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Prevalence of Non-Communicable Diseases and Its Relation with Demographic Variables among Women Residing on Urban Area of Uttar Pradesh

Meenakshi Manocha[1], Vasu Nikunj[2]

[1]Associate Professor, HOD, Department of Community Health Nursing, CON, Lucknow, India.
[2]Department of Surgery, Military Hospital Chennai, India.

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Corresponding Author:
Meenakshi Manocha, HOD, Department of Community Health Nursing, CON, Lucknow, India.

Email Id:
meenakshi.manocha@yahoo.com

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ABSTRACT

Non-communicable diseases (NCDs) pose a significant burden on public health in South East Asian countries, contributing to over 80% of all deaths. The World Health Organization (WHO) emphasizes the importance of ongoing surveillance of NCDs and their associated risk factors, employing the WHO Stepwise approach to surveillance (STEPS). This study aimed to investigate the prevalence and determinants of NCD risk factors in a Central Asian nation with a high annual mortality rate attributed to NCDs.

Between December 2021 and November 2022, a WHO STEPS survey was conducted among 1000 eligible participants aged 20-80. Data analysis was performed using SPSS version 20. The findings revealed significant proportions of participants being overweight or obese (BMI≥25kg/m^2) and morbidly obese (BMI≥40kg/m^2). Elevated blood pressure (BP) and blood glucose levels were also prevalent among the participants.

Further analysis indicated age-related patterns in NCD risk factors, with certain age groups being more predisposed to morbid obesity, elevated blood sugar, and blood pressure. Notably, individuals in the morbidly obese group were more frequently associated with elevated blood sugar and blood pressure levels.

These findings highlight the substantial prevalence of NCD risk factors in the population and emphasize the importance of targeted prevention and control initiatives. Utilizing this surveillance data can guide policy-making and monitoring efforts aimed at reducing mortality rates and enhancing public health and economic well-being.

Keywords: Disease, Health, Smoking, NCD, WHO

INTRODUCTION

In today's rapidly changing world, the prevalence of lifestyle diseases has reached alarming levels, posing a significant global public health challenge. These diseases, characterized by their association with modifiable lifestyle behaviors such as smoking, unhealthy diets, and physical inactivity, give rise to chronic conditions that include heart disease, stroke, diabetes, obesity, metabolic syndrome, chronic obstructive pulmonary disease, and certain types of cancer. The consequences of chronic diseases extend far beyond individual health, encompassing the loss of independence, years of disability, and even premature death, all while imposing a substantial economic burden on healthcare systems worldwide.

The gravity of this issue becomes evident when considering statistics provided by the World Health Organization (WHO), which estimated that, in 2005, chronic diseases were responsible for 61 percent of all global deaths and

accounted for 49 percent of the total burden of disease. Even more concerning is the projection that by 2030, the proportion of global deaths attributed to chronic diseases is expected to rise to a staggering 70 percent, with the associated burden of disease reaching 56 percent. As the United Nations Chronicle notes, non-communicable diseases (NCDs) have emerged as a paramount concern for public health in the 21st century, not only due to the immense human suffering they cause but also due to their adverse impacts on a country's socio-economic development.

On a global scale, NCDs claim the lives of approximately 41 million individuals each year, constituting a staggering 71 percent of global deaths. Shockingly, among this grim statistic, 14 million people meet their untimely demise between the ages of 30 and 70, highlighting the preventable nature of many premature NCD deaths. This dire situation is further reflected in India, where a WHO report from 2015 revealed that nearly 5.8 million people succumb to NCDs annually, equating to one in four Indians facing the risk of an NCD- related fatality before reaching the age of 70. The proliferation of NCDs on a global scale can be largely attributed to factors such as globalization, industrialization, rapid urbanization, as well as demographic and lifestyle changes.

While the statistics are grim, there is a ray of hope in the form of proactive lifestyle choices. Research suggests that adopting four key healthy lifestyle factors—maintaining a healthy weight, regular exercise, following a nutritious diet, and abstaining from smoking—can potentially reduce the risk of developing the most prevalent and life-threatening chronic diseases by as much as 80 percent. This underscores the importance of adhering to existing public health recommendations for cultivating and maintaining healthy lifestyle habits, especially since these habits often take root during formative stages in life.

