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Prevalence of hypertension and its associated risk factors

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Abstract

Hypertension is commonly known as the "silent killer", its prevalence is highly variable worldwide and it's an important risk factor for cardiovascular disease. The increase of hypertension in the developing countries may be connected with the economic transition within those countries. This study is aimed to assess the prevalence of hypertension among people in and around Kengeri Satellite town and the associated risk factors related to hypertension. Hence, there is a growing need for spreading awareness about it. In this study, the data was collected by a structured interview questionnaire, which included data about nutritional lifestyle, stress, exercises, family history and smoking pattern. In addition, blood pressure and body mass index were measured. Data was collected from September 2018 to April 2019 at RVCE Health Center and other local hospitals around Kengeri. The sample included 500 candidates. The results were analysed using Excel. Post analysis in excel, HTML and java script along with machine learning was used to specifically analyze the data collected and develop an app. This app is aimed to determine the stage and level of hypertension in a particular patient. The app is commercialized in latter stages to provide it to the general public.

Key Words: Hypertension, Risk factor, Cardiovascular disease

1. INTRODUCTION

The developing world is witnessing higher proportion of aged populations, rapid urbanization and globalization of unhealthy lifestyles. Globally, hypertension has rapidly become a world emergency, especially in developing countries. Treatment of hypertension holds the capacity to reduce the risk of cardiovascular events and its occurrence. Therefore, the early detection and treatment are the key components for the integrated cardiovascular risk.

Non communicable diseases such as Cancer, diabetes, CVD and chronic lung disease are the world's leading cause of mortality. Hypertension represents one of the most formidable dilemma, the world has faced in modern times leading to coronary heart disease, stroke and other vascular complications. It is a ubiquitous disorder. It is one of the major risk factors for cardiovascular mortality, which accounts for nearly quarter of all deaths. An estimated 1 billion approx. adults, or 24% of the world's adult population, had uncontrolled hypertension in 2008. More alarming, conservative estimates indicate that the global burden of hypertension will increase to more than 1.7 billion or 31% of the world's adult population by 2025. As the most important modifiable risk factor for cardiovascular disease and all-cause mortality, high blood pressure was responsible for approximately 8 million deaths globally, or 14% of all deaths, during the starting of the 21st Century. In developing regions, for morbidity and mortality, hypertension is one of the leading risk factor and is responsible for over 6 million deaths in low and middle-income nations in 2001.

Moreover, India has experienced rapid economic development and urbanization. The dietary pattern and lifestyles in India have dramatically changed. Specifically, Indians engage in lower amounts of physical activity as they consume more fat, meat products and salt whereas less complex carbohydrates, fruits and vegetables.

Therefore, the objective of our project is to carry out an extensive survey using a carefully proctored questionnaire with the help on a professional medical practitioner. In addition to this, the data procured from the questionnaire is used to develop an app coded out of Java script and machine learning to help the analysis of the prevalence of hypertension in different individuals.

Hypertension is now recognized as a very major contributor to disease burden globally. The World Health Report 2003 identified hypertension, as the third ranked factor for disability-adjusted life years. Nearly 2/3rds of hypertensive lives in low and middle-income countries, resulting in a huge economic burden. A Study stated that, in the year 2000 it is estimated that nearly one billion people or ~26% of the adult population had hypertension worldwide. It was common in both developed and undeveloped countries. However, these rates vary markedly in different regions with rates as low as 3.4% in men and 6.8% in women, in rural India and as high as 68.9% in men and 72.5% in women, in Poland.

Between Years 1990 and 2020, Hypertension is anticipated to increase by 120% for women and 137% for men in developing countries compared to 30-60% in developed countries.7¬ According to WHO (in Geneva 2005) Prevalence of hypertension is increasing rapidly among Indian urban population and using the current definitions more than two-fifths of the Indian urban adult population has hypertension. The prevalence of hypertension (blood pressure ≥160/≥95 mmHg) in urban populations increased from 2–4% (in mid-1950s) to 10–15% at the end of 20th century. In rural populations, the prevalence increased from 1–2% to 4–8%. The Global Burden of Diseases study has reported that by the year 2023, CVD would be the major cause of death all over the world including the developing countries. In India, cardiovascular diseases would result in a loss of around 19 million disability adjusted life years.

