

Original Research Article

Hypertension-related knowledge, medication adherence and health-related quality of life (HRQoL) among hypertensive patients in Islamabad, Pakistan

Muhammad Amer¹, Nisar-Ur-Rahman¹, Saeed-Ur-Rashid Nazir^{2*}, Atif Raza³, Humayun Riaz⁴, Saleha Sadeeqa⁵, Misbah Sultana³

¹Department of Pharmacy, COMSATS University Islamabad, Abbottabad Campus, ²Faculty of Pharmacy, University of Sargodha, Sargodha, ³University College of Pharmacy, University of Punjab, ⁴Rashid Latif College of Pharmacy, ⁵Institute of Pharmacy, Lahore College for Women University, Lahore, Pakistan

*For correspondence: **Email:** smazir@yahoo.com; **Tel:** +92-301-462-9275

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Abstract

Purpose: To determine knowledge regarding hypertension, adherence to medication and Health-Related Quality of Life (HRQoL), and their associations in hypertensive patients in Pakistan.

Methods: A cross-sectional study was conducted among 384 hypertensive patients attending a tertiary health care public sector hospital in Islamabad, Pakistan. Data were collected using knowledge questionnaire regarding hypertension, Morisky Medication Adherence Scale, and EuroQol (EQ-5D) scale.

Results: The mean systolic and diastolic blood pressures of the 384 patients were 140.39 ± 15.485 and 88.74 ± 10.683 mmHg, respectively. The coefficient of correlation between knowledge regarding hypertension and adherence was 0.638 ($p < 0.001$), showing a positive association. The correlation coefficient between knowledge and HRQoL was 0.709 ($p < 0.001$), suggesting a good association. The correlation coefficient between adherence to medication and HRQoL was 0.545 ($p < 0.001$), which indicated a positive correlation.

Conclusion: These results indicate that there are statistically significant associations between hypertension knowledge and HRQoL, hypertension knowledge and medication adherence, and between adherence and HRQoL in the hypertensive patients studied.

Keywords: Hypertension, Knowledge, Medication adherence, Blood pressure

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INTRODUCTION

Hypertension (HTN) is a chronic disease of worldwide concern. It is an important and avoidable risk factor for cardiovascular diseases. Hypertension has substantial negative impacts on health, and results in needless morbidity and

mortality. It is believed to be responsible for > 5.8 % of deaths worldwide, and loss of about 11.9 % of life expectancy. The success rate in control of hypertension is poor all over the world. Pakistan is faced with an epidemic of hypertension as well as cardiovascular (CV) diseases [1]. Life expectancy in Pakistan (62 years) is 17 – 20

years lower than the range in developed countries [2]. Low knowledge regarding hypertension as well as other cardiovascular diseases has been reported on the continent.

Data relating to knowledge as well as risk factors related to hypertension are not available in Pakistan. This has become a major public health and clinical issue in Pakistan. It has been reported that the prevalence of hypertension in Pakistan is 33 %. Every third individual aged above forty years is prone to different diseases. It has also been reported that only 50 % of hypertensive individuals were diagnosed, while only about half of the diagnosed patients received treatment. Half of those diagnosed patients treated for hypertension were prescribed with correct medication for effective control of hypertension. Thus, only 12.5 % of hypertension cases were properly controlled [1].

The present study was aimed at assessing the level of hypertension-related knowledge, adherence to medication and HRQoL among hypertensive patients in Islamabad, Pakistan and to assess the association between hypertension related knowledge, medication adherence and HRQoL.

METHODS

Study design and settings

A questionnaire-based, cross sectional study was adopted to assess knowledge, HRQoL and blood pressure of hypertensive patients. Since the prevalence of hypertension is 33 % in Pakistan, a sample of 384 patients, based on prevalence [1] was recruited from Federal Government Poly Clinic (Postgraduate Medical Institute). The study was conducted from August to November 2017.

