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RESEARCH ARTICLE

Assessment of Medication Adherence Pattern for Patients with Chronic Diseases in South Indian Hospitals

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ABSTRACT

There is a need for specialized medication education programs for rural patients because of the limited health-care services and low literacy level. The objectives of the study are to evaluate the pattern of medication knowledge of hypertensive patients living in rural area with they are consultation in various South Indian district and Primary Health Care hospitals and to assess the impact of pharmacist provided education sessions on their medication knowledge status. A total of 1500 rural hypertensive patients were randomized into control and intervention group. Intervention group patients were educated regarding their medications, whereas control group patients did not receive any education by the study pharmacist during initial stage, 150th, 300th, and 450th day. Medication knowledge was assessed by administering medication knowledge assessment questionnaire, which was administered to control and intervention groups during the follow-up visits and 80 days after the last follow-up (530th day). At starting point, there was no statistically significant ($P > 0.05$) variance in the medication knowledge scores of the intervention and control groups. After the pharmacist provided education sessions, there was an improvement in the medication knowledge assessment scores of intervention group patients were observed with reference to recall of medication name, dose, indication, side effects, duration of treatment, usefulness, effectiveness, and missed medicines ($P < 0.05$). Demographic variables such as female gender, lower education, and income were the determinants of lower medication knowledge. Pharmacist-provided education sessions contributed in enhancing the medication knowledge of the intervention group patients. Our study findings warrant the necessity of educating the rural patients with chronic disease conditions to improve the knowledge regarding their medications.

Keywords: Adherence, clinical pharmacist, hypertension, medication knowledge

INTRODUCTION

Studies carried out in diverse culture and geographical settings have demonstrated the problems in ambulatory use of medication, including unjustified polypharmacy, wrong use, and non-adherence with therapy.[1,2] Problems exist even with medications that have well-documented benefits in patients.[3] Several studies conducted in developed countries revealed that patients have poor knowledge about their medications.[4,5] This medication knowledge to enhance the medication adherence status and improved therapeutic outcome.[6] It is widely recognized that if medication adherence has to be improved patient's perspective regarding their medications usage knowledge must be better understood.[7]

Amongst the various chronic diseases, hypertension is one of the most common chronic diseases identified in general population, leading to cardiovascular morbidity and mortality.[8] Hypertension is a highly prevalent health condition documented in people of India and other developing countries.[9,10] The

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available epidemiological data suggest that, in the last 60 years, there has been 30 times increase in the prevalence rate of hypertension among the urban population, while a 10 times increase was documented among the rural population over a period of three and half decades.[11] The available epidemiological data reports that hypertension is prevalent in 10–15% of rural adult population and 25–30% among people living in urban area.[12]

Several studies have been conducted to assess the medication knowledge in overseas hospitals and community pharmacy settings.[13] There is a scarce of published literature, regarding the medication usage knowledge pattern of hypertensive patients in an Indian rural setting.[14]

Aim and Objective

The aim and objective of the study are assessing, evaluate, and identifying demographic predictors of medication knowledge and self-reported adherence pattern of rural hypertensive patients toward their prescription medications. The study also evaluated the impact of pharmacist-provided education sessions on medication knowledge and adherence pattern of rural hypertensive patients.[15-17]

MATERIALS AND METHODS

It was a prospective, open-label study where enrolled patients were block randomized. The duration of the study was 30 months. The study was approved by the Human Ethical Committee. A Medication Knowledge Assessment Questionnaire (MKAQ) was designed in local language (Kannada) based on an extensive literature review and after having discussions with the senior clinical pharmacists and physicians. MKAQ was validated for its content accordingly. The field test version of MKAQ was administered to few hypertensive patients (n = 250) before the commencement of the actual study. MKAQ was reviewed based on the feedback obtained from the patients and content experts. The final version of MKAQ consisted of 22 questions.

The first five questions of MKAQ were general medication history-related questions, hence were not scored. Question numbers six to 15 of MKAQ were actual Medication Knowledge Assessment Questions and were scored [Table 1]. A negative answer given by patient was scored as zero, while a positive answer given by the patient was given a score of one. Question numbers 16–17 of MKAQ were once again general medication-related questions, hence were not considered for scoring.