Regrettably, despite the well-documented benefits of a healthy lifestyle, only a small fraction of adults adheres to such a regimen, with the numbers showing a concerning decline. This dilemma is exacerbated by a general lack of public awareness regarding the intricate link between health and lifestyle. While lifestyle choices may be perceived as personal matters, it is crucial to recognize that they are, in essence, social practices and ways of living shaped by personal, group, and socio- economic identities.[1]

To address this burgeoning crisis, the WHO has developed the Surveillance of NCD Risk Factors (STEPS) approach, aimed at enhancing global surveillance capabilities to monitor trends in non-communicable diseases at the country level. By employing standardized questions and protocols, countries can not only track local trends but also facilitate cross-country comparisons. This data-driven approach encourages the regular collection of pertinent information regarding a minimum set of risk factors closely associated with major non-communicable diseases, with the ultimate goal of informing comprehensive disease prevention strategies through population-level risk reduction.[2]

In light of the escalating burden of lifestyle-related chronic diseases, it is imperative to delve deeper into the intricate web of factors contributing to this global health crisis and explore potential strategies for mitigation. This comprehensive examination will allow us to better understand the profound impact of lifestyle on public health and underscore the urgency of embracing healthier choices on an individual and societal level.

MATERIALS AND METHODS

Study Setting

The research was conducted in an urban area of Central Uttar Pradesh (UP), India.

Objectives

The primary objectives of this research were as follows:

To assess the prevalence of Diabetes Mellitus (DM) and Hypertension (HTN) in the adult population.

To identify the risk factors associated with Non-Communicable Diseases (NCD) among the studied population.

To analyse the associations between identified risk factors and the occurrence of NCD.

A) Research Approach

Considering the nature of the research problem and the objectives of the study, a descriptive survey approach was deemed most suitable. Descriptive studies aim to provide an overview of a specific situation, such as the distribution of a disease within a population concerning factors like age, gender, and region. The survey approach, a non-experimental research type, was employed to investigate a community or a group of individuals. Data collection techniques in this study primarily consisted of questionnaires and interviews.

Research Design

The term "research design" refers to the systematic plan for conducting a scientific investigation. It constitutes the comprehensive blueprint that the researcher selects to execute the study, aiming to address research questions. The chosen research design guides the overall process of obtaining answers.

For this study, a cross-sectional descriptive research design was selected. Descriptive research studies are commonly used in epidemiology. This study relied on cross-sectional designs, wherein data were collected from the population at risk for the specific condition of interest. The researcher obtained a snapshot of the population at risk to determine the extent of the presence of the condition.

B) Setting

The research was conducted in an urban area within Central Uttar Pradesh (UP). The selection of this setting was based on factors such as the ease of population access, approachability, feasibility of conducting the study, and uniformity.

Variables under Study

In research studies, concepts are often referred to as variables. Variables are attributes or characteristics of individuals, groups, or situations that can take on different values and are fundamental elements of any study.

Independent Variables

Independent variables are considered the potential causes or determinants in a research study. In this study, the independent variables included age, weight, height, blood pressure, sedentary lifestyle, tobacco consumption, and obesity.

Dependent Variables

Dependent variables are the outcomes or characteristics that are presumed to change as a result of variations in the independent variables. In this study, the dependent variables were the presence of Diabetes Mellitus (DM) and Hypertension (HTN).

METHODOLOGY

Identification of Target and Accessible Population

In the context of this study, two important population groups were defined:

Accessible Population: The accessible population refers to the group of cases that meet specific criteria and are accessible for inclusion in the study.

Target Population: The target population represents the group of cases that the researcher is interested in and aims to generalize findings to.

The urban area under investigation had a total population of approximately 895,300 individuals. The target population considered for this study consisted of individuals aged between 20 and 70 years.

Sampling technique

Sampling is the process of selecting a portion of the population to represent the entire population so that inferences can be made. The samples were selected from the patients attending the OPD. A convenient sampling method was adopted.

Sample size

The sample size refers to the number of people to be inclu-Zed in the study. The appropriate sample size for a population-based survey is determined largely by three factors: (a) the estimated prevalence of the variable under study- diabetes and HTN among the samples, in this instance, (ii) the desired level of confidence and (iii) the acceptable margin of error.

The sample size was calculated using the formula-

$$n = \frac{t^2 \times p\,(1-p)}{d^2}$$

$$= \frac{(1.96)^2 \times p \times q}{d^2}$$

Description

n = required sample size

t^2= confidence level at 95% (standard value is 1.96)

p= estimated prevalence of diabetes among the population (7.6%)

q= 1- p

d= margin of error at 1/4th of prevalence.

