

# Estimates of Diabetes Mellitus and Hypertension and Associated Risk Factors

Jeyanthi Shanmugam K<sup>1</sup>, Chitra P<sup>2</sup>, Sujitha Rani P<sup>3</sup>, Belsie P<sup>4</sup>, Vetri Selvi A<sup>5</sup>

<sup>1</sup>Principal, <sup>2</sup>Professor, <sup>3</sup>Nursing Tutor, <sup>4</sup>Nursing Tutor, <sup>5</sup>Nursing Tutor;  
Department of Fundamentals of Nursing, V. V. Vanniaperumal Nursing College for Women, Virudhunagar

Corresponding Author: Jeyanthi Shanmugam K

DOI: <https://doi.org/10.52403/ijhsr.20240611>

## ABSTRACT

**Background:** Non-communicable diseases are among the leading cause of morbidity and mortality in India

**Objective:** The present study aimed at identifying the prevalence of Diabetes mellitus, hypertension and their associated risk factors.

**Methods:** Descriptive survey design was used and 145 adults were selected by using non-probability purposive sampling technique. Random blood sugar and blood pressure were measured. Risk factors such as Smoking, alcohol intake, unhealthy dietary habits, physical inactivity and BMI were assessed.

**Results:** 16% of subject's blood sugar was above normal. Blood pressure was high among 41% of subjects. 10%, 9% of subjects reported smoking, alcohol intake respectively. BMI was high among 43% of subjects. A significant portion of study subjects had unhealthy dietary habits and physical inactivity. 46.3% subjects had more than two risk factors.

**Conclusion:** The current study reveals a high prevalence of DM, HTN and several risk factors among the study subjects, which calls for immediate action to curb this epidemic.

**Key words:** Non communicable diseases (NCDs), Diabetes mellitus, Hypertension, Risk factors

## INTRODUCTION

Recent reports on health scenario in India indicates a significant growth of non-communicable diseases (NCDs) across the nation. Non-communicable diseases (NCDs) such as Hypertension, diabetes, cancer, and chronic respiratory diseases have emerged as a predominant public health concern.

Apollo Hospitals' flagship Health of Nation Report on World Health Day 2024, presents that, one in three Indians are pre-diabetic and two in three are pre-hypertensive<sup>[1]</sup>.

World Health Organization (WHO) in their report titled 'Invisible Numbers', reveals that 66% of deaths in India in 2019 were attributed to NCDs. The report also suggests

that 22% of individuals aged 30 or older in India would be a victim to NCDs before reaching their 70 years<sup>[2]</sup>.

Indian Council of Medical Research-India Diabetes (ICMR-INDIAB), carried out a cross-sectional population-based survey among population 20 years and above in the period between 2008 and 2020. The study recruited 1, 13,043 adults from urban and rural residents of 31 states and union territories of India. The prevalence of diabetes was 11.4%, pre-diabetes was 15.3%, hypertension was 35.5% and generalized obesity was 28.6%. Hypertension was the most prevalent NCD throughout the country except the central regions. It was also found

that southern and northern regions of India had high prevalence of diabetes [3].

STEPwise approach to NCD risk factor surveillance (STEPS) survey 2020 indicated a community prevalence of 33.9% for hypertension, 17.6% for diabetes, in Tamil Nadu [4].

NCDs are primarily driven by the high prevalence of major preventable risk factors - tobacco use, consumption of alcohol, unhealthy dietary practices, lack of sufficient physical activity and obesity.

