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URBAN – RURAL DIFFERENTIALS IN THE ASSOCIATION OF HYPERTENSION DISEASE KNOWLEDGE AND PERCEPTION WITH SOCIO-DEMOGRAPHIC FACTORS - A CROSS-SECTIONAL STUDY

Physiotherapy

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ABSTRACT

Purpose: This study evaluated hypertension disease knowledge (HD-K) and perception scores (PS) of urban and rural hypertensive populations from Haryana as these factors are known to influence disease progression and further assessed differences in their association with socio-demographic factors between urban-rural participants. **Methods:** Prospective cross- sectional study done on 300 adults with hypertension in a tertiary care teaching hospital. HD-K was evaluated using 14-item hypertension evaluation of lifestyle and management knowledge (HELM) scale, with "GOOD" HELM code for score in range 9-14 and "POOR" HELM code for score in range 0-8. PS were evaluated through brief illness perception questionnaire (BIPQ) comprising of eight perception related statements with perception code's: - "LOW" (for score <42), "MODERATE" (for score 42-49) and "HIGH" (for score >50). **Results:** There were highly significant mean differences (M.D.) for HELM scale scores (M.D.= 1.07, t= 4.55, $p<0.01$) and BIPQ scores (M.D.= 9.01, t= 7.45, $p<0.01$) between urban and rural hypertensive participants with educational qualification found to be highly significant associated with HELM scale scores (Beta= -0.19, $p<0.01$) and BIPQ scores (Beta= -11.47, $p<0.01$). CHAID's tree analysis revealed highly significant differences for HELM scale codes between urban and rural participants possessing similar perception codes but different levels of education: - moderate perception ($p<0.01$; $\chi2 = 21.14$) and low perception ($p<0.01$; $\chi2 = 42.93$). **Conclusion: -** There is highly significant difference between HD-K and PS of urban and rural participants because of significant differences in the association of HELM scores and BIPQ scores with educational qualification between urban-rural participants.

KEYWORDS

Hypertension Knowledge, Disease Perception, Urban-Rural Differences, Education And Hypertension

INTRODUCTION

In developing countries, hypertension is becoming a public health emergency and is globally predominant[1,2]. Hypertension is a significant modifiable risk factor for cardiovascular disease, and its early diagnosis and control of hypertension can reduce premature mortality and disability[3].

The 2019-2021 National Family Health Survey in India revealed that 21.3% of women and 24% of men above 15 years have hypertension, a significant risk factor for ischemic heart disease[4].

The top-bottom approach focuses on treatment given by healthcare professionals as main stay for hypertension management whereas a bottom-up approach suggests that patient outcomes can be improved by patient self-care practices[5].

Hypertension self-care practice refers to a dynamic process which requires knowledge, attitude, awareness, and determination for disease management, with self- care being influenced by socio-demographic factors including patient's age, level of education and disease knowledge. Health literacy is known to affect self-care practices in hypertensive patients, as patients with higher heath literacy have higher medication adherence[6].

As health literacy affects disease management, understanding associations of hypertension disease knowledge (HD-K) and perception with socio-demographic factors is critical for designing effective rehabilitation strategies.

More knowledge is associated with better adherence to antihypertensive medications and adoption of a healthier lifestyle, both being the potential mechanisms for improving control of hypertension, whereas insufficient disease knowledge leads to inadequate blood pressure control[7].

To the best of our knowledge, there are no studies conducted till date on the hypertensive patients of Haryana that could reveal the HD-K knowledge and perception scores (PS) of these patients about hypertension. There is need to assess the disease knowledge and perception among patients with hypertension, to evaluate association of disease knowledge and perception with socio demographic factors and to assess the differences in the association of hypertension disease knowledge and perception with socio-demographic factors between urban-rural participants.

Therefore, present study was conducted to assess the disease knowledge and perception among patients with hypertension and further to evaluate the differences in the association of hypertension disease knowledge and perception with socio-demographic factors between urban-rural participants.

