

Predictors of Systolic and Diastolic Blood Pressure Control and Therapeutic

Adherence Among Rural Hypertensive Patients in India

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Abstract

Introduction: Hypertension is a chronic non-communicable disease condition in which the pressure in the blood vessels is very high leading to severe health complications such as heart failure, stroke and kidney disease if left undiagnosed and untreated. **Objective:** The primary objective of the study was to identify the factors that contributed to therapeutic adherence and blood pressure control among rural hypertensive patients. **Methods:** A community-based cluster randomized controlled trial that utilized a 4 X 3 factorial experimental design was used to explore the impact of three cognitive and behavioral psychosocial interventions on the level of BP control, therapeutic adherence, health beliefs and self-efficacy among a sample of hypertensive patients from four villages in Hyderabad, Telangana, in India. **Results:** The results of the multiple regression analysis showed that the three psychosocial interventions, hypertension-related knowledge, health beliefs and self-efficacy were significant positive predictors of adherence and BP control among patients. **Conclusions:** The conclusion of the study was that community-based interventions that utilized behavior change techniques were effective in enhancing the hypertension-related knowledge, health beliefs, self-efficacy, adherence and BP control among patients.

Keywords: Hypertension, Therapeutic Adherence, Knowledge, Health Beliefs, Self-Efficacy, BP control

Introduction

Hypertension also known as high blood pressure or the “silent killer” is a chronic non-communicable disease condition which occurs when the blood force acting on the arterial walls is excessively high (Forrester et al., 2018) and is defined as measured blood pressure of 140/90 mmHg or more (Ministry of Health and Family Welfare, 2022). The health complications of hypertension include cardiovascular disease, stroke, blood vessel damage and organ failure (Li et al., 2017). According to the World Health Organization (2025), 1.4 billion adults in the age range of 30 to 79 years globally have hypertension with the majority (two-thirds) of these individuals living in low- and middle- income countries.

The health complications of undiagnosed and untreated hypertension include heart disease, kidney failure, stroke, vision loss, cognitive impairment and even sudden death (WHO, 2025; Americal Psychological Association, 2024).

The prevalence of hypertension in India has been found to range between 25% to 35% in urban populations and 15% to 20% in rural populations (Gupta, Gaur, Ahuja, & Anjana, 2024). A meta-analysis and systematic review of data from 10 studies involving a total of 30757 participants, found the overall prevalence of hypertension among rural hypertensive adults to be 24% (Uthakalla, Naidana, Yendapu, Pissey, & Devireddi, 2024).

Hypertension has been found to have a multi-factorial etiology comprising of genetic and environmental risk factors viz. a family history of hypertension, age above 65 years, concomitant diseases such as diabetes or kidney disease, unhealthy habits (excessive salt consumption, a diet high in saturated fat and trans-fat, low intake of fruits and vegetables), physical inactivity, consumption of tobacco and alcohol and being overweight or obese (World Health Organization, 2025).

In a country like India where a vast majority of the socio-economically disadvantaged population lives in rural areas, a substantial body of evidence shows a significant urban -rural difference pointing to a high burden of undiagnosed, untreated and uncontrolled hypertension among rural residents due to poor health care provisions and outreach programs in rural India (Banerjee, 2021; Boro & Banerjee, 2022; Pandey, Ploubidis, Clarke, & Dandona, 2017). Given that 70% of the Indian population reside in villages, hypertension poses a major risk factor for rural populations due to the shortage of proper primary health care facilities in villages, lower levels of education, an insufficient number of trained medical personnel in existing facilities, long distance commutes to access medical care, lack of proper transportation services, belief in traditional medicines and non-medical healers,

unaffordability of anti-hypertensive medications and medical care and abysmally low levels of knowledge regarding the complications of the disease are responsible for the low utilization of health care services in rural areas (Boro & Banerjee, 2022).

The primary aim of the present research study was to examine the differential impact of three psychosocial interventions (doctor, video and community health worker intervention vis-à-vis a control group) on the level of blood pressure control, therapeutic adherence, hypertension-related knowledge, health beliefs, and self-efficacy among rural Indian hypertensive patients randomly selected from four villages in the Medchal district of Telangana.

Methods

Design

The study was community-based cluster randomized trial that adopted a 4 X 3 between-subjects factorial experimental design to determine the comparative effectiveness of 3 psychosocial interventions relative to the control on the levels of blood pressure control, therapeutic adherence, hypertension-related knowledge, health beliefs and self-efficacy among hypertension patients randomly selected from 4 villages in the Medchal district in Telangana, India.

Plan and Procedure

Three phases of psychological assessment and two stages of health education interventions were implemented for the study.

Participants and Study Setting

The participants of the study were 224 hypertensive patients in the age-group of 30 to 75 years randomly selected from the villages of Railapur, Athveli, Nuthankal, and Rawalkol in the Medchal district. The research project received the institutional ethical approval from the concerned university and written informed consent was obtained from all the hypertensive patients willing to participate in the study.

