Illness Perceptions, Beliefs about Medication and Blood Pressure Control Among Hypertensive Egyptian Cohort

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Abstract

Objectives: To assess medication adherence, illness perception, beliefs about medications, to examine their association with blood pressure control among patients in Zagazig University hospital. **Method:** A cross-sectional study was held on 259 hypertensive patients attending Internal Medicine outpatient clinic, Zagazig University hospital. They underwent complete history taking, comprehensive clinical examination comprising assessing of their blood pressure. Then the patients completed Modified Morisky scale-8 (MMS-8), brief illness perception (BIPQ) and belief about medication (BMQ) questionnaires. **Results:** About 55% and 58% reported poor blood pressure control and medication adherence respectively. There is statistically significant relation between blood pressure control and patients' sex, education, occupation, medication number, IPR causal domain, family history of hypertension-induced mortality, BIPR score, general overuse, specific necessity, specific concern, and adherence. There were significant relations between adherence and patients' sex, social class, marital status, education, occupation, duration, medications number, family history of hypertension-induced mortality, IPQ causal item, general overuse, specific concern, and necessity. Significant risk factors of both poor control and medication adherence included specific necessity ≤ 9, general overuse >15 and using 3 to 4 drugs. Male, not working/unskilled increased risk of poor control. Not working/unskilled workers and skilled worker/free business, disease duration >5 years, perceiving lifestyle and hereditary as hypertension causes, having secondary education or higher were significant protectors from poor adherence. **Conclusion:** Belief about medications and illness perception were among the predictors of poor medication adherence and blood pressure control as well. Both can affect blood pressure control directly or indirectly via influencing adherence.

Keywords: *perception, beliefs, adherence*

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Introduction

Hypertension is a global public health issue.[1] Its prevalence is expected to shoot by 30% during year 2025.[2] Poorly controlled hypertension represents a major concern in various countries.[3]

Hypertension is associated with bad effect on patients making them vulnerable to aggravated risk of heart disease, stroke and kidney disease.[4] It will then impair productivity of patient and increase health expenditures so this disease has also an economic yield.[4] In the general population younger than 60 years, pharmacologic treatment should be initiated when the systolic pressure is 140 mm Hg or higher, or when the diastolic pressure is 90 mm Hg or higher. The target systolic pressure in this population is less than 140 mm Hg, and the target diastolic pressure is less than 90 mm Hg.[5]

Medication adherence is the magnitude to which one's medication-taking behaviour agreed with that is mutually

contracted upon with the prescribing physician.[6] Suboptimal blood pressure control is strictly related to poor adherence to antihypertensive drugs and lifestyle changes.[7-9]

Correct reasonable awareness, positive perception, and attitudes about hypertension and its medication remain the corner stone for blood pressure control.[7]

Patients' beliefs about illness are supposed to have a significant effect on medication adherence.[10] Understanding barriers and determinants of adherence to antihypertensive medication may help physicians provide interventions that can increase patients' compliance. Such interventions can also improve patients' outcome.[11]

This study aimed at assessing medication adherence, illness perception, beliefs about medications, examining their association with blood pressure control among hypertensive patients attending Internal Medicine outpatient clinic, Zagazig University hospital

Method

A cross sectional study was held through the period from October 2018 to September 2019 at Internal Medicine outpatient clinic in Zagazig University hospitals

Supposing that prevalence rate of non-adherence among adult Egyptian population (71%)[12] and attendance rate of patients with hypertension was 180/month so the sample was calculated to be 235 patients. Ten % of calculated sample was added to compensate for potential drop out; hence a total of 259 patients were included. Sample size was calculated using open Epi program with power of study 80% and confidence level 95%

Inclusion criteria: Adult patients (from 18 to 60 years old) of both sexes were included. All of them should be diagnosed with essential hypertension for at least one year ago.

Exclusion criteria: Existence of any of the following disorders: severe or acute hypertension, uncontrolled cardiovascular and cerebrovascular complications or associated comorbidities.