MATERIALS AND METHODS

The prospective cross-sectional study was conducted in a tertiary care teaching hospital from March 2024 to September 2024. Participants clinically diagnosed with hypertension while waiting to see their physician on clinical days were recruited in study. Sample size was determined using the single population proportion formula, sample size= $Z_{(1-\alpha/2)}^2 \times p(1-p)/d^2$; where $Z_{(1-\alpha/2)}$ = standard normal variate (at 95% Confidence interval=1.96) and d (absolute error in precision for the current study) =0.05 was taken based on the prevalence of hypertension among Haryana to be 26.2% (p = 0.26), resulting in a minimum required sample size of 296. Thereby, sample size of 300 was determined for present study[8].

A total of 300 clinically diagnosed hypertensive patients were enrolled in study using convenience sampling. Patients in age group of 18-80 years, both male and female, on antihypertensive medications for more than six months, with or without comorbidities were included[8, 6, 9]. Patients who were suffering from diseases in addition to hypertension and with gestational hypertension were excluded. Study participants were explained about the purpose and procedure of study. Following this, written informed consent was obtained from willing participants. The study was conducted after ethically approval by Institutional Biomedical Research Ethics Committee (BREC/23/TH-Physio-therapy/15 dated 20/7/2023) and from Clinical trial Registry-India (CTRI/2024/03/063783 dated 07/03/2024).

A detailed demographic information of all participants was collected mentioning age category, gender, educational qualification, marital status, occupation, level of physical activity, duration of hypertension, history of diabetes mellitus and substance abuse. Subjects enrolled in study were asked to first fill out hypertension evaluation of lifestyle and management knowledge scale (HELM)[10] which contains a total of 14 questions. Disease perception was evaluated through filling of another 8-item questionnaire by participants, namely brief illness perception questionnaire (BIPQ)[11]. It had eight perception related statements in 10-point Likert type scale which were scored between 0-10 response scale with a maximum perception score of "80".

Statistical Methods

Statistical calculation was performed using SPSS version 26. Association between various categorical variables including demographic detail of urban and rural participants expressed as number (percentage) was done using Chi-square test. Comparison between urban and rural participants for means of continuous variables expressed as mean ± standard deviation, including sub-components of HELM mean score, total HELM mean score and total BIPQ mean score was done with independent sample "t-test" and Cohen's D effect size. Further, Bland- altman plots were used to compare between-group mean differences for HELM scale score and BIPQ score of urban and rural participants. Associations between hypertension knowledge score and disease perception score were evaluated with socio-demographic factors including participant's age, gender, area of living (urban / rural), educational qualification and duration of hypertension using standard multiple regression analysis. CHAID (Chi-square Automatic Interaction Detectors) decision tree were used for evaluating differences in the association of hypertension disease knowledge and perception with socio-demographic factors between urban-rural participants. The significance level was set at a p-value < 0.05.

RESULTS

The enrolment of urban/rural hypertensive participants is shown in the CONSORT (Consolidated Standards of Reporting Trials) flow diagram (figure 1). The demographic characteristics (table I) of patients included in study showed no significant association between any factors including age, gender, and duration of hypertension. However, there was highly significant association (χ^2 value = 75.09; $p<0.01$) between level of educational qualification and region of living (urban/rural) of hypertensive participants.

A two tailed t-test for independent samples showed that there was statistically significant difference between urban and rural hypertensive population ($p<0.01$) with respect to dependent variable(s) namely HELM Scale general knowledge domain-score, HELM Scale Lifestyle & Medication Management domain- score, HELM Scale Monitoring & setting goal domain-score, HELM Scale Total Score and BIPQ Total Score (table II).