National NCD Monitoring Survey (NNMS) in six geographic regions of India reported an increased prevalence of risk factors for NCDs. Tobacco (45.7%) and alcohol use (22.3%) was highly prevalent in Northeast region. Northern region reported low levels of physical activity (49.6%), while the southern region had high prevalence of metabolic risk factors - obesity (12.5%), raised fasting blood glucose (21.2%) and raised blood pressure (35.6%). Presence of  $\geq 3$  risk factors (50.1%) was highest in south India when compared to other regions. Older age, urban residents, alcohol consumption and overweight/obesity were significantly associated with higher odds of raised blood pressure and raised fasting blood glucose [5]. Furthermore, as regions and states in India differ widely from each other in ethnic composition, dietary habits, and socioeconomic development, overall NCD estimates for the state/country have failed to figure out the wide inter-regional and intraregional differences. Region wise estimation of risk factors is essential to enable state governments to plan and implement programmes aimed at preventing and managing NCDs in their respective jurisdictions.

This study attempts to identify the Prevalence of risk factors for NCDs in population of Virudhunagar district which is situated in the southern portion of Tamilnadu state.

## AIM

The present study aimed at identifying the prevalence of Diabetes mellitus,

hypertension and their associated risk factors among patients attending the OPD of selected hospital, Virudhunagar

## METHODOLOGY

Descriptive survey design was used to collect data. By using non-probability purposive sampling 145 patients were selected. Permission was obtained from the hospital authority and oral consent was obtained from the study subjects.

### Tool-Instrument for data collection consisted of five sections

**Section A.** Demographic Proforma which includes age, gender, educational status, marital status, place of residence, religion, occupation, family monthly income, History of DM, HTN, cancer, heart disease in the family

**Section B.** Checklist to assess the following behavioural risk factors

- Smoking
- Alcohol intake,
- Food habits
- Practices related to physical activity

**Section C.** Anthropometric measurement – Measurement of height and weight

**Section D.** Measurement of blood pressure using sphygmomanometer

**Section E.** Random blood sugar was estimated using Glucose oxidase-peroxidase method (GOD - POD)

## RESULTS

### I. Demographic characteristics of the subjects

The age of the study subjects ranged from 18 to 80 years with the mean age of  $47.90 \pm 13.72$ . Majority subjects (83%) were between 26-65 years. 62% of subjects were females. More than half of the subjects have completed primary education. Almost all the subjects (95%) were married. Nearly one quarter of the subjects (73%) resides in rural area. Nearly all the subjects (96%) were Hindus. Coolie work was the predominant occupation. A significant portion of the study subject's (53%) family monthly income was between Rs 5000-10000. Very few subjects

(8.3%) had the family history of DM and HTN.

## II. Prevalence of smoking and alcohol consumption among the subjects

**Table 1. Distribution of subjects based on smoking and alcohol consumption N=145**

S. No	Risk factor	Yes		No	
		Frequency	Percentage	Frequency	Percentage
1	History of smoking	14	10%	131	90%
2	History of alcohol intake	10	7%	135	93%

All the 14, 10 subjects who have reported smoking and alcohol intake were males. None of the female subjects have reported either smoking or alcohol intake. Among the 14, 10 subjects who smoke, drink alcohol 12,

7 subjects were from rural area respectively (Table 1).

## III. Prevalence of unhealthy food habits among the subjects

**Table 2. Distribution of subjects based on food habit N=145**

S. No	Food item	Never		Daily		Weekly once		Monthly once		Rarely	
		F	%	F	%	F	%	F	%	F	%
1	Parotta	46	32	5	3	24	17	24	17	46	32
2	Fried items	58	40	4	3	21	14.4	21	14.4	41	28.2

79% of subjects had the habit of consuming outside food items. Nearly 1/4<sup>th</sup> of the subjects (17%) consumes parotta every week. Very few subjects reported intake of parotta and fried items regularly (Table 2).

## IV. Prevalence of physical inactivity among the subjects

**Table 3. Distribution of subjects based on physical activity N=145**

S. No	Physical activity	Never		Daily		Weekly once		Monthly once		Rarely	
		F	%	F	%	F	%	F	%	F	%
1	Walking	59	41	62	43	11	7	4	3	9	6
2	Exercise	119	82	5	3	8	6	4	3	9	6
3	Yoga	124	86	2	1	6	4	5	3	8	6

Nearly half of the subjects (41%) never have the practice of walking. Majority of the subjects (82%, 86%) have never practiced exercise, yoga respectively (Table 3)

age group of 36-65 years, 44 resides at rural area. Family monthly income of 52 subjects was less than 10,000. Occupation of 42 subjects was coolie work (Table 4).

