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Pharmacist intervention in improving hypertension-related knowledge, treatment medication adherence and health-related quality of life: a non-clinical randomized controlled trial

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Abstract

Objective The study evaluated whether a pharmaceutical care intervention can result in better understanding about hypertension, increase medication adherence to antihypertensive therapy and improve overall health-related quality of life.

Methods A non-clinical randomized control trial was conducted whereby participants received an educational intervention through hospital pharmacists. Hypertension knowledge, medication adherence and health-related quality of life were measured by means of self-administered questionnaires. Descriptive statistics were used to describe the demographic and disease characteristics of the patients. Inferential statistics were used for inter- and intragroup comparisons. SPSS 17 was used for data analysis.

Results Three hundred and eighty-five hypertensive patients were randomly assigned (192 in the control group and 193 in the intervention group) to the study. No significant differences were observed in either group for age, gender, income, locality, education, occupation or duration of disease. There was, however, a significant increase in the participants' levels of knowledge about hypertension and medication adherence among the interventional group after completing the intervention. Significantly lower systolic and diastolic blood pressure levels were also observed among the interventional group after completion of the intervention. The interventional group, however, reported decreased yet significant health-related quality of life at the end of the interventional programme.

Conclusion Pharmacist intervention can significantly increase disease-related knowledge, blood pressure control and medication adherence in patients with hypertension. However, further research is needed to address the decreased health-related quality of life after completion of the study.

Background

Non-communicable diseases (NCDs) are the primary cause of mortality and disability around the globe. It is estimated that 57 million deaths occurred globally in 2008[1] and about two-thirds of those were owed to NCDs (mostly cardiovascular diseases, cancers, diabetes and chronic lung diseases). Under-developed and developing nations are those most affected, as an estimated 80% of deaths in these countries are the result of NCDs.[1] Within this context, the South Asian region, which comprises a quarter of the world's population, faces the highest burden of NCDs compared with other parts of the world.[2] NCDs are expensive to manage, and a region with a poor socio-economic status cannot afford this costly and increasing problem.

In Pakistan, NCDs are among the top ten causes of mortality and morbidity.[3] Estimates indicate that NCDs account for approximately 25% of total deaths.[3] One in three adults aged >45 years suffers from hypertension while 10% of the population suffers from diabetes.[3] Breast cancer in Pakistan is reported to be highest among the Asian populations.[4] One million people are severely mentally ill and >10 million individuals suffer from mental illnesses.[3] In Pakistan, as the majority of health-care costs are paid by patients themselves, the cost of health care for NCDs puts a significant strain on household budgets. Treatment for NCDs (especially in the case of diabetes, cardiovascular diseases and chronic respiratory diseases) is lifelong and therefore extremely expensive. Hence, people are pushed into poverty because they have to pay directly for health services.

As regards the prevalence of hypertension in Pakistan, the National Health Survey of Pakistan in 1998 reported that hypertension affected 18% of the total population.[5] Since the 1990s, evidence-based treatment and guidelines have been made available for management of hypertension, but control of blood pressure remains a challenge for health-care providers.[6,7] Similar to what has been reported in the literature worldwide, a study in Pakistan highlighted that only 12.5% of patients suffering from hypertension had their blood pressure adequately controlled.[8] This uncontrolled hypertension can be attributed to either patient-related or physician-related barriers. Poor medication adherence, patients' beliefs about hypertension and its treatment, low health literacy and lack of social support are major patient-related barriers to achieving the desired control of blood pressure.[9] Patient-centred barriers can be altered, however, as patients' beliefs and attitudes towards medication use are not entrenched. It has been reported that hypertensive patients can benefit from interventions that focus on improving knowledge and adherence to drug treatment.[10] Therefore, this study aims to assess the impact of an educational intervention provided to hypertensive patients through hospital pharmacists with the objective of improving their knowledge on hypertension, their adherence to the medication prescribed and their health-related quality of life.

