A Study on Detecting Blood Pressure Dynamics in Different Age Groups: A Community Health Intervention in Ranipet Village, Mahabubnagar Dist., Telangana

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Abstract:- This research paper presents the findings of a comprehensive survey conducted in Ranipet village, Mahabubnagar district, with the primary aim of raising awareness about blood pressure (BP) fluctuations and overall health conditions among its residents. The study encompassed 554 individuals aged 19 and above, segmented into three age groups (19-40, 41-60, and 61 & above) and categorized by gender. BP levels were classified into Low, Normal, and High BP. The results revealed that the majority of the population maintained Normal BP, with 89.34% of males and 89.01% of females falling within this category. High BP prevalence increased with age, especially among females aged 41-60, where 14.29% exhibited High BP compared to 5.75% of males in the same age group. Conversely, Low BP occurrence was consistently low across all demographics. These findings underscore the importance of regular BP monitoring and tailored health strategies to improve health outcomes in small communities.

I. INTRODUCTION

Blood pressure is a vital measure of cardiovascular health, indicating the force exerted by blood on the walls of the arteries. Understanding its dynamics is crucial for assessing health and managing risks. It's measured as systolic and diastolic pressure, with systolic representing contraction force and diastolic indicating resting pressure. Pulse pressure, the difference between the two, offers further insights into cardiovascular health. Deviations from normal pulse pressure levels can signal underlying cardiovascular issues, increasing the risk of adverse events like strokes or heart attacks. Suboptimal blood pressure contributes significantly to the growing economic and health challenges in developing countries. (Gaziano, et.al., (2009).

➢ *Hypertension*

High blood pressure, or hypertension, is a prevalent condition in the United States, posing significant risks such as heart attack and stroke. It's defined as a blood pressure reading of 130/80 mmHg or higher, with normal levels typically around 120/80 mmHg. Hypertension is categorized into two stages: Stage 1 (systolic 130-139 mmHg or diastolic 80-89 mmHg) and Stage 2 (systolic 140 mmHg or higher, or diastolic 90 mmHg or higher). (Healthy and unhealthy Blood Pressure ranges by (AHA) American Heart Association).

A hypertensive crisis occurs at 180/120 mmHg or higher, requiring immediate medical attention. Regular screenings, starting at age 18 and occurring every two years, are crucial for early detection and management. Pre-hypertension is identified by systolic readings between 121-140 mmHg and diastolic readings between 81-90 mmHg. One-quarter of the world's adult population has hypertension, and this is likely to increase to 29% by 2025. (Mittal, B. V., & Singh, A. K. (2010). Understanding blood pressure involves considering various contexts, emphasizing the importance of regular monitoring to mitigate risks and improve cardiovascular health.

➢ *Hypotension*

Low blood pressure, or hypotension, though less common, presents health risks such as dizziness, confusion, nausea, and fatigue. Causes include prolonged bed rest, dehydration, and nutritional deficiencies. In cases of extremely low blood pressure, syncope may occur. Other symptoms can arise, usually stemming from the underlying cause rather than the hypotension itself. (Sharma, S., et.al., (2023). Context matters in blood pressure measurement, emphasizing the need for regular monitoring for both normal and hypertensive individuals. Awareness of hypotension's implications underscores personalized care for optimal outcomes.

➢ *Clinical Implications*

The (PAFs) population attributable fractions suggest that keeping BP levels low is an important strategy for primary CVD (cardiovascular disease) prevention, even in an elderly population. (Fujiyoshi, et al. (2012). Blood pressure assessment is crucial for evaluating cardiovascular health and guiding interventions. While hypertension poses a significant challenge, awareness campaigns and evidence-based strategies aim to mitigate its impact. Similarly, understanding hypotension highlights the importance of tailored approaches for patient well-being.

II. GENETIC INFLUENCE ON BLOOD PRESSURE

Blood pressure (BP) is also a classical complex genetic trait with heritability estimates of 30–50%. (Ehret, G. B., & Caulfield, M. J. (2013). Certain syndromes demonstrate a profound genetic impact, affecting hypertension onset. Understanding genetic influences enhances management strategies, contributing to improved patient outcomes.

