

Blood pressure control in hypertensive patients: impact of an Egyptian pharmaceutical care model

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ABSTRACT

Hypertension is poorly managed in Egypt due to low rates of awareness about the disease. The aim of this study was to describe the role of the pharmacist as a health care provider and the implementation of a pharmaceutical care model to improve medications adherence, BP control, knowledge and quality of life (QOL) in a sample of Egyptian patients suffering from hypertension. A total of 280 hypertensive adults, whether their BP was controlled or not, were enrolled in the study and randomly classified into either control group (CG) or intervention group (IG); both received the usual hospital care and kept on their antihypertensive. Patients in the IG, beside the usual hospital care, received a pharmaceutical care program described in the methods. All patients visited the clinic monthly up to three months for check and evaluation. Significant improvements were observed in the studied parameters for the IG compared with the CG, at the end of the study, although there was no significant difference ($P > 0.05$) between them in demographics and characteristics at the baseline. At the end of the study, a significant lower SBP (-8.2 mmHg, $P = 0.003$) and DBP (-5.4 mmHg, $P = 0.001$) levels were observed in the IG with significantly higher BP control ($P=0.018$). Also, medication adherence was significantly higher ($P = 0.002$) in the IG (27.2%, 52.8%, 20.0% vs 48.6%, 33.6%, 17.8% for low, intermediate and high adherence, respectively). Similarly, patients' knowledge, attitude and practice were significantly improved ($P = 0.001$) in IG ((20.5 ± 1.8) , (4.7 ± 1.0) , (4.7 ± 1.0) , respectively) vs ((13.7 ± 7.2) , (3.8 ± 1.8) , (2.9 ± 2.0) , respectively) for the CG. While end of study QOL for the IG, increased significantly compared with the CG ($P = 0.001$, 0.001 , 0.020 , 0.010 and 0.016 for patients' rate of QOL, enjoy, energy, sleep and access to health system, respectively), most of QOL dimensions were decreased significantly from their baseline in the CG. Conclusion: Pharmacist intervention can significantly improve BP control, medication adherence, patients' knowledge, attitude, practice and QOL in hypertensive Egyptian patients treated with antihypertensive agents.

INTRODUCTION

The burden of non communicable diseases (NCD) is rising rapidly nationally and globally constituting a major challenge to development. The World Health Organization (WHO) developed a global strategy for the prevention and control of non communicable diseases. This strategy focuses on assessing the pattern and trends of risk factors of major NCD (WHO,2007). Recent changes in the definition and classification of blood pressure level make hypertension is the most commonly diagnosed condition in the primary and secondary healthcare systems (Pater, 2005), and is likely the most common disease on Earth

(Kearney *et al.*, 2005). Hypertension affects approximately 600 million people around the world (Lyra Júnior *et al.*, 2008). It is associated with high morbidity and mortality: the disease is a silent threat to the health of people all over the world (Lawes *et al.*, 2008). The prevalence of hypertension continues to rise across the world, and most patients who receive medical intervention are not adequately treated to the goal (Bakris *et al.*, 2008). In many economically developing countries, such as Egypt, patterns of illness are changing dramatically. Specifically, communicable diseases are becoming less common, and the incidence and prevalence of non communicable chronic diseases, such as hypertension, are rising. Indeed, several lines of evidence suggest that hypertension and its complications are a major health problem in Egypt.

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The incidence of blood pressure related clinical events such as myocardial infarction, stroke, and end-stage renal disease appears to be increasing dramatically. The estimated prevalence of hypertension in Egypt was 26.3% of adults ≥ 25 years of age. Its prevalence increases with aging; approximately 50% of Egyptians above the age of 60 years suffer from hypertension (Ibrahim *et al.*, 1995). Hypertension is poorly managed in Egyptians due to low rates of awareness about the disease, treatment and control. Only 8% of hypertensive Egyptians have their blood pressure controlled (Ibrahim *et al.*, 1995). Poor medication adherence and lack of knowledge and awareness on hypertension are the major reasons for poor BP control which is largely related to deterioration in a patient's quality of life (Cavalcante *et al.*, 2007).

Pharmacists may be able to enhance patients' outcomes and adherence to therapy. In addition to dispensing medications, the pharmacy profession advocates that pharmacists offer pharmaceutical care to improve patients' health (Hepler and Strand, 1990). Pharmaceutical care activities include monitoring patients' symptoms, counselling patients about their medications, helping resolve drug-related problems, facilitating communication with physicians, and performing patient-specific interventions when appropriate (Strand *et al.*, 1991). Pharmacists in Egypt have not yet implemented the pharmaceutical care into their practice. The health care system in Egypt expects pharmacists only to dispense medication according to physicians' prescription, pharmacists are not obliged to educate patient or monitor effectiveness or safety of their pharmacotherapy. The aim of this study was to describe the role of the pharmacist as a health care provider and the implementation of a pharmaceutical care model to improve medications adherence, BP control, knowledge and quality of life in a sample of Egyptian patients suffering from hypertension.