Methods

Study design, settings and recruitment of participants

The health system of Pakistan consists of both private and public sectors. The private health sector serves nearly 70% of the population, whereas the public sector comprises more than 10 000 health facilities, ranging from basic health units (BHUs) to tertiary referral centres. The BHUs cover around 10 000 people, whereas the larger rural health centres (RHCs) cover

around 30 000–450 000 people. In Pakistan, primary health centre (PHC) units comprise both BHUs and RHCs.[11] The study was carried out in the cardiac units of Sandeman Provincial Hospital (SPH) and Bolan Medical Complex Hospital (BMCH) located in Quetta, North-West Balochistan, Pakistan. Both of these institutes are public in nature and carry major health-care burden of the province.

The study was designed as a non-clinical randomized control trial. A simple randomization (SR) process was used to randomize the participants that is robust against selection and accidental bias and is applicable to a sample size of more than 200 to avoid the possibility of unbalanced group sizes.[12,13] Study patients were individually randomized into one of two parallel groups with an allocation ratio of 1:1.[14]

Eligible participants were all adults aged 18 or over with an established medical diagnosis of hypertension, familiarity with Urdu (the national language of Pakistan) and on antihypertensive medication for the last 6 months. Exclusion criteria were dementia, pregnancy and immigration from other countries.

At present, there is no ethical committee for non-clinical studies in Pakistan.[15] However, permission to conduct the study was obtained from the medical superintendents of the respective hospitals (EA/FS/1021-2). Written informed consent was also obtained from all participants before their enrolment in the study. The patients were informed about the research initiatives, the confidentiality of their responses and their right to withdraw from the study with no penalty or effects on their treatment.

For this intervention study, a prevalence-based sampling technique[16] was used to identify a representative sample of hypertensive patients. As hypertension is reported to affect 18% of the population in Pakistan,[5] 385 hypertensive outpatients were selected for the study.

Development of the educational module

Before the development of the educational module, pharmacists (who were recruited as health educators) were approached for a needs assessment session via means of a focus group discussion (FGD). The aim of the FGD was to elicit pharmacists' opinions on topics related to hypertension, medication adherence and HRQoL. The FGD was also carried out to develop an understanding of the pharmacists' perspectives on the importance of patient education and medication counselling. The needs assessment session highlighted basic concepts and theories related to health education, adult learning, overview of medication adherence and its importance in pharmacotherapy, HRQoL (concept and impact on disease), patient counselling and the importance of good communication skills, to be included in the training module for the pharmacist. The planned activities for the training session are provided as Appendix S1.

Validity of the training module

The training module was subjected to face and content validity. Two independent cardiologists and two researchers with social science backgrounds were invited to review the training module. The training module was declared a valid instrument for training purposes after a series of discussions with the experts. All objections and questions raised by the experts were presented and answered in the final assessment session prior to initiation of the intervention.

Training of hospital pharmacists

A total of 12 pharmacists were stationed in the cardiac units of the two hospitals. Four senior hospital pharmacists (two from each hospital) were selected and trained by the research team before the initiation of the educational programme. The research team consisted of the principal researcher and a cardiac specialist from each hospital. Four students (two medical students and two pharmacy students) also voluntarily assisted in the training of hospital pharmacists. Training of pharmacists was carried out for 2 months (from November 2009 to December 2009) and was scheduled for the first working day of each week. The training was divided into the following components: (i) presenta-

tions on health education and communication skills, (ii) hypertension (nature, management, treatment and recommended diet and lifestyle modification), (iii) medication adherence and its importance in pharmacotherapy and (iv) HRQoL (conceptualization and importance in treatment outcomes for hypertensive patients). Pharmacists were also given handouts of the training modules that highlighted the main aspects addressed during the training sessions. This module was available in English to all participants (English being the medium of education in Pakistan). During the training, participants were free to ask questions and express any reservations. The participants were also made aware about the research instruments that were to be used in the intervention programme. At the end of the training session, participants' levels of knowledge about health education, hypertension, medication adherence and HRQoL as well as the training assessment were measured. The assessment was conducted and analysed by another independent cardiologist who was not involved in the training and intervention process. The intervention was consequently instigated, once the success of the training process was assured.