➢ *Impact of Dietary Habits*

Maintaining a healthy lifestyle can significantly impact blood pressure. Strategies like achieving a healthy weight, consuming a balanced diet rich in fruits, vegetables, and whole grains, and limiting saturated fats are crucial. Additionally, reducing salt intake, moderating alcohol consumption, avoiding smoking, and regular physical activity play a pivotal role in preventing and managing high blood pressure. The severity of hypertension (achieved blood pressure) is associated with the incidence of (CVD) cardiovascular disease, and the study suggest that tight blood pressure control and salt restriction are important for preventing stroke. (Teramoto, T., et al. (2012).

➢ *Prevalence of Hypertension in India*

Hypertension is a significant health concern in India, affecting an estimated 188.3 million individuals. However, only 37% receive a diagnosis, with urban areas showing higher prevalence rates compared to rural areas. Men are more affected than women, with awareness and treatment rates relatively low at 51.4%.

Hypertension is estimated to be responsible for 10.8% of all deaths and 4.6% of Disability-Adjusted Life Years (DALYs) in the country. Over the past three decades, the prevalence of hypertension among adults has risen dramatically in both urban and rural areas. It is estimated that hypertension contributes to 16% of Ischaemic Heart Disease, 21% of Peripheral Vascular Disease, 24% of Acute Myocardial Infarctions, and 29% of strokes. (ICMR, 2018)

Genetic predisposition, coupled with lifestyle and regional variations, significantly influences hypertension prevalence and management. Understanding these factors is crucial for implementing effective interventions and public health policies to mitigate the burden of hypertension in diverse populations.

➢ *Objectives of the Study*

• Detect Blood Pressure Fluctuations: Identify variations in blood pressure levels among 554 Ranipet village residents through screenings and assessments.
• Promote Health Consciousness: Educate residents about the importance of maintaining optimal blood pressure and cardiovascular health through initiatives, outreach programs, and awareness campaigns.
• Encourage Health Checkups: Motivate Ranipet villagers to undergo regular health checkups by medical professionals for early detection and management of health conditions, including hypertension.

These objectives aim to enhance health awareness, encourage proactive health behaviors, and reduce the burden of preventable health conditions in the Ranipet community.

III. STUDY AREA

Located within the Midjil Mandal of Mahabubnagar district, Ranipet village serves as the focal point for our research endeavor. Situated approximately 16 kilometers from Jadcherla, Ranipet village was selected as the target location for our study on blood pressure (BP) fluctuations among its inhabitants.
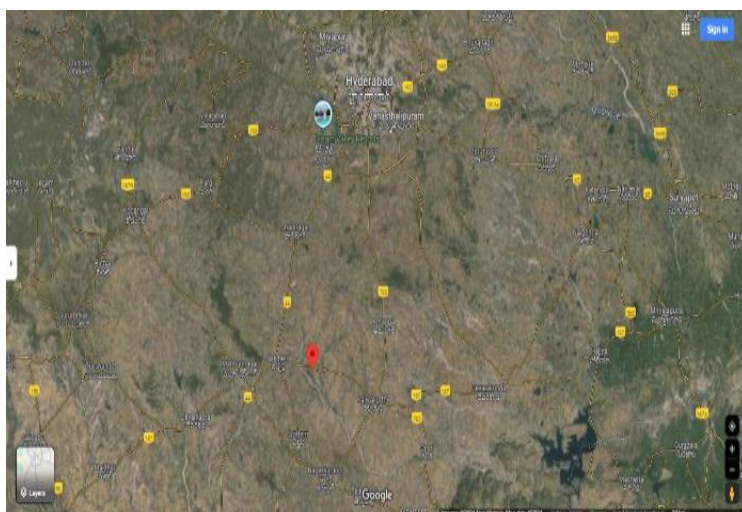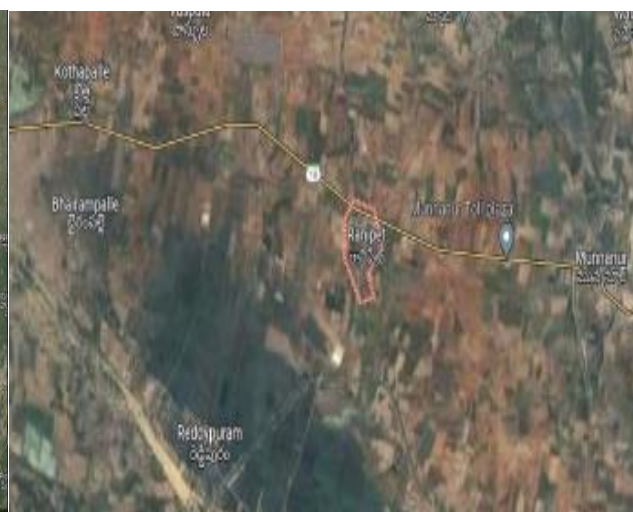