Ethical Approval: The Informed Consent Form was translated into the local language of Telugu, to facilitate the easy comprehension by the hypertensive participants. The hypertensive patients were requested to read the Informed Consent Form and clarify any doubts they had regarding the study or the nature of their participation. The participants who agreed to participate in the study, were asked to sign the Informed Consent Form. In the case of non-literate patients, their literate family members or care-takers were asked to read and explain the contents and information in the form to the patient. In case, both the patient and the family member were willing, the patient was asked to provide their thumb impression or to sign, if he or she had learnt to write their name on the Informed Consent Form. In the absence of any family member or care-taker for the non-literate patient, the community health worker read out the

information in the Informed Consent form which was in Telugu and then asked the patient whether they were ready to participate in the study. In case, the hypertensive patient agreed to participate, his or her thumb impression was taken to recruit the patient for the study.

Sampling Procedure

A two stage sampling technique was used to firstly randomly select 4 villages from the 40 villages in the Medchal district and then to randomly select hypertensive patients from each of these villages for inclusion in the study. The four villages of Railapur, Athveli, Nuthankal and Rawalkol were randomized to receive the Doctor, Video, Community Health Worker and Control conditions respectively. The sample size for the study was determined using the Cochran's formula, given that the population prevalence of hypertension was in the range of 20% to 25% in the Medchal district with a 95% confidence interval and a 5% margin of error (Cochran, 1977; Dandge, Jeemon, & Reddy, 2019). The sample size was deduced to be 224 hypertensive patients, using the Cochran's (1977) formula with 56 patients in each intervention group. The sites of data collection were the homes of the participants in the villages. A group counseling format with 5-8 hypertensive patients in each session, was adopted in the intervention conditions, to facilitate peer learning and sharing of health information.

Variables

Independent Variables. The type of intervention (Doctor led Patient Health Education and Counseling, Hypertension Patient Health Education Video, Community Health Worker led Patient Health Education and Counseling, and Control) and the time-points (baseline, second and third assessment phases) of the study constituted the two independent variables.

Dependent Variables. The dependent variables in the study were BP control, systolic and diastolic BP readings, clinical and therapeutic adherence, hypertension related knowledge, health beliefs, and self-efficacy.

Measures

Blood Pressure – The American Heart Association (2025) guidelines were followed wherein participants were seated comfortably and three consecutive blood pressure readings were obtained using a Rossmax (model MJ701f) automated sphygmomanometer from each participant with a gap of one minute between consecutive blood pressure readings. The arm of each participant was placed at the level of the heart while taking the BP measurements.

Therapeutic Adherence - Adherence to the medication and lifestyle regimen was measured using the Hypertension Adherence Scale for Indian

Hypertensive patients (Author, 2019). The HTAS-I was adapted from the Hill Bone Compliance to High Blood Pressure scale (Kim, Hill, Bone, & Levine, 2000) and was modified to suit the cultural characteristics of Indian hypertensive patients.

Hypertension Knowledge Test–The level of knowledge regarding the nature, causes, risk factors, lifestyle & behavioral modifications, medication, treatment and control of hypertension was measured using the Hypertension Knowledge Test for Hypertensive Patients (Author, 2020).

Health Beliefs–The Health Beliefs Scale for Hypertensive Patients (Author, 2018) was developed based on the Health Belief Model (Hochbaum, 1958; Rosenstock, 1966) to measure the health beliefs of hypertensive patients in the dimensions of Perceived Susceptibility to hypertension, Perceived Severity of the condition, Perceived Benefits and Barriers to adopting positive lifestyle modifications and perceived self-efficacy in implementing the lifestyle and behavioral changes.

Chronic Disease Self-Efficacy Scale – The Chronic Disease Self Scale was developed by Loring, Stewart, Ritter, Gonzalez, Laurent and Lynch (1996) and comprised of 33 items that were measured on a 10-point Likert scale with 1 indicating “no confidence at all” and 10 indicating “very confident”.

Description of Interventions

The psychosocial interventions administered in the present study, adopted a group counselling and patient health education format, to facilitate peer learning and sharing of information as well as to enhance the informational, emotional, social and tangible support from the hypertensive participants in the study.

Doctor and Health Psychologist led Patient Health Education and Counselling Intervention

Given the limited physician consultation times and poor doctor-patient communication in primary health care settings, a home-based patient health education intervention delivered by a doctor and a health psychologist was considered necessary to bridge the current lacunae in health communication interventions. This intervention utilized a group counseling format with 5 to 8 patients being counseled in the Railapur village of the Medchal district.

Thus, the doctor and health psychologist led psychosocial intervention, was a culturally sensitive personalized health education program that was designed, in accordance with the physiological, psychological, social, and cultural characteristics of the hypertensive patients.