PATIENTS AND METHODS

Patients

The study comprised 280 adult patients, of age between 18 to 80 years of either sex. Patients were recruited after full history taking, physical examination and complete investigations. Patients with a past medical history of hypertension, whether their BP was controlled or not, were primary candidates for the study. According to CGMH guidelines "BP control was defined as BP measurements in the clinic of systolic BP (SBP) < 140 mmHg and diastolic BP (DBP) < 90 mmHg for patients without diabetes, coronary heart disease (CHD) or chronic nephritis and of SBP < 130 mmHg and DBP < 80 mmHg for patients with diabetes, CHD or chronic nephritis" (Liu, 2011).

Further inclusion criteria included, uncomplicated renal impairment, type II diabetes mellitus or heart disease, treatment with antihypertensive drugs for at least 6 months and permanent residence close to the hospital. Exclusion criteria included, stage III hypertension (BP $\geq 180/110$), urgency or emergency hypertension, clinically relevant hepatic disease, renal impairment (serum creatinine ≥ 3.0 mg/dL), a history of unstable heart

diseases (unstable angina, MI, complicated heart failure), systemic infections, pregnancy or breastfeeding, dementia and significant impairment in vision, hearing or speech that precluded participation.

All patients were selected from those attending the out-patient cardiology clinics for routine follow up, during the period from March to October (2013) in Kasr Alainy Teaching Hospital, Faculty of Medicine, Cairo University, Cairo, Egypt. The study was approved from the hospital and faculty ethical committee and a written consent was obtained from each patient after explaining the objectives of the study. Study protocol was approved by the institutional ethical committee in 15/01/2013 (Approved No. 2013-H002).

METHODS

Study design

We designed a randomized controlled trial in which patients were selected to have non-significant variations in term of demographics and pre-treatment clinical presentation. A total of 280 patients were enrolled in the study and were randomly classified into either control group or intervention group; both received the usual hospital care. Patients in the control group, who were receiving the usual hospital care only, were asked to visit the clinic monthly as usual for check and evaluation. Patients in the intervention group, beside the usual hospital care, they received the proposed pharmaceutical care program. They also, were asked to visit the clinic monthly up to three months in a regular manner for check, evaluation, continual education, BP measurement and ensuring compliance. Patients in both groups, after physical examination and investigations were kept on the same or a modified antihypertensive therapy, according to physician recommendations. During the follow up, the study design excluded patients with modified therapies that interrupted the similarity between the two groups, so as the two groups became similar in terms of demographics and the provided treatments.

The proposed pharmaceutical care program for the intervention group provided by the pharmacist consisted of a baseline interview for 30-60 minute and follow-up visits (lasting approximately 20 min) conducted with each intervention patient monthly and up to 3 months. The baseline interview consisted of sessions, each comprised of 10-15 patients during which patients received essential information about the nature of hypertension, its complications, importance of controlling it, medications, compliance, encourage patients to self-care and lifestyle modifications that including diet and physical activities. Also, structural pictures, illustrated diagrams and written materials [Arabic leaflets] were provided together with self-measurement for BP was taught and patients encouraged to adhere their therapies. During the follow-up visits, efforts made to establish a partnership with the patient.

At these visits, the patient was asked to bring all medications (both prescription and over the counter drugs) to help him manage their therapies, review of the health situation,

identification of problems leading to poor BP control, identify, resolve and prevent drug related problems by communication with the patient's physician and other health care providers. The pharmacist could also schedule additional optional visits between scheduled visits at his discretion when required.