Baseline analysis and randomization

At baseline, current knowledge on hypertension, medication adherence and HRQoL was measured for all patients in addition to socio-demographic data. Disease-related information and blood pressure readings were taken from medical records. As baseline data were obtained and analysed, patients attending the cardiology units for routine follow-up were randomly allocated either to a control group [(CG) usual care, where no pharmaceutical care was provided] or to an intervention group [(IG) pharmaceutical care, consisting of follow-up by the trained hospital pharmacist during a 9-month period]. Participants were allocated to groups following simple randomization procedures using a computer-generated list. The computer-generated allocation was performed by a researcher with no clinical involvement in the trial. Given the nature of the intervention, it was not possible to blind the hypertensive patients. Thus, the pharmacists and the research team were aware of the patients involved in pharmaceutical care. The pharmaceutical care provided to the IG by a clinical pharmacist took approximately 15 min during the first visit, and the follow-up visits took approximately 10 min. The intervention was conducted with each patient twice per month (or in accordance with their appointment schedule). At each visit, the hospital pharmacist conducted a thorough interview with the patient, identified problems leading to poor medication adherence and provided patient education. Patients in the IG were also provided with a pocket-sized educational book on hypertension, information leaflets and medication adherence cards (all in Urdu) during the counselling process. The CG had no hospital pharmacist involvement, and control patients received the traditional service provided by the hospitals (receiving prescription orders, counselling about medication use and information about follow-up visits).

The intervention programme was conducted from January 2010 until September 2010 and the post-intervention data were collected in October 2010. Therefore, the time line for inter- and intragroup comparison was 9 months. The research team was involved in continuous feedback and discussion sessions with the pharmacists as well as patients to ensure the success of the intervention programme. Changes and adjustment in the planned activities were made according to the patients and health-care situational needs. The primary outcome measures with respect to pharmaceutical care efficacy were the proportion of patients with increased knowledge about hypertension, better medication adherence and improved HRQoL from baseline.

Assessment of knowledge on hypertension

The Hypertension Fact Questionnaire (HFQ) was used to measure disease-related knowledge among patients. The HFQ consisted of 15 questions (with responses of yes, no and do not know) and was constructed after an inten-

sive literature review by the research team.[17,18] The HFQ measured knowledge with a cut-off level of <8 as poor, 8–12 as average and 13–15 as adequate knowledge.[8] Knowledge scores at baseline and for each group (IG and CG) were calculated and presented as mean scores for the final analysis.

Assessment of medication adherence

The Drug Attitude Inventory (DAI-10) was used for the assessment of medication adherence. The scale was constructed by Voruganti and Awad[19] and consisted of 10 questions measuring adherence with responses of yes and no. DAI-10 calculated adherence scores ranging from 10 to −10. Patients who scored between six and 10 were described as adherent, between zero and five as moderately adherent and those in the negative range as non-adherent.[8] Mean adherence scores at baseline and for each group (IG and CG) were calculated and presented for the final analysis.

Assessment of HRQoL

The European Quality of Life scale (EQ-5D) was used to measure HRQoL. EQ-5D is a generic instrument for the measurement of health outcomes. It provides a descriptive profile and a single index value for health status.[20] It is composed of two parts. The first part, also known as EQ-5D descriptive, contains five dimensions (mobility, self-care, usual activities, pain/discomfort and anxiety/depression), each of which can take one of three responses (no problems/some or moderate problems/extreme problems) within a particular EQ-5D dimension. The second part is known as EQ-VAS (Visual Analogue Scale) and consists of a 20-cm health thermometer with two distinct endpoints, the best imaginable health state (score of 100) and the worst imaginable health state (score of zero). EQ-5D was scored as per criteria designed by EuroQol.