Community Health Worker and Health Psychologist led Patient Health Education and Counseling Intervention

Community health workers are trusted members of a community and are a rich source of health-related knowledge, skills, experience, expertise, and social support for community members. Similarly, health psychologists are trained in the specific psychological principles such as behavioral and cognitive techniques to foster behavioral, attitudinal and lifestyle changes, among hypertensive patients. This culturally tailored health education intervention was jointly administered by the community health worker and health psychologist to enhance the hypertension-related knowledge, adherence behaviors, health beliefs and self-efficacy of hypertensive patients. The intervention used a group counseling format with 5 to 8 hypertensive patients being counseled for a duration of 90 minutes in the home of a patient in the Nuthankhol village of Medchal district.

Hypertension Patient Health Education Video

The hypertension health education video comprised of a primary care physician providing health education and counseling regarding the importance of regular medication adherence, positive lifestyle changes such as having a nutritious diet rich in fiber and vegetables, regular exercise, avoiding alcohol and tobacco, stress management techniques and blood pressure control in both English and the local language of Telugu to improve the cultural sensitivity of the intervention and facilitate improved understanding by the rural residents. This video was shown by a health psychologist through a laptop in the village of Athvelly in a group counseling format comprising of 5 to 8 hypertensive patients for a duration of 30 minutes. Specifically, the physician in the video focused on explaining about the adverse health complications of undiagnosed, untreated and uncontrolled hypertension and the emergency measures to be taken in the event of a heart attack or a stroke.

Control Group

The hypertensive patients in the village of Rawalkhol in the Medchal district were not given any intervention. A community health worker provided health education and counseling to these participants after the completion of the third phase of assessments and second stage of intervention for the intervention groups in the study.

Results

Predictors of Systolic Blood Pressure During the Third Assessment Phase

Multiple regression analyses were computed to identify the combined impact of the significant psychosocial variables, on the overall systolic blood pressure levels among hypertensive patients during the third assessment phase. The significant independent predictors of overall systolic blood pressure readings, that emerged during the simple

regression analyses were entered as predictors for the multiple regression model. The results of the multiple regression analyses are presented in Table 1.

Table 1

Multiple regression analysis for variables predicting overall systolic blood pressure after the implementation of the second stage of psychosocial interventions

	<i>B</i>	<i>SEB</i>	β	<i>t</i>
Overall SBP(Time-point1)	.06	.08	.06	.76
Overall SBP(Time-point2)	.69	.04	.71	17.16***
Education				
Literate school drop-out	.89	1.72	.02	.51
Tenth Class Pass	-1.30	3.09	-.02	-.42
Intermediate Pass	-1.28	4.29	-.01	.30
Graduation & Higher Degrees	-3.82	3.44	-.05	-1.11
Doctor Intervention	-8.89	3.41	-.11	2.60**
Video Intervention	-8.95	3.46	-.22	2.59***
CHW	-8.86	3.38	-.22	2.62***
Total Therapeutic Adherence	-.26	.03	-.34	8.61***
Medication Adherence	-.59	.08	-.28	6.63***
Dietary Adherence	-.96	.14	-.28	6.67***
Appointment Keeping	-1.89	.22	-.34	8.51***
Avoidance of Risk Behaviors	-1.60	.38	-.19	4.23***
Self-Monitoring	-2.31	.30	-.32	7.84***
Stress Management	-1.76	.19	-.35	9.10***
Physical Exercise	-1.86	.29	-.26	6.34***
Total Hypertension Knowledge	-.55	.07	-.32	7.77***
Management& Control	-1.42	.18	-.32	7.88***
General Knowledge	-1.98	.26	-.31	7.56***

Lifestyle-related Knowledge	-2.56	.35	-.30	7.28***
Health Complications Knowledge	-4.6	.65	-.30	7.13***

Table 1 (continued)

Multiple regression analysis for variables predicting overall systolic blood pressure after the implementation of the second stage of psychosocial interventions

	<i>B</i>	<i>SEB</i>	β	<i>t</i>
Risk Factors Knowledge	-3.18	.92	-.16	3.47***
Hypertension Health Beliefs				
Total Health Beliefs	-1.27	.39	-2.00	3.22**
Perceived Susceptibility	-.88	.10	-.34	8.53***
Perceived Severity	-3.90	1.14	-1.12	3.43***
Perceived Benefits	-.40	.05	-.34	8.44***
Self-Efficacy				
Total Self-Efficacy	-2.40	.61	-1.36	3.93***
Self-Management Behaviors	-2.36	.58	-1.34	4.07***
General Self-Efficacy	-2.38	.62	-1.32	3.84***
Health Behavior Outcomes	-3.71	.78	-1.29	4.76***
<i>SE</i>			10.01	
<i>R</i> ²			.74	
<i>C</i>	.06		43.67	.76
<i>F</i>	.69		15.30***	17.16***

Note. *B* = Unstandardized Beta Coefficient, *SEB* = Standard Error of Beta, β = Standardised beta coefficient, *t*=*t* test,

SE=Standard Error of the estimate, *R*²= Variance, *C*=Constant, *F*=*F*-statistic **p*<.05, ***p*<.01, ****p*<.001