A systematic random sampling technique was adopted for selection of cases (as the patients were taken from outpatient clinic where there is no sample frame). As the average attendance is 6 patients /day and sample size of one to two patients/day was needed, so fourth patient starting from random number selected out of first six numbers was chosen in the sample. If patient was included before, it will be excluded and the next patient was used instead.

Case definition: In adult patients (≤ 60 years old), blood pressure control was defined as having systolic blood pressure <140 mmHg and diastolic blood pressure <90 mmHg.[4]

Study tools:

Socio-economic state (SES) was evaluated using modified version of the questionnaire of El Gilany et al.,[13]: Socio-demographic score < 50% (low), score 50%- < 75% (middle) and score ≥75% (high) after modification.

Complete history taking: all patients underwent complete history taking including personal data, present, past and family history.

Morisky Medication Adherence Scale: The MMAS-8© is an eight items questionnaire is used to measure medication adherence. It is formed of seven Yes/No questions and the eighth question comprises a 5-point Likert scale.[14] Arabic version by Jamous et al.,[15] was used. That version had adequate internal consistency (α = 0.70).[16] Total scores ranged from 0–8 with a cut-off value for adequate adherence set at ≥6.[14]

The Brief Illness Perception Questionnaire (Brief IPQ): The Brief IPQ is used for measuring illness perceptions. It included nine items;

Table (1a) Demographic and clinical characteristics of the studied patients

Parameters	N=259	%
Age:		
≤35 years	144	55.6
>35 years	115	44.4
Mean ± SD	36.32 ± 10.22	
Range	20 - 59	
Sex:		
Male	112	43.2
Female	147	56.8
Marital status:		
Single	29	11.2
Married	180	69.5
Divorced/widow	50	19.3
SES:		
Low	193	74.5
Middle	44	17
High	22	8.5
Education:		
Less than secondary	140	54.1
Secondary and higher	119	45.9
Occupation:		
Not working and Unskilled	139	53.7
Skilled/ Free trades,	65	25.1
clerk and professional/semi	55	21.2
Duration:		
≤ 5 years	160	54.1
>5 years	99	45.9
Medication:		
1 – 2	124	47.9
3 - 4	135	52.1
Drugs:		
Diuretics	159	61.4
ACEIs/ARBs	148	57.1
CCBs	49	18.9
Beta-blockers	169	65.3
Causal effect:		
Stress	117	45.2
Hereditary	71	27.4
Lifestyle	71	27.4
Family history:		
Irrelevant	166	64.1
Relevant	93	35.9
Family history of mortality:		
Negative	207	79.9
Positive	52	20.1

consequences, timeline, personal control, treatment control, identity, coherence, emotional representation and Illness concern. This mirrors a combination of emotional and cognitive representation. Each item is rated on a scale from 0 to10, with the global score fluctuating from 0–80. Item 9, causal one, probes the roots of hypertension by an open-ended question, by which patients enumerate three factors they thought to be the incriminated risk. Potentially, overall score can be calculated to uncover the degree to which the illness is alleged as threatening or benign.[17] Arabic version of Saarti, et al.[18] was used with Cronbach's alpha (0.717) and good internal consistency.

Table (1b) Demographic and clinical characteristics of the studied patients

Parameters	N=259	%
Brief IPR		
≤45	138	53.3
>45	121	46.7
General overuse:		
≤15	164	63.3
>15	95	36.7
General harm:		
≤15	142	54.8
>15	117	45.2
Specific concern:		
≤21	130	50.2
>21	129	49.8
Specific necessity:		
≤9	143	55.2
>9	116	44.8
Adherence:		
Poor	97	25.9
Good	162	74.1
Blood pressure control:		
Poor	143	55.2
Good	116	44.8
Systolic blood pressure (mmHg):		
Mean ± SD	143.78 ± 18.97	
Range	120 - 170	
Diastolic blood pressure (mmHg):		
Mean ± SD	88.98 ± 7.43	
Range	80 - 105	