## V. Prevalence of Increased BMI among the subjects

## VI. Prevalence of risk factors among the subjects

**Table 4. Distribution of subjects based on the BMI N=145**

S. No	BMI	Frequency	Percentage
1	Underweight (<18.50)	16	11
2	Normal (18.50-24.99)	66	45.5
3	Pre-obese (25-29.99)	40	27.6
4	Obese class I (30-34.99)	18	12.4
5	Obese class II (35-39.99)	4	2.8
6	Obese class III (>40)	1	0.7

A substantial number of study subjects (63) had BMI above normal. Among those who had high BMI 45 subjects were between the

**Table 5. Distribution of study subjects based on the risk factors N=145**

S. No	Number of risk factors	Frequency	Percentage
1	0	33	22.8%
2	1	45	31.0%
3	2	43	29.7%
4	3	20	13.8%
5	4	3	2.1%
6	5	1	0.7%

Prevalence of Smoking, alcohol intake, physical inactivity, unhealthy food habit and increased BMI among study subjects were assessed. Less than one quarter of subjects

(22.8%) had no risk factors for DM and HTN. Majority of the subjects had at least one risk factor. 17% of subjects had three or more risk factors (Table 5).

**VII. Prevalence of increased blood pressure among the subjects**

**Table 6. Distribution of subjects based on the level of blood pressure N=145**

S. No	Blood pressure in mm of hg	Frequency	Percentage
1	Optimal (<120/80)	59	40
2	Normal (120/80-129/84)	27	19
3	High normal (130/85-139/89)	24	17
4	Grade I Hypertension (140/90-159/99)	29	20
5	Grade II Hypertension (160/100-179/109)	3	2
6	Grade III Hypertension (>180/110)	3	2

Nearly half of the study subjects had their blood pressure above normal. 1/5<sup>th</sup> of the

study subjects had grade I hypertension (Table 6).

**VIII. Prevalence of increased blood sugar among the subjects**

**Table 7. Distribution of subjects based on the level of blood sugar N=145**

S. No	Random blood sugar	Frequency	Percentage
1	<140 mg/dl	127	88
2	140-200 mg-dl	12	8
3	>200 mg/dl	6	4

Majority of the subjects (88%) had normal blood sugar level. 12% of subject's blood sugar is above normal. The random blood sugar of the subjects ranged between 59 and 346 mg/dl. The mean RBS was 107.31±45.82 (Table 7).

**IX. Association between random blood sugar and selected demographic variables**

**Table 8. Association of level of random blood sugar with selected demographic variables N=145**

S. No	Demographic variables	Random blood sugar in mg/dl			Chi-square value
		<140	140-200	>200	
1	<b>Age in years</b>				10.745 <sup>#</sup>
	<25	5	1	0	
	25-35	20	1	2	
	36-45	34	2	3	
	46-55	34	2	0	
	56-65	19	2	1	
	>65	15	4	0	
2	<b>Gender</b>				0.488 <sup>#</sup>
	Male	47	5	3	
	Female	80	7	3	
3	<b>Educational status</b>				18.932 <sup>*</sup>
	No formal education	45	2	2	
	Primary education	69	7	2	
	Completed schooling	2	1	0	
	Under graduate	11	1	2	
	Post graduate	0	1	0	
4	<b>Marital status</b>				0.533 <sup>#</sup>
	Married	120	11	6	
	Unmarried	7	1	0	
5	<b>Place of residence</b>				4.530 <sup>#</sup>
	Rural	94	7	5	
	Urban	24	5	1	
	Semi urban	9	0	0	
6	<b>Occupation</b>				2.861 <sup>#</sup>
	Coolie workers	89	7	4	
	House wife	28	2	1	
	Private employee	8	2	1	
	Government employee	1	0	0	
7	<b>Family monthly income in rupees</b>				4.395 <sup>#</sup>
	<5000	39	2	1	
	5000-10000	66	8	3	
	10000-15000	18	1	2	
	>15000	4	1	0	
8	<b>History of smoking</b>				0.714 <sup>#</sup>
	Yes	13	1	0	
	No	114	11	6	
9	<b>History of alcohol consumption</b>				