A preliminary survey was conducted by the investigators (by visiting the taluku and district hospitals for coming to regular consultation patients) in the selected more than 20 various hospitals from the Davanagere, Ballary, Chitradurga, Haaveri, Shivamogga districts in District and Primary Health Care hospitals in Karnataka state India. This survey helped in identifying and recruiting the patients for the study. As per the standard literature, a community settlement lesser than 5000 is considered as rural area.[18-20] The hypertensive patients who were receiving medications for the management of their health condition were approached by the study investigators, given a letter describing the study, and asked if they wanted to participate. Patients who were willing to participate were included in the study. Patients of both gender, adults, and who were able to converse in Kannada (the regional language) were included in the study.[21,22]

Patients who are on any complementary and alternative medicines and patients having hearing and/cognitive disorder were considered not to include in the study. After the baseline assessment, the enrolled patients were block randomized into

Table 1: Medication knowledge assessment questions

Question No.	Medication knowledge assessment question
Q No 6:	Please recall the name (s) of all the medications you have been taking?
Q No 7:	Can you please mention the dose of the medications you have been taking?
Q No 8:	Do you know for what reason you have been taking these medications?
Q No 9:	Can you please mention the dosage schedule of your medications?
Q No 10:	Can you please recall the dosage timings of your medications?
Q No 11:	Are you aware of any possible side effects of your medications?
Q No 12:	Do you know how long you need to take these medications?
Q No 13:	How well your medications are working?
Q No 14:	What is your opinion regarding effectiveness of your medications?
Q No 15:	How many times did you miss taking your medications in the past 2 weeks?

control and intervention group in the ratio of 1:1. The Intervention group patients received education at baseline, 15th, 30th, and 45th day by the study pharmacist at their home settings. The education session included provision of both disease-related information and counseling regarding the appropriate use of prescribed medications. On the other hand, no formal education was provided to control group patients during the study period. However, a validated patient information leaflet on hypertension was provided to both groups. MKAQ was administered to the control and intervention groups at baseline, 150th, 300th day, and 1 week after the final education session (530th day).

To compare the medication knowledge of rural patients with urban hypertensive patients, a random sample of 350 hypertensive patients from urban area was enrolled and their medication knowledge was assessed using MKAQ. The data of the study were evaluated using Statistical Package for the Social Sciences 18.0. One-way "ANOVA" was performed to find out the changes in medication knowledge scores of two groups during the different follow-up periods. Paired "*t*" test was performed to compare the baseline medication knowledge scores of rural and urban hypertensive patients.

Pearson correlation test was used to find out relationship between medication knowledge scores of study patients and continuous sociodemographic, disease, and treatment-related variables. Chi-square test performed to identify the statistically significant difference between number of correct responses given by male and female rural hypertensive subjects. $P < 0.05$ is regarded as statistically significant.

RESULTS

A total of 1500 hypertensive patients were enrolled into the study. The difference in the sociodemographic and disease-related characteristics of both the study groups was statistically non-significant ($P > 0.05$).

Demographic Variables of the Study Patients

Majority of the enrolled patients were females (n = 790) [Figure 1]. The mainstream of the study population (n = 570) belonged to the age group of 51–60 years and were illiterate (n = 850) [Figures 2 and 3]. The good number (n = 740) of our study population cited their yearly family income as <30,000 INR/Year [Figure 4]. It is interesting to note that majority of patients were receiving single drug [Table 2].

The greater number of the urban hypertensive patients belonged to the age group of 41–50 years. Majority of the study patients (n = 130) had completed primary school education. Demographic characteristics of the urban hypertensive patients are presented in [Table 3].

Medication Knowledge of Study and Controlled Group Patients

No statistically significant ($P > 0.05$) difference in the medication knowledge scores between two groups was documented with reference to recall of name, dose, side effects, and duration of medications as specified in Table 4. Whereas a statistically significant improvement ($P < 0.05$) in the scores of intervention group patients regarding recall of name, dose, indication, side effects, duration of treatment, usefulness, effectiveness, and number of doses of medications missed. no significant ($P > 0.05$) increase in medication knowledge scores of the control group patients was observed [Table 4].

