International Journal of Allied Medical Sciences and Clinical Research (IJAMSCR)

ISSN:2347-6567

IJAMSCR | Volume 9 | Issue 2 | Apr - Jun - 2021
www.ijamscr.com

Research Study Medical research

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 the 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 530th 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 eighty 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.

Key words: hypertension; medication knowledge; adherence; clinical pharmacist.

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 nonadherence 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[2,4]. This medication knowledge in order to enhance the medication adherence status and improved therapeutic outcome[1,9]. It is widely recognized that if medication adherence has to be improved patient's perspective regarding their medications usage knowledge must be better understood [5,10].

Amongst the various chronic diseases, hypertension is one of the most common chronic diseases identified in general population leading to cardiovascular morbidity and mortality[11]. Hypertension is a highly prevalent health condition documented in people of India and other developing countries[5,6]. The 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 ten times increase was documented among the rural population over a period of

three and half decades[7]. The available epidemiological data reports that hypertension is prevalent in 10% to 15% of rural adult population and 25% to 30% among people living in urban area[12].

While several studies have been conducted to assess the medication knowledge in overseas hospitals and community pharmacy settings[2,5].There is a scarce of published literature regarding the medication usage knowledge pattern of hypertensive patients in an Indian rural setting.

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 towards their prescription medications. The study also evaluated the impact of pharmacist provided education sessions on medication knowledge and adherence pattern of rural hypertensive patients.

METHODS AND MATERIALS

It was a prospective, open label study where enrolled patients were block randomized. The duration of the study was for 30 months. 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, 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 twenty-two questions.

The first five questions of MKAQ were general medication history related questions, hence were not scored. Question numbers six to fifteen 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 sixteen to twenty-two 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 literatures a community settlement lesser than 5,000 is considered as rural area[13]. 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 the gender, adults and who were able to converse in Kannada (the regional language) were included in the study.

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 control and intervention group in the ratio of 1:1. The Intervention group patients received education at baseline, 150th, 300th and 450th 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 the groups. MKAQ was administered to the control and intervention groups at baseline, 150th, 300th and 450th day 530th , and one 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 were enrolled and their medication knowledge was assessed using MKAQ. The data of the study was evaluated using Statistical Package for the Social Sciences (SPSS) 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 socio demographic, 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. A 'p' value of less than 0.05 is regarded as statistically significant.

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 two weeks?

RESULTS

A total of 1500 hypertensive patients were enrolled into the study. The difference in the socio demographic and disease related characteristics of both the study groups were 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) belong to the age group of 51 to 60 years and were illiterate (n=850) **[Figure 2 & 3].** The good number (n=740) of our study population cited their yearly family income as less than 30,000 INR/Year **[Figure 4].** It is interesting to note that majority of patients were receiving single Drug [**Table 2**].

