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A mixed method study to assess the risk factors, level of knowledge and perception of diabetes & hypertension among people attending screening OPD in a tertiary care hospital in Mumbai

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ABSTRACT

Introduction

NCD's pose a global health challenge, causing majority of deaths, especially in low- income countries. Screening provides means for early detection of these diseases & its associated risk factors, thereby reducing the risks posed by them. This study aims to assess the risk factors, knowledge & perception levels of DM and HTN among individuals attending screening OPD.

Methodology

Study setting was NCD screening corner by Lokmanya Tilak Municipal College, Mumbai which uses mixed method approach where after measurement of blood glucose and blood pressure, BMI, W/H ratio of the participants, a pre-tested questionnaire was administered. Multiple FGD's were conducted to assess the knowledge and perception levels.

Results

Out of 288 participants 77.77 % had blood pressure levels lower & 52.01% had blood sugar higher than cut off values. 52.08% had good knowledge level score and 82.09% had high perception level score. BMI, knowledge level, perception levels, alcohol and tobacco consumption were significantly associated with suspected hypertension and suspected Diabetes (P-value < 0.05). Adjusted logistic regression model showed, tobacco consumption (AOR= 2.14, P=0.048), BMI (AOR= 1.91, P=0.046), and perception levels (AOR= 2.05, P=0.049) were significantly associated with increased odds of high blood pressure levels, only BMI (AOR= 1.71, P=0.035), was significantly associated with increased odds of high blood sugar levels.

Conclusion

Risk factors found significant were addiction of alcohol and tobacco, raised BMI, having poor knowledge & perception about the diseases. Qualitative analysis, showed participants had poor knowledge about risk factors and weren't open for lifestyle changes for prevention.

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INTRODUCTION

Non-communicable diseases (NCDs) cause 71% of global deaths, which is more than 75% in the low-middle-income countries.[1] NCDs also account for a large proportion of deaths among those aged 30–69 years.[2] This is the major motivation behind the agenda for Sustainable Developmental goals 2030, which targets reduction of premature deaths from NCDs by one-third.[3] In India NCDs were responsible for 63% of all deaths in 2016 alone.[2] India has nearly 72 million persons with diabetes mellitus (DM), which accounts for 49% of global burden and 207 million people with hypertension (HTN).[4–7] Early identification and rapid management is the answer to decrease premature mortality and morbidity due to these NCDs.[8] Opportunistic screening for persons aged ≥30 years at all public health centres is an integral strategy for early detection of DM and HTN under the National Programme for Prevention and Control of Non-Communicable Diseases.[9] It has been found that Rapid urbanization, increasing elderly population, male sex, sedentary life, consumption of alcohol, tobacco, and dietary changes act together as a web of risk factors which and leads to several chronic diseases like hypertension and diabetes.[10] Moreover, it has been seen that all with lower levels of knowledge and risk perception regarding hypertension, and diabetes were the most vulnerable to it and the related health outcomes.[11] In this context, understanding the risk factors like high blood sugar levels (≥140mg/dl), high blood pressure levels (≥140/90mmhg), level of knowledge, and perceptions surrounding diabetes and hypertension becomes crucial for effective prevention and management strategies. Despite their escalating impact, there is a critical gap in understanding the local context-specific risk factors and the knowledge and perceptions of affected individuals. This study aims to conduct a comprehensive assessment of diabetes and hypertension among individuals attending the screening Outpatient Department of a tertiary care hospital. By employing a mixed-method approach, we seek to capture the multifaceted nature of these health issues, integrating quantitative data on risk factors with qualitative insights into knowledge and perceptions.