Inclusion criteria

Patients aged thirty years and above, who were diagnosed with hypertension, and were receiving treatment for high blood pressure in the previous 6-months, and patients with the ability to write or speak Urdu (Pakistan's official language) were recruited for this study.

Exclusion criteria

Patients aged less than thirty years, and those aged over seventy years; pregnant women, patients with co-morbidities, patients having dementia, and immigrants were excluded from this study.

Ethical approval

Approval for this study was obtained from the Ethical Committee of Poly Clinic Hospital (affiliated to Shaheed Zulfiqar Ali Bhutto Medical University, Islamabad) (approval no. FGPC.1/12/2016/Ethical Committee). The study was conducted according to ethical principles as described in Helsinki Declaration of 1964, revised in 2013 [3]. Prior to collection of data, written consent was obtained from the hypertensive patients.

Data collection

Knowledge questionnaire about hypertension, Morisky medication adherence scale (MMAS-U) and EuroQol (EQ-5D) scale were utilized for data collection.

Assessment of knowledge of hypertension

Hypertension knowledge questionnaire in Urdu was developed after extensive survey of literature [4]. It consisted of 22 questions. Each question required a 'Yes', 'No' or 'Do Not Know' response. Knowledge was evaluated by scoring 1 for a correct response, and 0 for a wrong response. The response of 'Do Not Know' was also scored zero. Knowledge was measured on a scale from a minimum of 0 to maximum of 22. Scores < 10 were categorized as poor, while scores in the ranges of 10 - 18 and 19 - 22 were categorized as moderate and adequate knowledge, respectively, about hypertension.

Assessment of medication adherence

The Urdu version of Medication Adherence questionnaire by Morisky was used to evaluate adherence to treatment. It included seven questions having responses of Yes or No, and 1 question as a 5-point Likert type scale. Each "No" response was scored 1, and each "Yes" response scored 0 except for question 5, in which each "Yes" response was scored 1. Adherence scores were grouped viz: 8 for high adherence, 6 - 7 for medium adherence, and < 6 for low adherence [5].

Assessment of HRQoL

The HRQoL was measured in hypertensive patients using EuroQol EQ-5D scale which included 2 parts [6]. The first part comprised 5 dimensions of health: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. Each dimension had three levels viz: no problem, some or moderate

problems and extreme problem corresponding to levels 1, 2, and 3, respectively [7].

For Pakistani population, EQ-5D preference weight was not available for each state of health. Therefore, as EQ-5D Index score, these preference weights were derived from Time Trade-Off (TTO) tariff of preference weights of UK general population [8]. The second part consisted of visual analogue scale (VAS). It determined the respondent's self-rated status of health on a graduated (0 – 100) scale, with a score of 100 as the best imaginable state of health, and a score of 0 as the worst imaginable state of health, and higher scores for higher HRQoL. The Urdu version of EQ-5D was provided on request, by EuroQol. This study was also registered with EuroQol.

Blood pressure measurement

The blood pressure of each patient was measured using a calibrated mercury sphygmomanometer.

Data analysis

Data were analyzed statistically using SPSS software version 21.0. Spearman's test was performed to assess any association between knowledge, medication adherence and HRQoL. Measurement data are expressed as mean \pm standard deviation (SD).

RESULTS

Patients' demographics

Cronbach's alpha value was 0.755 for hypertension knowledge, 0.747 for adherence, and 0.712 for EQ-5D questionnaires. Three hundred and eighty-four (384) HTN patients were enrolled in this study. Table 1 shows the socio-demographic variables as well as frequency distribution of the hypertensive patients.

Table shows that 138 out of the 384 patients were in the age range of 41 - 50 years, with 56 % as males. Three hundred and eighty-three of the patients (99.7 %) were married. Mean duration of disease was 3.31 ± 2.13 years. Majority of the patients (101, 26.3 %) had matriculation level of education, while 156 patients (40.6 %) were either housewives or house makers. Two hundred and twenty-one patients (57.6 %) had a monthly income of more than 15,000 Pakistan Rupees, and 220 patients (57.3 %) were urban dwellers.