The doctor ($\beta = -.11$, *p* < .01), video ($\beta = -.22$, *p* < .01) and the community health worker ($\beta = -.22$, *p* < .01) interventions, were the significant negative and independent predictors of the overall systolic blood pressure readings, among hypertensive patients during the third assessment phase. The total therapeutic adherence ($\beta = -.34$, *p* < .001), dietary adherence ($\beta = -.28$, *p* < .001), avoidance of harmful health behaviors ($\beta = -.19$, *p* < .001), regular adherence to the doctors appointments ($\beta = -.34$, *p* < .001), regular self-monitoring of one's condition ($\beta = -.32$, *p* < .001), use of stress management techniques such as yoga and meditation ($\beta = -.35$, *p* < .001) and the practice of regular physical exercise ($\beta = -.26$, *p* < .001) were found to be significant negative and independent predictors, of overall systolic blood

pressure readings among hypertensive patients during the third assessment phase

The total hypertension-related knowledge was found to be a significant negative and independent predictor, of the overall systolic blood pressure readings among hypertensive patients during time-point 3, ($\beta = -.32, p < .001$). Knowledge regarding the management and control of hypertension ($\beta = -.32, p < .001$), general knowledge ($\beta = -.31, p < .001$), lifestyle-related knowledge ($\beta = -.30, p < .001$), the health complications of high BP ($\beta = -.30, p < .001$) and the risk factors of hypertension ($\beta = -.16, p < .001$) were found to be significant negative and independent predictors of the overall systolic blood pressure readings, among hypertensive patients during time-point 3.

The total hypertension-related health beliefs of hypertensive patients, were found to be a significant negative and independent predictor of overall systolic blood pressure readings, during time-point 3 ($\beta = -2.00, p < .001$). The perceived susceptibility to the health complications of hypertension ($\beta = -.34, p < .001$), the perceived severity of the condition ($\beta = -1.12, p < .001$), the perceived benefits of engaging in medication and lifestyle regimen adherence ($\beta = -.34, p < .001$) and perceived self-efficacy ($\beta = -1.77, p < .001$) were found to be significant negative and independent predictors of overall systolic blood pressure readings, among hypertensive patients during the third assessment phase.

The perceived barriers to engaging in medication and lifestyle regimen adherence ($\beta = .52, p < .001$) were found to be significant positive and independent predictors of overall systolic blood pressure readings, among hypertensive patients during time-point 3.

The total hypertension-related self-efficacy, related to the confidence in the ability to practice treatment regimen compliance and positive lifestyle modifications, was found to be a significant negative and independent predictor of the overall systolic blood pressure readings among hypertensive patients during time-point 3, ($\beta = -1.36, p < .001$).

The self-efficacy related to the confidence in the ability to engage in regular self-management behaviors ($\beta = -1.34, p < .001$), general self-efficacy related to the confidence in the ability to effectively manage one's disease condition ($\beta = -1.32, p < .01$) and self-efficacy related to confidence in the ability to practice positive health behavior outcomes ($\beta = -1.29, p < .01$) were found to be a significant negative and independent predictors of the overall systolic blood pressure readings among hypertensive patients during time-point 3.

Predictors of Diastolic Blood Pressure During the Third Assessment Phase

Multiple regression analyses were computed to identify the combined impact of the significant psychosocial variables, on the overall diastolic blood pressure levels among hypertensive patients after the implementation of the second stage of psychosocial intervention. The results of the multiple regression analyses are presented in Table 2.

Table 2

Multiple regression analysis for variables predicting overall diastolic blood pressure after the implementation of the second stage of psychosocial intervention

	<i>B</i>	<i>SEB</i>	β	<i>t</i>
Age	-.02	.04	-.02	.43
Diastolic Blood Pressure (Time-point1)	.26	.08	.29	3.41***
Diastolic Blood Pressure (Time-point2)	.37	.08	.39	4.82***
Type of Intervention				
Doctor	-7.04	1.41	-.26	5.00***
Video	-10.22	1.33	-.38	7.70***
CHW	-11.99	1.29	-.45	9.32***
Total Therapeutic Adherence	-.19	.02	-.38	9.49***
Medication Adherence	-.42	.06	-.33	7.63***
Dietary Adherence	-.73	.09	-.33	7.75***
Avoid Risky Behaviors	-.76	.26	-.14	3.00**
Appointment-Keeping	-1.33	.15	-.37	9.17***
Self-Monitoring	-1.58	.19	-.34	8.16***
Regular Physical Exercise	-.94	.34	-.21	2.77***
Total Hypertension Knowledge	-.43	.05	-.39	9.37***
Management & Control Knowledge	-1.10	.12	-.39	9.26***
General Knowledge	-1.56	.17	-.38	9.14***
Lifestyle Knowledge	-2.02	.23	-.37	8.69***
Health Complications	-3.65	.42	-.37	8.60***

Table 2 (continued)

Multiple regression analysis for variables predicting overall diastolic blood pressure after the implementation of the second stage of psychosocial intervention