Essential hypertension is the most prominent hypertension type, affecting around 95% of hypertensive patients. Though no direct cause has been identified, there are many factors such as unhealthy life style, smoking, stress, potassium deficiency hypokalaemia, obesity, salt (sodium), sensitivity alcohol intake, and vitamin deficiency that increase the risk of developing

hypertension. Risk also increases with aging, some inherited genetic mutation and having a family history of hypertension. Hypertension is the most important risk factor for death in industrialized countries. It increases atherosclerosis thus predisposes individuals to heart disease, peripheral vascular disease, and strokes. Types of heart disease that may occur include: myocardial infarction, heart failure, and left ventricular hypertrophy. Other complications include: hypertensive retinopathy hypertensive nephropathy. Lifestyle measures for lowering blood pressure includes reduced alcohol intake, reduced sodium chloride intake, increased physical activity, and control of overweight. Lifestyle interventions also have the potential to reduce the need and the amount of medications required for hypertensive patients and prevents high blood pressure from developing in non-hypertensive ones. Furthermore, lifestyle interventions are instrumental in controlling other concomitant cardiovascular risk factors not necessarily related to hypertension, such as smoking, raised cholesterol level, or diabetes, hence the importance of a multifunctional approach to effective risk reduction in hypertension.

A study aimed to assess the prevalence of hypertension among people in and around Kengeri satellite town, Bangalore, Karnataka, India and the associated risk factors related to hypertension was conducted. The sample consisted of 500 purposively selected adults>18 years of age. Data was obtained using a questionnaire. The findings showed that most of the selected candidates had less knowledge about hypertension and measures to control them. Researchers and doctors are faced with a profound urgency to enhance public and professional education toward this end to translate the results of research into improved practise. We felt that there is a need to plan the structured teaching programme on home care management and spread awareness among people. It will be more effective to prevent hypertension. Hence, we were motivated to do the present study entitled "**Prevalence of hypertension and its associated risk factors using survey data**" as an attempt to explore the knowledge on hypertension and to find out risk of developing among people in and around Kengeri, Bangalore.

Hypertension is commonly known as the "silent killer", its prevalence is highly variable worldwide and it's an important risk factor for cardiovascular disease. The increase of hypertension in the developing countries may be connected with the economic transition within those countries. This study is aimed to assess the prevalence of hypertension among people in and around Kengeri Satellite town and the associated risk factors related to hypertension. Hence, there is a growing need for spreading awareness about it. In this study, the data was collected by a structured interview questionnaire, which included data about nutritional lifestyle, stress, exercises, family history and smoking pattern. In addition, blood pressure and body mass index were measured. Data was collected from September 2018 to April 2019 at RVCE Health Center and other local hospitals around Kengeri. The sample included 500 candidates. The results were analysed using Excel. Post analysis in excel, HTML and java script along with machine learning was used to specifically analyze the data collected and develop an app. This app is aimed to determine the stage and level of hypertension in a particular patient. The app is commercialized in latter stages to provide it to the general public.

2. CONCEPT

Hypertension is another name for high blood pressure. It can lead to complications and increases the risk of heart disease, stroke, and death. Blood pressure is the force exerted by the blood against the walls of the blood vessels. The pressure depends on the blood pumped by the heart and the resistance of the blood vessels.

Definitions of certain risk factors related to hypertension

Smoker: A person who has smoked at least 100 cigarettes in his lifetime and has continued to smoke every day or some days in the last 30 days.

Tobacco chewing: A person who has consumed smokeless tobacco once a day or nearly every day in any form for the last 12 months.

Alcohol: Present consumer was defined as a person who has consumed alcohol every day or some days in the last 30 days. Past consumer was defined as a person who used to consume alcohol but stopped taking alcohol 12 months ago.

Salt intake: Estimated per capita salt intake was calculated by 24-h dietary recall method for three consecutive days and an average was calculated.

Measurement of blood pressure: Blood pressure measurements were made on the subject's left arm using a cuff of appropriate size at the level of the heart. The pressures where the sound appeared and disappeared were taken as systolic blood pressure and diastolic blood pressure respectively.