Due to significant differences in educational qualification (table I), HELM scale score and BIPQ score (table II) between rural and urban hypertensive participants, multiple linear regression analysis was further carried out for evaluating association of HELM scale total score and BIPQ total score of study participants with selected sociodemographic factors including age, gender, educational qualification, area of living (urban/rural) and duration of hypertension.

The following regression model (table IV) was obtained with multiple regression analysis of BIPQ total score as independent variable and age, gender, area of living and educational qualification as dependent variables: - BIPQ Total Score = 35.3 + 0 · Age + 0.13*Gender Female - 0.21*Urban/Rural + 8.6*Educational Qualification 12th + 16.74*Educational Qualification Higher education - 11.47 *Educational Qualification 5th.

Multiple linear regression analysis (table V) performed to examine the influence of duration of hypertension (in years) of urban and rural hypertensive participants on HELM scale total score showed following regression model:- HELM Scale Total Score = 9.61 - 0.35*Duration of Hypertension 6 to 10 years - 0.84*Duration of Hypertension 11 to 15 years - 1.94*Duration of Hypertension 16 to 20 years - 4.61*Duration of Hypertension 21 to 25 years.

Regression analysis of BIPQ Total Score (table VI) with duration of hypertension (in years) of urban and rural hypertensive participants showed following regression model: - BIPQ Total Score = 40.68 - 1.04* Duration of Hypertension 6 to 10 years - 3.68*Duration of Hypertension 11 to 15 years - 4.24*Duration of Hypertension 16 to 20 years - 17.68*Duration of Hypertension 21 to 25 years.

CHAID decision tree (figure 4) for evaluating association between educational qualification (5th standard, 10th standard, 12th standard and higher education) of urban/rural hypertensive participants with HELM Scale code and BIPQ code of urban/rural hypertensive participants revealed that there was highly significant association between educational qualification and perception codes of urban/rural hypertensive participants ($p<0.01$; χ^2= 275.44). All participants with high perception code had "GOOD" HELM scale code. Also, majority participants with high perception code were found to possess higher educational qualification (n= 47), with larger number of participants in urban group (n=37) as compared to rural group (n=10).

DISCUSSION

This study sought to explore how socio-demographic factors like education, and living environment influence the knowledge and perception of hypertension disease among urban and rural hypertensive participants. The findings highlight some key differences that are required to be incorporated while developing health education modules for patients with hypertension.

Socio-demographic Factors and Their Impact

Age: - Age remains one of the most significant contributors to hypertension risk. This is primarily due to biological changes such as increased arterial stiffness and peripheral resistance, leading to higher systolic blood pressure, particularly in older adults[12]. In present study, approximately one-third of both urban (31.3%) and rural (38%) participants were over the age of 60 with no significant age difference between urban and rural participants (table I).

Gender Disparities: -Gender also played a notable role, with a higher proportion of hypertensive patients being male (57%) compared to female (43%) with no significant difference between the number of male and female participants enrolled in urban/ rural group in study (table I). This pattern mirrors the findings of Bashyal et al.[14], who reported a similar distribution (58.2% male, 41.8% female). While the biological risk may not differ greatly by gender, men may be more exposed to behavioral risk factors like smoking and alcohol use or may underutilize healthcare services, contributing to these differences.

Marital and Occupational Influences: - There were no significant differences between participants enrolled in urban/ rural group in study in terms of marital status and occupation (table I). Given that many of the study participants were elderly, it is likely that some were retired or engaged primarily in home management—a pattern also seen in Bashyal et al.[14] work, where 38.5% of participants were homemakers. Such demographic details suggest that interventions tailored to older, home-based populations may be especially effective.

Lifestyle and Physical Activity: - The role of lifestyle choices was also apparent. A majority (74%) reported engaging only in mild physical activity with no significant difference between urban and rural participants (table I).