	<i>B</i>	<i>SEB</i>	β	<i>t</i>
Risk Factors	-2.71	.61	-.21	4.47***
Total Health Beliefs	-1.12	.24	-2.75	4.62***
Perceived Susceptibility	-.64	.07	-.38	9.51***
Perceived Severity	-2.64	.69	-1.18	3.82***
Perceived Benefits	-.29	.03	-.38	9.26***
Total Self Efficacy	-.04	.005	-.35	8.45***
<i>SE</i>			6.15	
<i>R</i> ²			.76	
<i>C</i>			30.54	
<i>F</i>			18.85	

Note. *B* = Unstandardized Beta Coefficient, *SEB* = Standard Error of Beta, β = Standardised beta coefficient, *t*=*t* test, *SE*=Standard Error of the estimate, *R*²= Variance, *C*=Constant, *F*=*F*-statistic **p*<.05, ***p*<.01, ****p*<.001

Exposure to the doctor intervention, video intervention and the community health worker intervention were the significant and independent predictors, of the overall diastolic blood pressure readings among hypertensive patients during time-point 3. The doctor ($\beta = -.26, p < .001$), video ($\beta = -.38, p < .001$) and the community health worker ($\beta = -.45, p < .001$) interventions, were the significant negative and independent predictors of the overall diastolic blood pressure readings, among hypertensive patients during time-point 3.

The total therapeutic adherence was a significant negative and independent predictor, of overall diastolic blood pressure readings, among hypertensive patients during time-point 3 ($\beta = -.38, p < .001$).

Regular adherence to the prescribed medication regimen ($\beta = -.33, p < .001$), dietary adherence ($\beta = -.33, p < .001$), avoidance of harmful health behaviors ($\beta = -.14, p < .001$), adhering to doctor's appointments ($\beta = -.37, p < .001$), regular self-monitoring of one's condition ($\beta = -.34, p < .001$), use of stress management techniques such as yoga and meditation ($\beta = .36, p < .001$) and the practice of regular physical

exercise ($\beta = -.21, p < .001$) were found to be a significant negative and independent predictor of the diastolic blood pressure readings, among hypertensive patients during time-point 3, .

The total hypertension-related knowledge was found to be a significant negative and independent predictor, of the overall diastolic blood pressure readings among hypertensive patients during time-point 3, ($\beta = -.39, p < .001$). Knowledge regarding the management and control of hypertension ($\beta = -.39, p < .001$), general knowledge about hypertension ($\beta = -.38, p < .001$), lifestyle-related knowledge ($\beta = -.37, p < .001$), health complications knowledge ($\beta = -.37, p < .001$) and knowledge regarding the risk factors of hypertension ($\beta = -.21, p < .001$) were found to be a significant negative and independent predictor of the overall diastolic blood pressure readings, among hypertensive patients during time-point 3, ($\beta = -.39, p < .001$).

The total hypertension-related health beliefs of hypertensive patients, were found to be a significant negative and independent predictor of the overall diastolic blood pressure readings, during time-point3, ($\beta = -2.75, p < .001$). The perceived susceptibility to the health complications of hypertension ($\beta = -.38, p < .001$), the perceived severity of the condition ($\beta = -1.18, p < .001$), the perceived benefits of engaging in medication and lifestyle regimen adherence ($\beta = -.38, p < .001$) and the perceived self-efficacy ($\beta = -1.73, p < .001$) were found to be significant negative and independent predictors of the overall diastolic blood pressure readings, among patients during time-point 3. The perceived barriers to engaging in medication and lifestyle regimen adherence, were found to be a significant positive and independent predictor, of the overall diastolic blood pressure readings among hypertensive patients during time-point 3, ($\beta = .77, p < .001$).

The total hypertension-related self-efficacy, pertaining to the confidence in the ability to practice treatment regimen adherence and positive lifestyle modifications, was found to be a significant negative and independent predictor of the overall diastolic blood pressure readings among hypertensive patients during time-point 3, ($\beta = -.35, p < .001$).

The total self-efficacy related to the confidence in the ability to practice self-management behaviors ($\beta = -.84, p < .001$), general self-efficacy related to the confidence in the ability to effectively manage one's disease condition ($\beta = -.95, p < .001$), and self-efficacy related to the confidence in the ability to practice positive health behaviors ($\beta = -.86, p < .001$) were found to be significant negative and independent predictors, of the overall diastolic blood pressure readings among hypertensive patients during time-point 3.

Predictors of Therapeutic Adherence to the Medication and Lifestyle Regimen During the Third Assessment Phase

It was considered relevant to assess the combined impact of the significant psychosocial predictors, towards the overall therapeutic adherence among the hypertensive patients, after the implementation of the second stage of psychosocial interventions. Multiple regression analyses were computed, to identify the combined impact of the significant psychosocial variables on the overall therapeutic adherence, among hypertensive patients during the third assessment phase.