In this study, the sample size was calculated considering the prevalence of Diabetes as 7.6% as per WHO statistics.

$$= \frac{3.8416 \times .076 \times 0.924}{(0.019)^2} = 747.29 = 750 = 1000$$

The sample size for HTN was calculated using the formula-

$$n = \frac{t^2 \times p\,(1-p)}{d^2}$$

$$= \frac{(1.96)^2 \times p \times q}{d^2}$$

Description

n = required sample size

t^2= confidence level at 95% (standard value is 1.96)

p= estimated prevalence of diabetes among the population (22%)

q= 1- p

d= margin of error at 5%.

In this study, the sample size was calculated considering the prevalence of Diabetes as 22% as per WHO statistics.

$$= \frac{3.8416 \times .22 \times 0.78}{(0.05)^2} = 264 = 500$$

A sample of 1000 was selected for the study purpose.

Inclusion and Exclusion Criteria:

Eligibility criteria, often referred to as inclusion and exclusion criteria, play a pivotal role in defining the characteristics of the study population. In this study, inclusion criteria were used to identify eligible participants:

a) Age Range: Individuals between the ages of 20 to 70 years.

b) Willingness: Participants who expressed a willingness to participate in the study.

c) Presence: Individuals who were present at the time of the study.

d) Residency: Permanent residents of the designated area.

Conversely, exclusion criteria identified individuals who did not meet the specific characteristics required for the study:

a) Diabetes Treatment: Participants currently undergoing treatment for diabetes were excluded.

b) Hypertension Treatment: Individuals receiving treatment for hypertension were excluded.

c) Unwillingness: Those who were unwilling to participate in the study.

Tool Preparation

To collect relevant data, the study employed a structured questionnaire called "STEPS" by the World Health Organization (WHO). Additionally, observation tools were prepared to assess physical measurements, including height, weight (for calculating BMI), and blood pressure, to detect hypertension. Blood sugar analysis was conducted to identify cases of diabetes mellitus.

The WHO STEPS approach comprised three sections

Step I: This section gathered demographic information about the subjects, including age, sex, marital status, socio-economic characteristics, and behavioural measurements.

Step II: Focused on the observation of physical measurements, such as height and weight.

Step III: Involved the observation of biochemical measurements, including blood sugar analysis.

Feasibility Study

A crucial consideration in any research project is its feasibility. This study found that it was feasible in terms of time and resources. The sample size was determined to be adequate for collecting data within the allotted time frame.

Pilot Study

A pilot study, involving 30 subjects who shared similar characteristics with the main study sample, was conducted. The primary objective of the pilot study was to test the methods and procedures to be employed in the larger, more comprehensive study. Researchers assessed the time taken by each respondent to answer questions and conducted clinical examinations as part of this phase.

Reliability and Validity

For data reliability and validity, the study employed the WHO STEPS Instrument (Core and Expanded), which is a pre-validated and standardized instrument.

Accuracy of the Instrument

a) Weight: Electronic weighing machines were used to measure clients' weight. The reliability of these machines was confirmed through daily comparisons with an electronic weighing machine used by the investigator for a week before the study. The same machine was consistently used throughout the study, and procedures were standardized.

b) Height: Portable height scales were used to measure height without footwear.

c) Blood Pressure: Blood pressure was recorded using the calibrated Mindray PM 8000 express NIBP machine, which was used consistently throughout the study.

d) Blood Sugar and Lipid Profile: Blood sugar levels were estimated through fasting and post-prandial samples, while lipid profiles were assessed using fasting samples.

Data Collection Method

Data collection spanned a two-year period from 2019 to 2021,

with data collected during the OPD (Outpatient Department) hours of the hospital, from 0800 hours to 1600 hours. During the interviews, subjects were asked questions based on the structured questionnaire. Weight measurements were taken without footwear, with the instrument calibrated to '0' kg before each individual's weighing. Height measurements were recorded without footwear, with the subject's shoulders, buttocks, and heels touching the wall. Blood pressure was measured using the standard NIBP machine while the subject was in a comfortable sitting position. Blood sugar levels were estimated using fasting and post-prandial samples shown in table 1.