Classification of blood pressure

Classification	Systolic BP mmHg	Diastolic BP mmHg
Normal	< 120	< 80
Pre Hypertension	120-139	80-89
Stage I Hypertension	140-159	90-99
Stage II Hypertension	> 160	> 100

Factors causing hypertension :

- **Age**: The risk of high BP increases as you grow old. High blood pressure is more common in men until about age 64. After 65, women are more likely to develop high blood pressure.
- **Family history**: High blood pressure tends to run in families.
- **Being overweight or obese**: More blood needs to supply oxygen and nutrients to your tissues if you weigh beyond a certain limit. As the volume of blood circulated through the vessels increase, so does the pressure on the walls of your artery.
- **Not being physically active**: People who are not physically active enough tend to have higher heart rates. The higher your heart pumps, the harder your heart must work with each contraction and the stronger the force on your arteries. Lack of physical activity also increases the risk of being overweight.

- **Using tobacco**: Smoking or chewing tobacco not only raises your blood pressure temporarily, but the chemicals in tobacco can damage the lining of your artery walls. This can cause the arteries to narrow down and increase the risk of a heart attack. Secondhand smoke also can increase your heart attack risk.
- **Too much salt (sodium) in your diet**: High amount of sodium in your diet can cause your body to retain fluid, which increases blood pressure.
- **Too little potassium in your diet**: Potassium helps in balancing the amount of sodium in your cells. If there is no enough potassium in your diet, you may accumulate too much sodium in your blood.
- **Drinking too much alcohol**: Over time, heavy drinking can damage your heart. Having more than one drink a day for women and more than two drinks a day for men may affect your blood pressure.

3. METHODOLOGY

The following methodologies were carried out in the chronological order:

1. Place of study
2. Study population and period
3. Study Design
4. Analysis of the data using machine learning and java script

Place of study: Our survey-based study was carried out in the RVCE health center and Kengeri satellite town.

Study population and period: To find out the prevalence of hypertension in the population 20 years and above residing in and around Kengeri. To study the socio demographic risk factors affecting hypertension among the population >18 years of age from September 2018 to March 2019 for a period of six months. The population covered in this area was 500.

Study design: A questionnaire containing all the socio demographic data (age, sex, family history, socio economic status, weight, height etc.) and factors affecting hypertension [Tobacco intake, alcohol consumption, salt intake, diabetes mellitus etc.] were included in the study. The data was collected by interviewing the participants. The clinical measurements which were obtained include weight, height and blood pressure. All these were calculated by using standard instruments and following standard guidelines.

Tools: Microsoft Excel was then used to integrate and interpret the acquired data to give an indication of the hypertension level that is present in and around Kengeri satellite town. In addition to this, Java script was used to code the data into an app. The data was analyzed by the use of machine learning.

4. EXPERIMENTAL PROCEDURE

4.1. Methods

4.1.1 Design: The study was conducted using a comparative cross-sectional study design.

4.1.2 Setting: The study was carried out in RVCE health center and Kengeri satellite town.

4.1.3 Sample size: The study constituted 500 people (>18 years), of which were male and were female. Students who had chronic illnesses such as diabetes, renal disease or pregnant students were excluded from the study.

4.1.4 Analysis: The analysis of the data procured was carried out using various tools and software. Excel was used to collect and analyze the data. Thereafter, machine learning was used to analyze the data in order to result out the precision of the hypertensive nature in a person. In addition to this, java script is used to code out the app.

4.2. Data ccollection:

The data was collected using the following tools:

4.3. Structured interview questionnaire

A structured interview questionnaire sheet was designed by the students (with the help of a medical practitioner) to meet the aims of the study, based on the literature review and was written in simple English language to suit the common mans' level of understanding. Sociodemographic characteristics were collected as age, gender, marital status, residence education degree, health behaviors smoking status, physical activity, and nutritional lifestyle and family history.

The Sociodemographic characteristics related questions are given below

Personal related questions are given below

3. Personal Questionnaire

1. **Have you ever smoked cigarette?**

   i. Yes ii. No

2. **If the answer is yes, how often do you smoke ?**

   i. Occasional (once or twice a week) ii. Regular (more than twice a day)

3. **Are you taking alcohol?**

   i. Yes ii. No

4. **If the answer is yes, how often do you consume alcohol?**

   i. Occasional (once or twice a week) ii. Regular (more than twice a week)

5. **What level of physical activities do you have while at work?**

   i. Light ii. Moderate iii. Active

6. **Do you have any close relative who is/was suffering from hypertension?**

   i. Father ii. Mother iii. Siblings iv. None

7. **Diet History**

   Are you? i. Veg ii. Non-Veg

8. **How often do you consume pickles/potato (per week)?**

   i. once ii. twice iii. thrice iv. More than thrice

4.4 Validity

The study tools were tested for validity by the medical practitioner.