At present, there is no gold standard for the measurement of disease-related knowledge, medication adherence and HRQoL in the existing literature. All tools were selected because of their use in previously reported studies and excellent reliability and validity. The reliability and validity of the instruments has also been reported in the literature, especially among the hypertensive population of Pakistan.[8,21,22] All three instruments were piloted among 30 patients before the beginning of the study. Data from the pilot study were not included in the final analysis. The Urdu version of EQ-5D was provided by EuroQol, and the study was registered with the developers. HFQ and DAI-10 were, however, translated into Urdu by means of standard translating procedures.[23,24] The internal consistency of all three questionnaires was ensured (the Cronbach's alpha value being 0.77, 0.81 and 0.75 for HFQ, DAI-10 and EQ-5D, respectively).

Statistical analysis

The Statistical Package for Social Sciences (SPSS® Inc., Chicago, IL, USA) was used for data analysis. Descriptive statistics were used to describe demographic and disease characteristics of the patients. Percentages and frequencies were used for categorical variables, and means and standard deviations were calculated for continuous variables. Inferential statistics were used to evaluate the effect of the intervention. The chi-squared test was used to test differences between categorical variables. The Mann–Whitney *U*-test was used to compare significance within IG and CG. Intergroup comparisons were calculated by applying the Wilcoxon signed-rank test. A statistical value of $P < 0.05$ was taken as significant.

Results

A total of 412 patients attended the cardiac units (227 at SPH and 185 at BMCH) during the recruitment period (from January 2010 to March 2010), and all were assessed for eligibility. Of these 412 patients, 27 were excluded (17 did not meet the criteria and 10 refused to participate), thus meeting the required sample number of 385. Baseline assessment of knowledge on hypertension, current medication adherence rate and HRQoL was carried out for the whole

cohort of 385 patients. Of the 385 patients who consented to participate, 193 patients were allocated to IG and 192 were allocated to CG. The IG and CG were comparable with respect to age, gender, education, occupation, income, locality and duration of disease. At baseline, knowledge on hypertension and medication adherence was reported as low in both the IG (7.9 ± 1.6, -1.6 ± 2.1) and CG (8.1 ± 1.7, -1.8 ± 2.2). In addition, participants in both groups declared poor HRQoL (45.5 ± 29.0 for IG and 47.9 ± 27.8 for CG). Table 1 describes the baseline analysis of the entire cohort ($n = 385$), IG ($n = 193$) and CG ($n = 192$).

Table 2 highlights the post-intervention analysis upon completion of the study. Data were available from 120 IG patients and 144 CG patients, giving completion rates of 62.1 and 75%, respectively. Inability to attend follow-up visits and loss to follow up ($n = 41$ for IG and $n = 33$ for CG), and non-completion of the study ($n = 32$ for IG and $n = 15$ for CG) were noted as the major reasons for the decreased completion rate. No significant association was seen when demographic and disease-related variables were compared. A statistically significant difference was observed ($P < 0.001$), however, when knowledge, adherence, blood pressure and HRQoL scores were compared between IG and CG after completion of the intervention. There was an increase in the mean knowledge score (10.2 ± 1.1) among the IG. For the CG, the knowledge score decreased to 7.8 ± 1.5 compared with the baseline analysis. In addition, medication adherence also improved in the IG, as the post-intervention analysis revealed an increase in medication adherence scores (3.2 ± 0.9). The CG was more or less the same in terms of medication adherence, and little difference was observed compared with the baseline analysis. Lower systolic and diastolic blood pressures were observed among the IG (-7.0 and -5.9 mmHg, respectively).

