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Knowledge Regarding Early Identification and Prevention of Hypertension Among Adults in Rural Puducherry: A Descriptive Cross-Sectional Study

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ABSTRACT: **Background**: Hypertension is a major non-communicable disease and an important preventable cause of cardiovascular, cerebrovascular and renal complications. Early identification and prevention require adequate public knowledge and regular blood-pressure monitoring.

Objective: To assess the level of knowledge regarding early identification and prevention of hypertension among adults in rural Puducherry and to determine its association with selected demographic variables.

Methods: A quantitative descriptive research design was used among 500 adults residing in Nallavadu rural area, Puducherry. Participants were selected by non-probability convenience sampling. Data were collected using a demographic proforma and a 25-item structured knowledge questionnaire. Content validity was established by three nursing experts and test-retest reliability was r=0.81. Descriptive statistics and chi-square test were used; $p<0.05$ was considered statistically significant.

Results: Among 500 participants, 54 (10.8%) had inadequate knowledge, 198 (39.6%) had moderately adequate knowledge and 248 (49.6%) had adequate knowledge. The mean knowledge score was 16.66±5.687 out of 25. Knowledge level was significantly associated with age, gender, marital status, educational level, occupation, monthly family income, type of family and smartphone ownership (all $p<0.001$).

Conclusion: Although nearly half of the participants demonstrated adequate knowledge, 50.4% had inadequate or moderately adequate knowledge. Community-based education, screening and accessible digital health support may be useful areas for further intervention research in rural populations.

INTRODUCTION

Hypertension is a common non-communicable disease and a major public health problem. Persistent elevation of blood pressure increases the risk of cardiovascular disease, stroke, chronic kidney disease and premature mortality. Because hypertension may remain asymptomatic for prolonged periods, early detection and regular blood-pressure assessment are important components of prevention and control.

Prevention of hypertension depends substantially on modifiable risk factors. Healthy dietary practices, reduced sodium intake, regular physical activity, maintenance of healthy body weight, avoidance of tobacco, limitation of alcohol, adequate sleep and appropriate stress management can contribute to blood-pressure control. Health education and community screening can help adults recognize risk factors and seek timely care.

Digital health and mobile health technologies have increasingly been explored as tools for health education, self-monitoring, reminders and communication with health professionals. Artificial intelligence-supported systems may have additional potential for risk assessment and individualized recommendations. However, the present project documentation records a descriptive assessment of knowledge using a structured questionnaire; it does not document implementation of an AI-supported mobile-health intervention or pre/post measurement of its effectiveness. Accordingly, this manuscript reports the knowledge assessment and does not make an effectiveness claim about an AI application.

The study was therefore undertaken to assess knowledge regarding early identification and prevention of hypertension among adults in a rural community of Puducherry and to examine its relationship with selected demographic characteristics.

OBJECTIVES

- To assess the level of knowledge regarding early identification and prevention of hypertension among adults in rural Puducherry.
- To determine the association between the level of knowledge regarding early identification and prevention of hypertension and selected demographic variables.

MATERIALS AND METHODS

Study design and setting

A quantitative descriptive research design was adopted. The study was conducted among adults residing in Nallavadu rural area, Puducherry.

Participants and sample size

The sample consisted of 500 adults aged 18 years and above. The project document states that the sample size was calculated using an expected proportion and 5% absolute precision and that 500 participants were ultimately included.

Sampling and eligibility

Participants were selected using non-probability convenience sampling. Adults were eligible if they resided in Nallavadu rural area, were aged 18 years or above, were available during data collection, were willing to participate, and could read and understand Tamil or English. Adults who were unavailable, seriously ill or unable to participate were excluded; those who had participated in the pilot study were also excluded where applicable.