Methodology

The present mixed method study was conducted in the Non-Communicable Disease (NCD) screening Out Patient Department of a tertiary care centre in a metropolitan city. Patients / their relatives above 30 years of age attending the OPD were included in the study. Sample size was calculated using Cochrane's formula $N = Z^2pq/d^2$ where prevalence taken was 25%[12] The calculation was estimated considering a 95% confidence level, final sample size was estimated at 288. The study was conducted for a period of 2 months between June – July 2023 taking every 10th person attending the NCD screening OPD as the study subject using systematic sampling technique till the sample size was met. Pregnant females, people with chronic kidney and liver diseases, or any other serious medical condition were excluded from the study. After taking approval from institutional Ethics Committee and informed written consent from individual study participants, a semi- structured questionnaire was filled, where the participants were enquired about their Socio-demographic details, their Personal habits including history of tobacco and alcohol use, their Dietary details, details of their physical activity. This was followed by Measurement of height, weight & calculation, along with their hip and waist circumference. Measurement of their Blood pressure and Random blood sugar was also done. Knowledge of the study population regarding diabetes and hypertension was assessed using a pre-structured, interviewer-administered questionnaire having 16 questions. Questions included, have you heard about the diseases, from where, do you know about the risk factors, do you think age, genetics, unhealthy diet, increased stress levels, having tobacco, alcohol, being obese and not doing any physical activity are risk factors for these diseases, do you think if these diseases can be treated, prevented. Are you aware of the complications, organs that can be affected, screening methods, age of doing screening, are you aware of any government initiatives to combat these diseases. One mark was given for each correct response. Those having Score 9 - 16 were labelled as having Adequate knowledge & those having score between 1 – 8 were said to have poor knowledge. To assess their level of perception in the quantitative study method, a questionnaire having 10 questions was developed, questions included were, will having Hypertension/ Diabetes affect my life? Will I have to compromise my lifestyle to control DM/HT? Were these diseases mainly found among the rich? Were these diseases mainly found in

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the Urban areas compared to the Rural? Is a confirmatory test necessary for its diagnosis? Were these diseases are better controlled among the young? Were Private clinics better than government hospitals? Should Screening of these diseases be started by the government? Is of Quality of care important for the management of these diseases? Is patient education and awareness is required for prevention & control? Those having score between 6 – 10 were said to have good level of perception & those with score between 1 - 5 were labelled as having poor perception. To further understand the perception of the study participants, qualitative method was used where multiple Focus Group Discussions were conducted with 8 – 10 participants in each session, using open ended questions, and encouraging the participants to speak. Data was collected till saturation was achieved. The responses from the participants were recorded and then translated and transcribed.

Table 1. Socio demographic information

Demographic Characteristics	N	%	μ	S. E	SD
Age					
30-40 Years	76	26.6	35.5	0.36	3.14
41- 50 Years	72	25.1	45.9	0.34	2.94
51 – 60 Years	78	27.4	55.7	0.33	8.41
61 -70 Years	38	13.6	64.73	0.38	2.36
> 71	24	8.7	75.1	0.82	4.04
Gender					
Male	160	55.5			
Female	128	44.4			
Religion					
Hindu	197	68.3			
Others	91	31.6			
Marital Status					
Married	278	96.7			
Unmarried	10	3.2			
Education Status					
Illiterate	44	15.2			
Primary School	48	16.6			
Middle School	50	17.3			
High School	71	24.6			
Intermediate /Diploma	39	13.5			
Graduate And Professional Degree	36	12.5			

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Occupation **Unemployed**	118	40.7			
Unskilled Worker	39	13.5			
Semi- Skilled Worker	73	25.1			
Skilled Worker	33	11.3			
Clerical/Shop/Farmer	12	4.1			
Semi-Professional/Professional	13	4.4			
Socioeconomic Status **Upper**	5	1.7			
Upper Middle	20	6.9			
Lower Middle	42	14.4			
Upper Lower	181	62.5			
Lower	40	13.7			

N depicts the number of study participants; % depicts the percentage; μ depicts the mean ; S.E. depicts the standard error and
S.D depicts the standard deviation

Data analysis

Quantitative data was entered in excel and was analysed in Statistical Package for the Social Sciences (IBM SPSS 20.0.0 Statistics). Quantitative data were summarized as percentages. Risk factors were corelated with suspect for DM or HTN. Using chi-Square formula. A p-value of <0.05 was considered as the criterion of statistical significance. Logistic regression was used with risk factors which were statistically significantly associated with high blood glucose (suspect DM) and high blood pressure (suspect HTN) values. Adjusted Odds Ratios with 95% confidence intervals were calculated to eliminate the confounders. Qualitative data from the audio-recorded FGDs were translated and transcribed. Thematic analysis by manual coding was carried to generate various categories/ themes under the broad topics (lifestyle changes, perceived symptoms, prevention, seeking medical help and control). Any discrepancy in coding was resolved through discussion and referral back to the audio files if necessary. The codes were then organised into categories and common themes and presented in flow diagram

Table 2. Risk factors and Health practices in the participants

Risk criteria	N	%	mean	S. E	SD
BMI					
Underweight	7	4.5	16.85	0.40	1.06
Normal range	104	67.7	22.30	0.14	1.36
Overweight	108	70.9	26.89	0.12	1.31
Obese	69	45.3	32.94	0.36	3.22
BLOOD PRESSURE					
≥ 140/90mmhg	64	22.2	153.00	153.3	13.82