	Yes	8	2	0	2.299 <sup>#</sup>
	No	119	10	6	
<b>10</b>	<b>Habit of taking outside food items</b>				
	Yes	97	10	6	2.081 <sup>#</sup>
	No	30	2	0	
<b>11</b>	<b>Frequency of parotta intake</b>				
	Never	42	4	0	14.405 <sup>#</sup>
	Daily	2	2	1	
	Weekly once	21	2	1	
	Monthly once	20	2	2	
	Rarely	42	2	2	
<b>12</b>	<b>Frequency of intake of fried items</b>				
	Never	53	4	1	13.239 <sup>#</sup>
	Daily	2	2	0	
	Weekly once	17	3	1	
	Monthly once	19	1	1	
	Rarely	36	2	3	
<b>13</b>	<b>Family history of DM</b>				
	Yes	11	0	1	1.664 <sup>#</sup>
	No	116	12	5	
<b>14</b>	<b>Habit of walking</b>				
	Never	50	5	4	16.839 <sup>*</sup>
	Daily	59	2	1	
	Weekly once	9	1	1	
	Monthly once	2	2	0	
	Rarely	7	2	0	
<b>15</b>	<b>Habit of exercise</b>				
	Never	106	8	5	6.803 <sup>#</sup>
	Daily	5	0	0	
	Weekly once	7	1	0	
	Monthly once	3	1	0	
	Rarely	6	1	1	
<b>16</b>	<b>Habit of yoga</b>				
	Never	111	8	5	10.000 <sup>#</sup>
	Daily	2	0	0	
	Weekly once	5	1	0	
	Monthly once	3	2	0	
	Rarely	6	1	1	
<b>17</b>	<b>Body Mass Index</b>				
	<18.50	15	1	0	8.185 <sup>#</sup>
	18.50-24.99	61	3	2	
	25-29.99	33	5	2	
	30-34.99	13	3	2	
	35-39.99	4	0	0	
	>40	1	0	0	

\*- Significant

# - Not significant

The level of blood sugar was associated with educational status (p-0.015) and habit of walking (p-0.032).

**Table 9. Association of level of blood pressure with selected demographic variables N=145**

S. No	Demographic variables	Blood pressure in mm of hg						Chi-square value
		<120/80	120/80-129/84	130/85-139/89	140/90-159/99	160/100-179/109	>180/110	
<b>1</b>	<b>Age in years</b>							
	<25	4	2	0	0	0	0	53.798 <sup>*</sup>
	25-35	14	6	2	1	0	0	
	36-45	18	12	6	3	0	0	
	46-55	13	4	8	10	0	1	
	56-65	6	3	5	5	1	2	
>65	4	0	3	10	2	0		
<b>2</b>	<b>Gender</b>							
	Male	17	10	11	16	0	1	8.251 <sup>#</sup>
	Female	42	17	13	13	3	2	
<b>3</b>	<b>Educational status</b>							
	No formal education	19	6	11	9	2	2	16.426 <sup>#</sup>
	Primary education	30	18	10	18	1	1	
	Completed schooling	2	0	1	0	0	0	
	Under graduate	8	3	1	2	0	0	
	Post graduate	0	0	1	0	0	0	
<b>4</b>	<b>Marital status</b>							

