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A STUDY ON SERUM ELECTROLYTE (SODIUM & POTASSIUM) IMBALANCES AND THEIR ASSOCIATION WITH HYPERTENSION AMONG THE ELDERLY IN DARBHANGA, BIHAR

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Keywords

Hypertension, Serum Potassium, Serum Sodium, Elderly, Electrolyte Imbalance, DARBHANGA, Bihar.

Abstract

Background: Hypertension is a major public health challenge among the elderly population in India. The role of serum electrolyte imbalances, particularly sodium and potassium, remains under-explored in the geriatric population of North Bihar [1, 2].

Objectives: To assess serum sodium and potassium levels in the elderly population of Darbhanga, Bihar, and to evaluate their association with hypertension [3].

Methods: A community-based cross-sectional study was conducted among 150 elderly individuals (≥60 years) residing in various locations of Darbhanga city. Blood pressure was measured using standard protocols, and fasting serum sodium and potassium levels were estimated [4, 5].

Results: Out of 150 participants, 88 (58.7%) were hypertensive. The mean serum potassium level was significantly lower in the hypertensive group (3.72 ± 0.46 mEq/L) compared to the normotensive group (4.28 ± 0.40 mEq/L) ($p<0.001$). Serum sodium levels showed no significant difference. Hypokalemia was observed in 24 (27.3%) hypertensive compared to only 6 (9.7%) normotensives ($p<0.01$).

Conclusion: A significant inverse association exists between serum potassium levels and hypertension in the elderly population of Darbhanga [11, 13].

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1. INTRODUCTION

India is currently experiencing a demographic transition with a rapidly aging population. According to the 2001 census, the elderly population (60 years and above) accounted for 77 million, which is projected to reach 301 million by 2051 [1]. This greying of the population brings with it an increased burden of age-related disorders, among which hypertension is one of the most prevalent and significant [2].

Hypertension is a major risk factor for cardiovascular diseases, stroke, and renal failure, contributing substantially to morbidity and mortality worldwide [3]. In India, the prevalence of hypertension among the elderly ranges from 40% to 70% depending on the region and population characteristics [4]. The pathophysiology of hypertension is multifactorial, involving genetic, environmental, and lifestyle factors [5].

Among the various factors influencing blood pressure, electrolyte balance plays a crucial physiological role. Sodium and potassium are key electrolytes involved in maintaining vascular tone, fluid balance, and cardiac function [6]. The Renin-Angiotensin-Aldosterone System (RAAS) tightly regulates these electrolytes, and any imbalance can lead to sustained blood pressure elevation [7].

Epidemiological evidence from large international studies has established a positive association between sodium intake and blood pressure, and an inverse association between potassium intake and blood pressure [8]. However, most Indian studies have focused on dietary intake rather than actual serum electrolyte levels. Furthermore, region-specific data from Bihar, particularly among the geriatric population, is conspicuously absent [9].

The elderly are particularly vulnerable to electrolyte disturbances due to age-related physiological changes, multiple comorbidities, polypharmacy, and nutritional deficiencies [10]. Hypokalemia, in particular, can exacerbate hypertension and increase the risk of cardiac arrhythmias [11].

Darbhanga, a major city in North Bihar, has a significant elderly population with distinct socio-cultural and dietary practices. However, no comprehensive study has examined the association between serum electrolyte levels and hypertension in this population. The present study, utilizing data from a larger community-based survey, aims to fill this research gap [12].

2. MATERIALS AND METHODS

2.1 Study Design and Area

A community-based cross-sectional study was conducted in various locations of Darbhanga city and its surrounding areas, including Laheriasarai, Bahadurpur, Bela Dullah, Donar, GM Road, Kathalbari, Laxmisagar, Mirzapur, Railway Colony, and Sundarpur [12].

2.2 Sample Size and Sampling Technique

A total of 150 elderly individuals (aged 60 years and above) were included in the study. Purposive sampling was employed to select participants from the aforementioned locations, ensuring representation across different socio-demographic strata [12].

2.3 Inclusion and Exclusion Criteria

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Inclusion Criteria:

- Age 60 years or above
- Willingness to participate and provide informed consent
- Resident of Darbhanga for at least one year [1]

Exclusion Criteria:

- Known cases of chronic kidney disease or renal failure
- Patients on diuretic therapy or potassium supplements (self-reported)
- Critically ill or bedridden individuals
- Refusal to provide consent [11]

2.4 Data Collection Tools

A structured questionnaire was used to collect socio-demographic and clinical information, including age, gender, marital status, education, occupation, economic status, food habits, and alcohol consumption [4].