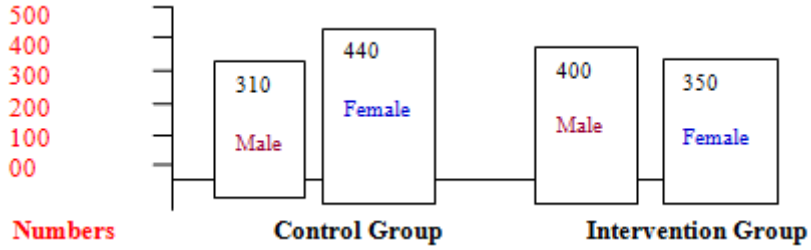

Figure 1: Gender of the study patients

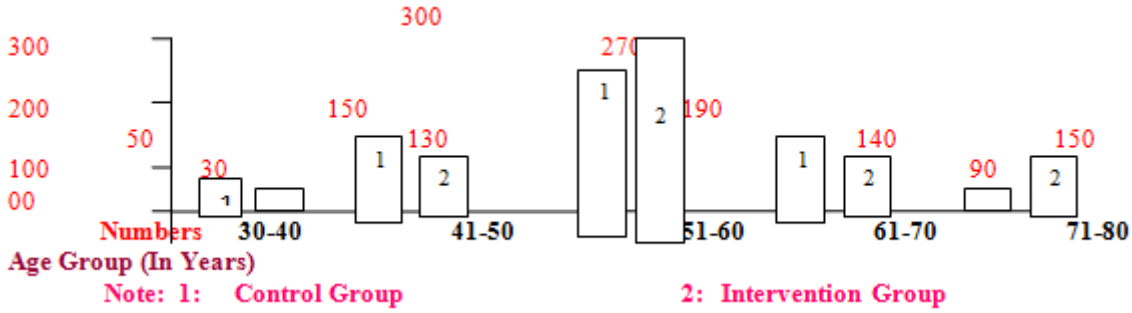

Figure 2: Age group of the study patients

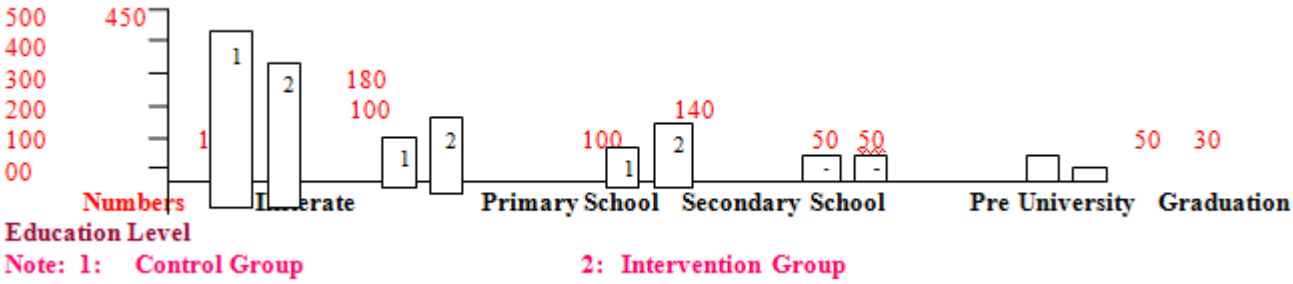

Figure 3: Education level of the study patients

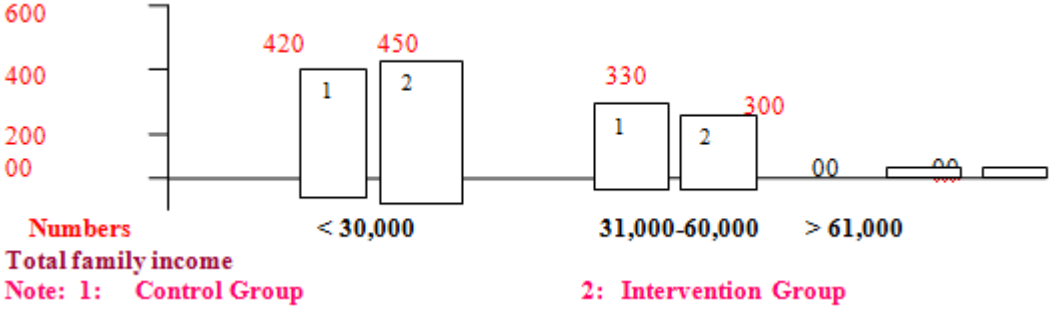

Figure 4: Total family income of the study patients

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%)

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].

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%)

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. While no significant ($p>0.05$) increase in medication knowledge scores of the control group patients was observed [**Table 4**].

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	Std-error	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		
150^{th} 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		
530rd 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.

Correlation between continuous socio demographic, disease and treatment variables with medication knowledge scores

Pearson Correlation test was carried out to find out the relationship between socio demographic, 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, dose of the medications. While 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**].

Table 5: Correlation between continuous socio demographic, disease and treatment with medication knowledge score.