SES Socioeconomic status, ACEI/ARBs (Angiotensin converting enzyme inhibitors/Angiotensin receptors blockers), CCB (calcium channel blockers

Belief about Medication Questionnaire (BMQ): It is an 18-item questionnaire which determines medication beliefs generally it includes two main domains; perception of medication in general (BMQ–General), as well as in specific chronic illnesses (BMQ –Specific).[19]

The BMQ-General encompasses 8 items which in turn are segmented into two sub-scales. The General-Harm sub-scale measures beliefs about how injurious the drugs are and the General-Overuse sub-scale discloses the thought of over-prescription of medication by physicians. The items are recorded on a 5-point Likert scale with scores fluctuating from 4 to 20.[19]

The BMQ-Specific comprises 10 items which included two sub-scales. Specific-Concerns scale measures perceptions of the potentiality of adverse reactions the prescribed drug produces. The Specific-Necessity scale addresses the patients' belief about their need to adhere to drugs.[19]

Higher scores in the General-Harm and General-Overuse scales denote an overall negative perception of medication. High scores in the Specific-Concerns scale represent the conception that adverse reactions of using drugs on regular basis are potentially hazardous. Increasing the Specific-Necessity scale scores points to the patient's need to adhere to medication to maintain health. To calculate the score, reverse score items 3, 4, and 7 and add these to items 1, 2, 5, 6, and 8. A higher score reflects a more threatening view of the illness. Arabic version of Al-Noumani et al.[7] was used with Cronback Alpha was 0.73.

Thorough clinical examination: Complete general examination with measuring of blood pressure using standard precautions according to JNC8 guidelines, measuring heart rate, respiratory rate and temperature. Local clinical examination was done with focusing on cardiac examination to detect potential complications.

Apparently complicated patients were excluded from the sample however they were managed by the internist.

A pilot study was applied on 10 % of the sample size (26 patients) to check study feasibility, clarity of the questionnaires and calculate the time essential to fill in each questionnaire. Study tools were sufficiently clear and no adjustment was needed. Patients who were included in pilot study were excluded from the main field work.

Upon agreement to share in the study, informed oral consents were taken from the patients. All of them underwent compete history taking, thorough clinical examination. Blood pressure was measured using mercury sphygmomanometer while the patients were seated for 10 minutes after they were asked to evacuate their bladders. Then they filled in the questionnaires (it took approximately 35 minutes to complete the questionnaires) during waiting time for clinic consultation. For illiterate participants, the researchers read the question items word by word exactly as they appeared on the questionnaires. Responses were recorded. The questionnaires were collected immediately after being completed.

Ethical Approval

An official permission was obtained from Ethical committee of Faculty of Medicine, Zagazig University.

The required official approvals to accomplish the research were gotten from the head of the Internal Medicine department at Zagazig University Hospitals.

An informed oral consent was obtained from all study participants after ensuring confidentiality of their data.

Statistical analysis

Data analysis was accomplished using the software SPSS (Statistical Package for the Social Sciences) version 20. Quantitative data was represented using means and standard deviations. Categorical variables were designated using their absolute frequencies. Kolmogorov-Smirnov (distribution-type) and Levene (homogeneity of variances) tests were utilized to prove suppositions for use in parametric tests. For quantitative variables, independent samples t-test (t) was used to compare means of two groups while Mann Whitney U test was used for non-normally distributed data. For categorical variables, Chi square (χ^2) and Fisher's exact tests were used to compare the studied groups. Binary backward Wald regression analysis was done to evaluate risk factors for poor blood pressure control and medication adherence. P value <0.05 was considered statistically significant, $p \leq 0.001$ was considered as highly significant.

Results

Age of the studied patients ranged from 23 to 59 years with mean 40.83 years. Female constituted 56.8% of the studied patients and 69.5% were married.