The post-intervention analysis reported a significant yet noteworthy reduction in HRQoL among the IG as compared with baseline. There was a marked decrease (a shift from 46.7 at baseline to 36.3 at post-intervention). For the CG, a minute change was observed when HRQoL was compared with the baseline analysis.

To identify intergroup differences among variables (pre- and post-IG), the Wilcoxon signed-rank test was performed. Table 3 explains the intergroup analysis among the IG (before and after). There was a significant difference ($P < 0.001$) when knowledge on disease, medication adherence and HRQoL was compared. As reported in the IG and CG comparison, however, HRQoL was again reported as less than the baseline analysis. There was no statistically significant difference among the other study variables.

Discussion

Interventions are effective in modifying beliefs and attitudes and can result in population-wide behavioural changes.[25,26] Such interventions generate opportunities for patients to understand their conditions better and clarify misapprehensions they have of their disease and its treatment.[27] Fortunately, patients' attitudes towards disease and its management are not static, and sometimes their beliefs derive from misperceptions about diseases and medication use.[28,29] Therefore, it can be hypothesized that imparting education to patients through a well-designed intervention can result in better awareness of disease, increased medication adherence and improved HRQoL.

Results from the current study highlighted a significant increase in the level of knowledge about hypertension among the IG after completion of the intervention. This is an indication that patients learned more about their disease than they knew at the beginning. This increase in knowledge would be expected to cause a change in patients' attitude towards medications, resulting in improved adherence to medication. This significant increase in the participants' level of knowledge about hypertension and its management is in line with previous findings, which show that patient education programmes can be used to increase patients' knowledge about hypertension and result in better understanding and management of disease.[17,25,30]

Table 1 Baseline characteristics of study respondents

Characteristics	Entire cohort $n = 385$ Frequency (%)	Intervention group $n = 193$ Frequency (%)	Control group $n = 192$ Frequency (%)	*P*-value
Age, mean (SD) = 39.0 ± 6.5				
18–27	48 (12.5)	28 (14.5)	20 (10.4)	0.782*
28–37	186 (48.3)	82 (42.4)	104 (54.1)	
38–47	128 (33.2)	72 (37.3)	56 (29.1)	
>48	23 (6.0)	11 (5.7)	12 (6.2)	
Gender				
Male	265 (68.8)	125 (64.8)	140 (72.9)	0.522*
Female	120 (31.2)	68 (35.2)	52 (27.1)	
Education				
Illiterate	9 (2.3)	4 (2.1)	5 (2.6)	0.566*
Religious	62 (16.1)	37 (19.2)	25 (13.0)	
Primary	7 (1.8)	5 (2.6)	2 (1.0)	
Secondary	51 (13.2)	22 (11.4)	29 (15.1)	
Higher secondary	51 (13.2)	28 (14.5)	23 (12.0)	
Bachelors	154 (40.0)	78 (40.4)	76 (39.6)	
Masters	51 (13.2)	19 (9.8)	32 (16.7)	
Occupation				
Jobless	97 (25.2)	53 (27.5)	44 (22.9)	0.421*
Government servant	78 (20.3)	36 (18.7)	42 (21.9)	
Private servant	134 (34.8)	64 (33.2)	70 (36.5)	
Businessman	76 (19.7)	40 (20.7)	36 (18.8)	
Income†				
Nil	97 (25.2)	53 (27.5)	44 (22.9)	0.566*
<Pakistan rupees (Pk Rs) 5000	2 (0.5)	2 (1.0)	0 (0.0)	
5001–10 000	22 (5.7)	9 (4.7)	13 (6.8)	
10 001–15 000	104 (27.0)	49 (25.4)	55 (28.6)	
>15 001	160 (41.6)	80 (41.5)	80 (41.7)	
Locality				
Urban	289 (75.1)	140 (72.5)	149 (77.6)	0.223*
Rural	96 (24.9)	53 (27.5)	43 (22.4)	
Duration of disease, mean (SD) = 3.01 ± 0.939				
<1 year	26 (6.8)	8 (4.1)	18 (9.4)	0.247*
1–3 years	89 (23.1)	48 (24.9)	41 (21.4)	
3–5 years	124 (32.2)	58 (30.1)	66 (34.4)	
>5 years	146 (37.9)	79 (40.9)	67 (34.9)	
Baseline knowledge score, mean (SD)	8.0 (0.4)	7.9 (1.6)	8.14 (1.7)	0.157**
Baseline adherence score, mean (SD)	−1.7 (2.1)	−1.6 (2.1)	−1.81 (2.2)	0.215**
Baseline EQ-5D score, mean (SD)	46.7 (28.4)	45.5 (29.0)	47.9 (27.8)	0.356**
Baseline VAS score, mean (SD)	63.9 (7.62)	63.8 (6.3)	64.0 (6.8)	0.357**
Baseline SBP, mean (SD) mmHg	145.9 (17.2)	144.5 (16.9)	144.1 (16.5)	0.419**
Baseline DBP mean (SD) mmHg	91.2 (11.7)	90.5 (10.2)	90.9 (11.1)	0.784**
Hypertension control, *n* (%)	161 (41.8)	82 (42.4)	79 (41.14)	0.566**

