men	8.2	7.5	15.7
HTN > 140/90 mmHg	Women	11.4	9.2	20.6
	Men	16.9	13.1	30.0

DISCUSSION

In Uttar Pradesh, based on findings of the NFHS 4 to 5 survey, BMI increased in urban areas for both men and women (from 20.6% to 24.9% to 27.1% to 30.6%), with urban women having the highest BMI (30.6%). According to the research conducted by Pradeepa R et al., the percentage of people living in Tamil Nadu (TN), Maharashtra (MH), Jharkhand (JH), and one Union Territory (UT), Chandigarh (CH), who are obese is 24.6%, 16.6%, 11.8%, and 31.3%. In all four of the study regions, the total number of cases of obesity was found to be considerably higher among urban people than among rural ones. Residents in TN, MH, JH, and CH had a prevalence of overweight of 15.2, 11.3, 7.8, and 15.9%, respectively.16 Luhar S. et al.'s study indicates that between 2010 and 2040, the prevalence of obesity will triple among Indian individuals aged 20-69, while the prevalence of overweight will exceed twofold. Overweight and obesity are predicted to reach 30.5% (27.4%–34.4%) and 9.5% (5.4%) among males and 27.4% (24.5%–30.6%) and 13.9% (10.1%–16.9%) among women by 2040, respectively. Maximum increase in overweight and obesity in older age groups and in rural versus urban areas from 2010 to 2040.(17)

It has been suggested by Venkatrao M et al. that 40.3% of Indians are obese. The south had the most zonal variances, at 46.51%, while the east had the lowest, at 32.96%. Obesity has been reported to be comparatively more common in women over 40 (45.81%) and 41.88% of those living in metropolitan areas. 44.17%).(18)

Hypertension in stages two and three was more common in both rural and urban areas in NFHS-5 than NFHS-4, in Uttar Pradesh nearly double in rural men. Bhansali A et.al. Say that in overall prevalence of HTN of 26.3%, newly detected HTN was very high i.e., 20.8% and self-reported is very low i.e., 5.5 %. Tamil Nadu, Jharkhand, Chandigarh, and Maharashtra had higher prevalence in Urban population than rural residents.(19)

Vijna, Mishra CP resulted that prevalence of hypertension was 31.5%. The age group of 45–64 years old had an increased risk of hypertension.(20)

The prevalence of diabetes is increasing considering NFHS5 than NHFS4 in Uttar Pradesh, much higher in urban than rural population. Men are found to be more diabetic prevalent than women. The total diabetes prevalence throughout India's 15 states by Anjana RM et. al. was 7•3%. Diabetes was more common in urban regions (11%) than in rural areas (5%) and in mainland states (8%) than in the northeast (5%) and ranged from 4.3% in Bihar to 10.0% in Punjab. (21)

Singh, P. et al. reported that the prevalence of type 2 diabetes in rural residential settings was found to be 8.03%. The prevalence was greater in the female population (9.91%) than in the male population (6.79%). Diabetes affected 19.74% of people over the age of 70, compared to just 2.95 percent of those in the 25–39 age range. The number of people with diabetes rises along with age.(22)

According to Kumar, A. et al., 11.7% of people in Meerut, Uttar Pradesh's rural population who are 30 years of age and older have diabetes. Research revealed a substantial correlation between the occurrence of

diabetes and getting older, genetic genealogy, status in society, and height and weight.(23)

Conclusion

Obesity, diabetes, and hypertension are among the lifestyle disorders that are becoming more common leads to the socioeconomic threat to population as well as nations. Therefore, there is a need for early lifestyle or behavioural change prevention measures as well as quality healthcare facilities that include initial prevention, education about health issues, screening, early detection, treatment, and management of lifestyle disease consequences. It is very important that drift of NCDs and their confederated risk factors play a very critical for making policies and guidelines for preventive and curative management.

Recommendation

To reduce the risks linked to non-communicable illnesses and to stimulate initiatives for their control and prevention, cooperation in the areas of finances, education, healthcare, and governance is necessary.

Relevance of the Study

The finding provide valuable insight information about increasing prevalence of lifestyle disease among adults. Knowing the pattern of these disease we have to emphasis on preventive measures & lifestyle changes along with curative care.

Authors Contribution

All authors had equally contribution.

Financial Support and Sponsorship

Nil

Conflict of Interest

None declared

Declaration of Generative AI and AI Assisted Technologies in the Writing Process

The authors haven't used any generative AI/AI assisted technologies in the writing process.