4.5. Filed work

The data were collected during the period from the 1st September 2018 and to the end of October 2018. Data were collected using a self-constructed face-to-face interviewed questionnaire: each person took about 10 minutes to complete the tool and to perform physical measurements at the manner of privacy in the presence of doctors.

4.6. Ethical consideration

Ethical issues including anonymity, confidentiality and voluntary participation were considered before starting data collection. We fulfilled the official steps required to get the approval for carrying out the study. The aims of the study and physical measurement were explained to each person to be familiar of his/her participation. It was the participants' right to reject participation or withdraw from the study at any time. This was guaranteed by no disciplinary action against them in the future.

4.7. Excel Analysis

The collected data was feed to the excel sheet for further validations. The 80 collected data was named as Data Points as it would be used as a reference for future work. The survey points when feed on the excel sheet gave us a lot of idea regarding the percentage of men to women who surveyed , the difference in numbers w.r.t a person having high DSP to a person having low DSP, etc.

5. Result and Discussion

5.2 First Stage of Results: Collection and Analysis of data by conducting the survey again in order to increase the data points from 80 to 500. These survey was completed in 2 months as the location places were choosen keeping diversity in mind. The main purpose of collecting these many data points was to have a better accuracy in the results.

Picture representation of these 500 data points with values provided to various parameters is shown below

Total Sample Size = 500

BMI

Age in years	
<20	35
20-29	134
30-39	121
40-49	98
50-59	67
60-69	29
70-79	14
>=80	2
Total	500

Sex	
Female	212
Male	288
Total	500

Residence	
Urban	345
Rural	155
Total	500

Male

Age	Normal(<25)	Over Weight (25-29)	Obese > 30	Total
<20	18	3	0	21
20-39	75	67	9	151
40-69	46	45	15	106
70-80+	6	4	0	10
				288

Female

Age	Normal(<25)	Over Weight (25-29)	Obese > 30	Total
<20	13	1	0	14
20-39	75	24	5	104
40-69	34	44	10	88
70-80+	5	1	0	6
				212
				500

Hospitals visited during survey

Suhasini Hospital	100
Medsol Hospital	68
H.K Hospital	178
Fortis Hospital	56
Chandana Hospital	98
	500

Fig 1. Data points collected using survey methods

Duration of stay in Bangalore	
1-4 years	78
5-15 years	29
16-34 years	193
35-60 years	161
>60 years	39
Total	500

Level of Education	
Illiterate	32
Primary School	127
Middle School	120
High School	123
Graduate/Post Graduate	98
Total	500

Smoking

Male

Age	YES	NO	Total
<20	0	21	21
20-39	106	45	151
40-69	97	9	106
70-80+	10	0	10
			288

Female

Age	YES	NO	Total
<20	0	14	14
20-39	29	75	104
40-69	24	64	88
70-80+	5	1	6
			212
			500

Fig 2.

Blood Pressure						Alcohol				
	STAGES	Stage 1	Stage 2	Stage 3	TOTAL					
Male		NormoTensive	First Stage/Pre Hypertensive	Second Stage Hypertensive		Male				
	Age						Age	YES	NO	Total
	<20	16	5	0	21		<20	5	16	21
	20-29	34	32	13	79		20-39	95	56	151
	30-39	14	36	22	72		40-69	87	19	106
	40-49	8	32	24	64		70-80+	10	0	10
	50-59	3	10	16	29					288
	60-69	1	4	8	13	Female	Age	YES	NO	Total
	70-79	0	2	6	8		<20	0	14	14
	>=80	0	0	2	2		20-39	52	52	104
					288		40-69	24	64	88
Female	Age						70-80+	3	3	6
	<20	14	0	0	14					212
	20-29	40	11	4	55					
	30-39	26	17	6	49					
	40-49	12	12	10	34					
	50-59	4	14	20	38					
	60-69	2	6	8	16					
	70-79	0	3	3	6					
	>=80	0	0	0	0					
					212					