| Fig 1 | Fig 2 |

Fig 1 & 2: Location of the study area, Ranipet Village (Source Google Maps)

Table 1: Demographic details of Ranipet Village

Property	Value
Name of the village	Ranipet
Mandal of the village	Midjil
District of the village	Mahabubnagar
State	Telangana
Pin code	509347
Longitude	78.143585
Latitude	16.763159

The primary aim of our survey in Ranipet village is to raise awareness regarding BP fluctuations and overall health conditions among its residents. With 554 individuals in the age group of 19 and above, Ranipet village represents a small yet significant community within Mahabubnagar district. Our survey seeks to shed light on the prevalence of BP fluctuations within this population and to provide essential health education and guidance to improve health outcomes.

The selection of Ranipet village as our project site stems from the imperative to address the health needs of local communities. By focusing our efforts on Ranipet, we aim to contribute meaningfully to the health and well-being of its residents. Our team strives to empower individuals with the knowledge and resources needed to monitor and manage their blood pressure effectively through comprehensive surveys and awareness initiatives.

Ranipet village serves as the cornerstone of our research project, symbolizing our commitment to promoting health consciousness and fostering positive health outcomes within rural communities.

➢ *Hypothesis*

- Blood Pressure Variation in Ranipet: We hypothesize that residents of Ranipet village exhibit diverse blood pressure readings, reflecting varying cardiovascular health statuses.
- Systolic and Diastolic Assessment: Our investigation aims to uncover insights into residents' health conditions, particularly regarding systolic and diastolic blood pressure measurements, revealing overall cardiovascular health patterns.
- Health Ailment Correlations: We propose correlations between blood pressure levels and prevalent health ailments in Ranipet, identifying potential risk factors influenced by blood pressure fluctuations.
- Advice and Awareness: By providing personalized advice and raising awareness about blood pressure management, we aim to empower Ranipet villagers to proactively safeguard their cardiovascular health, fostering alertness and responsibility.

- Through thorough testing and analysis, we seek to validate these hypotheses, contributing valuable insights to blood pressure-related health concerns in the Ranipet community.

IV. RESEARCH METHODOLOGY

Our research project focused on assessing blood pressure (BP) fluctuations among the residents of Ranipet village. The following outlines the methodology employed:

- Project Scope and Location: The study was conducted exclusively in Ranipet village, situated within the Midjil Mandal of Mahabubnagar district, Telangana, India.
- Measurement Instruments: BP measurements were obtained using an automated BP apparatus, ensuring standardized and accurate readings.
- Population and Sample Size: Ranipet village has a total population of 554 individuals in the age group 19 and above. Our research team aimed to include all members of the age 19 and above in the study to ensure comprehensive data collection.
- Data Collection Process: Surveys were conducted among the residents of Ranipet village to gather pertinent information regarding BP fluctuations. Weight measurements were also recorded during the survey process.
- Survey Method: The survey method was utilized to collect data on various parameters related to BP fluctuations and overall health status. This approach facilitated direct interaction with participants, allowing for the acquisition of detailed information.
- Data Analysis: Collected data, including BP measurements, height, and weight, were analyzed using appropriate statistical methods to identify trends, correlations, and associations. This analysis provided insights into the prevalence of BP fluctuations and their potential impact on the health of Ranipet village residents.