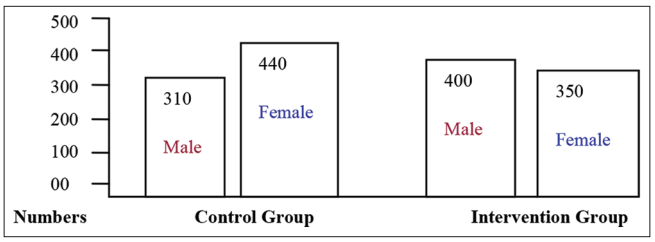

Figure 1: Gender of the study patients

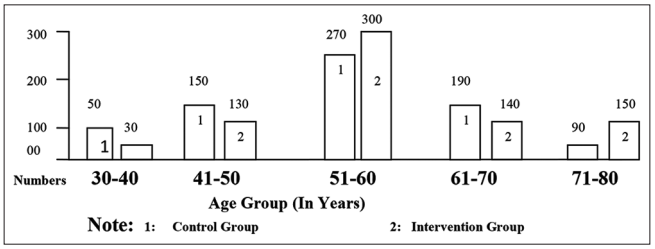

Figure 2: Age group of the study patients

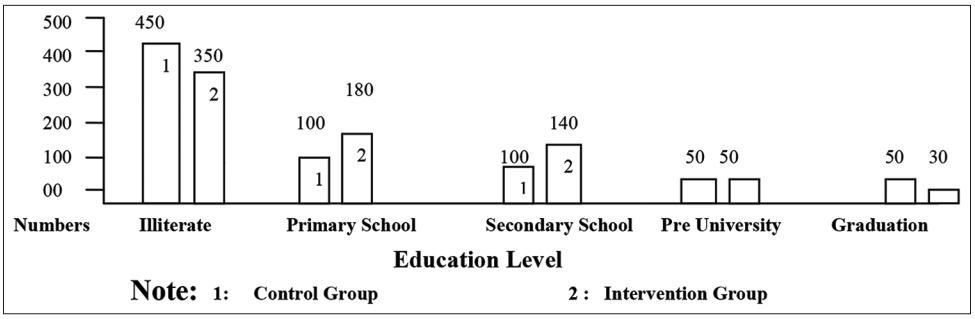

Figure 3: Education level of the study patients

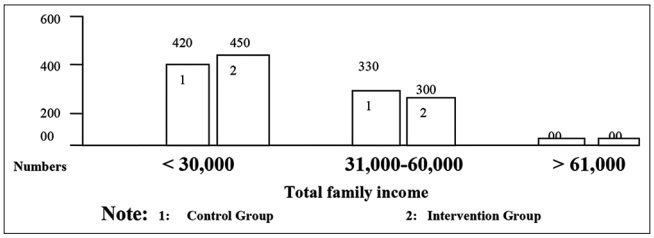

Figure 4: Total family income of the study patients

Table 2: Number of medications received by intervention and control group patients

Variable	Control group (n=750) *n* (%)	Intervention group (n=750) *n* (%)
Number of medications		
Monotherapy	500 (66.6)	400 (53.4)
Dual therapy	220 (29.3)	300 (40)
>2 drugs	30 (4)	50 (6.6)

Table 3: Demographic characteristics of urban hypertensive patients

Demographic details	Age (In year) (%)
30–40	20 (5.7)
41–50	120 (34.2)
51–60	80 (22.8)
61–70	70 (20
>70	60 (17.1)
Gender	
Male	180 (51.4)
Female	170 (48.5)
Marital Status	
Married	280 (80)
Widow	70 (20)
Educational Status	
Illiterate	30 (8.5)
Primary school	130 (37.1)
Secondary school	60 (17.1)
Pre-university course	50 (14.2)
Post-graduation	80 (22.8)
Occupation	
Professional	90 (25.7)
Business	40 (11.4)
Agriculture	40 (11.4)
House duties	180 (51.4)
Family Income (Indian Rupees [INR]/annum)	
<30,000	190 (58)
31,000–60,000	160 (42)

Correlation between Continuous Sociodemographic, Disease, and Treatment Variables with Medication Knowledge Scores

Pearson correlation test was carried out to find out the relationship between sociodemographic, disease, and treatment variables with baseline medication knowledge scores of study patients. A positive association was observed between education status of the patient and recall of appropriate indication of the medication. A positive relationship was also observed between total annual family income of the patients and recall of name, dose, and appropriate indication of medications. A positive association was also documented between number of diseases and recall of name, and dose of the medications. A negative association was documented between number of disease and recall of the dosage timings of the medications. A positive relationship was observed between number of medications and recall of name, dose, and indication of their medications. However, variable such as age was not associated with any parameters of medication knowledge [Table 5].