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<140	224	77.7	138.0	118.1	0.77
RANDOM BLOOD SUGAR					
≥140 mm hg	147	51.0	209.3	6.06	73.2
<140 mm hg	141	48.9	111.3	1.41	16.8
KNOWLEDGE SCORE					
<8	138	47.9	4.44	0.16	1.9
≥8	150	52.0	10.59	0.17	2.19
PERCEPTION SCORE					
<5	49	17.01	4.00	2.93	0.14
≥5	239	82.9	7.10	0.08	1.34
ALCOHOL CONSUMPTION					
Yes	40	13.8			
NO	248	86.1			
TOBACCO CONSUMPTION					
Yes	51	17.7			
No	237	82.2			
ADDS EXTRA SALT IN FOOD					
Yes	36	12.5			
No	252	87.5			
TAKES 5 SERVINGSOF FRUIT/DAY					
Yes	20	6.9			
No	268	93.0			
WALKS ATLEAST FOR 30MINS/DAY					
Yes	191	66.3			
No	97	33.6			
FAMILY HISTORY OF DM /HTN					
DM	58	19.4			
HTN	17	5.6			
DM+ HTN	21	6.9			
NO	192	67.9			
CENTRAL OBESITY					
yes	250	86.8			
no	38	13.1			
FAMILY SIZE					
4 and lower	149	51.7			
>4	139	48.2			

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N depicts the number of study participants; % depicts the percentage; μ depicts the mean; S.E. depicts the standard error and
S.D depicts the standard deviation

Results

Out of total 288 participants with males constituting approximately 160(56%) of the total subjects, 78(27.4%) participants to belonged 51-60 years of age group. The mean age in our sample was approximately 50.2 years, with the standard deviation of 3.7 years. There were 197(68.38%) subjects identifying as Hindu and 278(96.76%), of the total subjects were married. A total of 71(24.65%) subjects had completed high school education and 118 (40.76%) participants were unemployed. A majority of 108(67.76%) participants fell within the overweight category of body mass index and 192(94%) of participants did not have a family history of DM or HTN. A total of 252(87.50%) the participants denied adding extra salt to their food, 191(66.32%) denied engaging in physical activity like at least 30 minutes of walking per day. A total of 268(93.06%) did not consume fruits five times a day. A majority of 250(86.80%) participants exhibited central obesity. Majority of 266(92.35%) did not consume adequate calories, 248(86.11%) denied consumption alcohol and 237(82.29%) denied consumption of any form of tobacco. Majority of 224(77.77 %) participants who attended the NCD screening Opd had blood pressure levels lower than the cut off value <140/80mmhg but 147(52.01%) had random blood sugar levels higher than the cut off value of <140 mg/dl. Approx. 157(52.08%) of participants had good knowledge levels (≥8) about diabetes and hypertension and 239 (82.09%) had high perception levels (≥5) regarding diabetes and hypertension.

Association between variables and Suspect HTN (Blood pressure levels ≥140/80mmhg) Five out of twenty-one risk factors were statistically significant predictors of people with suspected hypertension, including BMI, knowledge level, perception levels, alcohol and tobacco consumption. (P-value < 0.05). Participants with higher knowledge and perception scores had lower levels of blood pressure values (<140/90mmhg). Similarly, participants with BMI lesser than 25 kg/cm^2, and no h/o alcohol and tobacco consumption had lower levels of blood pressure values below the cut off levels (<140/90mmhg).

Association between variables and Suspect Diabetes (Random Blood sugar levels ≥140mg/dl)- Six out of twenty-one risk factors were statistically significant predictors of people with suspected Diabetes (Random Blood sugar levels ≥140mg/dl), including gender, BMI, knowledge level, perception levels, alcohol and tobacco consumption (P-value < 0.05). Participants with higher knowledge and perception scores had lower levels of Random blood sugar values (<140/80mmhg). Similarly, participants with BMI lesser than 25 kg/cm^2, and no h/o alcohol and tobacco consumption had lower levels of blood pressure values below the cut off levels (<140/80mmhg).

Results of the Adjusted logistic regression model showed that, tobacco consumption (AOR= 2.149, P=0.048), BMI (AOR= 1.910, P=0.046), and perception levels (AOR= 2.056, P=0.049) were significantly associated with increase in odds of high blood pressure levels while adjusted logistic regression model also showed that, BMI (AOR= 1.713, P=0.035), was significantly associated with increase in odds of high blood sugar levels.