Education and its impact: - One of the most striking findings, was the difference in educational levels between urban and rural participants. A large portion of urban participants had at least completed 12th grade or higher, while rural participants mostly had education up to 10th grade or below. This educational divide was statistically significant (χ^2 = 75.09; $p < 0.001$, table1) and had a direct influence on disease knowledge and perception. Research by Mohammad R (2024)[16] supports the link between higher education and better health literacy, with educated individuals more likely to understand the implications of hypertension and adopt healthier lifestyles. For instance, those with education grade above 10th standard or more had significantly higher HELM scores ($p =0.001$) and PS, suggesting that education improves both understanding and attitude toward the disease (Figure 3, 4).

Hypertensive Disease Knowledge and Perception Scores in Urban and Rural Participants

The most compelling evidence of disparity came from the analysis of HD-K and PS. Urban participants scored significantly higher ($p<0.01$) on both HELM scale total mean score (9.74 ± 1.92) and BIPQ total mean score (44.31 ± 8.75) compared to rural participants (HELM scale total mean score: -8.67 ± 2.16; BIPQ total mean score: 35.31 ± 11.94)

(table II, figure 2 and 3). Medium Cohen's D effect size (0.52) was observed for HELM scale total score and for BIPQ total score large Cohen's D effect size (9.01) was observed between urban and rural participants.

Differences in the Association of Hypertension Disease Knowledge and Perception with Socio-demographic Factors Between Urban and Rural Participants

HELM scale total score (table III) was found to be significantly associated ($p<0.05$) with area of living (urban / rural) and highly significantly ($p<0.01$) associated with educational qualification (5^{th}, 12^{th} and higher education) of participants whereas non-significantly associated with socio-demographic factors including age and gender ($p>0.05$). This suggests that geographical distribution does affects the HD-K because of disparity in educational levels between urban and rural population.

BIPQ (table 4) linear regression model supports the fact that disease perception score was non-significantly associated with age, gender, and area of living (urban/rural) ($p>0.05$) and was highly significantly associated with educational qualification ($p<0.01$).

CHAID decision tree (figure 4) revealed that there was highly significant association between educational qualification (5^{th} standard, 10^{th} standard, 12^{th} standard and higher education) and PS (low, moderate, and high) of all hypertensive participants (both urban and rural). Both urban and rural participants with high perception score had "GOOD" HELM scale score and majority were found to possess higher educational qualification (n= 47), with larger number of participants in urban group (n=37) as compared to rural group (n=10).

For similar levels of perception, HELM scale scores of participants differed highly significantly between urban-rural groups and within urban-rural groups. The differences in HD-K and PS between urban and rural participants are attributable to the differences in level of education possessed by these participants.

The findings of present study indicate that educational qualification equally affects an individual's HD-K and perception irrespective of the geographical location/area of living of participants. These findings are suggestive of the fact that education is the primary factor that contributes to differences in both perception and HELM scale scores in both urban and rural participants irrespective of their area of living.