Variables	Q No:6	Q No:7	Q No:8	Q No:9	QNo: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***	-.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)										
Number of patients	**0.170***	**0.170***	**0.181***	-0.069	-0.102	0.00	0.152	0.006	-0.043	0.066
	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)**

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 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.

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 two weeks?

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

The baseline medication knowledge scores of rural hypertensive patients was 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 hypertensive patients was observed in reference to recall of possible side-effects of their medications. While medication knowledge scores of rural hypertensive patients was significantly ($p<0.05$) better than urban hypertensive patients with respect to recall of dosage schedule and duration of treatment [**Table 7**].

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 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 two weeks?

DISCUSSION

A number of studies suggest that pharmacists can play an important role in improving medication usage knowledge of the chronic disease patients [14, 15]. Hypertension is a common chronic health condition, which is now identified as significant cause of cardiovascular morbidity and mortality [16]. Hypertension is highly prevalent and a major health concern among the public population of India and other developing countries [17]. 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 were in the age group of 51 to 60 years with majority being females. In line with our findings, other studies have reported higher prevalence in this age group [18, 19]. Other studies have documented higher prevalence of hypertension in the age group of 55 to 74, >60, 60 to 69 and 65 to74 years of age [19-23]. It is interesting to note that higher prevalence of hypertension is documented female subjects. This is in accordance with findings of study, which reported higher prevalence in female subjects from rural community in India [24]. Studies conducted in other parts of the world have also reported similar findings [25, 26]. In contrast, few studies have documented higher prevalence among males [21, 27]. However, few studies have not documented any gender wise difference in the prevalence of hypertension [28].

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 [2, 6, 7, and 17].

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 [7, 12, and 20]. This may be possibly due to the higher level of intolerance and unwillingness in 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 [5, 21].

Medication knowledge and education status

Hypertensive patients with 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 [3, 22]. Similar findings have been reported in previous studies. A study

conducted by Marks *et al*. observed a positive association between medication knowledge and education level of the patient [29].

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 [30, 31].

Medication knowledge and number of medications

Patients with 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 previous studies [2, 11].

Medication knowledge and number of diseases

Patients with higher number of comorbidities reported less knowledge of dosage timings of their medications. In our study the type of co-morbidity was diabetes. Patients with diabetes as a co-morbidity 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 [24]. This possibly could be the cause for lower medication knowledge scores in patients with greater number of comorbidity [17, 22, and 31].

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 healthcare professionals. Better education status and health literacy are considered as influencing factors in enhancing medication knowledge [2, 29]. Previous studies conducted in other countries have reported poor knowledge regarding hypertension & its management in rural patients and suggests the importance of educational interventions to the rural patients [32]. 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 [33].

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 professionals [2, 14, and 15]. 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 smaller sample size and shorter study period. Medication knowledge was measured using self-reported behavior measure. Since the same investigator was involved in 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.

CONCLUSION

The study confirms that medication knowledge of the rural hypertensive patients was extremely poor regarding the name, indication, dosage regimen, side effects, belief towards efficacy and usefulness of medications. Pharmacist delivered education/counseling sessions was 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.

ACKNOWLEDGEMENTS

Our Sincere thanks to all the administrators of Career Point University and various Districts and Primary Health Care Hospitals from Davanagere, Chitradurga, and Ballary, Shivamogga, Haaveri districts for their timely help and cooperation. We thank the various District and Primary Health Care Hospitals Physicians and staffs of from Davanagere, Chitradurga, and Ballary, Shivamogga, Haaveri districts Karnataka, India for their kind support during the PhD work of the study.

Key words: hypertension; medication knowledge; adherence; clinical pharmacist.

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How to cite this article: Karibasappa Mathad V, Dr. K. Sattanathan. Assessment of Medication Adherence Pattern for Patients with Chronic Diseases in South Indian Hospitals. Int J of Allied Med Sci and Clin Res 2021; 9(2): 432-441.

Source of Support: Nil. **Conflict of Interest:** None declared.