*Chi-squared test.
**Mann–Whitney *U*-test.
†1 Pk Rs = 0.0118120 US$.

From the broader perspective of health belief and behaviour, certain characteristics should be considered before health education is designed and offered to patients. Within this context, Pakistan, as the sixth most populated country in the world, has approximately 67% of its total population living in rural areas.[31] The impact of spiritual, religious and magical factors in illness

Table 2 Post-interventional analysis between interventional and control group

Characteristics	Interventional group (*n*, %)	Control group (*n*, %)	*P*-value
Age*			
18–27	20 (16.6)	20 (13.8)	0.779
28–37	49 (40.8)	60 (41.6)	
38–47	34 (28.3)	54 (37.5)	
>48	17 (14.1)	10 (6.9)	
Gender*			
Male	84 (70.0)	102 (70.8)	0.756
Female	36 (30.0)	42 (29.1)	
Education*			
Illiterate	5 (4.1)	3 (2.0)	0.303
Religious	22 (18.3)	19 (13.1)	
Primary	3 (2.5)	5 (3.4)	
Secondary	12 (10.0)	27 (18.7)	
Higher secondary	23 (19.1)	14 (9.7)	
Bachelors	35 (29.1)	53 (36.8)	
Masters	20 (16.6)	23 (15.9)	
Occupation*			
Jobless	24 (20.0)	33 (22.9)	0.920
Government servant	30 (25.0)	32 (24.3)	
Private servant	45 (37.5)	49 (34.0)	
Businessman	21 (17.5)	30 (20.8)	
Income*			
Nil	21 (17.5)	30 (20.8)	0.790
<Pakistan Rupees (Pk Rs) 5000	8 (6.6)	3 (2.0)	
5001–10000	15 (12.5)	9 (6.2)	
10 001–15 000	34 (28.3)	42 (29.1)	
>15 001	42 (35.0)	60 (41.6)	
Locality*			
Urban	89 (74.1)	108 (75.0)	0.613
Rural	31 (25.8)	36 (25.0)	
Duration of disease*			
<1 year	10 (8.3)	15 (10.4)	0.621
1–3 years	30 (25.0)	30 (20.8)	
3–5 years	33 (27.5)	52 (36.1)	
>5 years	47 (39.1)	47 (32.6)	
Knowledge score†, mean (SD)	10.2 (1.1)	7.8 (1.5)	<0.001
Adherence score†, mean (SD)	3.2 (0.9)	−1.9 (2.1)	<0.001
EQ-5D score†, mean (SD)	39.6 (30.2)	47.6 (28.5)	<0.001
VAS score†, mean (SD)	63.5 (6.7)	64.3 (7.4)	<0.001
SBP, mean (SD)	137.5 (17.2)	143.9 (19.4)	0.004
DBP, mean (SD)	84.6 (9.9)	90.1 (10.5)	0.009
Hypertension control, *n* (%)	107 (89.1)	101 (70.1)	0.023