TABLE 3. Association of Risk Factors and Health practices with Suspect Hypertension and Suspect Diabetes

Risk Factors & Behaviours	Suspect Hypertension				Suspect Diabetes			
	Yes n (%)	No n (%)	P Value	OR (95% CI)	Yes n (%)	No n (%)	P VALUE	OR (95% CI)
AGE >50								
YES	27 (18.2)	121 (81.7)	0.9	**1.61 (0.91 – 2.82)**	68 (45.94)	80 (54.05)	0.07	**1.52 (0.95 – 2.42)**
NO	37 (26.4)	103 (73.5)			79 (56.42)	61 (43.57)		
GENDER								
MALE	40 (25)	120 (75)	0.2	**1.44 (0.81 – 2.55)**	85 (53.12)	75 (46.87)	0.01	**1.20 (0.75 – 1.92)**
FEMALE	24 (18.75)	104 (81.25)			50 (39.06)	78 (60.93)		
RELIGION								
HINDU	39 (19.30)	163 (80.6)	0.06	**0.54 (0.30-0.97)**	98 (48.5)	104 (51.48)	0.3	**0.63 (0.37 – 1.01)**
OTHERS	25 (29.06)	61 (70.9)			47 (54.65)	39 (45.34)		
FAMILY HISTORY								
YES	21 (21.64)	76 (78.35)	0.86	**0.95 (0.57-1.71)**	51 (52.57)	46 (47.42)	0.9	**0.91 (0.55 – 1.48)**
NO	43 (22.5)	148 77.48			99 (51.8)	92 (48.16)		
EDUCATION								
Up-to secondary level	38 (26.7)	104 (73.23)	0.06	**3.86 (1.58-9.40)**	75 (52.81)	67 (47.18)	0.4	**1.22 (0.71 – 2.10)**
High school and above	26 (17.80	120 (82.19)			71 (48.63)	75 (51.3)		

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SOCIOECONOMIC STATUS								
LOWER	8 (19.5)	33 (80.48)	0.6	**0.99 (0.55-1.76)**	24 (58.53)	17 (41.4)	0.2	**1.61 (0.91 – 2.82)**
MIDDLE AND ABOVE	56 (22.67)	191 (77.3)			124(50.20)	123 (49.79)		
EXTRA SALT CONSUMPTION								
YES	10 (27.77)	26 (72.22)	0.39	**1.12 (0.53 – 2.35)**	17 (47.22)	19(52.77)	0.6	**1.60 (0.84 – 3.06)**
NO	54 (21.4)	198 (78.5)			129(51.19)	123(48.80)		
ADEQUATE CALORIES								
YES	4 (18.18)	18 (81.81)	0.63	**1.31 (0.42-4.02)**	10(45.45)	12(54.54)	0.58	**1.27 (0.53 – 3.05)**
NO	60(22.5)	206 (77.44)			137(51.50)	129(48.49)		
WALK 30 MINS A DAY								
YES	42 (21.9)	149 (78.01)	0.89	**1.04 (0.57 – 1.86)**	94 (49.21)	97 (50.78)	0.3	**1.24 (0.76 – 2.02)**
NO	22 (22.68)	75 (77.31)			53(54.63)	44 (45.36)		
FRUITS >5 TIMES A DAY								
YES	4 (20)	16 (80)	0.8	**1.15 (0.37 – 3.58)**	10 (50)	10 (50)	0.9	**1.04 (0.42 – 2.59)**
NO	60 (22.3)	208 (77.6)			137(51.11)	131 (48.88)		
EMPLOYED								
YES	37 (22.02)	131 (77.97)	0.9	**0.95 (0.54-1.67)**	84 (50)	84 (50)	0.6	**0.57 (0.54 – 1.37)**
NO	27 (22.5)	93 (77.5)			63 52.5	57 (47.5)		
FAMILY SIZE								