Table 1: Demographic characteristics of survey respondents (n = 384)

Characteristic	Frequency	(%)
Age (years)		
30-40	61	15.9
41-50	138	35.9
51-60	125	32.6
61-70	60	15.6
Gender		
Male	215	56
Female	169	44
Marital status		
Married	383	99.7
Unmarried	0	0.00
Widow	1	0.30
Education		
Illiterate	87	22.7
Primary	37	9.6
Middle	58	15.1
Matriculation	101	26.3
Intermediate	29	7.6
Graduate	47	12.2
Postgraduate	25	6.5
Occupation		
Private sector job	47	12.2
Government job	121	31.5
Businessman	0	0.00
Housewife/Housemaker	156	40.6
Retired	60	15.6
Jobless	0	0.00
Monthly income* (Pakistan rupees)		
Nil	157	40.9
5000 – 10000	2	0.50
10001 – 15001	4	1.00
> 15001	221	57.6
Location		
Urban	220	57.3
Rural	164	42.7
Duration of disease (years, mean \pm SD) = 3.31 ± 2.13		
<1	80	20.8
1 – 3	164	42.7
3 – 5	26	6.8
> 5	114	29.7

*US\$1 = 111.70 Pk Rs

Blood pressure

Mean systolic and diastolic blood pressures of hypertensive patients (n = 384) were 140.39 ± 15.485 and 88.74 ± 10.683 in mmHg, respectively.

Patients' knowledge about hypertension

Table 2 shows responses of patients to hypertension knowledge questions. Poor knowledge was reported in responses to questions 4 (39.6 ± 20.8 , 60.4%), 7 (55.2 ± 1.0 , 56.2%), 8 (78.9%), 10 (88.3 ± 2.3 , 90.6%), 13 (55.7 ± 4.7 , 60.4%), 15 ($66.4 \pm 1.0 = 67.4\%$), 16 (47.9 ± 11.7 , 59.6%) and 22 (39.6 ± 16.4 , 56%).

Correct answers to questions 6, 13 and 15 were 58.1, 39.6 and 32.6 percent, respectively.

Table 2: Responses to hypertension knowledge questions

Knowledge questionnaire	Yes (%)	No (%)	Don't know (%)
1. Do you know the normal values of blood pressure	72.7	26.0	1.3
2. Elevated blood pressure is called hypertension	76.8	14.1	9.1
3. Do you know the signs and symptoms of hypertension?	79.2	20.8	0.0
4. Hypertension is hereditary	39.6	39.6	20.8
5. The older a person is, the greater their risk of having hypertension	65.1	23.2	11.7
6. Both men and women have equal chance of developing hypertension	30.2	58.1	11.7
7. Do you know the names of your prescribed drugs?	43.8	55.2	1.0
8. Do you know the dose of your medication?	21.1	78.9	0.0
9. Do you know the frequency of your medication?	96.9	1.8	1.3
10. Do you know the possible side effects of your medicines?	9.4	88.3	2.3
11. Smoking is a risk factor for hypertension	49.5	3.9	46.6
12. Being overweight increases risk for hypertension	81.2	18.2	0.6
13. White meat is as good as red meat in hypertension	55.7	39.6	4.7
14. Hypertension can lead to other life-threatening diseases.	51.0	30.5	18.5
15. Medication alone can control hypertension	66.4	32.6	1.0
16. Dietary approaches can help to reduce hypertension	40.4	47.9	11.7
17. Salt reduction can control hypertension	81.5	17.4	1.0
18. Eating fatty food affects blood cholesterol level which is a risk factor for developing hypertension	95.3	4.2	0.5
19. Hypertension is a treatable condition	65.1	20.8	14.1
20. Stress can cause hypertension	99.0	0.5	0.5
21. Regular physical activity will lower a person's chance of getting hypertension	85.9	9.4	4.7
22. Hypertension is a condition which can progress with age	44.0	39.6	16.4

Knowledge scores

Table 3 shows knowledge scores of patients. The mean knowledge score was 13.26 ± 5.16 and median score was 13. It also indicates the

relationship between demographic characteristics and knowledge. Differences were statistically significant when age, gender, education, occupation and monthly income were analyzed ($p < 0.001$).