Table (2a) Association between poor blood pressure control and both demographic and disease related characteristics of the studied patients:

Parameters	Total	Poorly controlled Blood pressure	p	Odds ratio (95% CI)
	N=259	N=143(%)		
Age:				
≤35 years	144	82 (56.9)		1.17 (0.72 – 1.92)
>35 years	115	61 (53)	0.53	1 (reference)
Sex:				
Male	112	75 (67)		2.35 (1.41 – 3.92)*
Female	147	86 (46.3)	<0.001**	1 (reference)
Marital status:				
Single	29	19 (65.5)		1.74 (0.77 – 3.95)
Married	180	94 (52.2)		1 (reference)
Divorced/widow	50	30 (60)	0.224	1.37 (0.73 – 2.59)
SES:				
Low	193	108 (56)		0.374 (0.17 – 0.8)*
Middle	44	34 (77.3)		1 (reference)
High	22	1 (4.5)	0.351	0.014 (0.001 – 0.12)*
Education:				
Less than secondary	140	105 (75)		6.39(3.72 - 11.01)*
Secondary and higher	119	38 (31.9)	<0.001**	1 (reference)
Occupation:				
Not working	139	42 (66.7)		5.19 (2.61 – 10.3)*
Unskilled and skilled	65	74 (74.7)		7.67 (4.07 – 14.48)*
Skilled				
Free trades, clerk and professional/semi	55	27 (27.8)	<0.001**	1 (reference)
Duration:				
≤ 5 years	160	90 (56.3)		1 (reference)
>5 years	99	53 (53.5)	0.669	0.9 (0.54 – 1.48)
Medication:				
1 – 2	124	55 (38.5)		**1 (reference)**
3 - 4	135	88 (61.5)	0.001**	2.35 (1.42 – 3.88)*
Drugs:				
Diuretics	159	90 (56.6)	0.05	1.64 (0.997 – 2.7)
ACEIs/ARBs	148	65 (43.9)	<0.001**	0.18 (0.1 – 0.29)*
CCBs	49	19 (38.8)	0.376	0.74 (0.37 – 1.45)
Beta-blockers	169	50 (29.6)	<0.001**	0.02 (0.1 – 0.06)*
Causal effect:				
Stress	117	62 (53)		1 (reference)
Hereditary	71	52 (73.2)		2.43 (1.28 – 4.6)*
Lifestyle	71	29 (40.8)	0.255	0.61 (0.35 – 1.11)
Family history:				
Irrelevant	166	90 (62.9)		0.89(0.54 – 1.49)
Relevant	93	53 (37.1)	0.667	1 (reference)
Family history of mortality:				
Negative	207	123 (59.4)		2.34 (1.26-4.37)*
Positive	52	20 (38.5)	0.007*	1 (reference)

Table (2b) Association between poor blood pressure control and both demographic and disease related characteristics of the studied patients:

Parameters	Total	Poorly controlled Blood pressure	p	Odds ratio (95% CI)
	N=259	N=143(%)		
Brief IPR				
≤45	138	94 (68.1)		3.14 (1.89 – 5.23)*
>45	121	49 (40.5)	<0.001**	1 (reference)
General overuse:				
≤15	164	76 (46.3)		1 (reference)
>15	95	67 (70.5)	<0.001**	2.77 (1.62 – 4.74)*
General harm:				
≤15	142	76 (53.5)		1 (reference)
>15	117	67 (57.3)	0.547	1.16 (0.72 – 1.91)
Specific concern:				
≤21	130	53 (40.8)		1 (reference)
>21	129	90 (69.8)	<0.001**	3.35 (2.01 – 5.6)*
Specific necessity:				
≤9	143	106 (74.1)		6.12 (3.56 -10.51)*
>9	116	37 (31.9)	<0.001**	1 (reference)
Adherence:				
Poor	97	77 (79.4)		5.6 (3.13 – 10.03)*
Good	162	66 (40.7)	<0.001**	1 (reference)

*CI Confidence interval *p<0.05 is statistically significant **p≤0.001 is statistically highly significant COR crude odds ratio ACEI/ARBs (Angiotensin converting enzyme inhibitors/Angiotensin receptors blockers), CCB (calcium channel blockers)*

Concerning level of education; 54.1% received less than secondary education. About 54% of them were not working/unskilled workers and about three quarters of patients had low socioeconomic class (SES) (Table 1).