	Married	56	24	22	29	3	3	4.051 <sup>#</sup>
	Unmarried	3	3	2	0	0	0	
<b>5</b>	<b>Place of residence</b>							
	Rural	44	20	16	21	3	2	4.226 <sup>#</sup>
	Urban	10	5	7	7	0	1	
	Semi urban	5	2	1	1	0	0	
<b>6</b>	<b>Occupation</b>							
	Coolie workers	42	19	14	21	2	2	14.419 <sup>#</sup>
	House wife	12	7	5	5	1	1	
	Private employee	3	0	5	3	0	0	
	Government employee	0	1	0	0	0	0	
<b>7</b>	<b>Family monthly income in rupees</b>							
	<5000	18	10	3	9	0	2	17.148 <sup>#</sup>
	5000-10000	31	12	17	13	3	1	
	10000-15000	9	3	2	7	0	0	
	>15000	1	2	2	0	0	0	
<b>8</b>	<b>History of smoking</b>							
	Yes	2	1	3	8	0	0	15.305 <sup>*</sup>
	No	57	26	21	21	3	3	
<b>9</b>	<b>History of alcohol consumption</b>							
	Yes	2	1	1	6	0	0	10.874 <sup>#</sup>
	No	57	26	23	23	3	3	
<b>10</b>	<b>Habit of taking outside food items</b>							
	Yes	45	22	19	23	2	2	0.788 <sup>#</sup>
	No	14	5	5	6	1	1	
<b>11</b>	<b>Frequency of parotta intake</b>							
	Never	18	8	8	10	1	1	11.858 <sup>#</sup>
	Daily	3	0	0	2	0	0	
	Weekly once	11	5	5	3	0	0	
	Monthly once	6	5	5	7	1	0	
	Rarely	21	9	6	7	1	2	
<b>12</b>	<b>Frequency of intake of fried items</b>							
	Never	24	11	11	9	1	2	9.723 <sup>#</sup>
	Daily	2	0	0	2	0	0	
	Weekly once	8	5	3	5	0	0	
	Monthly once	6	4	4	6	1	0	
	Rarely	19	7	6	7	1	1	
<b>13</b>	<b>Family history of DM</b>							
	Yes	2	4	4	2	0	0	6.216 <sup>#</sup>
	No	57	23	20	27	3	3	
<b>14</b>	<b>Habit of walking</b>							
	Never	24	10	12	11	1	1	27.380 <sup>#</sup>
	Daily	26	13	9	13	0	1	
	Weekly once	3	3	3	1	1	0	
	Monthly once	1	0	0	2	0	1	
	Rarely	5	1	0	2	0	1	
<b>15</b>	<b>Habit of exercise</b>							
	Never	53	20	17	24	2	3	20.868 <sup>#</sup>
	Daily	0	2	2	1	0	0	
	Weekly once	0	4	2	1	1	0	
	Monthly once	2	0	1	1	0	0	
	Rarely	4	1	2	2	0	0	
<b>16</b>	<b>Habit of yoga</b>							
	Never	53	22	19	25	2	3	27.697 <sup>#</sup>
	Daily	0	2	0	0	0	0	
	Weekly once	0	3	1	1	1	0	
	Monthly once	2	0	1	2	0	0	
	Rarely	4	0	3	1	0	0	
<b>17</b>	<b>Body Mass Index</b>							
	<18.50	9	2	0	5	0	0	24.992 <sup>#</sup>
	18.50-24.99	30	12	9	11	1	3	
	25-29.99	14	7	10	7	2	0	
	30-34.99	5	4	3	6	0	0	
	35-39.99	1	1	2	0	0	0	
	>40	0	1	0	0	0	0	

\*-Significant

#-Not significant

The level of blood pressure was associated with age (p-0.001), habit of smoking (p-0.009).

## DISCUSSION

This study attempted to find out the prevalence of diabetes mellitus and Hypertension and their associated factors.