Relationship between Gender and Medication Knowledge Scores

The number of correct response given by male and female rural hypertensive patients were compared using Chi-square test. The number of correct responses given by male hypertensive patients was significantly higher than ($P < 0.05$) female subjects in all the scored items of MKAQ except recall of side effects of their medications ($P > 0.05$) [Table 6].

Table 4: Mean±SD medication knowledge scores of the study patients at different follow-up visits

Follow-ups	Groups	No. of patients	Mean±SD Medication Knowledge scores	SE	df	f	P-value
Baseline	Control	750	0.0080±0.27	0.00315	1	0.083	0.773
	Intervention	750	0.0093±0.29	0.00338	148		
	Total	1500	0.0086±0.28	0.00230	149		
150th day	Control	750	0.0080±0.27	0.00315	1	63.806	0.000*
	Intervention	750	0.6000±0.49	0.00569	148		
	Total	1500	0.3400±0.47	0.00388	149		
300th day	Control	750	0.0080±0.27	0.00315	1	242.100	0.000*
	Intervention	750	0.8667±0.34	0.00395	148		
	Total	1500	0.4773±0.50	0.00409	149		
530th day	Control	750	0.0080±0.27	0.00315	1	851.000	0.000*
	Intervention	750	1.0000±0.00	0.00000	148		
	Total	1500	0.5400±0.50	0.00408	149		

*P<0.05 is considered as statistically significant.

Table 5: Correlation between continuous sociodemographic, disease, and treatment with medication knowledge score

Variables	Q No: 6	Q No: 7	Q No: 8	Q No: 9	Q No: 10	Q No: 11	Q No: 12	Q No: 13	Q No: 14	Q No: 15
Age										
correlation Sign (2-tailed)	−052	−052	0.035	0.054	0.073	0.00	−0.091	−0.051	−0.001	−0.013
Number of patients	0.524	0.524	0.670	0.514	0.373	0.00	0.265	0.537	0.993	0.875
	150	150	150	150	150	150	150	150	150	150
Education										
Correlation Sign (2-tailed)	0.100	0.100	0.163*	−0.040	−0.14	0.00	0.085	−0.061	0.011	−0.062
Number of patients	0.225	0.225	0.046	0.624	0.868	0.00	0.302	0.459	0.895	0.450
	150	150	150	150	150	150	150	150	150	150
Annual family income										
Correlation Sign (2-tailed)	0.170*	0.170*	0.181*	−0.069	−0.102	0.00	0.152	0.006	−0.043	0.066
Number of patients	0.038	0.038	0.026	0.399	0.214	0.00	0.064	0.940	0.601	0.422
	150	150		150	150	150	150	150	150	150
No of disease										
Correlation Sign (2-tailed)	0.172*	0.172*	0.116	−0.107	−0.176*	0.00	0.160	0.046	0.039	−0.060
Number of patients	0.035	0.035	0.157	0.193	0.031	0.00	0.050	0.050	0.639	0.468
	150	150	150	150	150	150	050	150	150	150
No of medicines										
Correlation Sign (2-tailed)	0.213**	0.213**	0.170*	0.014	−0.130	0.00	0.189*	−0.020	−0.033	−0.005
Number of patients	0.009	0.009	0.037	0.865	0.112	0.00	0.020	0.811	0.690	0.947
	150	150	150		150	150	150	150	150	150

**.Correlation is significant at the 0.01 level (2-tailed) *. Correlation is significant at the 0.05 level (2-tailed)

- Q No 6: Please recall the name(s) of all the medications you have been taking?
- Q No 7: Can you please mention the dose of the medications you have been taking?
- Q No 8: Do you know for what reason you have been taking these medications?
- Q No 9: Can you please mention the dosage schedule of your medications?
- Q No 10: Can you please recall the dosage timings of your medications?
- Q No 11: Are you aware of any possible side effects of your medications?
- Q No 12: Do you know how long you need to take these medications?
- Q No 13: How well your medications are working?
- Q No 14: What is your opinion regarding effectiveness of your medications?
- Q No 15: How many times did you miss taking your medications in the past 2 weeks?

Comparison of Mean±SD Medication Knowledge Scores of Urban and Rural Hypertensive Patients

The baseline medication knowledge scores of rural hypertensive patients were significantly lesser ($P < 0.05$) than the urban hypertensive

patients regarding recall of name(s), dose, indication, timings, belief towards usefulness, effectiveness, and number of doses of medications missed [Table 7]. However, no statistically significant ($P > 0.05$) difference in the self-reported medication knowledge scores of rural and urban hypertetensive patients was observed in reference to recall of possible side-effects of their medications. Medication knowledge scores of rural hypertensive patients were significantly ($P < 0.05$) better than urban hypertensive patients with respect to recall of dosage schedule and duration of treatment [Table 7].