Measured parameters

Four primary parameters were measured for both (control and intervention) groups at the baseline, monthly (for follow up) and after 3 months from the start (end of the study for evaluation). They included BP, medication adherence, "knowledge, attitude, practice" and quality of life. **Patient's BP** (systolic/diastolic) in mmHg was measured and recorded. The BP clinic measurement was performed by trained nurses blind to the study, according to the American Heart Association (AHA) technique for BP measurement (Saseen and Joseph, 2013) using the standard mercury sphygmomanometer with appropriate cuff bladder sizes and adult stethoscope; the mean of two consecutive measurements being recorded. **Patient's medication adherence**, the second outcome measure, was investigated by a standard questionnaires using a validated four-item adherence scale (Zhao *et al.*, 2012): 1) Whether there is forgotten medication experience, 2) Whether sometimes do not pay attention to the medication, 3) When the symptoms improve, the medication had been discontinued or not and 4) When the symptoms got worse after taking the drug, the medication was withdrawn or not. Low medication adherence was defined as answering yes to 3 or more of 4 questions. High and intermediate adherence were defined as answering no to the 4 questions and yes to 1 -2 questions, respectively. **Patients' knowledge, attitude and practices** were assessed by a standardized and structured questionnaire described by (Biradar *et al.*, 2012a) using 31 questions; 21 for knowledge, 5 for attitude and 5 for practice. Each positive answer takes 1 score and each negative answer takes zero score. For each patient, scores of knowledge, attitude and practice were determined. **Patient quality of life** was assessed by using structured questionnaires (Biradar *et al.*, 2012b) using 5 items regarding each of: 1) How would you rate your quality of life? (**Rate QL**); concerning the usual patient's works, tasks, activities, 2) How much do you enjoy life (**Enjoy**), 3) Do you have enough energy for everyday life (**Energy**), 4) How satisfied are you with your sleep (**Sleep**) and 5) How satisfied are you with your access to health services (**Access to HS**). The 5 dimensions of QOL were determined as percentages per group.

Patients' evaluation and statistical analysis

Data were managed with Microsoft Excel spreadsheet software. Systat (SYSTAT, Inc., Evanston, IL) was used to generate any additional statistical analysis. Variables for BP, patients' knowledge; attitude and practice were expressed as the Mean \pm standard deviation (SD), while those for patients' medication adherence, patients' quality of life were expressed as frequency and percentages. Baseline data and data at the end of the study were evaluated and compared for the control and the intervention groups. Student's test and chi-square test were used to

compare variables and groups depending on the collected data. Differences in means between groups for BP, patients' knowledge, attitude and practice were compared using independent "t" test while absolute changes in means within groups over the evaluation period were compared using paired "t" test. Differences between groups and changes within groups for patients' medication adherence, patients' quality of life were evaluated using chi-square test. All statistical analyses were done with Statistical Package for Social Sciences (SPSS), and a P value < 0.05 was considered statistically significant.

RESULTS

The study enrolled 280 hypertensive patients meeting the inclusion criteria that explained in the methods. One hundred and forty patients of the enrolled patients were allocated to the control group and one hundred and forty patients were allocated to the intervention group. Only 107 patients from the control group and 125 patients from the intervention group completed the three months follow-up visits (**Figure-1**). A total of 48 patients didn't complete the study for different reasons: refusing follow up, lack of cooperation, unannounced loss during follow up, exclusion due to developing complicated renal impairment, unstable heart diseases or receiving a modified therapy by physician, that disturb the baseline characterisation.

At baseline (**Table -1**), the intervention group and control group were comparable and there was no significant difference ($P > 0.05$) between values of the two groups with respect to age, gender, education status, body mass index, marital status, smoking status, alcoholic status, family history with hypertension, presence of co-morbidity, duration of antihypertensive, antihypertensive combination and the prescribed antihypertensive medications (at the baseline and continued up to the end of the study).

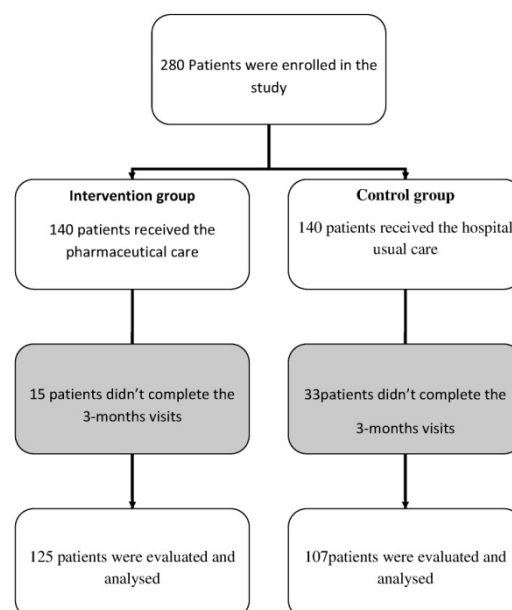


Fig. 1: patients' enrolment and withdrawal.

Table 1: Baseline demographics and clinical characteristics of patients enrolled in the study.