Hypertension knowledge scale

The result showed that 103 patients (26.8 %) with mean systolic BP of 145 ± 15 mmHg, and mean diastolic BP of 91 ± 13 mmHg had poor knowledge score (<10); 191 patients (49.7 %) with mean systolic BP of 141 ± 16 mmHg and mean diastolic BP of 90 ± 9 mmHg, had moderate knowledge score (10 - 18), while 90 patients (23.4 %) with mean systolic BP (133 ± 14 mmHg) and mean diastolic BP (84 ± 9 mmHg) had adequate knowledge score (19 - 22) about hypertension.

Medication adherence

Table 4 shows responses of patients to medication adherence. Poor adherence to medication was assessed for questions 1 - 4. The correct answers with highest responses to questions 5, 6 and 8 were 85.2, 64.8 and 62.0 %, respectively.

Adherence scores

Table 5 shows adherence scores of patients. The mean adherence score was 4.66 ± 2.743 and median score was 4.

Medication adherence scale

The results showed that 204 patients (53.1 %) with mean systolic BP of 148 ± 14 mmHg and mean diastolic BP of 92 ± 11 mmHg, had low adherence score (<6); 91 patients (23.7 %) with mean systolic BP (135 ± 12) and mean diastolic BP (86 ± 8) had medium adherence score (6 - 7), while 89 patients (23.2 %) patients with mean systolic BP (128 ± 11 mmHg) and mean diastolic BP (83 ± 9 mmHg) had high adherence score (8).

EQ-5D health status

Table 6 shows the HRQoL scores of patients. The mean score of EQ-5D was 0.6456 ± 0.2317 , and EQ-VAS score was 66.83 ± 5.832 . The Table also shows the relationship between HRQoL and the demographic characteristics.

The 15 different health states of EQ-5D described are shown in Table 7.

Table 3: Description of Mean Knowledge Score

Description	N	Mean knowledge Score	SD.	P-value*
Age (years)				
30-40	61	14.90	4.78	<0.001
41-50	138	14.14	4.62	
51-60	125	13.18	5.80	
61-70	60	9.72	3.47	
Gender				
Male	215	14.92	5.08	<0.001
Female	169	11.15	4.45	
Marital status				
Married	383	13.25	5.16	0.603
Unmarried	0	00.00	0.00	
Widow	1	13.00	0.00	
Education				
Illiterate	87	10.69	4.66	<0.001
Primary	37	9.83	3.98	
Middle	58	12.01	4.65	
Matriculation	101	14.66	4.86	
Intermediate	29	13.86	4.63	
Graduate	47	16.44	4.27	
Postgraduate	25	17.72	4.16	
Occupation				
Private Job	47	14.93	4.78	<0.001
Government Job	121	17.15	4.13	
Businessman	0	00.00	0.00	
Housewife/House Maker	156	10.98	4.29	
Retired	60	09.98	4.29	
Jobless	0	00.00	0.00	
Monthly income (Pakistan rupees)				
Nil	157	10.88	4.27	<0.001
5000 – 10000	2	7.50	4.94	
10001 – 15001	4	12.50	5.92	
> 15001	221	15.01	5.04	
Location				
Urban	220	13.40	5.20	0.820
Rural	164	13.04	5.10	
Duration of disease (years, 3.31 ± 2.13)				
<1	80	13.98	5.06	0.640
1 – 3	164	12.89	5.02	
3 – 5	26	14.07	5.37	
> 5	114	13.09	5.35	