*Chi-squared test.
†Mann–Whitney *U*-test.

and treatment is highly dominant in these rural populations. However, with modernization and educational transformation, more emphasis is now placed on pharmaceutical-based treatment in urban areas of Pakistan. On the contrary, a slow shift in the same direction can be observed, however, among the rural population of Pakistan. Therefore, it is vital to address existing beliefs and concepts in the design and implementation of an educational programme. Only then can educational interventions lead to a greater acceptance of the biomedical concept of illness and medicines, which is of great importance in managing chronic conditions.

Table 3 Differences in variables between pre- and post-interventional in case group

Variable	Pre-interventional case group Mean (median)	Post-interventional case group Mean (median)	*P*-value*
Knowledge	7.5 (8)	10.2 (10)	<0.001
Adherence	−1.8 (−2)	3.2 (3)	<0.001
EQ-5D	42.2 (60)	39.6 (62)	<0.001
EQ-VAS	58.8 (60)	63.5 (65)	<0.001
SBP	145.9 (155)	137.5 (143)	<0.001
DBP	91.2 (97)	84.6 (89)	<0.001

*Wilcoxon signed-rank test.

Statistical analyses of the participants' attitudes and beliefs towards medication use and adherence before and after the educational intervention revealed a positive shift among the IG. This change in the participants' level of perceived importance of medication adherence was significant ($P < 0.001$) in both intragroup (IG and CG) and intergroup (pre- and post-IG) comparisons. These changes in beliefs about medicines are consistent with other studies that suggest educational interventions can lead to modifications in patients' attitudes towards therapy and improve medication adherence.[28,30,32,33] One study suggested that hypertensive patients' attitude and behaviour can be altered by providing patients with information and ensuring that they understand the nature of hypertension.[34]

Although increase in adherence levels is apparent from our study, an important aspect to be considered is the long-term impact of the educational programme on the status of medication adherence. In developing countries, a number of interventions have been implemented regarding treatment and management of diseases. These interventions are often analysed within a specific time period, and long-term impact is often neglected. Hence, the intervention proves to be useless and, moreover, results in heavy losses to the health system and patients. Therefore, it is recommended that continuous medical education (CME) should be applied even after the intervention, so that patients can retain maximum knowledge and obtain benefit from it.

Hypertensive patients are often reported to experience a considerable reduction in HRQoL compared with normotensive subjects.[35,36] In a population-based study in China, Wang *et al.*[37] 2009 highlighted a marked deterioration in HRQoL among hypertensive patients, which was even worse with comorbid conditions. Cavalcante *et al.* in their clinical study in Brazil echoed the findings of Wang *et al.* However, studies focusing on HRQoL in hypertensive patients seem to present conflicting results. In the established literature, while De Gusmão *et al.*[35] showed that hypertension negatively affected physical function, Ogunlana *et al.*[38] confirmed a greater impact on the mental component score and total quality of life score. Cavalcante *et al.*[39] also reported marked dissimilarities in the emotional component and quality of their sex life. Disparities in study populations, presence of comorbidities, differences in HRQoL instruments, socio-economic structure, the nature and severity of hypertension and the characteristics of therapy (mono vs. poly) can be counted as key reasons for such conflicting results. As hypertension is an asymptomatic condition, it is assumed that the poor HRQoL among hypertensive individuals is attributable to complications or comorbidities, knowledge about hypertension and/or adverse effects from antihypertensive medications.[40]