Groups' parameters	Control group N=140		Intervention group N=140		Statistical analysis	
	Test-value	P-value	Test-value	P-value	Test-value	P-value
Sex						
Male, N (%)	67	(47.90)	71	(50.70)	0.229	0.633
Female, N (%)	73	(52.10)	69	(49.30)		
Age in years, mean (SD)	53.51	(12.73)	54.54	(14.06)	0.642	0.522
BMI (kg/m²), mean (SD)	24.7	(3.97)	24.53	(4.109)	0.355	0.723
Marital status						
Not married, N (%)	15	(10.70)	17	(12.10)	0.141	0.707
Married, N (%)	125	(89.30)	123	(87.90)		
Family history of hypertension					0.014	0.905
Negative family history, N (%)	69	(49.30)	68	(48.60)		
Positive family history, N (%)	71	(50.70)	72	(51.40)		
Education status						
Illiterate, N (%)	73	(52.10)	66	(47.10)	3.671	0.299
Elementary schooling, N (%)	44	(31.40)	43	(30.70)		
High schooling, N (%)	12	(8.60)	10	(7.10)		
University education, N (%)	11	(7.90)	21	(15.00)		
Smoking status	75	(53.60)	79	(56.40)	2.152	0.341
Non smokers, N (%)						
Smokers, N (%)	47	(33.60)	37	(26.40)		
Past smokers, N (%)	18	(12.90)	24	(17.10)		
Alcoholic status	126	(90.00)	130	(92.90)	0.735	0.693
Non alcoholic, N (%)						
Alcoholic, N (%)	4	(2.90)	3	(2.10)		
Past alcoholic, N (%)	10	(7.10)	7	(5.00)		
Co morbidity						
No co morbid, N (%)	35	(25.00)	35	(25.00)	0.000	1.000
Uncomplicated renal impairment, N (%)	35	(25.00)	35	(25.00)		
Uncomplicated diabetes types II, N (%)	35	(25.00)	35	(25.00)		
Uncomplicated heart disease, N (%)	35	(25.00)	35	(25.00)		
Obesity	93	(66.43)	104	(74.3)	2.957	0.085
BMI < 30, N (%)						
BMI ≥ 30, N (%)	47	(33.57)	36	(25.7)		
Advanced age						
<65, N (%)	112	(80.00)	105	(75.00)	1.004	0.316
>65, N (%)	28	(20.00)	35	(25.00)		
Antihypertensive combination						
Patients with one type medications, N (%)	85	(60.71)	78	(55.71)	0.235	0.312
Patients with two type medications, N (%)	38	(27.15)	43	(30.72)		
Patients with three type medications, N (%)	17	(12.14)	19	(13.57)		
Duration of ATHs in years, mean (SD)	6.52	(4.87)	7.51	(5.08)	1.656	0.099
Antihypertensive drug class, N (%)						
Diuretics	73	(52.14%)	66	(47.14%)	0.514	0.473
Potassium-sparing diuretic	41	(29.29%)	35	(25.00%)	0.451	0.501
ACE inhibitors	92	(65.71%)	86	(61.43%)	0.386	0.534
Angiotensin II receptor antagonists	17	(12.14%)	22	(15.71%)	0.705	0.401
Calcium channel blockers	23	(16.43%)	18	(12.86%)	0.457	0.498
Beta blockers	16	(11.43%)	11	(7.86%)	0.656	0.418
Another medication	25	(17.86%)	32	(22.86%)	0.793	0.373

N: number of patients; %: percentage; SD: standard deviation; **ATHs**: antihypertensive.

Comparisons of patients' clinical characteristics were tested by Chi-square test except the age; BMI and duration of antihypertensive were tested by student "t"

(Table-2) evaluated the studied parameters at the baseline and at the end of the study for both groups. Regarding BP, baseline results revealed non-significant difference in each of SBP ($P=0.745$) and DBP ($P=0.911$) between intervention and control groups. Only 81 of 140 patients (57.9%) in the intervention group had both SBP and DBP controlled. This was not significantly different ($P=0.064$) from the control group, where 71 of 140 patients (50.7%) had their BP controlled. Each of SBP, DBP and BP control, for the control group at the end of the study, didn't significantly change ($P>0.05$) from the baseline. In response to the pharmaceutical care intervention, results at the end of the study for the intervention group, compared with the base line, revealed a statistically significant reduction ($P<0.05$) in both of SBP and

DBP by (8.2) mmHg and (5.38) mmHg, respectively (Figure-2). Patients with BP control showed a significant increase in number ($P<0.05$), in response to pharmaceutical care intervention (99 out of 125 patient: 79.2%), compared with the base line (81 out of 140 patient: 57.9%). Comparing both groups at the end of the study, results of the intervention group revealed a statistically significant reduction in each of SBP ($P=0.003$), DBP ($P=0.001$) and BP control ($P=0.018$) compared with the control group. Regarding medications adherence, baseline results revealed non-significant difference ($P=0.529$) between intervention and control groups. In the control group, findings showed that 64 of 140 patients (45.7%) had low adherence, 49 of 140 patients (35.0%) had intermediate adherence and 27 of 140 patients (19.3%) had high adherence.