Systolic blood pressure ranged from 120 to 170 mmHg while diastolic blood pressure lied within range of 80 to 105 mmHg. Patients who had SBP<140 mmHg and DBP<80 were considered controlled and represented 44.8%. Patients had hypertension for 1 to 14 years. Patients reported that they received from 1 to 4 antihypertensive medications. About 61%, 57%, 19% and 65% were on diuretics, Angiotensin converting enzyme inhibitors/Angiotensin receptors blockers (ACEI/ARBs), calcium channel blockers (CCB) and beta blockers respectively. On measuring medication adherence using MMS-8, score ranged from 0 to 8 with 57.9% were poor controlled. Regarding blood pressure control, about 55% had poor control (Table 1).

Concerning BMQ, means general overuse and harm subscales were 13.26 and 14.19 respectively. While specific concern and necessity subscales ranged from 5 to 25 each with means 18.48 and 10.74 respectively. Total score of the first 8 items of Brief IPR was 46.7 ranged from 18 to 74. Regarding causal item, stress was ranked as the most important cause in 45.2% while each of hereditary and family history represented 27.4% each.

There is statistically significant relation between blood pressure control and each of patient sex, education, occupation, number of medication, use of ACEI or beta blockers, IPR causal domain, family history of mortality due to hypertension, total brief IPR score, general overuse, specific necessity, specific concern and adherence. There is non-significant relation between level of blood pressure control and either age group, marital status, SES, disease duration and general harm (Table 2).

On univariate analysis of those factors, male sex, receiving less than secondary

Table (3) Logistic regression analysis of risk factors for poor blood pressure control:

	β	AOR	95% C.I.		p
			Lower	Upper	
Causal factors (stress) ¥					0.536
Causal factors (Lifestyle)	0.051	1.052	0.097	11.437	0.966
Causal factors (Hereditary)	1.1	3.003	0.359	25.131	0.31
Male sex	2.32	10.173	2.521	41.049	0.001**
Education (secondary school and higher)	-23.533	0.000	0.000	.	0.995
Disease duration (>5 years)	-27.176	0.000	0.000	.	0.994
General over use score (>15)	3.239	25.505	6.754	96.314	<0.001**
Specific concern score (>21)	0.151	1.163	0.17	7.957	0.878
Specific necessity score (<9)	2.648	14.132	4.628	43.149	<0.001**
Number of medications (3 to 4)	4.022	55.824	12.859	242.35	<0.001**
Brief IPR score ≤45	1.441	4.225	.724	24.661	0.109
Poor medication adherence	1.059	2.883	0.968	8.586	0.057
Clerk, semi/professional¥					0.035*
Not working and unskilled workers	1.804	6.072	1.075	34.304	0.041*
Skilled workers and free business	0.953	2.594	0.549	12.262	0.229

*AOR adjusted odds ratio CI Confidence interval *p<0.05 is statistically significant **p≤0.001 is statistically highly significant ¥ reference category*

education, brief IPR≤45, specific necessity≤9 and poor medication adherence significantly increased risk of poor blood pressure control by 2.974, 6.39, 3.14, 6.12 and 5.6 folds respectively. Being not working/unskilled or skilled/free business, using from 3 to 4 drugs increased significantly risk of poor control by 5.19, 7.67 and 2.35 folds respectively. use of ACEI/ARBs or Beta blockers protected against poor blood pressure control (Table 2).