By employing a systematic and rigorous research methodology, our team aimed to generate comprehensive data on BP fluctuations and associated health indicators within the Ranipet village community. This approach enabled us to fulfill the objectives of our study and contribute valuable insights to the field of cardiovascular health research.

Fig 3,4 & 5: Measuring Blood Pressure and Collecting Data by the Student Researchers at Ranipet Village

V. RESULTS

The study aimed to investigate the blood pressure dynamics among the complete 554 individuals of different age groups in Ranipet Village of Midjil Mandal, Mahabubnagar District. The data were categorized into three age groups—19-40, 41-60, and 61 & above, and further segmented by gender. Blood pressure levels were classified into Low BP, Normal BP, and High BP.

Table 2: The Blood Pressure Levels Recommended by (AHA) American Heart Association

BLOOD PRESSURE CATEGORY	SYSTOLIC mm Hg (upper number)		DIASTOLIC mm Hg (lower number)
NORMAL	LESS THAN 120	and	LESS THAN 80
ELEVATED	120-129	and	LESS THAN 80
HIGH BLOOD PRESSURE (HYPERTENSION) STAGE 1	130-139	or	80-89
HIGH BLOOD PRESSURE (HYPERTENSION) STAGE 2	140 OR HIGHER	or	90 OR HIGHER
HYPERTENSIVE CRISIS (consult your doctor immediately)	HIGHER THAN 180	and/or	HIGHER THAN 120

Table 3: Detailed Extracted List of the Persons Suffering from Hypertension or Hypotension

| S No	Name	Gender	Age	Weight (Kg)	Blood Pressure (mm/Hg)	Pulse rate/ Min	Blood Pressure Range	Under medication?
1	Habeeda	F	45	58	90/65	79	Low	NO
2	Nazreen	F	65	75	142/86	81	High	Using
3	Kadhar	M	50	80	140/80	78	High	Using
4	Shivamma	F	58	72	140/97	73	High	Using
5	Tulja Ramu	M	65	75	130/80	82	High	Using
6	Waheed	M	71	68	135/85	79	High	Using
7	Suguna Bhai	F	62	66	140/74	80	High	Using
8	Vishnu Murali	M	78	69	138/87	77	High	Using
9	Srihari	M	45	65	137/65	79	High	Using
10	Nagubhai	F	56	57	134/80	76	High	NO
11	Janakibhai	F	68	50	141/95	96	High	Using
12	Janakamma	F	55	53	138/94	89	High	Using
13	Yadamma	F	50	65	95/62	75	Low	Using
14	Rahemathi Bee	F	80	60	140/90	82	High	Using
15	Parvathamma	F	44	40	146/87	77	High	Using
16	Renuka	F	36	50	143/94	89	High	Using
17	Beeraiah	M	85	67	144/85	79	High	Using
18	Alamma	F	48	46	148/87	80	High	Using
19	Masamma	F	60	58	131/80	79	High	Using
20	Venkatesh	M	50	70	134/80	76	High	Using
21	Manjula	F	45	52	130/94	89	High	Using
22	Yadagiri	M	67	69	145/87	76	High	Using
23	Anjamma	F	52	58	149/74	81	High	Using
24	Shiva	M	45	66	132/80	79	High	Using
25	Sadhik	M	25	69	134/85	90	High	Using
26	Shaheen	F	35	50	135/80	76	High	Using
27	Santhosha	F	27	49	89/65	78	Low	Using
28	Shivudu	M	34	60	143/87	77	High	Using
29	Padma	F	48	57	141/90	82	High	Using
30	Krishna	M	42	51	130/80	80	High	Using
31	Anjaneyulu	M	32	54	134/80	81	High	Using
32	Ramachandraih	M	74	80	140/80	85	High	Using
33	Jameer	M	30	79	148/74	85	High	Using
34	Shivaleela	F	29	56	134/80	79	High	Using
35	Sudhakar	M	23	65	165/95	75	High	Using
36	Sabera Begum	F	50	70	140/90	67	High	Using
37	Md. Mohen	M	26	46	148/87	74	High	Using
38	Uma	F	39	56	134/85	90	High	Using
39	Beeraiha	F	27	80	134/85	90	High	NO
40	Julekha Begum	F	56	53	146/87	72	High	NO
41	Sathya Narayana	M	61	59	143/87	77	High	Using
42	Nagamma	F	81	90	141/90	82	High	Using
43	Hajeera Begum	F	45	70	90/65	79	Low	NO
44	Suleman	M	76	82	142/86	81	High	NO
45	Kudhus	M	51	67	89/65	78	Low	NO
46	Fazeen	M	36	60	143/87	77	High	Using
47	Udhay Kumar	M	28	57	141/90	82	High	Using
48	Chinnamma	F	43	80	134/85	90	High	NO
49	Pullaya	M	36	67	89/65	78	Low	Using
50	Bheemamma	F	56	50	143/94	89	High	NO
51	V.Sharadama	F	38	56	134/85	90	High	Using
52	K.Raju	M	33	49	89/65	78	Low	Using
53	Balayya	M	72	56	134/80	79	High	Using
54	Balamani	F	23	79	148/74	85	High	Using