References

1. Sharma M, Majumdar PK. Occupational lifestyle diseases: An emerging issue.Indian J Occup Environ Med. 2009;13(3):109-12.
2. Tabish SA. Lifestyle diseases: consequences, characteristics, causes and control. J Cardiol Curr Res. 2017;9(3):00326.
3. World Health Organization (WHO). Non Communicable disease. 2023. Available from https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases. [Last accessed 24/06/2024].
4. Mane SV, Agarkhedkar SR, Karwa DS, Pande V, Singhania SS, Karambelkar GR. Study of risk factors for lifestyle diseases among adolescents in Western India. Int J Pharm Biomed Sci. 2012;3(4):224-8.
5. Ministry of Health and Family Welfare. Status of Non-Communicable Diseases (NCDs) in India. 2022. Available on https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1796435. [Last accessed 24/06/2024].
6. World Health Organization (WHO). Noncommunicable Diseases Progress Monitor 2020. Available from: https://www.who.int/publications/i/item/9789240000490. [Last accessed 24/06/2024].
7. Ahirwar R, Mondal PR. Prevalence of obesity in India: A systematic review. Diabetes Metab Syndr. 2019 Jan-Feb;13(1):318-321.
8. World Health Organization (WHO). Obesity and overweight.2020. Available from https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight. [Last accessed 24/06/2024]
9. Mukhra R, Kaur T, Krishan K, Kanchan T. Overweight and Obesity: A major concern for health in India. Clin Ter. 2018 Sep-Oct;169(5):e199-e201.
10. World Health Organization (WHO). Hypertension. 2023. Available on https://www.who.int/news-room/fact-sheets/detail/hypertension. [Last accessed 24/06/2024].
11. Kearney PM, Whelton M, Reynolds K, Muntner P, Whelton PK, He J. Global burden of hypertension: analysis of worldwide data. Lancet. 2005 Jan 15-21;365(9455):217-23.
12. Gupta R. Trends in hypertension epidemiology in India. J Hum Hypertens. 2004 Feb;18(2):73-8.
13. Intenational Diebetic Federation. IDF Diabetes Atlas reports. 2021. Avilable on https://www.idf.org/aboutdiabetes/what-is-diabetes/facts-figures.html [Last accessed 24/06/2024].
14. Pradeepa R, Mohan V. Epidemiology of type 2 diabetes in India. Indian J Ophthalmol. 2021 Nov;69(11):2932-2938.
15. Ranjani H, Mohan V. Prevention and control of noncommunicable diseases role of family physicians in improving compliance to lifestyle modification.Asia J Diabetology 2009, 11 (2). pp. 9-14.
16. Pradeepa R, Anjana RM, Joshi SR, Bhansali A, Deepa M, Joshi PP, Dhandania VK, Madhu SV, Rao PV, Geetha L, Subashini R, Unnikrishnan R, Shukla DK,

Kaur T, Mohan V, Das AK; ICMR-INDIAB Collaborative Study Group. Prevalence of generalized & abdominal obesity in urban & rural India--the ICMR-INDIAB Study (Phase-I) [ICMR-NDIAB-3]. Indian J Med Res. 2015 Aug;142(2):139-50.

17. Luhar S, Timæus IM, Jones R, Cunningham S, Patel SA, Kinra S, et.al. Forecasting the prevalence of overweight and obesity in India to 2040. PLoS One. 2020 Feb 24;15(2):e0229438.
18. Venkatrao M, Nagarathna R, Majumdar V, Patil SS, Rathi S, Nagendra H. Prevalence of Obesity in India and Its Neurological Implications: A Multifactor Analysis of a Nationwide Cross-Sectional Study. Annals of Neurosciences. 2020;27(3-4):153-161.
19. Bhansali A, Dhandania VK, Deepa M, Anjana RM, Joshi SR, Joshi PP, et.al., Prevalence of and risk factors for hypertension in urban and rural India: the ICMR-INDIAB study. J Hum Hypertens. 2015 Mar;29(3):204-9.
20. Vijna, Mishra CP. Prevalence and predictors of hypertension: Evidence from a study of rural India. J Family Med Prim Care. 2022 Mar;11(3):1047-1054.
21. Anjana RM, Deepa M, Pradeepa R, Mahanta J, Narain K, Das HK, et.al.; ICMR–INDIAB Collaborative Study Group. Prevalence of diabetes and prediabetes in 15 states of India: results from the ICMR-INDIAB population-based cross-sectional study. Lancet Diabetes Endocrinol. 2017 Aug;5(8):585-596.
22. Singh PS, Sharma H, Zafar KS, Singh PK, Yadav SK, Gautam, et al. Prevalence of type 2 diabetes mellitus in rural population of India: a study from Western Uttar Pradesh. Int J Res Med Sci. 2017;5(4):1363-1367.
23. Kumar A, Bano T, Garg SK, Singh G, Kumar S. Prevalence of diabetes mellitus in a rural population of north India. Int J Community Med Public Health. 2020;7(4):1465-1469.