Table 3

Multiple regression analysis for variables predicting overall Therapeutic Adherence after the implementation of the second stage of psychosocial interventions

	<i>B</i>	<i>SEB</i>	<i>β</i>	<i>t</i>
Age	.03	.06	.01	.48
SBP(Time-point 3)	-.52	.08	-.39	6.41***
DBP(Time-point 3)	-1.07	.19	-.52	5.69***
Education Level				
Literate School drop-out	.57	3.57	.01	.16
Tenth Class Pass	5.86	9.04	.04	.65
Intermediate Pass	16.22	6.45	.17	2.52*
Graduation or higher degrees	19.53	6.46	.21	3.02**
Type of Psychosocial Intervention				
Doctor Intervention	42.61	2.41	.61	17.68***
Video Intervention	44.72	2.45	.81	18.25***
CHW Intervention	54.29	2.39	.99	22.72***
Total Hypertension Knowledge	1.83	.10	.80	18.15***
Management and Control	4.52	.27	.78	16.75***
General Knowledge	6.57	.38	.78	17.36***
Lifestyle Knowledge	8.72	.50	.78	17.46***
Health Complications	15.47	.95	.76	16.36***
Risk Factors	9.63	1.62	.35	5.76***

Table 3 (continued)

Multiple regression analysis for variables predicting overall Therapeutic Adherence after the implementation of the second stage of psychosocial interventions

	<i>B</i>	<i>SEB</i>	β	<i>t</i>
Total Health Beliefs	1.07	.26	1.27	4.08***
Perceived Susceptibility	4.23	.73	1.23	5.77***
Perceived Severity	4.20	.76	.91	5.53***
Perceived Benefits	4.25	.68	1.05	6.25***
Perceived Barriers	-1.44	.28	-.58	5.26***
Perceived Self-Efficacy	4.22	.70	.23	6.02***
Hypertension Self-Efficacy				
Total Self-Efficacy	.57	.07	.68	8.22***
Self-Management Behaviors	5.29	1.57	.69	3.37***
General Self-Efficacy	5.39	1.60	.63	3.36***
Positive Health Behavior Outcomes	5.22	1.94	.61	2.69**
<i>SE</i>			7.93	
<i>R</i> ²			.91	
<i>C</i>			37.75	
<i>F</i>			61.01	

Note: Unstandardized Beta Coefficient, *SEB* = Standard Error of Beta, β = Standardised beta coefficient, *t*=*t* test, *SE*=Standard Error of the estimate, *R*²= Variance, *C*=Constant, *F*=*F*-statistic**p*<.05, ***p*<.01, ****p*<.001

The results of the multiple regression analyses, indicated that the model explained 91% of the variance in the overall therapeutic adherence among hypertensive participants, during time-point 3 and that the model was a significant predictor of the overall therapeutic adherence, *R*²= .91, *F*(30,193) = 61.01, *p* < .001.

The level of education of the hypertensive patients, was a significant positive and independent predictor of the overall therapeutic adherence to the medication and lifestyle

regimen, among hypertensive patients during time-point 3. Having the qualification of being an intermediate pass was found to be a significant positive and independent predictor, of the overall therapeutic adherence among hypertensive patients during time-point 3, ($\beta = .17, p < .05$). Having completed graduation or higher degrees was found to be a significant positive and independent predictor, of the overall therapeutic adherence among hypertensive patients during time-point 3, ($\beta = .21, p < .01$).

Exposure to the doctor intervention, video intervention and the community health worker intervention were the significant positive and independent predictors, of the overall therapeutic adherence among hypertensive patients during time-point 3. The doctor ($\beta = .61, p < .001$), video ($\beta = .81, p < .001$) and the community health worker ($\beta = .99, p < .001$) interventions, were the significant positive and independent predictors, of the overall therapeutic adherence among hypertensive patients during time-point 3. The total hypertension-related knowledge ($\beta = .80, p < .001$, knowledge related to the management of high BP ($\beta = .78, p < .001$), general knowledge about hypertension ($\beta = .78, p < .001$), lifestyle-related knowledge ($\beta = .78, p < .001$), health complications knowledge ($\beta = .76, p < .001$), and the knowledge related to the risk factors of hypertension ($\beta = .35, p < .001$) were found to be a significant positive and independent predictors, of the overall therapeutic adherence to the medication and lifestyle regimen among hypertensive patients during time-point 3,).

The total hypertension-related health beliefs were found to be a significant positive and independent predictor, of the overall therapeutic adherence to the medication and lifestyle regimen among hypertensive patients during time-point 3, ($\beta = 1.27, p < .001$). The perceived susceptibility to the health complications of hypertension ($\beta = 1.23, p < .001$), the perceived severity of the condition ($\beta = .91, p < .001$), perceived benefits of engaging in medication and lifestyle regimen adherence ($\beta = 1.05, p < .001$), and the perceived self-efficacy related to engaging in medication and lifestyle adherence ($\beta = .23, p < .001$) were found to be a significant positive and independent predictor of the overall therapeutic adherence, to the medication and lifestyle regimen among hypertensive patients during time-point 3, The perceived barriers to engaging in medication and lifestyle regimen adherence, were found to be significant negative and independent predictor of the overall therapeutic adherence, among hypertensive patients during time-point 3, ($\beta = -.58, p < .001$).