2.5 Anthropometric and Physiological Measurements

Blood Pressure Measurement: Blood pressure was recorded using a standard mercury sphygmomanometer following WHO guidelines [11]. Participants were seated comfortably for at least 5 minutes before measurement. Two readings were taken at 5-minute intervals, and the average was recorded [5]. Hypertension was defined as systolic blood pressure ≥140 mmHg and/or diastolic blood pressure ≥90 mmHg, or self-reported history of hypertension with current use of antihypertensive medication [3].

BMI Measurement: Height and weight were measured using standard techniques, and Body Mass Index (BMI) was calculated as weight (kg)/height (m^2) [1]. BMI categories were defined as per WHO classification: Normal (18.5-24.9), Overweight (25-29.9), and Obese (≥30) [2].

2.6 Biochemical Analysis

Fasting venous blood samples were collected under aseptic conditions. Serum was separated by centrifugation and analyzed for the following parameters:

- Serum Sodium (Na^+): Normal range: 135-147 mEq/L [6]
- Serum Potassium (K^+): Normal range: 3.5-5.5 mEq/L [6]
- Fasting Blood Glucose: Normal range: 80-120 mg/dL [9]
- Total Serum Cholesterol: Normal range: <225 mg/dL [2]

2.7 Operational Definitions

*Hypertension: SBP ≥140 mmHg and/or DBP ≥90 mmHg, or self-reported history on medication [3]

- Normotensive: SBP <140 mmHg and DBP <90 mmHg, with no history of hypertension [5]
- Hypokalemia: Serum potassium <3.5 mEq/L [6]

2.8 Statistical Analysis

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Data were entered into Microsoft Excel and analyzed using appropriate statistical software. Descriptive statistics (mean, SD) and inferential statistics (t-test, chi-square, and Pearson correlation) were used. A p-value <0.05 was considered statistically significant [13].

2.9 Ethical Considerations

The study followed the Declaration of Helsinki. Informed consent was obtained, and confidentiality was maintained [12].

3. RESULTS

3.1 Demographic Profile of Study Population

The mean age of participants was 68.6 ± 7.4 years. Males constituted 54% of the sample.

Table 1: Demographic Profile of Study Participants (N=150)

Characteristic	Category	Frequency (n)	Percentage (%)
Age Group	60-69 years	84	56.0
	70-79 years	44	29.3
	80 years & above	22	14.7
Gender	Male	81	54.0
	Female	69	46.0
Marital Status	Married	106	70.7
	Widowed	39	26.0
	Single/Divorced	5	3.3
Education	Illiterate	65	43.3
	Primary	48	32.0
	Secondary & above	37	24.7
Economic Status	Poor	58	38.7
	Middle	74	49.3
	High	18	12.0
Food Habit	Vegetarian	62	41.3

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Characteristic	Category	Frequency (n)	Percentage (%)
	Non-Vegetarian	88	58.7
Family Type	Joint Family	108	72.0
	Single Family	42	28.0

3.2 Prevalence of Hypertension

Out of 150 participants, 88 (58.7%) were classified as hypertensive. Among these, 32 (36.4%) were newly diagnosed [4].

3.3 Comparison of Serum Electrolyte Levels

Table 2: Comparison of Serum Electrolyte Levels between Hypertensive and Normotensive Elderly

Parameter	Hypertensive (n=88) Mean ± SD	Normotensive (n=62) Mean ± SD	t-value	p-value
Serum Sodium (mEq/L)	142.1 ± 4.7	141.4 ± 4.4	0.92	0.359
Serum Potassium (mEq/L)	3.72 ± 0.46	4.28 ± 0.40	7.84	<0.001

3.4 Prevalence of Electrolyte Imbalances

Table 3: Prevalence of Electrolyte Imbalances in Study Population

Abnormality	Hypertensive n (%)	Normotensive n (%)	Total N=150 n (%)	Chi-square	p-value
Hypokalemia (K<3.5)	24 (27.3)	6 (9.7)	30 (20.0)	7.26	0.007
Hyperkalemia (K>5.5)	2 (2.3)	2 (3.2)	4 (2.7)	-	0.721
Hyponatremia (Na<135)	5 (5.7)	3 (4.8)	8 (5.3)	0.052	0.819
Hypernatremia (Na>147)	6 (6.8)	4 (6.5)	10 (6.7)	0.008	0.928