Table I: Demographic Details of Urban and Rural Hypertensive Participants

		Area of Living (Urban/ Rural)						Total		$\chi 2$ value	p-value
		Urban			Rural						
		N	%	% within Urban/ Rural	N	%	% within Urban/ Rural	n	%		
Age Category	18-30	13	4.33%	50%	13	4.33%	50%	26	8.67%	1.636	.802 NS
	31-40	26	8.67%	52%	24	8%	48%	50	16.67%		
	41-50	26	8.67%	52%	24	8%	48%	50	16.67%		
	51-60	38	12.67%	54.29%	32	10.67%	45.71%	70	23.33%		
	>60	47	31.3%	45.19%	57	38.0%	54.8%	104	34.66%		
	Total	150	50%		150	50%		300	100%		
Gender	Male	84	28%	56%	87	29%	58%	171	57%	.122	.726 NS
	Female	66	22%	44%	63	21%	42%	129	43%		
Educational Qualification	5th	1	0.33%	0.67%	39	13%	26%	40	13.33%	75.09	0.001**
	10th	44	14.67%	29.33%	70	23.33%	46.67%	114	38%		
	12th	53	17.67%	35.33%	30	10%	20%	83	27.67%		
	Higher education	52	17.33%	34.67%	11	3.67%	7.33%	63	21%		
Marital Status	Married	140	46.67%	93.33%	141	47%	94%	281	93.67%	2.822	0.244 NS
	Unmarried	6	2%	4%	2	0.67%	1.33%	8	2.67%		
	Widow	4	1.33%	2.67%	7	2.33%	4.67%	11	3.67%		
Occupation	Worker	28	9.33%	18.67%	20	6.67%	13.33%	48	16%	10.00	0.26 NS
	Housewife	60	20%	40%	61	20.33%	40.67%	121	40.33%		
	Professional	8	2.67%	5.33%	6	2%	4%	14	4.67%		
	Unemployed	5	1.67%	3.33%	6	2%	4%	11	3.67%		
	shopkeeper	12	4%	8%	5	1.67%	3.33%	17	5.67%		
	Farmer	18	6%	12%	19	6.33%	12.67%	37	12.33%		
	Retired	14	4.67%	9.33%	29	9.67%	19.33%	43	14.33%		
	Driver	1	0.33%	0.67%	1	0.33%	0.67%	2	0.67%		
Level of Physical Activity	No	13	4.33%	8.67%	19	6.33%	12.67%	32	10.67%	4.33	.144 NS
	Moderate	25	8.33%	16.67%	14	4.67%	9.33%	39	13%		
	Mild	112	37.33%	74.67%	117	39%	78%	229	76.33%		
Duration of Hypertension (in years)	1-5 yrs.	89	29.67%	59.33%	80	26.67%	53.33%	169	56.33%	6.66	0.15 NS
	6-10 yrs.	48	16%	32%	43	14.33%	28.67%	91	30.33%		
	11-15 yrs.	11	3.67%	7.33%	19	6.33%	12.67%	30	10%		
	16-20 yrs.	2	0.67%	1.33%	7	2.33%	4.67%	9	3%		
	21-25 yrs.	0	0%	0%	1	0.33%	0.67%	1	0.33%		
Diabetes Mellitus (yes/ no)	No	115	38.33%	76.67%	112	37.33%	74.67%	227	75.67%	.163	.686 NS
	Yes	35	11.67%	23.33%	38	12.67%	25.33%	73	24.33%		
Any Substance Abuse	No	117	39%	78%	115	38.33%	76.67%	242	80.67%	0.08	0.78 NS
	Yes	33	11%	22%	35	11.67%	23.33%	58	19.33%		

** Statistically significant at $p<0.01$; NS-nonsignificant at $p>0.05$

Table II: Comparison Between the Mean Values of HELM Scale Score and BIPQ Score of Urban and Rural Hypertensive Participants

Participants Region	HELM mean score (s)				BIPQ mean score
	General knowledge domain	Lifestyle and medication management domain	Monitoring and setting goal domain	Total HELM Scale mean score	Total BIPQ Mean score
	Mean ± SD				Mean ± SD
Urban (n=150)	2.45 ± 0.82	5.4±1.52	2.16±0.8	9.74±1.92	44.31±8.75
Rural (n=150)	2.17 ± 0.97	4.61±1.67	1.89±0.72	8.67±2.16	35.31±11.94
t- value	2.7	4.26	3.04	4.55	7.45
p-value	0.007**	0.001**	0.003**	0.001**	0.001**
Mean difference	0.28	0.79	0.27	1.07	9.01

95% Confidence interval	0.07-0.49	0.42-1.15	0.09-0.44	0.61-1.54	6.62-11.4
Cohen's d effect size	0.31	0.49	0.35	0.52	0.86

*Significant at p<0.05 with two tailed independent "t-test;" **Highly significant at p<0.01 with two tailed independent "t-test;" NS: - non-significant at p>0.05 with two tailed independent "t-test"; Cohen's D effect size: - small effect = 0.2, medium effect = 0.5, large effect = 0.8.