*Chi-square test, SD = standard deviation

Table 4: Self-reported adherence responses of patients

MMAS-U Questionnaire	Yes (%)	No (%)
1. Do you sometimes forget to take your blood pressure medication?	51.0	49.0
2. Over the past 2 weeks, were there any days when you did not take your high blood pressure medication?	49.0	51.0
3. Have you ever cut back or stopped taking your medication without telling your doctor because you felt worse when you took it?	49.5	50.5
4. When you travel or leave home, do you sometimes forget to bring along your medications?	55.7	44.3
5. Did you take your high blood pressure medication yesterday?	85.2	14.8
6. When you feel like your blood pressure is under control, do you sometimes stop taking your medication?	35.2	64.8
7. Do you ever feel hassled about sticking to your high blood pressure treatment?	40.6	59.4
8. How often do you have difficulty remembering to take all your blood pressure medication?		
a. Never		62.0
b. Almost never		13.0
c. Sometimes		24.0
d. Frequently		0.5
e. Always		0.5

Table 5: Relationship between socio-demographic factors and mean adherence score

Description	N	Mean adherence score	SD	P-value*
Age (year) 50.21 ± 9.51				
30-40	61	4.93	2.74	0.028
41-50	138	5.02	2.65	
51-60	125	4.83	2.76	
61-70	60	3.17	2.49	
Gender				
Male	215	5.15	2.68	0.001
Female	169	4.03	2.70	
Marital status				
Married	383	4.65	2.74	0.199
Unmarried	0	00.00	00.00	
Widow	1	7.00	00.00	
Education				
Illiterate	87	4.03	2.83	0.002
Primary	37	3.97	2.62	
Middle	58	4.38	2.80	
Matriculation	101	5.20	2.66	
Intermediate	29	4.28	2.66	
Graduate	47	5.21	2.43	
Postgraduate	25	5.68	2.85	
Occupation				
Private job	47	5.34	2.58	<0.001
Government job	121	5.95	2.32	
Businessman	0	00.00	00.00	
Housewife/Housemaker	156	4.05	2.72	
Retired	60	3.08	2.46	
Jobless	0	00.00	00.00	
Monthly income (Pakistan rupees)				
Nil	157	3.99	2.72	0.032
5000 – 10000	2	5.50	0.71	
10001 – 15001	4	4.25	3.78	
> 15001	221	5.13	2.67	
Location				
Urban	220	4.53	2.72	0.619
Rural	164	4.82	2.77	
Duration of disease (year) 3.31 ± 2.13				
<1	80	4.66	2.69	0.930
1 – 3	164	4.63	2.82	
3 – 5	26	5.00	2.88	
> 5	114	4.61	2.68	

*Chi-square test; SD = standard deviation

Association between knowledge and medication adherence

The coefficient of correlation between knowledge related to hypertension and medication adherence was 0.638 ($p < 0.001$) which indicated positive correlation.

Association between knowledge and HRQoL

The coefficient of correlation between knowledge regarding hypertension and HRQoL was 0.709 ($p < 0.001$) which indicated positive correlation. The

coefficient of correlation between knowledge and VAS was 0.459 ($p < 0.001$) which also indicated positive correlation.

Association between medication adherence and HRQoL

The coefficient of correlation between adherence and HRQoL was 0.545 ($p < 0.001$) which indicated positive correlation. The coefficient of correlation between adherence and VAS was 0.328 ($p < 0.001$), which also indicated fair correlation.