The total hypertension-related self-efficacy, related to the confidence in the ability to practice treatment regimen adherence and positive lifestyle modifications, was found to be a significant positive and independent predictor of the overall therapeutic adherence, to the medication and lifestyle regimen among hypertensive patients during time-point 3, ($\beta = .68$, $p < .001$).

The self-efficacy related to the confidence in the ability to practice regular self-management behaviors ($\beta = .69$, $p < .001$), the general self-efficacy related to the confidence in the ability to manage one's disease condition ($\beta = .63$, $p < .001$) and the confidence in the ability to practice positive health behaviors ($\beta = .61$, $p < .001$) were found to be a significant positive and independent predictor, of the overall therapeutic adherence to the medication and lifestyle regimen among hypertensive patients during time-point 3,

Discussion

Hypertension has been labelled as a “silent killer” as the disease is mostly asymptomatic and can lead to the sudden development of a severe medical crisis such as a heart attack, stroke or kidney failure (Chobanian et al., 2003; Prabakaran, Vijayalakshmi, & Venkatarao, 2013). India with a rapidly increasing prevalence of hypertension in rural areas is well on its way to becoming the hypertension capital of the world (Gupta, 2016; Joshi & Parikh, 2007). According to the NFHS-5 (2019-2021), the prevalence of hypertension among rural men was found to be 22.7% and among rural women it was found to be 20.2% (International Institute for Population Sciences, 2021). The present study was conducted among rural hypertensive patients randomly selected from four villages in the Medchal district, Hyderabad and is a scientific account, of the impact of psychosocial interventions on the hypertension control, treatment regimen adherence, hypertension-related knowledge, health beliefs, and self-efficacy of hypertensive patients.

Research evidence has indicated that the primary barriers to the treatment and control of hypertension among rural hypertensive patients in India have been found to be lack of awareness regarding the lifestyle and behavioral modifications required for the effective management and control of hypertension, a shortage of doctors (below 1:20,000 in some regions), absenteeism of doctors in primary health care facilities, lack of trained health personnel, infrastructure and medical equipment in health centers, long distance commutes and transportation problems to access health care services, unaffordability of treatment costs

and medicines (Gamage et al., 2020; Woodham, Taneepanichskul, Somrongsong, Kitsanapun, & Sompakdee, 2020; Meelab et al., 2019; Gupta, Dhamija, Mohan, & Gupta, 2019; Central Bureau of Health Intelligence, 2015; Attaei et al., 2017; Busingye et al., 2017; Muralidharan et al., 2011; Chow et al., 2013; World Health Organization, 2005).

The culturally contextualized psychosocial interventions in the study were successful in fostering graded improvements in the therapeutic adherence to the anti-hypertensive medication regimen and the lifestyle recommendations such as an increase in the consumption of vegetables and fruits, higher levels of physical exercise, reduction of salt intake, reduction in alcohol use, cessation of smoking, practice of stress management techniques, regular self-monitoring of BP and enhanced adherence to physician appointments among the intervention group patients after the first and second stages of administration of interventions as compared to those in the control group.

The primary hypotheses of the study predicted that socio-demographic and psychosocial variables such as age, gender, education, exposure to the three psychosocial interventions, the overall hypertension-related knowledge and its dimensions, the overall hypertension-related health beliefs and its dimensions, and the overall hypertension-related self-efficacy and its dimensions will emerge as the significant predictors of the overall hypertension-related therapeutic adherence and systolic and diastolic blood pressure control among the hypertensive patients across the three time-points (baseline, second and third assessment phases) of the study. The results of the study indicated that the socio-demographic variables of age, gender, and education did not significantly predict the outcome variables of blood pressure control and therapeutic adherence.

A finding of the study that is of considerable importance is that exposure to the three psychosocial interventions viz. Doctor led Patient Health Education and Counselling, Hypertension Health Education Video and the Community Health Worker led Patient Health Education and Counseling interventions predicted significant improvements in the blood pressure control and the overall therapeutic adherence among hypertensive patients.

The results of the study demonstrating the effectiveness of the psychosocial interventions in improving blood pressure control are consistent with a large meta-analysis of 100 articles including 90,474 hypertensive patients with 116 comparisons of randomized trials of interventions which found that interventions led by pharmacists, community health workers

and health educators resulted in the greatest reductions in blood pressure levels while interventions led by multiple healthcare professionals, nurses and physicians also resulted in moderately significant blood pressure reductions (Mills, Connell, Pan, Oust, He, & He, 2025). A cross-sectional study with pre- and post-test design that involved non-physician health workers equipped with tablet computers on which an mHealth application was installed to create an electronic health record for each patient, facilitate a video call between the patient and the physician which enabled the remote diagnosis and management of hypertension among patients randomly selected from 2 villages in the Medchal district showed significant improvements in the detection, treatment and blood pressure control outcomes among them (Dandge, Jeemon, & Reddy, 2019). Concordant with the results of the study, a randomized controlled trial conducted among 102 hypertensive patients found that a combined intervention based on cognitive behavioral therapy involving structured activities that focused on identifying and changing negative thought patterns, promoting adaptive coping strategies and developing emotional regulation skills followed by a 30 minute relaxation training resulted in greater reductions in blood pressure levels as compared to a single intervention group that underwent a 30 minute relaxation training comprising of guided techniques to promote physical and mental relaxation such as controlled breathing exercises, progressive muscle relaxation and visualization methods to reduce stress and anxiety (Dou et al., 2025).