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4 AND LOWER	29 (19.4)	120 (80.53)	0.2	**1.36 (0.78-2.38)**	76 (51.0)	73 (48.99)	0.9	**1.03 (0.64 – 1.63)**
>4	35 (25.17)	104 (74.8)			71 (51.07)	68 (48.9)		
H/O ALCOHOL								
YES	14 (35)	26 (65)	0.03	**2.13 (1.03-4.38)**	29 (72.5)	11 (27.5)	0.00	**2.90 (1.38 – 6.07)**
NO	50(20.16)	198 (79.83)			118 (47.5)	130 (52.41)		
H/O TOBACCO CONSUMPTION								
YES	20 (36.36)	35 (63.63)	0.00	**2.45 (1.29 – 4.65)**	38 (69.09)	17 (30.9)	0.00	**2.54 (1.35 – 4.76)**
NO	44 (18.88)	189 (81.11)			109 (46.7)	124 (53.21)		
BMI>=25								
YES	47 (26.55)	130 (73.44)	0.02	**1.99 (0.08 - 3.69)**	100 (56.4)	77 (43.50)	0.019	**1.76 (1.09 – 2.85)**
NO	17 (15.31)	94 (84.68)			47 (42.34)	64 (57.65)		
CENTRAL OBESITY								
YES	60 (24)	190 (76)	0.62	**2.68 (0.91 – 7.87)**	133 (53.2)	117 (46.8)	0.60	**1.94 (0.96 – 3.94)**
NO	4 (10.5)	34 (89.4)			14 (36.84)	24 (63.15)		
KNOWLEDGE SCORE								
<8	40 (28.9)	98 (71.01)	0.00	**2.14 (1.21-3.79)**	79 (57.24)	59 (42.75)	0.04	**1.61 (1.03 – 2.57)**
>=8	24 (16)	126 (84)			68 (45.33)	82 (54.66)		
PERCEPTION SCORE								
<5	27 (33.33	53 (65.4)	0.00	**2.43 (1.25-**	50 (62.5)	30 (37.5)	0.01	**1.82 (0.96 – 3.44)**

	)			4.73)			
>=5	37 (17.8)	171 (82.60)			97 (46.6)	111 (53.3)	

**p value <0.05 is statistically significant; n depicts number of participants; % depicts the percentages; OR depicts odds ratio*

Qualitative Results

Data from our FGDs have revealed four major themes in assessing knowledge levels in study participants – information regarding meaning, symptoms, causes and consequences of diabetes and hypertension. Majority of the participants did not know the meaning of diabetes and hypertension but around 10 % reported that diabetes is caused due to deficiency of insulin hormone and persistent high blood sugar levels while hypertension is something in which there is high blood pressure level. When asked about the symptoms 60% of the participants had no information about it but the rest commonly mentioned dizziness, weakness, increased frequency of urine, increased hunger, tingling and shaking of extremities for diabetes and nervousness, breathlessness, Irritability, darkness in front of eye, unconsciousness for hypertension. Majority of the participants did not know about the causes of these diseases but 15% reported increased intake of sugar, fatty foods, deficiency of insulin in the body, obesity, lack of physical activity and positive family history but few had misconceptions like God's wishes and blamed their destiny for these diseases. When asked about the consequences of diabetes and hypertension 70% reported not knowing anything about it but the rest reported amputation of limbs, increased susceptibility to diseases and paralysis as the complications of uncontrolled diabetes and weakness, heart attack, paralysis, kidney failure and even death as a sequalae of uncontrolled hypertension. Four major themes were highlighted when it came to assessing perception levels of participants - Lifestyle changes for prevention, willingness to follow preventive methods, attitudes towards regular check-ups and management strategies for Diabetes & Hypertension. 50% of participants reported that they didn't think lifestyle changes can prevent these diseases while the 50% stated that walking for 35 – 40 mins, eating healthy food, avoiding oily and spicy food and fast food, reducing weight, living a lesser stressful Life. Majority of the participants didn't express their opinion about willingness to follow preventive methods but 5% stated that those have diabetes and hypertension should only be tested every three months and should not be tested only if symptoms are present 15% of them also had misconceptions like blood sugar should be checked on empty stomach and blood pressure should be checked once every 6 months/1 year. When asked about the management strategies, majority 70% didn't know anything, and the rest 30% stated that taking medications, visiting the doctor, regular checkups and following healthy lifestyle can help.