On doing binary backward Wald logistic regression analysis, not working and unskilled (AOR=6.072), skilled workers or free business (AOR=2.594), BMQ general overuse score > 21 (AOR=25.505), BMQ specific concern>15 (AOR=1.163), BMQ specific necessity≤9 (AOR=14.132), number of medication [3 to 4] (AOR=55.824), male sex (AOR=10.173), poor medication adherence (AOR=2.883), and brief IPR≤45 (AOR=4.225) were independent risk factors for poor control (Table 3).

There were significant relations between adherence and sex, social class, marital status, education, occupation, duration, number of medications, use of diuretics , family history of hypertension-induced mortality, causal item of IPQ, general overuse, specific concern and specific necessity (Table 4). Male sex (COR=2.974), unskilled and skilled workers (COR=2.73), had less than secondary education (COR=8), negative family history of hypertension-induced mortality (COR=2.05), perceiving hereditary (COR=0.44), lifestyle as causes of hypertension (COR=0.58), general overuse>15 (COR=2.23), specific concern >21 (COR=4.19) and specific necessity ≤9 (COR=5.6) were significant risk factor of poor medication adherence. Use of diuretics significantly increased risk of poor adherence by 2.13 folds (Table 4).

On doing binary backward logistic regression analysis, BMQ specific necessity≤9 (AOR=2.599), BMQ general overuse score (>15) (AOR=4.741), using 3 to 4 drugs (AOR=2.721) were risk factors of poor medication adherence. Being not working/unskilled workers (AOR=0.111) and skilled worker/free business (AOR=0.145), disease duration>5 years (AOR=0.085), perceiving lifestyle (AOR=0.176) and hereditary (AOR=0.148) as causes of hypertension, having secondary education or higher (AOR=0.012) were

Table (4a) Association between poor medication adherence and both demographic and disease related characteristics of the studied patients:

Parameters	Total	Poor medication adherence	p	Odds ratio (95% CI)
	N=259	N=97(%)		
Age:				
≤35 years	144	50 (34.7)		0.77 (0.46 – 1.28)
>35 years	115	47 (40.9)	0.31	1 (reference)
Sex:				
Male	112	58 (51.8)		2.974 (1.77 – 5.01)*
Female	147	39 (26.5)	<0.001**	1 (reference)
SES:				
Low	193	78 (40.4)		0.89 (0.46 – 1.73)
Middle	44	19 (43.2)		1 (reference)
High	22	0 (0)	0.006*	0
Marital status:				
Single	29	10 (34.5)		0.74 (0.32 – 1.67)
Married	180	75 (41.7)		1 (reference)
Divorced/widow	50	12 (24)	0.021*	0.44 (0.22 – 0.9)*
Education:				
Less than secondary	140	80 (57.1)		8 (4.33 – 14.77)*
Secondary and higher	119	17 (14.3)	<0.001**	1 (reference)
Occupation:				
Not working and unskilled	139	67 (48.2)		2.73 (1.36 – 5.44)*
Skilled and free trades	65	16 (24.6)		0.96 (0.42 – 2.19)
Clerk and professional/semi	55	14 (25.5)	<0.001**	1 (reference)
Duration:				
≤ 5 years	160	70 (43.8)		1 (reference)
>5 years	99	27 (27.3)	0.008*	0.48 (0.29 – 0.83)*
Medication:				
1 – 2	124	33 (26.6)		1 (reference)
3 - 4	135	64 (47.4)	0.001**	2.49 (1.47 – 4.19)*
Drugs:				
Diuretics	159	70 (44.03)	0.006*	2.13 (1.24 – 3.65)*
ACEIs/ARBs	148	50 (33.8)	0.169	0.69 (0.42 – 1.15)
CCBs	49	18 (36.7)	0.908	0.96 (0.51 – 1.83)
Beta-blockers	169	57 (33.7)	0.089	0.63 (0.38 – 1.07)
Causal effect:				
Stress	117	55 (49.6)		1 (reference)
Hereditary	71	20 (45.1)		0.44 (0.24 – 0.83)*
Lifestyle	71	24 (9.9)	<0.001**	0.58 (0.31 – 1.06)
Family history:				
Irrelevant	166	67 (40.4)		1.67 (0.83 – 2.42)
Relevant	93	30 (30.9)	0.196	1 (reference)
Family history of mortality:				
Negative	207	84 (86.6)		2.05 (1.03-4.07)*
Positive	52	13 (25)	0.038*	1 (reference)

protective factors among poor adherence (Table 5).