Data collection instrument

The instrument consisted of two sections. Section A collected demographic information: age, gender, marital status, educational level, occupation, monthly family income, type of family and smartphone ownership. Section B was a 25-item structured multiple-choice questionnaire assessing knowledge of hypertension, including definition, risk factors, blood-pressure levels, lifestyle factors, obesity, diet and salt intake, stress, physical activity, screening, warning symptoms, complications, healthy weight, sleep, tobacco and alcohol, prevention, early identification and management, and regular blood-pressure monitoring.

Each correct response was scored 1 and each incorrect response 0. The possible score ranged from 0 to 25. Knowledge was classified as inadequate (0–8), moderately adequate (9–17), and adequate (18–25).

Validity and reliability

Content validity was established by three nursing experts who reviewed the items for relevance, clarity, appropriateness and adequacy. The final tool incorporated their recommendations. Test-retest reliability produced a coefficient of r=0.81.

Ethical considerations

The project document reports approval from the appropriate institutional authorities/ethical committee and permission from the concerned study-setting authorities. Written informed consent was obtained. Participation was voluntary, confidentiality and anonymity were maintained, and participants were informed of their right to withdraw.

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Data collection procedure

After institutional approvals and permission, eligible adults were approached and the purpose and procedure were explained. Following written informed consent, demographic information and knowledge data were collected using the study questionnaire. The investigator clarified questions related to completion without influencing responses. Completed questionnaires were checked, coded and entered for statistical analysis.

Statistical analysis

Data were analyzed using descriptive and inferential statistics. Frequencies and percentages summarized demographic characteristics and knowledge categories. Mean and standard deviation summarized knowledge scores. Chi-square testing examined associations between knowledge category and selected demographic variables. A p-value <0.05 was considered statistically significant. The project document reports analysis using SPSS version 26.

RESULTS

Participant characteristics

Variable	Category	n	%
Age	19–20 years	20	4.0
	21–30 years	221	44.2
	31–40 years	251	50.2
	41–50 years	8	1.6
Gender	Male	241	48.2
	Female	236	47.2
	Other	23	4.6
Marital status	Single	100	20.0
	Married	347	69.4
	Widowed	17	3.4
	Divorced	36	7.2
Education	No formal education	45	9.0
	Primary	134	26.8
	Secondary	138	27.6
	Higher	183	36.6
Occupation	Self-employment	129	25.8
	Homemaker	120	24.0
	Private	194	38.8
	Government	57	11.4
Monthly family income	Below ₹10,000	153	30.6
	₹10,001–20,000	242	48.4
	Above ₹20,001	105	21.0
Family type	Nuclear	314	62.8
	Joint	186	37.2
Smartphone ownership	Yes	417	83.4
	No	83	16.6

The largest age group was 31–40 years (50.2%), followed by 21–30 years (44.2%). Males accounted for 48.2% and females 47.2%. Most participants were married (69.4%), had higher education (36.6%), were employed in the private sector (38.8%),

had a monthly family income of ₹10,001–20,000 (48.4%), belonged to nuclear families (62.8%), and owned a smartphone (83.4%).

Knowledge regarding early identification and prevention of hypertension

Knowledge level	n	%
Inadequate	54	10.8
Moderately adequate	198	39.6
Adequate	248	49.6
Total	500	100.0

Nearly half of the participants (49.6%) had adequate knowledge. However, 39.6% had moderately adequate knowledge and 10.8% had inadequate knowledge, indicating that half of the sample did not reach the adequate-knowledge category.

Mean knowledge score

Measure	Value
Mean score	16.66
Standard deviation	5.687
Maximum possible score	25

Association between knowledge and demographic variables

Variable	χ^2	df	p-value	Interpretation
Age	202.841	6	<0.001	Significant
Gender	57.465	4	<0.001	Significant
Marital status	130.542	6	<0.001	Significant
Educational level	40.376	6	<0.001	Significant
Occupation	45.975	6	<0.001	Significant
Monthly family income	52.375	4	<0.001	Significant
Type of family	29.369	2	<0.001	Significant
Smartphone ownership	36.823	2	<0.001	Significant

All eight demographic variables examined in the project were reported to have statistically significant associations with knowledge category at $p<0.001$.