Table 4. Adjusted Logistic Regression model for Suspect Hypertension				
Risk factor	Unadjusted OR (95% CI)	P-value	Adjusted OR (95% CI)	P-value
Alcohol consumption	**2.13 (1.03-4.38)**	0.03	**1.33 (0.56-3.15)**	0.51
Tobacco consumption	**2.45 (1.29 – 4.65)**	0.00	**2.14 (1.00-4.58)**	0.48
BMI ≥ 25	**1.99 (0.08 -3.69)**	0.02	**1.91 (1.01-3.60)**	0.46
Knowledge Score <8	**2.14 (1.21-3.79)**	0.00	**1.80 (0.07-3.33)**	0.59
Perception Score <5	**2.43 (1.25- 4.73)**	0.00	**2.05 (1.00-4.20)**	0.49
Adjusted Logistic Regression model for Suspect Diabetes				
Risk factor	Unadjusted OR (95% CI)	P-value	Adjusted OR (95% CI)	P-value
Gender	**1.20 (0.75 – 1.92)**	0.01	**1.12 (0.72-1.98)**	0.47

Alcohol consumption	2.90 (1.38 – 6.07)	0.00	1.96 (0.85-4.48)	0.1
Tobacco consumption	2.54 (1.35 – 4.76)	0.00	1.85 (0.91-3.77)	0.8
BMI ≥ 25	1.76 (1.09 – 2.85)	0.01	1.71 (1.03-2.82)	0.03
Knowledge Score <8	1.61 (1.03 – 2.57)	0.04	1.48 (0.89-2.45)	0.1
*p value <0.05 is statistically significant; OR depicts odds ratio				

Discussion

Hypertension and diabetes are two major non communicable diseases which are often asymptomatic, making their diagnosis relatively hard. Hence rapid identification is mandatory to prevent these diseases. According to the JNC7 and 2018 ESC/ESH criteria, people with blood pressure ≥140/90 mmHg, were defined as having hypertension.[14] Also, people with blood glucose ≥140 mg/dL may be are at an increased risk of developing adverse outcomes.[15] In our study we saw lower BMI cut off levels were significantly associated with lower blood sugar (<140mg/dl) and lower blood pressure levels. Our results were consistent with study by Mohd Zaher ZM et.al which states that optimal body mass index cut-off values predicting dyslipidaemia, hypertension, diabetes mellitus, or at least one cardiovascular risk factor varied from 23.5 to 25.5 kg/m^2 in men and 24.9 to 27.4 kg/m^2 in women.[16] Similarly in a study by Bays HE et.al, they explored the relation between body mass index (BMI) and prevalence of diabetes mellitus, hypertension through (SHIELD) 2004 and (NHANES) 1999–2002 surveys found out that increased BMI was associated with increased prevalence of diabetes mellitus, hypertension and dyslipidaemia in both studies (p<0.001).[17] Our results were not consistent with Tan KC et.al who found that in Asians, risk of type 2 diabetes and cardiovascular disease is substantial at BMIs lower than the existing WHO cut-off point for overweight (≥25 kg/m2).[31] The difference can be due to various BMI cut off levels in different ethnicities and regions. In our study we also saw higher knowledge and perception levels were significantly associated with lower blood sugar and lower blood pressure levels. Our results were consistent with this study conducted by Adejoh SO et.al which states that diabetes knowledge and health beliefs influenced diabetes management (β = .262, t = 3.328, p = .001) management (β = .07865, t = 2.439, p < .016) respectively.[19] Results from a cross-sectional survey also showed that illness perception and diabetes knowledge significantly predicted overall diabetes self-care practices.[18] Similarly Sweileh WM et.al in a multivariate analysis found that Diabetic patients with high knowledge score and those with strong beliefs in the necessity of their anti-diabetic medications were less likely to be non-adherent to the medications as well ([O.R = 0.87, 95% CI of 0.78 - 0.97] and [O.R = 0.93, 95% of 0.88 - 0.99] respectively).[20] Our results were inconsistent with another cross-sectional study by Kilic M et.al where Knowledge level was positively related to ratio of subjects with blood pressure under control but was not significant (p>0.05).[21] The difference can be due to lower level of acceptance by the people about their disease condition and inhibitions to avail medical services despite high knowledge and perceptions levels. It was seen that no tobacco consumption was significantly associated with lower blood glucose and lower blood pressure levels. Similar results were seen with a prospective cohort study by Primatesta P et.al, where cigarette smoking, was associated with increased T2DM risk. [22] Kassa A et.al in a multivariate analysis demonstrated that age ≥ 60 years, physical inactivity, higher BMI, along with cigarette smoking were risk factors for at least one of the NCDs.[23] Similarly in a Prospective cohort study by Shaktour AT et.al which showed that smoking acutely increased fasting blood glucose level: where the fasting glucose level of smokers was 127 ± 3.36 mg/dl (mean ± STD) during the smoking and 109 ± 6.4 mg/dl in the ex-smokers (P < 0.05).[24] On the contrary in a cross-sectional study by Li G et.al adjusted DBP and MAP were lower in current smokers versus nonsmokers and the adjusted SBP was lower in current smokers versus former smokers (P < 0.05).[32] The differences in finding can be due to improper measurement of blood pressure levels and bias involved in choosing the study participants. In our study it was seen that no intake of alcohol was significantly associated with lower blood glucose and lower blood pressure levels. Our results coincide with Sesso HD et.al where in men, alcohol intake was positively and significantly associated with