55	Nagamma	F	57	53	146/87	72	High	Using
56	Gnaneshwar	M	21	58	90/65	79	Low	NO
57	Balakrishana	M	29	90	141/90	82	High	Using
58	Md Ismile	M	42	58	90/65	79	Low	NO
59	Baskar	M	47	77	89/72	82	Low	Using
60	Sirisha	F	21	58	90/65	79	Low	NO

Across all age groups, it was noted that among males, 6 individuals (2.21%) had Low BP, 243 individuals (89.34%) had Normal BP, and 23 individuals (8.46%) had High BP, totaling 272 males. Among females, 5 individuals (1.77%) had Low BP, 251 individuals (89.01%) had Normal BP, and 26 individuals (9.22%) had High BP, totaling 282 females. It was observed that the majority of the population in Ranipet Village, regardless of gender, maintained Normal BP. The distribution of High BP showed an increase with age, particularly among females in the 41-60 age group. The prevalence of Low BP remained consistently low across all age groups.
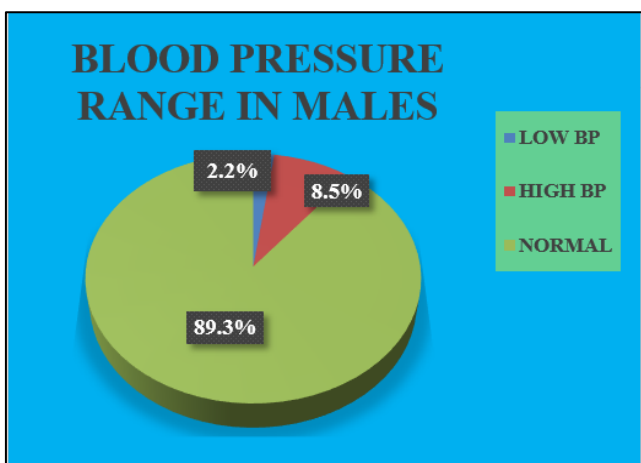
Graph 1: Blood Pressure Range in Males
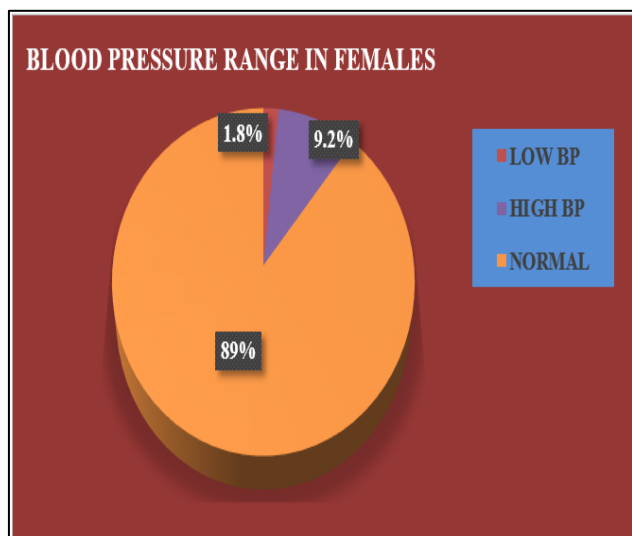
Graph 2: Blood Pressure Range in Females