Table 1: Parameters considered for the standardizing the findings

HTN	NORMAL	PRE HTN	STAGE I HTN	STAGE II HTN
SBP	<120	120-139	140-159	>160
DBP	<80	80-89	90-99	>100
DM				
DM	NORMAL	Stage I DM	STAGE II DM	
	>100	100-125	>126	
BMI				
BMI	NORMAL	Overweight	Obese	Morbid obesity
	>18.5	18.5->24.9	>25- <30	>30

*SBP= Systolic Blood Pressure; DBP= Diastolic Blood Pressure; BMI= Body Mass Index; BSL= Blood Sugar Level; HTN=Hypertension

Table 2: Distribution of study samples as per the age

Age	Frequency	Percentage
20-30	108	10.80%
31-40	223	22.30%
41-50	195	19.50%
51-60	283	28.30%
61-70	169	16.90%
71-80	22	2.20%
TOTAL	1000	100%

In conclusion, this public health study meticulously planned its inclusion and exclusion criteria, employed standardized tools, conducted feasibility and pilot studies, and ensured data reliability and validity throughout the data collection process. These rigorous methodologies are essential to produce high-quality data for informed public health decision-making.

RESULTS

Understanding the age distribution of a population or a sample is essential for various demographic and sociological studies. In this analysis, we will examine the age distribution of a sample comprising 1000 individuals shown in table 2.

Age Categories and Frequency:

The sample is divided into six age categories, and each category is represented by a specific age range. Here are the age categories along with the corresponding frequency and percentage of the sample they represent:

This analysis provides insights into the age distribution of a sample of 1000 individuals. Understanding the age composition of a population or sample is crucial for making informed decisions in fields such as marketing, healthcare, and social policy, as it can help tailor services and strategies to specific age groups.

Key Observations:

Middle-aged Dominance: The age group ranging from 41 to 60 years (41-50 and 51-60) collectively represents nearly half (48%) of the sample. This suggests that the sample is skewed towards middle-aged individuals.

Youth and Seniors: Individuals in their 20s and 30s (20-30) represent a significant portion (10.8%) of the sample, while those aged 71-80 make up the smallest percentage (2.2%), indicating a relatively lower representation of youth and seniors in the sample.

Diversity: The sample's age distribution reflects a diverse range of ages, which can be valuable for conducting various studies and analyses.

The samples were categorized as per the BMI classification to understand the prevalence of Obesity among the samples. From the above graph it is evident that majority (55.8%) of the samples were morbidly obese while 25.9% were in the category of obesity. Only 1.6% samples were in the normal BMI range figure 1.

This data gives us an insight that the population is moving towards life style diseases at an alarming speed and are thus at a high risk for NCDs. Sedentary life style and lack of attitude towards self-care is endangering the population and making them vulnerable.

Figure 2, denotes that in the present study that out of 1000 women, a total number of 645 were detected to have Diabetes. This analysis suggests that women are at high risk of diabetes.