Table 2: Comparison between intervention and control groups regarding the studied parameters at the baseline and at the end of the study.

Variable	Control group			Intervention group			P-value
Baseline Variable							
Patients' numbers	140			140			
Clinic BP figures	144.0 (20.5)			143.0 (16.4)			0.745
SBP(mmHg), mean (SD)	85.6 (9.0)			85.5 (7.3)			0.911
DBP(mmHg), mean (SD)	71 (50.7%)			81 (57.9%)			0.064
BP control, N (%)	64 (45.7)			69 (49.3)			
Medications adherence, N (%)	low	intermediate	high	low	intermediate	high	
	49 (35.0)	27 (19.3)	27 (19.3)	51 (36.4)	20 (14.3)	20 (14.3)	0.529
Knowledge, mean (SD)	12.6 (2.2)			13.1 (8.2)			0.523
Attitude, mean (SD)	3.36 (1.9)			3.1 (1.9)			0.254
Practice, mean (SD)	2.6 (2.1)			2.8 (2.1)			0.426
Quality of life	83 (59.3)			91 (65.0)			
Rate QL, N (%)							0.388
Enjoy, N (%)	76 (54.3)			75 (53.6)			1.000
Energy, N (%)	93 (66.4)			87 (62.1)			0.532
Sleep, N (%)	102 (72.9)			98 (70.0)			0.691
Access to HS, N (%)	109 (77.9)			100 (71.4)			0.271
End of the study Variable							
Patients' numbers	107			125			
SBP(mmHg), mean (SD)	142.0 (20.2)			135.1 (15.2)*			0.003
DBP(mmHg), mean (SD)	84.2 (8.9)			80.1 (8.2) *			0.001
BP control, N (%)	69 (64.5)			99 (79.2) *			0.018
Medications adherence, N (%)	low	intermediate	high	low	intermediate	high	
	52 (48.6)	36 (33.6)	19 (17.8)	34 (27.2)*	66 (52.8)*	25 (20.0)*	0.002
Knowledge, mean (SD)	13.7 (7.2)			20.5 (1.8) *			0.001
Attitude, mean (SD)	3.8 (1.8)			4.7 (1.0) *			0.001
Practice, mean (SD)	2.9 (2.0)			4.7 (1.0) *			0.001
Quality of life Rate QL, N (%)	72 (51.4)			111 (79.3) *			0.001
Enjoy, N (%)	59 (42.1)			102 (72.9) *			0.001
Energy, N (%)	86 (61.4) *			105 (75.0) *			0.020
Sleep, N (%)	92 (65.7) *			112 (80.0) *			0.010
Access to HS, N (%)	98 (70.0) *			116 (82.9) *			0.016

N: number of patients; SD: standard deviation, %: percentage; BP: blood pressure; SBP: systolic BP; DBP: diastolic BP; MABP: main arterial BP; QL: quality of life; HS: health services. "t" test was used to evaluate each of SBP, DBP, patients' knowledge, attitude and practice. Chi-square test was used to evaluate each of BP control, Medications adherence, and Quality of life. Bolded p-values means that there is a statistically significant difference between the 2 groups at the end of the study (P-value < 0.05). * means that there is a statistically significant difference between base line and end of the study within the same group (P-value < 0.05)

Respecting the intervention group, findings showed that 69 of 140 patients (49.3%) had low adherence, 51 of 140 patients (36.4%) had intermediate adherence and 20 of 140 patients (14.3%) had high adherence.

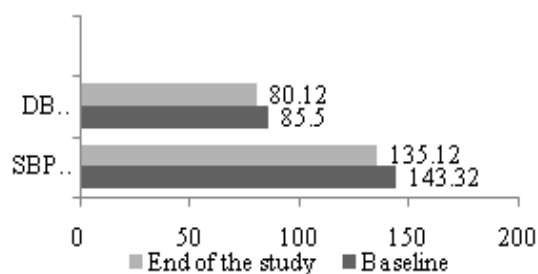


Fig. 2: Baseline and the end of the study BP figures (SBP, DBP) for the intervention group.

Results at the end of the study, in the control group, didn't significantly changed ($P > 0.05$) from the baseline, while those for the intervention group, in response to the pharmaceutical care intervention, compared with the base line, revealed a statistically significant improvement ($P < 0.05$) in medications adherence. There was a statistically significant reduction in the number of patients with low adherence (34 of 125 patients: 27.2%) when compared with those at the baseline (69 of 140 patients: 49.3%).