3.5 Correlation between Serum Potassium and Blood Pressure

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Table 4: Correlation between Serum Potassium and Blood Pressure

Parameter	Correlation Coefficient (r)	p-value
Serum K^+ vs Systolic BP	-0.428	<0.001
Serum K^+ vs Diastolic BP	-0.364	<0.001

4. DISCUSSION

4.1 Key Findings

The key finding is a significant inverse relationship between serum potassium levels and hypertension, with hypokalemia being substantially more prevalent among hypertensive individuals [7, 8].

4.2 Prevalence of Hypertension

The observed prevalence of 58.7% is consistent with recent estimates suggesting hypertension affects 50-70% of Indians aged 60 and above [4, 5].

4.3 Serum Potassium and Hypertension

Potassium influences BP through vasodilation, natriuresis, and RAAS modulation [6, 7]. The inverse correlation observed (r = -0.428) corroborates findings from the INTERSALT study [8, 13].

4.4 Prevalence of Hypokalemia

The 20% prevalence of hypokalemia is a clinical concern, likely due to dietary patterns in Bihar, age-related changes, or potential diuretic use [10, 11, 12].

4.5 Serum Sodium and Hypertension

No significant association was found, likely because serum sodium is tightly homeostatically regulated [6].

4.6 Regional and Demographic Considerations

The high proportion of joint families (72%) and non-vegetarians (58.7%) reflects the unique socio-cultural fabric of North Bihar [12].

5. CONCLUSION

1. High hypertension burden: Prevalence is 58.7% among the elderly in Darbhanga [4].
2. Significant electrolyte association: Strong inverse association exists between serum potassium and hypertension [6, 13].
3. High hypokalemia prevalence: Affects 20% of the elderly and is nearly three times more common in hypertensives [10].
4. Clinical recommendation: Routine monitoring of serum potassium should be integral to geriatric care [11].

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6. AUTHOR(S) CONTRIBUTION

The writers affirm that they have no connections to, or engagement with, any group or body that provides financial or non-financial assistance for the topics or resources covered in this manuscript.

7. CONFLICTS OF INTEREST

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

8. PLAGIARISM POLICY

All authors declare that any kind of violation of plagiarism, copyright and ethical matters will take care by all authors. Journal and editors are not liable for aforesaid matters.

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REFERENCES

[1] Park, K. (2017). Park's textbook of preventive and social medicine (pp. 45-92). Banarsidas Bhanot.

[2] Guyton, A. C., & Hall, J. E. (2016). Textbook of medical physiology (pp. 3-58, 905-960). Elsevier.

[3] Tortora, G. J., & Derrickson, B. H. (2018). Principles of anatomy and physiology (pp. 22-74). Wiley.

[4] Irudaya Rajan, S. (1999). Ageing and Social Security. In B. A. Prakash (ed.), Kerala's Economic Development (pp. 49-71). Sage Publications.

[5] Mancia, G., et al. (2013). 2013 practice guidelines for the management of arterial hypertension. Journal of Hypertension, 31, 1925-1938.

[6] Walker, W. G., et al. (1979). Relation between blood pressure and renin... Hypertension, 1, 287-291.

[7] Hall, J. E. (2003). The kidney, hypertension, and obesity. Hypertension, 41, 625-633.

[8] Lim, S. S., et al. (2012). A comparative risk assessment of burden of disease... The Lancet, 380, 2224-2260.

[9] Inzucchi, S. E. (2002). Oral antihyperglycemic therapy for type 2 diabetes. JAMA, 287(3), 360-372.

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[10] Finch, C. E. (1990). Longevity, senescence, and the genome (pp. 211-245). University of Chicago Press.

[11] WHO Expert Committee. (1978). Arterial Hypertension. WHO Technical Report Series, 628, 7-58.

[12] Junaid, M. & Rahmatullah, M. (2018). Certain Age Associated Disorders... BIOGLOBIA, 5(1), 15-18.

[13] Kannel, W. B., et al. (1970). Epidemiologic assessment of the role of blood pressure in stroke. JAMA, 214, 301-310.