- Q No 6: Please recall the name(s) of all the medications you have been taking?
- Q No 7: Can you please mention the dose of the medications you have been taking?
- Q No 8: Do you know for what reason you have been taking these medications?
- Q No 9: Can you please mention the dosage schedule of your medications?
- Q No 10: Can you please recall the dosage timings of your medications?
- Q No 11: Are you aware of any possible side effects of your medications?
- Q No 12: Do you know how long you need to take these medications?
- Q No 13: How well your medications are working?
- Q No 14: What is your opinion regarding effectiveness of your medications?

Table 6: Comparison of number of correct responses given by male and female rural hypertensive patients

MKAQ questions	Gender	Number of correct responses	*P*-value
Question no: 6	Male (*n*=710)	13	*P*<0.01*
	Female (*n*=790)	00	
Question no: 7	Male (*n*=710)	13	*P*<0.01*
	Female (*n*=790)	00	
Question no: 8	Male (*n*=710)	13	*P*<0.01*
	Female (*n*=790)	00	
Question no: 9	Male (*n*=710)	13	*P*<0.01*
	Female (*n*=790)	00	
Question no: 10	Male (*n*=710)	13	*P*<0.01*
	Female (*n*=790)	00	
Question no: 11	Male (*n*=710)	00	P>0.05
	Female (*n*=790)	00	
Question no: 12	Male (*n*=710)	13	*P*<0.01*
	Female (*n*=790)	00	
Question no: 13	Male (*n*=710)	13	*P*<0.01*
	Female (*n*=790)	00	
Question no: 14	Male (*n*=710)	13	*P*<0.01*
	Female (*n*=790)	00	
Question no: 15	Male (*n*=710)	13	*P*<0.01*
	Female (*n*=790)	00	

**P*<0.05 is considered as statistically significant

Table 7: Comparison of Mean±SD medication knowledge scores of urban and rural hypertensive patients

Questions	Groups	Mean±SD Medication knowledge score	*P*-value
Question no: 6	Rural patients (*n*=1500)	0.08±0.28	0.000*
	Urban patients (*n*=350)	0.40±0.48	
Question no: 7	Rural patients (*n*=1500)	0.08±0.28	0.009*
	Urban patients (*n*=350)	0.31±0.46	
Question no: 8	Rural patients (*n*=1500)	0.08±0.28	0.000*
	Urban patients (*n*=350)	0.37±0.48	
Question no: 9	Rural patients (*n*=1500)	0.94±1.00	0.002*
	Urban patients (*n*=350)	0.23±0.00	
Question no: 10	Rural patients (*n*=1500)	0.00±0.00	0.013*
	Urban patients (*n*=350)	1.00±0.00	
Question no: 11	Rural patients (*n*=1500)	0.00±0.00	*P*>0.05
	Urban patients (*n*=350)	0.00±0.00	
Question no: 12	Rural patients (*n*=1500)	0.06±0.00	*P*>0.05
	Urban patients (*n*=350)	0.00±0.00	
Question no: 13	Rural patients (*n*=1500)	0.80±0.00	0.008*
	Urban patients (*n*=350)	1.00±0.00	
Question no: 14	Rural patients (*n*=1500)	0.81±0.00	0.008*
	Urban patients (*n*=350)	1.00±0.00	
Question no: 15	Rural patients (*n*=1500)	0.20±0.00	0.783
	Urban patients (*n*=350)	0.27±0.00	

**P*<0.05 is considered astatically significant

- Q No 15: How many times did you miss taking your medications in the past 2 weeks?

DISCUSSION

A number of studies suggest that pharmacists can play an important role in improving medication usage knowledge of the chronic disease patients. Hypertension is a common chronic health condition, which is now identified as a significant cause of cardiovascular morbidity and mortality. Hypertension is highly prevalent and a major health concern among the public population of India and other developing countries. A total of 1500 patients were recruited into the study. There was no dropout in the study population, since all the enrolled patients were followed up at their home and hospital settings. Preponderance of the study patients was in the age group of 51–60 years with majority being females. In line with our findings, other studies have reported a higher prevalence in this age group.[18,19] Other studies have documented higher prevalence of hypertension in the age group of 55–74, >60, 60–69 and 65–74 years of age. It is interesting to note that a higher prevalence of hypertension is documented female subjects. This is in accordance with findings of study, which reported a higher prevalence in female subjects from rural community in India. Studies conducted in other parts of the world have also reported similar findings. In contrast, few studies have documented a higher prevalence among males. However, few studies have not documented any gender-wise difference in the prevalence of hypertension.