Physicians who involve their patients in medical decision making relating to their treatment plan, realistically assess their patients' perceived facilitators and barriers to treatment compliance, and help them overcome their perceived obstacles, have achieved considerable success in helping patients reach target blood pressure goals (Harmon, Lefante, & Wood, 2006; Author, 2019).

Consistent with the results of the study, previous research has found that effective doctor-patient communication, wherein the doctor supplements verbal messages with written or visual forms of health educational material and tailors the health information in accordance with patient characteristics such as age, gender, culture, education level and socio-economic status has been found to be effective in facilitating positive health behavior change and treatment adherence among hypertensive patients (Jolles, Clark, & Braam, 2012; Fongwa et al., 2008).

The video intervention which was recorded on a DVD format and shown to patients via a laptop involved a respected primary care physician disseminating health education on the risk factors, health complications, lifestyle modifications and behavioral changes needed for the effective management and control of hypertension. The hypertension health education video depicted the health complications of untreated and uncontrolled hypertension such as heart attack and stroke in a story-telling format and thus induced fear among patients regarding the adverse health consequences of hypertension leading to improved adherence behaviors and blood pressure control among them.

The findings of the study related to the effectiveness of psychosocial interventions to improve the knowledge, health beliefs, self-efficacy, medication adherence and blood pressure control levels among hypertensive patients have been supported by the results of a randomized controlled trial based on the Health Belief model which showed that lectures delivered by trained nurses in community health centers on the definitions, causes, complications and the importance of medication adherence and lifestyle modifications, the application of HBM constructs to enhance self-efficacy and overcome barriers, videos designed by professional media companies featuring stories of patients who effectively controlled their high BP using the principles of the Health Belief Model and personalized counseling sessions conducted by trained nurses at the community health center provided patients with the individualized feedback, guidance, support and reinforcement based on their individual blood pressure values, medication adherence, health beliefs and lifestyle behaviors resulted in significantly lowered systolic and diastolic blood pressure levels, higher medication adherence, self-efficacy, higher perceived susceptibility to and severity of the disease condition as compared to the control group at the 3-month and 6-months follow up interval (Wang, Chen, Shen, & Wang, 2024).

The findings of the present study related to the effectiveness of psychosocial health education interventions in positively modifying the health beliefs, improving knowledge and enhancing self-efficacy of hypertensive patients have been supported by several randomized controlled trials of clinical and community interventions using the participatory approach guided by the principle of the behavioral theory of self-efficacy wherein an interactive approach between healthcare providers and patients consisting of education emphasizing the importance of goal setting based on the SMART principle (specific, measurable, achievable,

realistic and time-related), regular physical exercise, home blood pressure monitoring, salt reduction, following the DASH diet, positive thinking, relaxation, and weight control resulted in significant improvements in the knowledge, self-management skills, self-efficacy, physical activity, adherence to dietary recommendations and enhanced blood systolic and diastolic blood pressure control rates at the 3-month and 6-month follow-up interval (Daniali, Eslami, Maracy, Shahabi, & Darani, 2017; Taghavi, Salmani, & Norozi, 2022; Brady et al., 2013; Jaihooni, Sobhani, Harsini, & Amirkhani, 2023; Park, Song, Cho, Lim, Song, & Kim, 2011; Jung & Lee, 2017; Siu, Chan, Poon, Chui, & Chan, 2007; Lorig, Sobel, Ritter, Laurent, & Hobbs, 2001; Jones & Hall, 2004; Khosravi et al., 2014; Sadeghi, Shiri, Roohafza, Sepanlou, & Sarrafzadegan, 2013; Glynn, Murphy, Smith, Schroeder, & Fahey, 2010; Kamran, Shekarchi, Sharifirad, Sharifian, & Shekarchi, 2015; & Lu et al., 2015).

Conclusions

The primary conclusion of the study was that exposure to the three psychosocial interventions viz. Doctor led Patient Health Education and Counselling, Hypertension Health Education Video and the Community Health Worker led Patient Health Education and Counseling interventions as well as the hypertension-related knowledge, health beliefs and self-efficacy predicted significant improvements in the blood pressure control and the overall therapeutic adherence among hypertensive patients in a rural setting of Telangana, India.

The repeated administration of the psychosocial interventions during the first (baseline) and second stage of intervention (3-week follow-up interval) in the study was found to reinforce the hypertension-related knowledge, health beliefs and self-efficacy of patients facilitating the translation of health information into positive behavioral modification in terms of blood pressure control, treatment compliance and positive health behavior change.

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