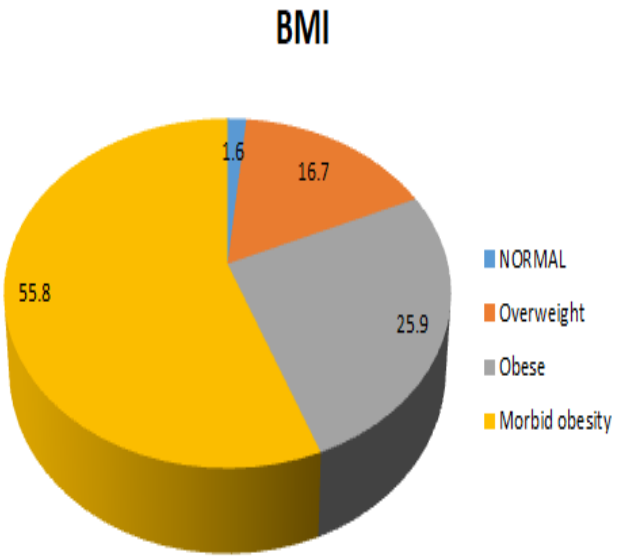

Figure 1: Distribution of samples as per BMI category

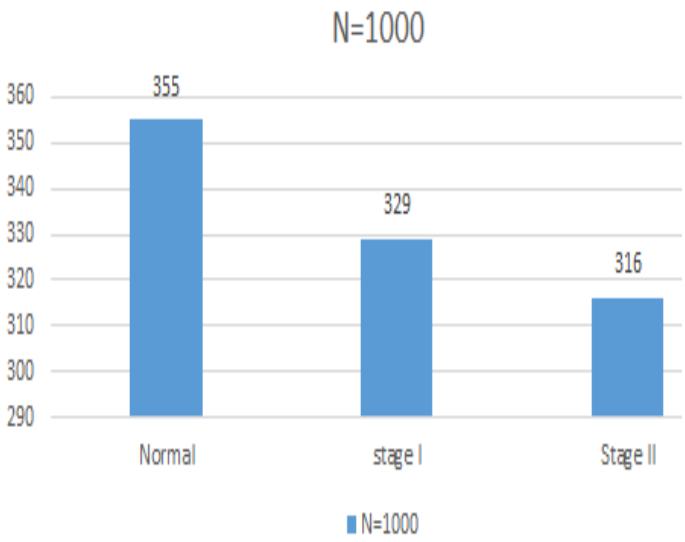

Figure 2: Distribution of samples detected to have diabetes

Table 3 depicts that maximum number of overweight samples were in the age group of 31- 40 yrs. (23.32%), obese women in the age group of 31-40 yrs and 67.84% women were found to have morbid obesity. Statistically there is a highly significant association between obesity and Age($p<0.001$). This strong association suggests that obesity in the younger age women is on the rise and puts them in high risk for various NCDs.

Table 4 data reveals that there is a strong association between DM and Age. It can be seen that maximum (84%) women in the age group of 31-40 yes were found to have stage I

Table 3: Association between age and BMI

20-30		AGE						Total		
		31-40	41-50	51-60	61-70	71-80		Chi SQUARE Value	p Value	
BMI	NORMAL	4(3.7)	1(0.45)	3(1.54)	3(1.06)	4(2.37)	1(4.55)	16(1.6)	133.21	<0.001
	Overweight	50(46.3)	52(23.32)	17(8.72)	21(7.42)	22(13.02)	5(22.73)	167(16.7)		
	Obese	26(24.07)	66(29.6)	44(22.56)	67(23.67)	47(27.81)	9(40.91)	259(25.9)		
	Morbid obesity	28(25.93)	104(46.64)	131(67.18)	192(67.84)	96(56.8)	7(31.82)	558(55.8)		
Total		108(100)	223(100)	195(100)	283(100)	169(100)	22(100)	1000(100)		

Table 4: Association between Age and DM

20-30		AGE						Total		
		31-40	41-50	51-60	61-70	71-80		Chi SQUARE Value	p Value	
DM	NORMAL	63(58.33)	111(49.78)	66(33.85)	77(27.21)	34(20.12)	4(18.18)	355(35.5)	151.52	<0.001
	Stage I DM	40(37.04)	84(37.67)	75(38.46)	68(24.03)	55(32.54)	7(31.82)	329(32.9)		
	STAGE II DM	5(4.63)	28(12.56)	54(27.69)	138(48.76)	80(47.34)	11(50)	316(31.6)		
Total		108(100)	223(100)	195(100)	283(100)	169(100)	22(100)	1000(100)		

DM and 48.76% women had stage II DM in the age group 51-60 yrs. But it is also noteworthy 37% women had stage I DM in the age group 20-30 yrs.

It can be thus concluded that DM in the young women is seen as an increasing trend and it is no more a disease of the elderly.

Table 5 shows that as per the JNC VII criteria, that out of 1000 samples 145 women were in the pre HTN category (BP range 120-139 and 80-89mm of Hg), 346 (34.6%) had Grade I HTN (BP range 140-159 and 90-99 mm of Hg) and 174 (17.4%) had Grade II HTN (BP range >160 and >100 mm of Hg). It is depicted from the above analysis that there exists a very strong association ($p<0.001$) between Age and HTN. It can be seen that 16.67% women were in the Pre HTN group, 42% and 24.03% women were having stage I HTN in the age group 51-60 yrs. Here it can deduct that HTN has no age barrier and is more women in the younger age group are suffering from HTN.

It can be concluded from the above findings that as the BMI increases the risk of DM increases. It can be explained that Obesity possesses a very high risk of DM and endangers the life of the individual. It can be seen in the table below that as the weight increases the risk of HTN also increases.

Hence, it is proven that more the BMI more is the risk of DM and HTN. This brings out the fact that NCDs are no more the disease of the elderly but affects all the age groups.

An OR of 2.13 infers that the Odds of developing DM in obese women is 2.13 times higher than the odds of developing DM in women with normal BMI. A RR of 1.84 indicates that the risk of developing DM in obese women is as compared to non-obese women is 1.84.