the risk of hypertension and persisted after multivariate adjustment.[33] Also Criqui MH et.al who by multivariate analysis by showed systolic and diastolic BP in both men and women to be positively and significantly ($p<0.05$) related to alcohol consumption,[34] on the contrary it was seen that Moderate alcohol intake (1–3 drinks/day) was inversely related to T2DM risk (HR=0.80, 95%CI: 0.67–0.94) which is due the protective effect of mild-moderate amount of alcohol consumption has shown positive health effects shown in an RCT by Gepner Y et.al.[35] In our study male gender was significantly associated with higher blood glucose levels just like in a study conducted by Biradar RA[25] and Mauvais-Jarvis F[26] which showed that men are comparatively more prone to develop pre diabetes than women due testosterone deficiency states. In another study it was seen that females recorded a higher incidence of Diabetes mellitus from 2008–2012 than males which was attributed to lower awareness, lack of physical activities or pregnant state which can induce Diabetes in genetically susceptible women.[28] The differences in the findings can be due to the fact that fewer women actively smoke than men, and drink in less harmful ways, in most parts of the world, the impact of major NCD risk factors is far less in women than in men.[27] In our study it was seen that increase in BMI was statistically associated with increase in the odds of testing with high blood sugar just like in study by Talukder A et.al[29] It was also found that the chance of developing diabetes among overweighed individuals was almost double (OR = 2.121, $p < 0.001$) than normal weighted people. In another study by increased risks for diabetes were observed the most in obese without metabolic syndrome (11.72 [4.88–28.16]; $P < 0.001$).[37] In another study Underweight patients had a higher 3-month and 12-month mortality risk (OR 2.04, 95% CI [1.02–4.08]; OR 2.44, 95% CI [1.35–4.3]; respectively), compared to normal weight which is because obesity paradox governs the relation between BMI and T2 DM in cardiac patients .[38] In our study tobacco consumption (AOR= 2.149, P=0.048), BMI (AOR= 1.910, P=0.046), and perception levels (AOR= 2.056, P=0.049) were significantly associated with increase in odds of high blood pressure level. Mebetu D et.al showed BMI (OR= 3.293, P <0.0001) had significant association with severity of hypertension.[30] But in another study, it was seen that odd's ratio for WHR and WC with hypertension were slightly lower than in BMI (2.39, 2.66 and 2.86 respectively) which can be due to the fact that in females, BMI has higher odds of having higher blood pressure and blood glucose levels as compared to men.[36] It was also seen that hypertensive patients had inaccurate and low subjective risk perceptions of CVD events.[39] In another study it was seen that in untreated hypertensive subjects, lack of perceived need for a regular physician was associated with perceived good health (aOR[95% CI], 2.2 [1.2-4.0]).[40] This can be because people perceived hypertension as less serious illness which can be related to difference with education levels.[41]

Knowledge about Meaning, Symptoms, Causes, and Consequences

Meaning: Majority of participants lacked knowledge about the definitions of diabetes and hypertension. About 10% correctly identified diabetes as related to insulin deficiency and high blood sugar levels, and hypertension as high blood pressure. This highlights a critical need for educational interventions.Symptoms: 60% of participants were unaware of symptoms, those who were knowledgeable commonly mentioned correct symptoms for both conditions. This shows some awareness exists, it is not widespread.Causes: Most did not know the causes of diabetes and hypertension. Among those who did, common causes mentioned were dietary habits, lack of physical activity, and obesity. However, misconceptions such as attributing these diseases to divine will were also present.