VI. BLOOD PRESSURE DISTRIBUTION BY AGE GROUP AND GENDER

A. Age Group 19-40

In the 19-40 age group, it was observed that among males, 3 individuals (1.99%) had Low BP, 139 individuals (92.05%) had Normal BP, and 9 individuals (5.96%) had High BP, making a total of 151 males. Among females in the same age group, 2 individuals (1.32%) were found to have Low BP, 142 individuals (94.04%) had Normal BP, and 7 individuals (4.64%) had High BP, also summing up to 151 females. It was noted that the majority of both males and females exhibited Normal BP. Low BP occurrences were minimal, while High BP was slightly more common in males than in females.

B. Age Group 41-60

For the 41-60 age group, it was recorded that 3 males (3.45%) had Low BP, 79 males (90.80%) had Normal BP, and 5 males (5.75%) had High BP, with a total of 87 males. Among females, 3 individuals (3.06%) were found to have Low BP, 81 individuals (82.65%) had Normal BP, and 14 individuals (14.29%) had High BP, resulting in a total of 98 females. In this age group, Normal BP was still the most common category, but the incidence of High BP was noted to have increased significantly among females, indicating a higher risk in this group compared to males.

C. Age Group 61 & Above

In the age group of 61 & above, it was found that no males had Low BP, while 25 males (73.53%) had Normal BP and 9 males (26.47%) had High BP, with a total of 34 males. Among females, no individuals had Low BP, while 28 individuals (84.85%) had Normal BP, and 5 individuals (15.15%) had High BP, summing up to a total of 33 females. Among the elderly, Normal BP was still prevalent, but the incidence of High BP was significant, particularly among males.