In the other hand, findings at the end of the study revealed a statistically significant increase in the number of patients with respect to both intermediate adherence (66 of 125 patients: 52.8%) and with high adherence (25 of 125 patients: 20.0%) when compared with those at the baseline (51 of 140 patients: 36.4%) and (20 of 140 patients: 14.3%) for intermediate and high adherence, respectively (**Figure-3**).

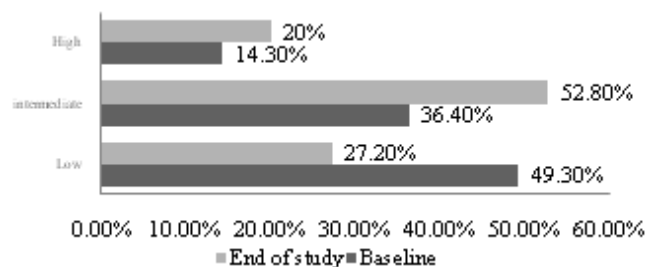


Fig. 3: baseline and the end of the study Medications adherence for the intervention group.

Comparing the two groups at the end of the study, there was a statistically significant reduction ($p=0.002$) in the number of patients with low adherence (34 of 125 patients: 27.2%) in the intervention group compared with those in the control group (52 of 107 patients: 48.6%). In the other hand, findings at the end of the

study revealed a statistically significant increase in the number of patients with respect to both intermediate adherence (66 of 125 patients: 52.8%) and high adherence (25 of 125 patients: 20.0%) in the intervention group when compared with those in the control group (36 of 107 patients: 33.6%) and (19 of 107 patients: 17.8%) for intermediate and high adherence, respectively.

Regarding knowledge, attitude and practice, baseline results showed that non-significant differences (P -values: 0.523, 254 and 426, respectively) were clear between control and intervention groups. For the control group, the mean patients' knowledge, attitude and practice were 12.6, 3.36, 2.6, while for the intervention group, were 13.1, 3.1, 2.8, respectively. Results at the end of the study, for the control group, didn't significantly changed ($P > 0.05$) from the baseline, while those for the intervention group, in response to the pharmaceutical care intervention, compared with the base line, were highly improved at the end of the study. The mean patients' knowledge, attitude and practice were statistically significantly increased ($P < 0.05$, for each) from (13.1), (3.1) and (2.8), to (20.5), (4.7) and (4.7), respectively (**figure-4**).

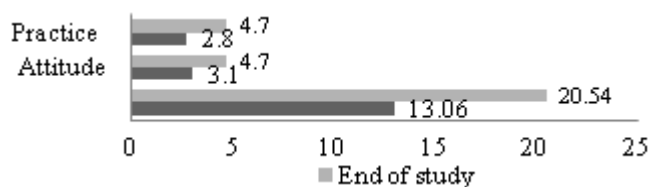


Fig. 4: Baseline and the end study patients' knowledge, attitude and practice for the intervention group.

Comparing both groups at the end of the study, patients' knowledge; attitude and practice were highly improved for the intervention group compared with the control. The mean values of patients' knowledge, attitude and practice (20.5, 4.7 and 4.7, respectively) in the intervention group were statistically significantly different ($P=0.001$ for each), from the results of the control group (13.7, 3.8, 2.9, respectively).

Regarding quality of life, baseline results revealed statistically non-significant differences for each of rate QL, enjoy, energy, sleep and access to HS (P -values: 0.388, 1.00, 0.532, 0.691 and 0.271, respectively) between the intervention and the control groups. In the control group findings showed, that the number of patients with rate QL, enjoy, energy, sleep and access to HS were 83 patients of 140 (59.3%), 76 of 140 patients (54.3%), 93 of 140 patients (66.4%), 102 of 140 patients (72.9%), 109 of 140 patients (77.9%), respectively. Respecting the intervention group findings showed, that the number of patients with rate QL, enjoy, energy, sleep and access to HS were 91 of 140 patients (65.00%), 75 of 140 patients (53.6%), 87 of 140 patients (62.1%), 98 of 140 patients (70.00%) and 100 of 140 patients (71.4%), respectively. In response to pharmaceutical care implementation, all of the quality of life parameters (rate QL, enjoy, energy, sleep and access to HS) at the end of the study, for the intervention group were highly improved ($P < 0.05$ for each), compared with that of the baseline results (**Fig. 5**).

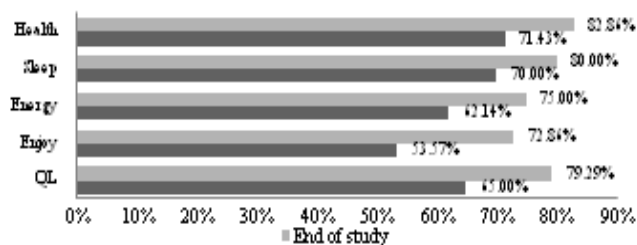


Fig. 5: QOL for intervention group at the baseline and the end of the study.