Table III: Association of Hypertension Evaluation of Lifestyle and Management Knowledge Score (HELM Scale Total Score) with Selected Sociodemographic Factors.

	Unstandardized Coefficients	Standardized Coefficients				95% confidence interval for B	
Model	B	Beta	Standard error	t	p	lower bound	upper bound
Constant	9.75		0.5	19.53	<.001	8.76	10.73
Age	-0.01	-0.05	0.01	-0.87	.387NS	-0.02	0.01
Gender Female	-0.16	-0.03	0.24	-0.65	.515 NS	-0.63	0.32
Urban/ Rural	-0.58	-0.13	0.27	-2.16	.032*	-1.11	-0.05
Educational Qualification 12th	0.94	0.19	0.3	3.13	.002**	0.35	1.53
Educational Qualification Higher education	1.07	0.2	0.34	3.13	.002**	0.39	1.75
Educational Qualification 5th	-1.21	-0.19	0.39	-3.14	.002**	-1.98	-0.45

Reference categories for regression: - Gender-Male, Area of living- Urban, Educational qualification- 10th. *Significant at p<0.05, ** Highly Significant at p<0.01; NS-nonsignificant at p>0.05

Table IV: Association of Brief Illness Perception Score (BIPQ Total Score) with Selected Sociodemographic Factors.

	Unstandardized Coefficients	Standardized Coefficients				95% confidence interval for B	
Model	B	Beta	Standard error	t	p	lower bound	upper bound
Constant	35.3		1.78	19.88	<.001	31.79	38.82
Age	0	0	0.03	0.13	.898 NS	-0.05	0.06
Gender Female	0.13	0.01	0.85	0.15	.878 NS	-1.55	1.81
Urban/ Rural	-0.21	-0.01	0.96	-0.22	.826 NS	-2.11	1.69
Educational Qualification 12th	8.6	0.34	1.07	8.08	<.001**	6.5	10.71
Educational Qualification Higher education	16.74	0.6	1.22	13.75	<.001**	14.33	19.15
Educational Qualification 5th	-11.47	-0.34	1.38	-8.33	<.001**	-14.19	-8.74

Reference categories for regression: - Gender-Male, Area of living- Urban, Educational qualification- 10th. *Significant at p<0.05, ** Highly Significant at p<0.01; NS-nonsignificant at p>0.05

Table V: Association Between HELM Scale Total Score and Duration of Hypertension in Urban and Rural Hypertensive Patients.

	Unstandardized Coefficients	Standardized Coefficients				95% confidence interval for B	
Model	B	Beta	Standard error	t	p	lower bound	upper bound
Constant	9.61		0.17	57.32	<.001	9.28	9.94
Duration of Hypertension 6 to 10 years	-0.35	-0.07	0.28	-1.22	.223NS	-0.91	0.22
Duration of Hypertension 11 to 15 years	-0.84	-0.11	0.43	-1.95	.05 NS	-1.7	0.01
Duration of Hypertension 16 to 20 years	-1.94	-0.15	0.75	-2.61	.01*	-3.42	-0.47
Duration of Hypertension 21 to 25 years	-4.61	-0.12	2.19	-2.11	.036*	-8.94	-0.28

Reference category for Regression: - Duration of Hypertension: - 1 to 5 years
*Significant at p<0.05, ** Highly Significant at p<0.01; NS-nonsignificant at p>0.05

Table VI: Association Between BIPQ Total Score and Duration of Hypertension in Urban and Rural Hypertensive Patients.