This study found that 10% of subjects had the habit of smoking and alcohol was consumed by 7% of subjects. A cross-sectional study conducted among 502 tribal population 40 years and above in three villages of Vellore district showed a similar prevalence of smoking among the study subjects which was 9%. They also found that 38.8% people had high BMI, which is almost similar to finding of the current study in which 43% of subjects had high BMI. 12% of study subjects in the current study had a family history of DM and HTN, which was much high comparing to the other study in which only 2.4% of subjects had a family history of DM and HTN each [6]. The current study found that 79% of subjects consume outside food items, also found consumption of unhealthy food items such as parotta and fried items. Majority of the study subjects were physically inactive. This study findings are comparable to the study conducted among 370 adults in the rural areas of Kancheepuram district, which also revealed a significant portion of study subjects with physical inactivity (50.2%) and unhealthy diet (62%) [7].

With regard to hypertension, 17% of subjects were in pre-hypertensive stage and 24% had hypertension. These findings are dissimilar to the findings of the cross-sectional study conducted among 420 study subjects aged 20-40 years residing in urban area of Bagalkot city, Karnataka, which revealed a 17.9% of hypertension and 52% of pre-hypertension [8].

In the present study 8% of subjects had their Random blood sugar between 140-200mg/dl. Random blood sugar of 4% of subjects was more than 200 mg/dl. This is almost identical to the study conducted among 525 tribal adults above 40 years in Salem district of Tamil Nadu, where 7.42%, 5.33% of subject's Random blood sugar was between 140-200mg/dl, above 200mg/dl respectively [9].

In our study age and hypertension had a statistically significant association, and educational status and random blood sugar also had a significant association. A similar finding was observed a study conducted among 1003 geriatric subjects aged 60 years and above in Nainital, Uttarakhand. In that study there was a statistically significant association found between age and hypertension ( $p = 0.004$ ), Educational status was associated with Random blood sugar ( $p = 0.000$ ) [10].

Several research studies found a significant association between BMI and HTN, DM. In our study BMI was neither associated with Blood pressure nor with Random blood sugar.

Regarding the risk factors for NCDs, 16.6% of subjects had 3 or more risk factors. Regional estimates of NCDs and associated risk factors among adults in India found that 50.1% subjects had clustering of three or more risk factors for NCDs in the south region.

The finding of the current study reveals clustering of risk factors for DM and HTN. 46.3% subjects had more than one risk factor. 16.6% had more than three risk factors. Almost identical result was found in a study among 12012 subjects aged between 18-69 years, in which 47.1% study subjects had more than single risk factor. More than three risk factors were found in 16.6% of subjects [11].

## CONCLUSION

Considerable portion of study subjects had high RBS. Nearly half of the study subjects had high blood pressure. There were multiple risk factors found among the study subjects. This calls for urgent and concerted primary and secondary prevention activities to address the future burden of NCDs. Studies need to be carried out to assess the magnitude, Socio-demographic determinants and preventive measures for diabetes and hypertension. There is a need to promote and strengthen health care delivery system to address the growing burden of hypertension and diabetes mellitus in the country.