Table 4: The BP Variations among Different Age Group Villagers of Ranipet

AGE GROUP	MALE				FEMALE			
	LOW BP	NORMAL BP	HIGH BP	TOTAL	LOW BP	NORMAL BP	HIGH BP	TOTAL
19-40	3	139	9	151	2	142	7	151
41-60	3	79	5	87	3	81	14	98
61&ABOVE	0	25	9	34	0	28	5	33
TOTAL	6	243	23	272	5	251	26	282
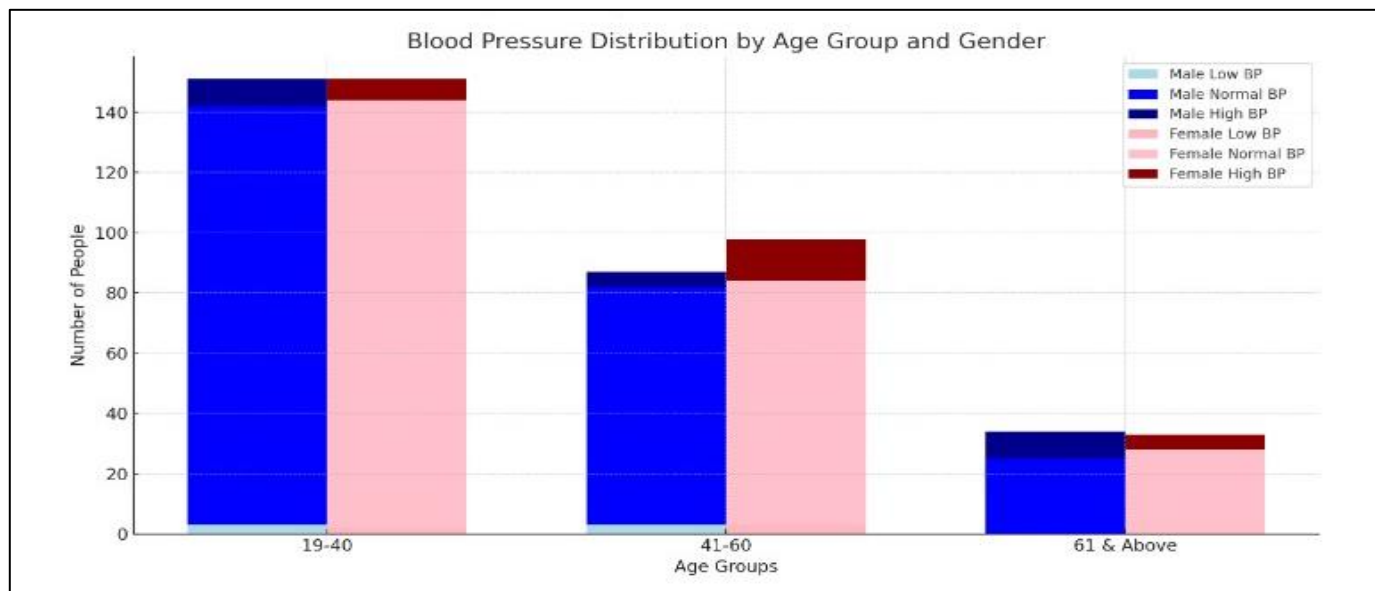
Graph 3: Stacked Bar Diagram of Blood Pressure Distribution by Age Group and Gender
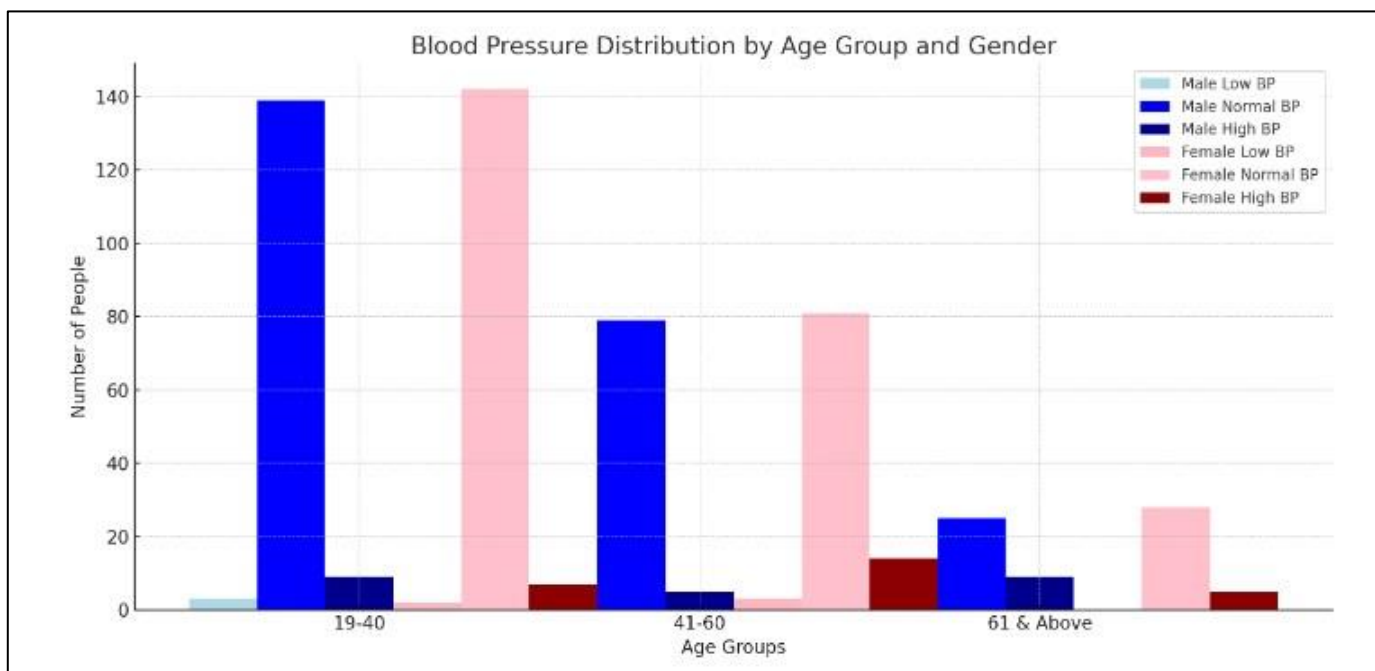
Graph 4: Bar Diagram of Blood Pressure Distribution by Age Group and Gender