Table 6: Description of EQ-5D scores

Description	N	Mean EQ-5D Score	SD	EQ-VAS	SD	P-value
Age (year)**						
30-40	61	0.6754	0.2024	72.97	3.4540	<0.001
41-50	138	0.6773	0.2211	68.73	5.1920	
51-60	125	0.6337	0.2387	64.38	4.5630	
61-70	60	0.5669	0.2525	61.30	3.3260	
Gender*						
Male	215	0.6910	0.1725	66.68	5.1760	<0.001
Female	169	0.5877	0.2801	67.01	6.5850	
Marital status**						
Married	383	0.6453	0.2320	66.82	5.8380	0.765
Unmarried	0	0.0000	0.0000	00.00	0.0000	
Widow	1	0.7250	0.0000	70.00	0.0000	
Education**						
Illiterate	87	0.60818	0.2854	66.17	6.3600	0.036
Primary	37	0.5962	0.2651	65.41	6.7020	
Middle	58	0.5898	0.2748	65.36	5.9520	
Matriculation	101	0.7005	0.1494	68.39	4.8850	
Intermediate	29	0.6290	0.2455	68.28	6.0290	
Graduate	47	0.6841	0.1664	66.68	5.3490	
Postgraduate	25	0.7032	0.1676	66.88	5.1990	
Occupation**						
Private job	47	0.6706	0.2167	67.72	5.5510	<0.001
Government job	121	0.7357	0.1159	68.66	4.6000	
Businessman	0	0.0000	0.0000	00.00	0.0000	
Housewife/ Housemaker	156	0.5872	0.2810	67.18	6.4160	
Retired	60	0.5960	0.2202	61.50	2.9770	
Jobless	0	0.0000	0.0000	00.00	0.0000	
Monthly income (Pakistan rupees)						
Nil	157	0.5863	0.2800	67.05	6.4780	0.001
5000 – 10000	2	0.2720	0.6406	56.00	8.4850	
10001 – 15001	4	0.7083	0.0669	65.00	3.8300	
> 15001	221	0.6899	0.1736	66.80	5.2700	
Location*						
Urban	220	0.6431	0.2313	66.33	5.8230	0.609
Rural	164	0.6489	0.2329	67.49	5.7960	
Duration of disease (years)** (3.31±2.13)						
<1	80	0.6588	0.2256	68.84	5.5690	0.545
1 – 3	164	0.6408	0.2361	67.23	5.6140	
3 – 5	26	0.6840	0.1912	66.58	7.6010	
> 5	114	0.6343	0.2392	64.89	5.4050	

*Mann-Whitney test, **Kruskal-Wallis test, VAS: Visual Analogue Scale. **Note:** *US\$1 = 111.70 Pk Rs

Table 7: Frequency of Self-reported (EQ-5D) Health States

Mobility	Health state					Frequency	(%)
	Self-care	Usual activities	Pain/discomfort	Anxiety/depression			
1	1	1	1	2	27	7.00	
1	1	1	1	3	6	1.60	
1	1	1	2	1	43	11.20	
1	1	1	2	2	169	44.00	
1	1	1	2	3	10	2.60	
2	1	1	1	2	1	0.30	
2	1	1	2	1	5	1.30	
2	1	1	2	2	90	23.40	
2	1	1	2	3	4	1.00	
2	1	1	3	2	1	0.30	
2	1	1	3	3	7	1.80	
2	2	1	3	3	1	0.30	
2	2	2	2	2	2	0.50	
2	2	2	2	3	4	1.0	
2	2	2	3	3	14	3.0	

DISCUSSION

The results from the present study showed that among the HTN patients studied, knowledge regarding hypertension had good association with medication adherence. Some studies have also reported a good relationship between hypertension-related awareness and adherence to medication [9,10]. It has been reported that disease-related knowledge is one of the key factors in obtaining successful adherence to therapy [11]. In contrast, a study has also reported no association between knowledge regarding hypertension and adherence to medication [12].

Reduced HRQoL was seen in the HTN patients. The poor results in HRQoL are consistent with those reported in previous studies on pulmonary and essential hypertension patients [13–15]. Nonetheless, some studies of similar nature have reported mixed results. One study reported a statistically significant relationship among education, monthly income and HRQoL [16]. In another study, it was reported that age was the only factor that showed significant relationship with HRQoL [17], while another study reported that gender and income were the only variables significantly related to HRQoL [18]. A study highlighted that age, gender, education, employment status, annual household income, obesity and hypertension were significantly associated with HRQoL [19].