Fig 3

Are you still Studying?		
Yes	74	
No	426	
Total	500	
Occupation		
Professional	59	
Semi - professional	125	
Clerk/Shop Owner/Farmer	121	
Skilled	43	Skilled people are financial representattives , sales represntattives , nurses
Semi-skilled	20	Semi Skilled people are taxi drivers , waiters , flight attendant ,bartenders, retail salesperson
Unskilled	58	Unskilled people are maids , grocery clerk , fast food workers , parking lot people
Total*	426	* means students are excluded from the occupation column
Marital Status		
Single	142	
Married*	358	* (include people who either are a divorced/widow/widower)
Total	500	

Fig 4

Fig 1 – 4. Data collected using the survey method.

6. DISCUSSION:

The above seen data points were then divided on the basis of the below criteria to satisfy the different stages of Hypertension.

6.1 Criteria

Second Stage Hypertensive	First Stage/Pre Hypertensive	NormoTensive
SBP 140 - 159	SBP 120-139	SBP <120
DSP 90-99	DSP 80-89	DSP <80
Smoker	Often Smokes	No smoking
Alcoholic	Often drinks	Never Drank
No physical activity	Moderate active	Active like sportsman
Consumes pickles	Consumes pickles	Hates pickles

There are 6 different parameters which can cause directly or indirectly cause Hypertension, which were considered in the Android platform are as mentioned in table 1.

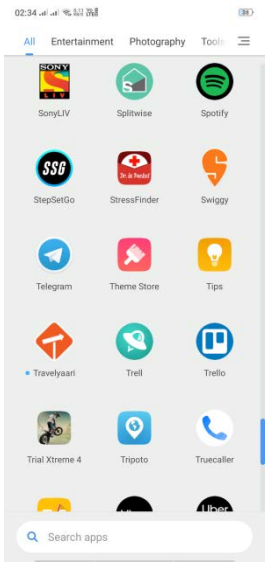
Table 1. Classification of the survey data.

Stages/Intake	Alcohol activity	Smoking	DSP	SBP	Use of more salt	Physical activities
Normal Hypertensive Stage 1	NO	NO	<80	<120	Low	Active
Normo Hypertensive Stage 2	NO	NO	<80	120-130	Moderate	Active
First Stage Pre- Hypertensive 1	YES	NO	80-89	120-130	Moderate	Moderate
First Stage Pre - Hypertensive 2	YES	YES	80-89	130-139	High	Low
Second Stage Hypertensive 1	YES	YES	>90	>140	Low	High
Second Stage Hypertensive 2	YES	YES	>90	>140	High	Low

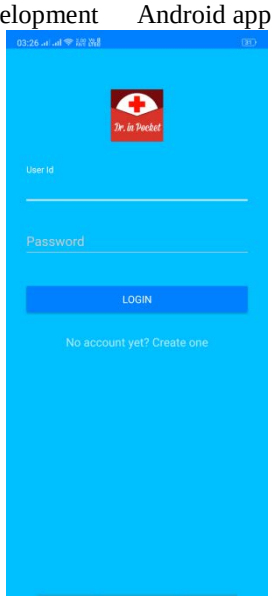
6.2 Android Studio Software:

The Android Studio software is used for Android Operating System because of the Integrated Development Environment it provides. The software helps in de-bugging the issues related to the platform.

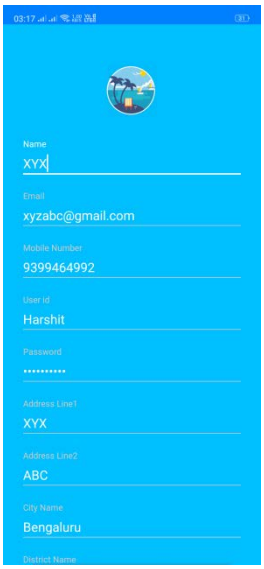
Android app showcasing:



Icon



Login Window



Register

REFERENCES :