DISCUSSION

The present study assessed knowledge regarding early identification and prevention of hypertension among 500 adults in a rural community of Puducherry. Nearly half of the participants had adequate knowledge (49.6%), while 39.6% had moderately adequate knowledge and 10.8% had inadequate knowledge. The mean score was 16.66±5.687 on a 25-point scale.

The findings indicate that although a substantial proportion of adults demonstrated adequate knowledge, a considerable proportion remained below the adequate-knowledge category. This supports the continued importance of community-based health education addressing blood-pressure screening, modifiable risk factors, dietary practices, physical activity, weight management and other preventive behaviours.

The study also found statistically significant associations between knowledge category and age, gender, marital status, educational level, occupation, income, family type and smartphone ownership. These associations identify demographic groups that may differ in knowledge levels within this sample. Because the study was descriptive and used convenience sampling, these associations should be interpreted as relationships observed in the study population rather than causal effects.

The project literature review describes evidence supporting the use of mobile-health interventions for hypertension self-management and blood-pressure monitoring. Such evidence provides a rationale for future intervention studies. However, the present dataset does not establish that an AI-supported mobile application caused an improvement in knowledge, blood pressure, adherence or lifestyle behaviour. A future experimental or quasi-experimental study would be needed to test the effectiveness of the proposed application.

Strengths

- The study included a relatively large community sample of 500 adults.
- A structured 25-item knowledge questionnaire was used with reported content validation and test-retest reliability.
- Both descriptive and inferential statistical methods were used to examine the study objectives.

Limitations

- The study was conducted in a selected rural area of Puducherry, which may limit generalizability to other populations.
- Convenience sampling may introduce selection bias.
- The study measured knowledge and did not document an intervention, follow-up period, or objective outcome evaluation of an AI-supported mobile health application.
- Because the study is cross-sectional/descriptive, causal relationships cannot be established.

Implications

Nursing practice

Community health nurses can incorporate hypertension education and routine blood-pressure screening into community activities. Digital tools may be used as supportive educational and follow-up resources when appropriate.

Nursing education

Nursing curricula and community postings can emphasize digital health literacy, hypertension prevention, blood-pressure monitoring and communication strategies for rural populations.

Nursing administration

Health-service administrators can support community screening, health education and appropriate digital-health initiatives with training and technical support for nurses.

Nursing research

Future research should evaluate an actual AI-supported mobile-health intervention using a controlled design and measurable outcomes such as knowledge, blood pressure, adherence, lifestyle behaviours and user engagement.

CONCLUSION

Among 500 adults in rural Puducherry, 49.6% had adequate knowledge regarding early identification and prevention of hypertension, while 39.6% had moderately adequate and 10.8% had inadequate knowledge. The mean knowledge score was 16.66±5.687. Knowledge category was significantly associated with all eight demographic variables examined. The findings support the need for continued community-based hypertension education and screening. The documented study does not, however, provide evidence of the effectiveness of an AI-supported mobile health application; that question requires a separate intervention evaluation.

Recommendations

- Conduct a randomized controlled or quasi-experimental study to evaluate the proposed AI-supported mobile health application.

- Include baseline and post-intervention measures of knowledge and objective blood-pressure outcomes.
- Assess usability, digital literacy, adherence, engagement and acceptability of the application.
- Replicate the study in larger and geographically diverse rural and urban populations.
- Consider comparison with conventional health education to determine the added value of mobile-health support.

Declarations

Ethics approval and consent to participate: The project document reports institutional/ethical approval and written informed consent. Insert the exact ethics committee name, approval number and date before journal submission.

Consent for publication: Not applicable; insert journal-required statement if needed.

Availability of data: Insert the data-availability statement required by the target journal.

Competing interests: Insert author declaration.

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