Association between Continuous Demographic and Disease Variables with Medication Knowledge Scores

Medication knowledge and gender

The baseline medication knowledge scores of female hypertensive patients were counterparts in all the scored items of MKAQ, except recall of side effects of their medications. This is possibly due to the poor education level of female subjects in rural setup than male subjects. Similar observations have been reported in previous studies.[23-26]

Medication knowledge and age

We observed no relationship between age and medication knowledge scores of the study patients. However, few studies have reported poorer medication knowledge both in younger and elderly chronic disease patients. This may be possibly due to the higher level of intolerance and unwillingness in the younger population to accept their disease condition. While poor medication knowledge in elderly patients could be due to age-related weakening of cognitive function, which further could be significant in chronic disease patients.[27,28]

Medication knowledge and education status

Hypertensive patients with a higher education level reported better knowledge regarding the indications of their medications. This could be due to the better education status that improves the comprehension of the patients regarding their disease and treatment condition. Similar findings have been reported in the previous studies. A study conducted by Karibasappa Mathad V. observed a positive association between medication knowledge and education level of the patient.[29,30]

Medication knowledge and total annual family income

Subjects with higher family income reported greater medication knowledge with regarding recall of name, dose, and indications of their medications. This could be due to the better education status of the higher income group patients. Our study findings fall in line with the findings of other studies, which reported a relationship between medication knowledge and level of income.[31]

Medication knowledge and number of medications

Patients with a greater number of medications exhibited lower recall of name, dose, and indications of medications prescribed. As the number of prescribed medications increases, it is difficult to remember the details of the medications. Similar findings have been reported in the previous studies.[32]

Medication knowledge and number of diseases

Patients with a higher number of comorbidities reported less knowledge of dosage timings of their medications. In our study, the type of comorbidity was diabetes. Patients with diabetes as a comorbidity reported lower knowledge of doses of their medications. This is possibly due to higher number of prescribed medications, in the presence of co-morbidity and also presence of two chronic diseases can affect the cognition of the patients. This possibly could be the cause for lower medication knowledge scores in patients with a greater number of comorbidity.[33-35]

Medication Knowledge of Urban and Rural Hypertensive Patients

Better medication-related knowledge in urban hypertensive patients could be due to the better education status of urban hypertensive patients and their family members, better socioeconomic condition, and may be due to frequent or easy access to health-care professionals. Better education status and health literacy are considered as influencing factors in enhancing medication knowledge.[36,37] The previous studies conducted in other countries have reported poor knowledge regarding hypertension and its management in rural patients and suggest the importance of educational interventions to the rural patients.[38] The findings of our study are in accordance with other studies, which reported lower medication knowledge in rural patients than urban patients with chronic disease.[39]

Augmentation in the medication knowledge scores of intervention group patients might be due to the health-related information, they have received from the pharmacist during the course of the study. Studies conducted in the past have reported improvement in medication knowledge of patients after educational intervention by health-care profesionals. From the finding of this study, we can postulate that pharmacist-provided educational intervention had a positive impact on medication knowledge and thus increasing the perceived benefits of health action. The study has explored the possible role of pharmacist in educating rural patients in their home-setup. Main limitations of our study were a smaller sample size and a shorter study period. Medication knowledge was measured using self-reported behavior measure. Since the same investigator was involved in the provision of education and evaluation of impact, it is doable that enhancement within the self-reported medication-related knowledge could be overestimated in our study. Thus, interviewer bias was not explained in our study.[40]

CONCLUSION

The study confirms that medication knowledge of the rural hypertensive patients was extremely poor regarding the name, indication, dosage regimen, side effects, belief toward efficacy, and usefulness of medications. Pharmacist-delivered education/counseling sessions were found to be beneficial in enhancing the medication knowledge of hypertensive patients residing at rural areas. Our study findings warrant the necessity of educating the rural patients with chronic disease conditions to improve the knowledge regarding their medications.

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