VII. ANALYSIS AND DISCUSSION

A. Prevalence of Normal BP

The high prevalence of Normal BP across all age groups suggests that the majority of the population in Ranipet Village maintains healthy blood pressure levels. This could be attributed to various factors, including genetic predispositions, dietary habits, and physical activity levels common in this rural setting. The results align with studies indicating that rural populations often exhibit healthier BP levels due to lifestyle factors such as lower stress levels and physical labor.

B. Age-Related Trends

An age-related increase in the incidence of High BP is evident from the data. This trend is particularly pronounced among females in the 41-60 age group, where 14.29% have High BP compared to 5.75% of males. The rise in High BP with age can be attributed to physiological changes such as arterial stiffness, increased peripheral resistance, and cumulative exposure to risk factors like poor diet, sedentary lifestyle, and obesity. Hormonal changes, especially in postmenopausal women, further contribute to the increased risk of hypertension.

C. Gender Differences

Gender-specific differences in BP distribution are noticeable, particularly in the middle-aged group. Females aged 41-60 exhibit a higher prevalence of High BP compared to their male counterparts. This discrepancy may be influenced by hormonal changes during menopause, which can lead to increased BP. Additionally, societal and cultural factors might impact health behaviors differently across genders, influencing BP levels. For example, women might have less access to healthcare or health education, contributing to poorer management of BP.

D. Low BP Incidence

The consistently low incidence of Low BP across all age groups indicates that hypotension is not a significant health concern in this population. This might suggest that dietary intake and overall health status prevent occurrences of BP falling below normal levels. However, it is essential to monitor these trends to ensure they do not indicate underlying health issues that could emerge with changes in lifestyle or demographics.

E. Public Health Implications

The findings highlight the importance of targeted public health interventions to manage and prevent hypertension, especially as individuals age. For younger adults, maintaining healthy BP levels should be prioritized through preventive measures such as promoting physical activity, healthy eating, and regular BP monitoring. For middle-aged individuals, especially females, specific programs addressing the risks of hypertension related to menopause and lifestyle changes are crucial. Educational campaigns, regular screenings, and promoting healthy lifestyle modifications can help mitigate the rising trend of High BP in this demographic.

F. Elderly Population

For the elderly population, effective management of hypertension is critical to prevent complications such as cardiovascular diseases and strokes. Strategies should include regular health check-ups, appropriate medication management, and support for adopting healthy lifestyles. Community-based programs can play a vital role in providing accessible healthcare services and education to manage hypertension effectively.

VIII. CONCLUSION

The analysis of blood pressure dynamics in Ranipet Village reveals significant insights into the health status of different age groups and genders. While Normal BP is predominant, the increasing trend of High BP with age, particularly among middle-aged females, necessitates targeted health interventions. These findings underscore the need for age-specific and gender-specific public health strategies to manage and prevent hypertension, ultimately improving the overall health outcomes in Ranipet Village. Future research could further explore the underlying causes of these trends and evaluate the effectiveness of specific interventions in this population.

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