In the intervention group the number of patients at the end of the study regarding rate QL, enjoy, energy, sleep and access to HS were 111 patients (79.3%), 102 patients (72.9%), 105 patients (75.0%), 112 patients (80.0%) and 116 patients (82.9%), respectively. Regarding the control group, end of the study energy, sleep and access to HS (86 of 107 patients (61.4%), 92 of 107 patients (65.7%) and 98 of 107 patients (70.0%), respectively) were statistically significantly decreased ($P < 0.05$ for each) compared with baseline results (**figure-6**).



Fig. 6: QOL for control group at baseline and the end of the study.

On the other hand rate QL and enjoy (72 of 107 patients (51.4%) and 59 of 107 patients (42.1%), respectively) at the end of the study for the control group, were not statistically changed ($P > 0.05$) compared with baseline results. Comparing both groups at the end of the study, rate QL, enjoy, energy, sleep and access to HS were highly improved for the intervention group compared with the control. The number of patients' rate QL, enjoy, energy, sleep and access to HS (111 patients: 79.3%, 102 patients: 72.9%, 105 patients: 75.0%, 112 patients: 80.0% and 116 patients: 82.9%, respectively) in the intervention group were statistically significantly different (P -values: 0.001, 0.001, 0.020, 0.010 and 0.016, respectively), from the results of the control group (72 patients: 51.4%, 59 patients: 42.1%, 86 patients: 61.4%, 92 patients: 65.7% and 98 patients: 70.0%, respectively).

DISCUSSION

Hypertension affects more than 26% of the Egyptian population (Ibrahim *et al.*, 1995). Despite the well-established benefit from controlling hypertension in reducing cardiovascular morbidity and mortality, only 8% of the Egyptian hypertensive meets the current recommended BP goals. Poor adherence to therapy and poor quality of care with regard to current therapeutic guidelines contribute to inadequate control of this condition (Cavalcante *et al.*, 2007). The pharmacist intervention program developed for this 3-month study resulted in a significant reduction of SBP, DBP and an increase in the proportion of

patients with BP control. Pharmacist intervention, in the present study, also had a positive impact on knowledge and awareness on hypertension, adherence, and patient's quality of life.

The mentioned pharmacist intervention described here in this study, resulted in reduction values of 8.2 mmHg and 5.38 mmHg in each of SBP and DBP, respectively; was observed in the intervention group. The smaller reduction in BP values observed in our results may be partly explained by the low mean SBP and DBP level of the study population at baseline (143.0/85.5 mmHg). Low mean SBP and DBP values in the current study may be attributed to the inclusion of hypertensive's patients regardless of whether their BP was controlled or not; contrary to most of the mentioned studies. Such differences in study population could explain variations in BP reduction. Our results consistent with results in other studies (Vivian, 2002; Carter BL *et al*: 2009) that showed similar reduction in BP values. A population approach that decreases the blood pressure level in the general population by even modest amounts has the potential to substantially reduce morbidity and mortality. For example, it has been estimated that a 5 mmHg reduction of SBP in the population would result in a 14 % overall reduction in mortality due to stroke, a 9 % reduction in mortality due to CHD, and a 7 % decrease in all-cause mortality (JNC 7,2003). Reduction in DBP of 5 mmHg is also associated with 34% less strokes and 21% less coronary heart disease (Lyra Júnior *et al*, 2008). SBP is typically less controlled than DBP, and recently published recommendations advocate that SBP must be the major criterion for managing hypertensive individuals, particularly middle-aged and older patients (Izzo *et al*, 2000). Previously reported studies and ours demonstrate that pharmacist intervention may reduce SBP to an extent similar to that obtained with antihypertensive agents (7–13 mm Hg for mono therapy) (Chalmers *et al*, 1999). Thus, inclusion of a clinical pharmacist on the hypertension care team represents one possible strategy to address this important public health issue (Kusek *et al*, 1996). Improvement of BP values that occurred in the intervention group was probably due to the fact that the patients in this group implemented the recommended pharmaceutical care plan as advised by the pharmacist and patients became more knowledgeable about their disease and their medications which in turn led to improvement in medications adherence.