Table 5: Association between age and HTN

HTN 20-30		AGE 31-40	41-50	51-60	61-70	71-80		Total Chi SQUARE Value	p Value	
	Normal	78 (72.22	123 (55.16)	67 (34.36	53 (18.73)	13 (7.69)	1 (4.55)	335 (33.5)	272.15	<0.001
	Pre HTN	18 (16.67	33 (14.8)	24 (12.31	43 (15.19)	24 (14.2)	3 (13.64	145 (14.5)		
	stage I	12 (11.11	59 (26.46)	80 (41.03	119 (42.05)	68 (40.24	8 (36.36	346 (34.6)		
	stage II	0(0)	8 (3.59)	24 (12.31	68 (24.03)	64 (37.87	10 (45.45	174 (17.4)		
Total		108 (100)	223 (100)	195 (100)	283 (100)	169 (100)	22 (100)	1000 (100)		

Discussion

The present community-based study was a cross-sectional study to determine the prevalence of NCDs among the women residing in an urban area. The study was done over a period of two years. Purposive sampling was the sampling technique. A total of 1000 women were included in the study. WHO STEPs tool was used for the data collection. Analysis and interpretation of data was done using statistical and inferential statistics.

Proportion of women

In the present study it is seen that the population the middle-aged population is more than the young adults and elderly population. The age group ranging from 41 to 60 years (41-50 and 51-60) collectively represents nearly half (48%) of the sample. This trend of more middle-aged population was also more in the study conducted in Gujarat [2] where 47% of the samples belong to the age group between 35-60 yrs. As per another study done in Himachal Pradesh [3], 52% of the sample population belonged to the age group 30-49 yrs.

The overall impression is that there is predominance of middle-aged population in the country.

Prevalence of Diabetes among the women

Diabetes Mellitus is the commonest metabolic disease in the world. Type 2 DM is the commonest form of diabetes constituting 90 percent of the diabetic population in any country. Similarly, we found that out of 1000 women, a total

number of 645 were detected to have Diabetes. A new study on prevalence of Diabetes in middle aged women in southern and Eastern states were higher than central India. We also observed in our study that 37% of the women detected to have Diabetes belonged to 20-30 yrs. A Banglorean study brings out that out of the total respondents, 75.8% belonged to the age range of 18-25 years whereas only 4.6% of the study population was above 40 years. A strong association was also found between age and onset of Diabetes ($p<0.001$). This analysis suggests that middle aged women are at high risk of diabetes.[4]

Magnitude of obesity among women

It was seen that maximum number of overweight samples were in the age group of 31-40 yrs (23.32%), morbidly obese women were in the age group of 51-60 yrs (67.84%). it is also seen that 67 (29.6%) obese women were in the age group 31-40 yrs. Statistically there is a highly significant association between obesity and Age($p<0.001$). This strong association suggests that obesity in the younger age women is on the rise and puts them in high risk for various NCDs.

Prevalence of HTN

We also found that as per the JNC VII criteria, 145 women were in the pre HTN category (BP range 120-139 and 80-89mm of Hg), 346 (34.6%) had Grade I HTN (BP range 140-159 and 90-99 mm of Hg) and 174 (17.4%) had Grade II HTN (BP range >160 and >100 mm of Hg). depicted from the above analysis that there exists a very strong association ($p<0.001$) between Age and HTN. It was also seen that 16.67% women were in the Pre HTN group, 42% and 24.03% women were having stage I HTN in the age group 51-60 yrs. Here it can deducted that HTN has no age barrier and is more women in the younger age group are suffering from HTN. Another study showed that the prevalence of HTN reported is 52% is comparatively higher than reported by NFHS-4 is 11.3%.[(5)] Another recent study reported that women were less likely to be hypertensive in younger age group 24.1% as compared to older samples (46.4%). overall females were slightly more predisposed to hypertension than males (46.4% in females vs. 44.7% in males).[6]

Another finding in this study tells us that as the BMI increases the risk of DM increases. It can be explained that Obesity possesses a very high risk of DM and endangers the life of the individual. It can be seen in the table below that as the weight increases the risk of HTN also increases.[7]

Hence, it is proven that more the BMI more is the risk of DM and HTN. This brings out the fact that NCDs are no more the disease of the elderly but affects all the age groups.[8]

CONCLUSION

The prevalence of NCD risk factors, especially obesity, hypertension, and elevated blood sugar levels, is a major public health concern in the urban area of Uttar Pradesh. This study's findings underscore the need for comprehensive NCD prevention and control initiatives, targeting middle-aged and older individuals, and highlight the importance of addressing obesity as a key risk factor. By implementing effective policies and strategies, there is an opportunity to reduce the burden of NCDs, improve overall health outcomes, and enhance economic well-being in the region.

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CONFLICT OF INTEREST

None

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