Similar to what has been reported in the literature, HRQoL in our cohort of hypertensive patients was measured as low. Interestingly, even in the presence of a significant association ($P < 0.001$), HRQoL decreased in the IG after completion of the intervention. There was no meaningful change in HRQoL among the CG. To the best of our knowledge, and in the light of an extensive literature review, few studies have

highlighted the impact of an intervention on HRQoL. Côté *et al.*[41] discussed how pharmacists' interventions can have both a positive and negative impact on HRQoL. Contrary to our study results, a pharmacists' intervention was shown to improve HRQoL in hypertensive patients in India.[42] Borgaonkar *et al.*[43] in their study of inflammatory bowel disease (IBD) concluded that provision of educational booklets to IBD patients in a tertiary centre does not improve, and indeed may worsen, HRQoL. Mayberry *et al.*[44] have shown that anxiety level increased up to 50% when patients read a book about their illness. Martin *et al.*[45] reported similar results in the context of HRQoL. The reasons for this decline in HRQoL are multifactorial. HRQoL recapitulates a wide range of physical, communal and emotional behaviours, which are vital in the management of diseases. HRQOL is extremely difficult to measure impartially, as it depends on many pre-existing and irreversible factors such as economic status, intelligence, personality, socio-political conditions and the nature and duration of the disease.[46]

Within the context of developing countries like Pakistan, HRQoL is an area of social sciences that is often neglected. Pakistan faces severe shortages in terms of professionals and health-care facilities. There are huge gaps in income disparity and living status between population subgroups. All these factors may have a profound impact on HRQoL. In addition, lack of basic health facilities and resources inversely affects the health status and HRQoL of the population in general and specifically of patients suffering from chronic diseases like hypertension. This may be one of many reasons why HRQoL in our study population declined even when patients were provided with education and knowledge about their condition. In addition, it has been observed that patients tend to become more cautious as they learn more about their diseases. In the absence of an ideal living environment, this learning can impact negatively on patients' everyday activities. Patients see the 'missing things' in their disease management and treatment, and their HRQoL decreases with an overall reduction in the quality of satisfaction.

Conclusion

This study shows that pharmacist-initiated educational interventions increase patients' knowledge about their condition in a way that positively modifies their beliefs about medicines. Such changes are expected to result in increased adherence levels. Therefore, health-care professionals should develop strategies that enlist the patient as a participant in the management of his/her health through the help of patient education and counselling.

Limitations

A repeated-measurement bias was expected because the same self-administered questionnaire was given to the participants. To limit this bias, however, pharmacists asked the patients to complete the questionnaires in their presence. Therefore, patients had no chance to discuss and compare their responses with family members, friends and peers. Another factor is that the participants completed the questionnaires as individuals and did not have the opportunity to share answers with other patients. Our study instruments were in the form of responses (yes/no, true/false and one/two/three), so guessing was another unavoidable possibility.

The biggest challenge, however, was to persuade patients to participate in the study. At times, some of them would be too busy to sit in an educational session. There were also some participants who lost interest in the study and left within the study period. The political uncertainty in the area also meant a number of patients missed their routine follow-up visits. Although the research team tried their best to contact patients, patients' presence could never be guaranteed. In addition, the pharmacists and the research team were aware of the patients involved in pharmaceutical care, which is also a limitation of this study.

Another limitation of the study is the generalizability of the results, as the study was conducted with a selective sample of hypertensive patients from a remote area of Pakistan. Furthermore, as the study was designed as a single

post-intervention measure, the long-term impact of the intervention is always questionable. However, as the groups were equal in comparison, the likelihood of demographic and morbidity-related biasness was not an issue. Furthermore, only the health-care professionals' knowledge was assessed, and a process to evaluate how well the intervention was delivered by the health-care professionals was not set up, which is also a limitation of the study.

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Competing interests

The author(s) declare that they have no competing interests. No funding (external or internal) was received for this study.

Supporting Information

Additional Supporting Information may be found in the online version of this article:

Appendix S1 Description of training module.

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