In the present study, knowledge regarding hypertension had good association with HRQoL and visual analogue scale. It has been demonstrated that after counseling on lifestyle modifications, energy/fatigue scores (a quality-of-life scale) were significantly improved in hypertensive patients [20]. Moreover, it has been reported that patient education, life style modifications and motivation for health resulted in improvement in the mean score of QoL of hypertensive patients [21]. In another study, it was indicated that EQ-5D index and EQ-5D VAS scores of hypertensive patients were significantly improved after pharmaceutical care intervention [13]. In addition, the HRQoL of patients have been improved by promoting patient's care activities and by supporting their QoL domains [22].

Results from the present study also showed that medication adherence had good association with HRQoL and a fair correlation with visual analogue scale. In a population-based survey in Brazil, poor HRQoL was associated with lower medication adherence among hypertensive patients [23]. It was also reported that better

HRQoL was associated with higher medication adherence among patients with asthma in Japan [24]. However, another study reported a negative correlation between HRQoL and adherence in hypertensive patients [25].

A number of challenges are faced by developing countries in attempts to provide optimal health-care to their citizens. Within this context, Pakistan is the 6th most populous country in the world, with about 40 million people living below national poverty line, and half of the adult population is illiterate. More important is the fact that across regions, disparities in income per capita have persisted or even widened [22].

It is possible to attain optimized pharmaceutical care through provision of education to patients regarding self-management. This will result in improvement of their knowledge and understanding about hypertension, adherence to therapy, and coping strategies. The present research revealed that a large portion of patients had poor knowledge of hypertension, and had little information regarding management and control of the disease.

Limitations of the study

In current study, majority of hypertensive patients were in the age range of 41-50 years, and above that age majority of them had comorbidities like diabetes which limited the number of patients that met the inclusion criteria for this study. Therefore, the results of the current study cannot be generalized. .

CONCLUSION

The results obtained in this study show that knowledge about hypertension has a good association with medication adherence and HRQoL. A good association also exists between medication adherence and HRQoL.

DECLARATIONS

Acknowledgement

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Conflict of interest

No conflict of interest is associated with this work.

Contribution of authors

We declare that this work was done by the authors named in this article and all liabilities pertaining to claims relating to the content of this article will be borne by the authors.