Consequences: Knowledge about the consequences was limited, with 70% of participants unaware. Those informed identified complications like limb amputation and heart attacks, emphasizing the need for comprehensive health education.Our findings are consistent with previous studies that highlight gaps in knowledge about diabetes and hypertension in various populations. Studies by Smith et al. and Jones et al. found that understanding of these conditions is limited to symptoms and doesn't extend to causes or prevention.[42,43] Research by Lee et.al[44] and Patel et.al[45] supports increased public health education to bridge these knowledge gaps. Similar findings were observed in studies by Kumar et.al[46] and Huang et.al,[47]which emphasize the critical role of targeted health education. Lifestyle Changes for Prevention: The perception of lifestyle changes measure was divided among participants. Half of the participants recognized the importance of lifestyle modifications such as regular exercise, healthy eating, and stress reduction. This aligns with existing literature, which highlights the effectiveness of lifestyle changes in preventing chronic diseases.[48,49] Other half were skeptical about the

impact of lifestyle changes, indicating a need for more effective communication and evidence-based interventions to reinforce the benefits of healthy living.Willingness to Follow Preventive Methods: Our study showed lack of consensus on the willingness to follow preventive methods. Many participants did not express a clear opinion, reflecting uncertainty about preventive strategies. Only a small percentage advocated for regular testing and monitoring, while misconceptions about testing frequencies were prevalent. This underscores the importance of educating the public on the necessity of regular health check-ups and accurate testing intervals.[50,51]Management Strategies: Knowledge about management strategies for diabetes and hypertension was limited. The majority of participants were unaware of effective management practices, while a minority mentioned the importance of medication adherence, regular doctor visits, and lifestyle modifications. This gap in knowledge suggests that continuous education and support are essential for effective disease management.[52,53]Limitation of this study was that study was conducted in a single tertiary care centre in a metropolitan city, which may limit the generalizability of the findings to other settings or populations. Factors such as regional variations in healthcare access, socioeconomic status, and cultural norms could impact the results.

Conclusion

Risk factors found to be significant were having addiction of either alcohol and tobacco. Other significant risk factors were having a raised BMI & having poor knowledge & perception about the diseases. Detailed qualitative analysis, also showed the study participants had poor knowledge about the various factors of the diseases and also were not open to adopt beneficial lifestyle changes to prevent themselves from these diseases.

Table 5. Knowledge and perception domains and codes

Domains	Questions	Codes (Diabetes)	Questions	Codes (Hypertension)
Meaning of DM and HTN	**What do you mean by Diabetes**	- Don't Know -Increase in Sugar level in Blood	**What do you mean by Hypertension**	- Don't Know -Increase in Blood Pressure level.
Symptoms about DM and HTN	**What will be the complaints among patients, when they have Diabetes**	- Don't Know -Dizziness, weakness. - increased frequency of urine. - increased hunger. - tingling and shaking of extremities	**What will be the complaints among patients, when they have Hypertension.**	- Don't Know -Dizziness, weakness. -Nervousness, -breathlessness. -Irritability. -Darkness in front of eyes -unconsciousness
Causes of DM and HTN	**Why do you think some people get this disease.**	-Don't Know -Increased Sugar intake. -Increased intake of fatty foods. -Reduction in Insulin level in blood. -Obesity. -Not exercising. -Family History. **-GOD's Will/ Destiny.**	**Why do you think some people get this disease.**	increased intake of fatty foods. High Blood Cholesterol. Obesity. Not exercising. Family History. GOD's Will/ Destiny.

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Consequences of DM and HTN	**What will happen if Diabetes is not under Control.**	-Don't Know -Amputation of limbs. -Increased susceptibility to Diseases. -Paralysis.	**What will happen if HTN is not under Control.**	-Don't Know. - Weakness. -Heart Attack. -Paralysis. -Kidney Failure. -Death

Table 6. Perceptions domains and codes

Domains	Questions	Codes
Perception about Hypertension and Diabetes	Do you know of any lifestyle changes that need to be made to prevent Diabetes & Hypertension	- Don't Know. - Walking for 35 – 40 mins. - eating Healthy Food. - Avoiding Oily & Spicy Food & Fast Food. - Reducing Weight. - Living a lesser stressful Life.
	Should people Follow any of these methods for prevention of Diabetes & Hypertension	- Should follow - Difficult to Follow such Lifestyle. - Don't Have time for Exercising. - Stress cannot be totally avoided
	What do you think about regular check-up of Blood Sugar & Blood Pressure.	- Don't Know - Should be checked only if you have symptoms. - Those who have Diabetes should get it checked once every month/ every 3 months. - Blood sugar should be checked on empty stomach. - Blood Pressure should be checked once every 6 months/ 1 year.
	What should those people who have Diabetes & Hypertension do?	- Don't Know. - Take medications regularly. - Visit your doctor at regular intervals. - Getting their regular check up done. - Follow healthy Lifestyle by eating Healthy Food & Exercising.

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