	Unstandardized Coefficients	Standardized Coefficients				95% confidence interval for B	
Model	B	Beta	Standard error	t	p	lower bound	upper bound
Constant	40.68		0.87	46.62	<.001	38.95	42.41
Duration of Hypertension 6 to 10 years	-1.04	-0.04	1.47	-0.71	.48NS	-3.96	1.88
Duration of Hypertension 11 to 15 years	-3.68	-0.1	2.25	-1.64	.103 NS	-8.13	0.77
Duration of Hypertension 16 to 20 years	-4.24	-0.06	3.88	-1.09	.276 NS	-11.92	3.44
Duration of Hypertension 21 to 25 years	-17.68	-0.09	11.38	-1.55	.121 NS	-40.2	4.84

Reference category for regression: - Duration of Hypertension: - 1 to 5 years
*Significant at p<0.05, ** Highly Significant at p<0.01; NS-nonsignificant at p>0.05

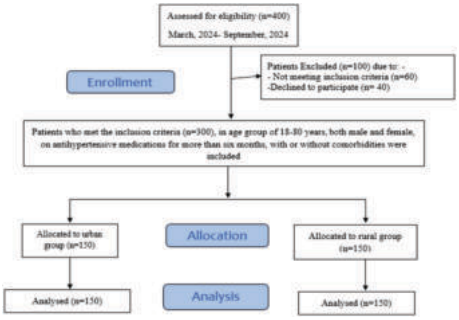

Figure 1: CONSORT (Consolidated Standards of Reporting Trails) Flow Diagram of Study Participants from Enrolment to Analysis

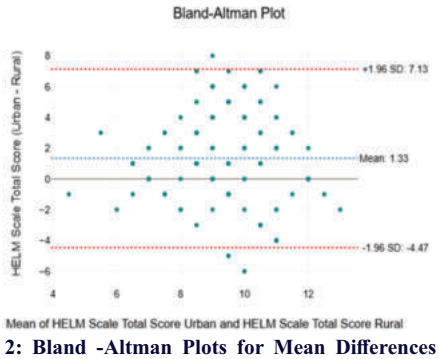

Figure 2: Bland -Altman Plots for Mean Differences Between HELM Total Score (Urban vs Rural)

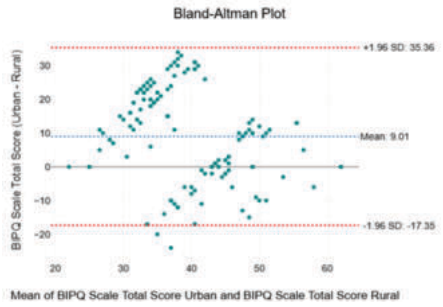

Figure 3: Bland -Altman Plots for Mean Differences Between BIPQ Total Score (Urban vs Rural)

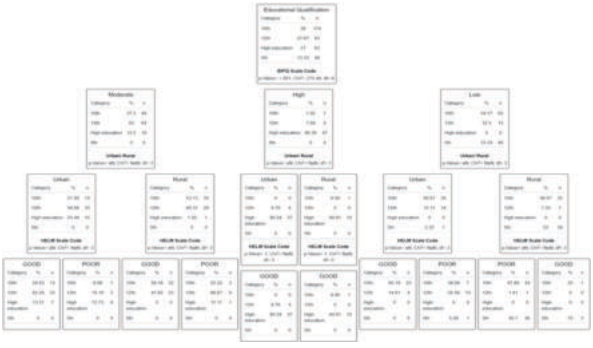

Figure 4: CHAID Decision Tree was for Evaluating Association Between Educational Qualification, HELM Scale Code and BIPQ Scale Code of Urban Hypertensive Participants

CONCLUSION

The findings of present study led us to accept the alternate hypothesis that there is highly significant difference between the hypertensive disease knowledge and perception of urban and rural hypertensive participants. The determinants of hypertensive disease knowledge and perception of both rural and urban participants are area of living and educational qualification, with duration of hypertension found to affect only hypertensive disease knowledge. Association of hypertensive disease knowledge score and perception score with educational qualification differed significantly between rural and urban participants due to disparity in levels of education.

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