1. Gupta R, Pandey RM, Misra A, Agrawal A, Misra P, Dey S, High prevalence and low awareness, treatment and control of hypertension in Asian Indian women. Jaipur, India. Journal of Hypertension. 2011 Sep 1.doi: 10.1038/jhh.2011.79.
2. Kaur P, Rao SR, Radhakrishnan E, Rajshekar D, Gupte MD, "Prevalence, awareness, treatment, control and risk factors for hypertension in a rural population in South India" Chennai, India, International journal of public health. 2011 Sep 23.
3. Pandey RM, Gupta R, Mishra A, Mishra P, Singh V, Agrawal A, " Determinants of urban-rural differences in cardiovascular risk factors in middle-aged women in India" New Delhi, India. International journal of cardiology. 2011 Aug29.
4. Singh RB, Beegom R, Ghosh S, Niaz MA, Rastogi V, Rastogi SS, Singh NK, Nangia S, "Epidemiological study of hypertension and its determinants in an urban population of North India", Medical Hospital and Research Centre, Moradabad, India Journal of human hypertension. 1997 Oct; 11(10):679-85.
5. Bhardwaj R, Kandori A, Marwah R, Vaidya P,Singh B, Dhiman P, Sharma A, "Prevalence, awareness and control of hypertension in rural communities of Himachal Pradesh", Indira Gandhi Medical College, Shimla-171001. The Journal of the Association of Physicians of India. 2010 Jul; 58:423-4, 429.
6. Zernike W, Henderson A "Evaluating the effectiveness of two teaching strategies for patients diagnosed with hypertension", Royal Brisbane Hospital, QLD, Australia. Journal of clinical nursing. 1998 Jan; 7(1):37-44.
7. Prabhu G. R. Reddy S.S. Prevalence and Risk Factors of Hypertension in Adults in an Urban Slum, Tirupati, A.P. Indian Journal of Community. Medicine. 2005July-Sep; 30 (3): 84-86.
8. Murthy SN, Rao NS, Nandkumar B, Kadam A "Role of naturopathy and yoga treatment in the management of hypertension", INYS Medical Research Society, Jindal Nature cure Institute, Jindal Nagar, Bangalore, India. Complementary therapies in clinical practice. 2011 Feb; 17(1):9-12
9. Pandey RM, Gupta R, Mishra A, Mishra P, Singh V, Agrawal A, " Determinants of urban-rural differences in cardiovascular risk factors in middle-aged women in India" New Delhi, India. International journal of cardiology. 2011 Aug29.

10. Nahla IKR, Nariman HA, Adnan AA. Prevalence and determinants of prehypertension and hypertension among preparatory and secondary school teachers in Jeddah. J Egypt Public Health Association 2008;83(3-4):184-203.
11. Bani IA. Prevalence and related risk factors of essential hypertension in Jazan region, Saudi Arabia.
12. Walker S. Dietary and lifestyle factors related to risk of obesity and hypertension in Jamaican women. Implications for health promotion.
13. Agrawal VK, Bhalwar R, Basannar DR. Prevalence and determinants of hypertension in a rural community. MJAFI 2008;64:21-5
14. Greiw ASH, Gad Z, Mandil A, Wagdi M, Elneihoum A, Greiw ASH. Risk factors for CVD among teachers.[cited 2010].
15. Omorogiuwa A, Ezenwanne EB, Osifo C, Ozor MO, C. Ekhator N. comparative study on risk factors for hypertension in a university setting in southern Nigeria. International Journal of Biomedical and Health Sciences 2009 Jun 30;5(2):103-107.
16. Hypertension/drug therapy; Aged; Prevalence; Awareness; Risk factors; Cross-sectional studies; Multicenter studies; India MESH, INSERM, BIREME. Bulletin of the World Health Organization, 2001, 79: 490–500
17. Sarala Sabapathy, Nagaraju B. A.*, Bhanuprakash C. N, Prevalence of childhood hypertension and pre-hypertension in school going children of Bangalore rural district: a cross sectional study**,** International Journal of Contemporary Pediatrics Sabapathy S et al. Int J Contemp Pediatr. 2017 Sep;4(5):1701-1704.
18. Ashfaq Modiwala1*, Ajit Deshpande2, R. R. Wavare2, S. L. Kantharia1, Assessment of prevalence of hypertension in an urban population: a cross sectional study in Indore city **,** International Journal of Community Medicine and Public Health Modiwala A et al. Int J Community Med Public Health. 2018