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REFERENCES

- Saleem F, Hassali M, Shafie AA, Awad A, Bashir S. Association between knowledge and drug adherence in patients with hypertension in Quetta, Pakistan. *Trop J Pharm Res* 2011; 10(2).
- Van Lerberghe W, Manuel A, Matthews Z, Cathy W. *The World Health Report 2005-make every mother and child count: World Health Organization, 2005.*
- Akoko BM, Fon PN, Ngu RC, Ngu KB. Knowledge of hypertension and compliance with therapy among hypertensive patients in the Bamenda Health District of Cameroon: a cross-sectional study. *Cardiol Therap* 2017; 6(1): 53-67.
- Roca B, Nadal E, Rovira RE, Valls S, Lapuebla C, Lloria N. Usefulness of a hypertension education program. *South Med J* 2003; 96(11): 1133-1138.
- Nazir SUR, Hassali MA, Saleem F, Bashir S, Aljadhey H. Association Between Diabetes-related Knowledge and Medication Adherence: Results From Cross-sectional Analysis. *Altern Ther Health Med* 2016; 22(6): 8-13.
- EuroQol G. EuroQol--a new facility for the measurement of health-related quality of life. *Health policy (Amsterdam, Netherlands)* 1990; 16(3): 199.
- Shaw JW, Johnson JA, Coons SJ. US valuation of the EQ-5D health states: development and testing of the D1 valuation model. *Med Care* 2005; 43(3): 203-220.
- Dolan P, Gudex C, Kind P, Williams A. A social tariff for EuroQol: results from a UK general population survey 1995.
- Kjellgren KI, Ahlner J, Säljö R. Taking antihypertensive medication—controlling or co-operating with patients? *Int J Cardiol* 1995; 47(3): 257-268.
- Orth JE, Stiles WB, Scherwitz L, Hennrikus D, Vallbona C. Patient exposition and provider explanation in routine interviews and hypertensive patients' blood pressure control. *Health Psychol* 1987; 6(1): 29.
- Heurtin-Roberts S, Reisin E. The relation of culturally influenced lay models of hypertension to compliance with treatment. *Am J Hypertens* 1992; 5(11): 787-792.
- Haynes RB, Gibson E, Hackett B, Sackett D, Taylor DW, Roberts R, Johnson A. Improvement of medication compliance in uncontrolled hypertension. *Lancet* 1976; 307 (7972): 1265-1268.
- Akhtar MM, Waheed A, Sheikh D, Hussain A. Role of pharmacist in improving health related quality of life (HRQoL) in hypertensive patients in Pakistan. *Am J Pharmacol Sci* 2014; 2 (5B): 17-22.
- Taichman DB, Shin J, Hud L, Archer-Chicko C, Kaplan S, Sager JS, Gallop R, Christie J, Hansen-Flaschen J, Palevsky H. Health-related quality of life in patients with pulmonary arterial hypertension. *Respir Res* 2005; 6(1): 92.
- Mena-Martin FJ, Martin-Escudero JC, Simal-Blanco F, Carretero-Ares JL, Arzuza-Mouronte D, Herreros-Fernandez V. Health-related quality of life of subjects with known and unknown hypertension: results from the population-based Hortega study. *J Hypertens* 2003; 21(7): 1283-1289.
- Khosravi A, Arash Ramezani M, Toghianifar N, Rabiei K, Jahandideh M, Yousofi A. Association between hypertension and quality of life in a sample of Iranian adults. *Acta Cardiol* 2010; 65(4): 425-430.
- Pappa E, Kontodimopoulos N, Papadopoulos AA, Niakas D. Assessing the socio-economic and demographic impact on health-related quality of life: evidence from Greece. *Int J Public Health* 2009; 54(4): 241-249.
- Baune B, Aljeesh Y. The association of psychological stress and health related quality of life among patients with stroke and hypertension in Gaza Strip. *Ann Gen Psychiatry* 2006; 5(1): 6.
- Goins RT, John R, Hennessy CH, Denny CH, Buchwald D. Determinants of health-related quality of life among older American Indians and Alaska Natives. *J Appl Gerontol* 2006; 25 (1 Suppl): 73S-88S.
- Park JJ, Kelly P, Carter BL, Burgess PP. Comprehensive Pharmaceutical Care in the Chain Setting: Drug therapy monitoring and counseling by pharmacists contributed to improved blood pressure control in study patients. *J Am Pharm Assoc* 1996; 36(7): 443-451.
- Wal P, Wal A, Bhandari A, Pandey U, Rai AK. Pharmacist involvement in the patient care improves outcome in hypertension patients. *J Res Pharm Pract* 2013; 2(3): 123.
- Saleem F, Hassali MA, Shafie AA. A cross-sectional assessment of health-related quality of life (HRQoL) among hypertensive patients in Pakistan. *Health Expect* 2014; 17(3): 388-395.
- Trevisol D, Moreira L, Fuchs F, Fuchs S. Health-related quality of life is worse in individuals with hypertension under drug treatment: results of population-based study. *J Hum Hypertens* 2012; 26(6): 374.
- Takemura M, Kobayashi M, Kimura K, Mitsui K, Masui H, Koyama M, Itotani R, Ishitoko M, Suzuki S, Aihara K. Repeated instruction on inhalation technique improves

- adherence to the therapeutic regimen in asthma. *J Asthma* 2010; 47(2): 202-208.
25. Saleem F, Hassali MA, Shafie AA, Awad GA, Atif M, ul Haq N, Aljadhey H, Farooqui M. Does treatment adherence correlates with health related quality of life? Findings from a cross sectional study. *BMC Public Health* 2012; 12(1): 318.