### Declaration by Authors

**Ethical Approval:** Approved

**Acknowledgement:** None

**Source of Funding:** None

**Conflict of Interest:** The authors declare no conflict of interest.

### REFERENCES

1. Sriram S. Heart Disease and Diabetes Threats: Preventable NCDs cause 66% of deaths in India. The Hindu [Internet]. 2023 Dec 27 [cited 2024 May 2]; Available from: <https://www.thehindu.com/opinion/op-ed/making-health-our-top-priority-in-2024/article67679605.ece>
2. India. Significant growth in non-communicable diseases across India: Apollo report [Internet]. @bsindia. Business Standard; 2024. Available from: [https://www.business-standard.com/health/significant-growth-in-non-communicable-diseases-across-india-apollo-report-124040500259\\_1.html](https://www.business-standard.com/health/significant-growth-in-non-communicable-diseases-across-india-apollo-report-124040500259_1.html)
3. Anjana RM, Unnikrishnan R, Deepa M, Pradeepa R, Tandon N, Das AK, Joshi S, Bajaj S, Jabbar PK, Das HK, Kumar A, Dhandhanika VK, Bhansali A, Rao PV, Desai A, Kalra S, Gupta A, Lakshmy R, Madhu SV, Elangovan N, Chowdhury S, Venkatesan U, Subashini R, Kaur T, Dhaliwal RS, Mohan V; ICMR-INDIAB Collaborative Study Group. Metabolic non-communicable disease health report of India: the ICMR-INDIAB national cross-sectional study (ICMR-INDIAB-17). *Lancet Diabetes Endocrinol.* 2023 Jul;11(7):474-489. doi: 10.1016/S2213-8587(23)00119-5. Epub 2023 Jun 7. PMID: 37301218.
4. M SJ. STEPS survey to estimate NCD risk factors in Tamil Nadu. The Hindu [Internet]. 2024 Jan 5 [cited 2024 May 5]; Available from: <https://www.thehindu.com/news/cities/chennai/steps-survey-to-estimate-ncd-risk-factors-in-tamil-nadu/article67710366.ece>
5. Ramamoorthy, T., Leburu, S., Kulothungan, V. et al. Regional estimates of noncommunicable diseases associated risk factors among adults in India: results from National Noncommunicable Disease Monitoring Survey. *BMC Public Health* 22, 1069 (2022). <https://doi.org/10.1186/s12889-022-13466-5>
6. Shriram V, Mahadevan S, Arumugam P. Prevalence and Risk Factors of Diabetes, Hypertension and Other Non-Communicable Diseases in a Tribal Population in South India. *Indian J Endocrinol Metab.* 2021 Jul-Aug;25(4):313-319. doi: 10.4103/ijem.ijem\_298\_21. Epub 2021 Dec 15. PMID: 35136738; PMCID: PMC8793947.
7. Vijayakarhikeyan M, Krishnakumar J, Umadevi R. Cross-sectional study on the prevalence of risk factors for non-communicable disease in a rural area of Kancheepuram, Tamil Nadu. *Int J Community Med Public Health* 2017; 4:4600-7.
8. Sidenur B, Shankar G. A Cross-Sectional Study of Hypertension among 20-40 Years Old Residing in an Urban Area of Bagalkot City, North Karnataka. *Indian J Community Med.* 2023 Jan-Feb;48(1):98-102. doi: 10.4103/ijcm.ijcm\_255\_22. Epub 2023 Feb 1. PMID: 37082399; PMCID: PMC10112762.
9. Radhakrishnan, Shankar; Ekambaram, Manivanan I. Prevalence of diabetes and hypertension among a tribal population in Tamil Nadu. *Archives of Medicine and Health Sciences* 3(1):p 66-71, Jan–Jun 2015. | DOI: 10.4103/2321-4848.154948
10. Kapil U, Khandelwal R, Ramakrishnan L, Khenduja P, Gupta A, Pandey RM, Upadhyay AD, Belwal RS. Prevalence of hypertension, diabetes, and associated risk factors among geriatric population living in a high-altitude region of rural Uttarakhand, India. *J Family Med Prim Care.* 2018 Nov-Dec;7(6):1527-1536. doi: 10.4103/jfmpc.jfmpc\_108\_18. PMID: 30613554; PMCID: PMC6293909.
11. Sarma PS, Sadanandan R, Thulaseedharan JV, Soman B, Srinivasan K, Varma RP, Nair MR, Pradeepkumar AS, Jeemon P, Thankappan KR, Kutty RV. Prevalence of risk factors of non-communicable diseases in Kerala, India: results of a cross-sectional study. *BMJ Open.* 2019 Nov 10;9(11):e027880. doi: 10.1136/bmjopen-2018-027880. PMID: 31712329; PMCID: PMC6858196.

How to cite this article: Jeyanthi Shanmugam K, Chitra P, Sujitha Rani P, Belsie P, Vetri Selvi A. Estimates of diabetes mellitus and hypertension and associated risk factors. *Int J Health Sci Res.* 2024; 14(6):72-79. DOI: <https://doi.org/10.52403/ijhsr.20240611>

\*\*\*\*\*