Poor adherence at the baseline was found in about 50% of the enrolled patients in either the control group or the intervention group. It was noted that poor adherence was the predominant character of patients with uncontrolled BP. During the baseline survey, it is noted that non-complier patients consider they do not require treatment for simple reason they do not consider themselves sick, especially they were most likely asymptomatic hypertensive patients. Other main causes for medications' discontinuation were: asymptomatic subside, when they consider has been cured, economic burden and the very long treatment period. All of these poor adherence reasons were subjective factors and improved by our pharmacist intervention provided for the intervention group. Thus, this intervention resulted in significant improvement in the antihypertensive

medication adherence, which is a likely reason for better BP control in the intervention group because antihypertensive medications modifications did not differ along the study period for both of the control and the intervention groups as mentioned in the methods. Improvement in medication adherence in the intervention group appeared as a significant reduction in the number of patients with low adherence and a significant increase in the number of patients with respect to both intermediate adherence and high adherence. Most studies that reported significant improvements in medication adherence reported also, a significant improvement in patients' outcomes. This in turn proves that medication adherence is an important key in BP control (Aguwa *et al*, 2008; Blenkinsopp, 2000 ; Sookaneknun *et al*, 2004; Brouker *et al*, 2000; De Souza *et al*, 2007; Lai, 2007 and Lee *et al*, 2006). Baseline medication adherence of 75% or more, is expected to produce insignificant outcome improvement as a result of pharmacist interventions (Chabot *et al*, 2003; Carter *et al*, 2009; Roumie *et al* , 2006 and Carter *et al*, 2008). In the present study, our low baseline medication adherence which was approximately about 50% gave us the chance to obtain a positive impact through pharmaceutical care intervention.

As we mentioned, the improved medication adherence obtained in our study for the intervention group, could be attributed to education given to the patients in that group. Lack of sufficient knowledge about hypertension and its complications, the importance of antihypertensive medications to control high BP and the required BP targets have been considered as barriers to adherence (Whelton *et al.*, 2002; Oliviera *et al.*, 2005 and Ragot *et al*, 2005).

One of most dramatic problem identified, in the current work, was the extremely poor level of patients' knowledge and understanding regarding the disease and the used medications. Adequately increasing patients' knowledge was one of the main targets in our study by making complete educational system as explained in the methods section. Patients' knowledge measured by 21 questions, also we measured patients' attitude which is a measure of intentionality and it is an important predictor of future. The education provided to the patient in the intervention group could contribute to awareness development; stimulate changes in behaviour and improving adherence to medication for those patients. The significant higher levels of knowledge, attitude and practice observed in patients who received pharmaceutical care in this study could have great impact in improving adherence. Data in the literature support our findings (Biradar *et al*, 2012" a" and Skowron *et al*, 2011).

Many studies reported lower rates of acceptance to follow the treatment by the patients because of the side effects of hypertension treatment that may affect the QOL of these patients. The WHO conceptualizes QOL as "an individual's perception of their position in life, in the context of culture and system of values in which they live and in relation to their goals, expectations, standards and concerns" (Carvalho *et al.*, 2012). Pharmaceutical care provided for the intervention group in the current study, increased significantly all of the health dimensions used to assess

the QOL from both of the baseline and the control group at the end of study. The opposite result obtained for the control group; lower levels of most of the measured health dimensions from the baseline, provides a prove for the positive impact of the pharmaceutical care on patient health care related quality of life. Health-related quality of life is considered as a viable patient outcome and an important measure of clinical or provider interventions (Pickard *et al.*, 1999; Park *et al.*, 1996). In a study conducted by (Kusek *et al.*, 1996) all of QOL scores increased significantly (for most of the health dimensions used to assess the QOL) from baseline to the last follow-up visit, due to control in blood pressure. Also, similar results were reported by (Wal *et al.*, 2013, Biradar *et al.*, 2012 "b" and Lyra *et al.*, 2007).

Successful implementation of pharmaceutical care has the potential to increase patients' satisfaction with their pharmacists' activities and may increase patients' expectations that pharmacists will work on their behalf to assist them with their health care needs. However, more high-quality studies are needed for a comprehensive quantitative assessment (Wal *et al.*, 2013).

Our study may had limit quality of standard pharmaceutical services due to, that the Pharmacists in Egypt had no experience to act as a health care providers, add to; inadequate cooperation of some staff and patients.

Because that the program conducted in only one setting the population was small, and that may lead to lacks statistical power to detect a more significant difference in baseline and follow-up BP in patients.

However, the obtained results were a point of reference for further actions in relation to implementation of pharmaceutical care in Egypt and its effectiveness assessment.

CONCLUSION

Based on these findings, this study concludes that Pharmacist intervention can significantly improve blood pressure control, medication adherence, patients' knowledge, attitude, practice and QOL in hypertensive patients treated with antihypertensive medications.

This study may provide a practice framework for the future development of other antihypertensive studies in pharmaceutical care to patients.

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