Discussion

Suffering from a predominantly asymptomatic condition such as hypertension, makes patients feel that drug had no benefit. Instead, they perceived that drugs would add risk of dependence and adverse effects. This leads to impaired medication adherence, blood pressure control and increases risk of complications

Poor medication and blood pressure control were observed in more than half of the studied patients.

Table (4b) Association between poor medication adherence and both demographic and disease related characteristics of the studied patients:

Parameters	Total	Poor medication adherence	p	Odds ratio (95% CI)
	N=259	N=97(%)		
Brief IPR				
≤45	138	56 (40.6)		1.33 (0.8 – 2.21)
>45	121	41 (33.9)	0.267	1 (reference)
General overuse:				
≤15	164	50 (30.5)		1 (reference)
>15	95	47 (49.5)	0.002*	2.23 (1.32 – 3.76)*
General harm:				
≤15	142	47 ()		1 (reference)
>15	117	50 (38.7)	0.111	1.51 (0.91 – 2.5)
Specific concern:				
≤21	130	28 (21.5)		1 (reference)
>21	129	69 (53.5)	<0.001**	8.74 (4.6 – 15.25)*
Specific necessity:				
≤9	143	77 (53.8)		5.6 (3.13 -10.01)*
>9	116	20 (17.2)	<0.001**	1 (reference)

*CI Confidence interval *p<0.05 is statistically significant **p≤0.001 is statistically highly significant COR crude odds ratio ACEI/ARBs (Angiotensin converting enzyme inhibitors/Angiotensin receptors blockers), CCB (calcium channel blockers)*

In a prior Ethiopian research by Muleta et al.[20], 43.51% reported good blood pressure control. They also reported that patients' older ≥50 years, female, disease duration, non-adherence and poorly controlled diabetes were significant predictors for uncontrolled hypertension.

In a survey in Cameron, 63.2% of patients had poor blood pressure control. Non-adherence was associated with poor blood pressure control.[21]

In prior study held in Saudi Arabia, 54% of them were non-adherent to antihypertensive medications. Male sex, patients older than 65 years, and comorbid diabetes were risk factors of poor medication adherence.[22]

Non-adherence to antihypertensive drugs ranges from 45.2% to 66.7% in low- and middle-income countries.[2,23]

Furthermore, only 6.2% of hypertensive patients were confirmed to have a high level of adherence in Saudi Arabia.[24] In China, only 21.3–35.23% of patients showed good or optimal adherence to their antihypertensive therapy.[25-26]

Poor medication adherence was reported in in 58.6% in a previous study in Ghana.[27] In a previous Egyptian study, non-adherence was prevalent among adult patients (29.03%).[12] Farahat et al.[12], also reported that poor adherence was more prevalent among adult as compared to elderly patients. In That study showed female sex was associated with non-adherence in disharmony with the current study.

Shelley et al.[28] denied role of medication number or income on blood pressure control yet they confirmed relation between male sex and poor control in disagreement with the current study where increasing number of drugs (from 3 to 4 increased risk by about 56 folds that may be attributed to poor adherence).

Male sex is considered a risk factor for poor medication adherence and hence, blood pressure control. Feeling that their disease is a burden that hinders work and necessitates drug use with increased expenditures can explain this finding. This, in turn, represents a big load on male patients who are supposed to be the active members in society and have the main financial responsibilities of their families.

Having positive family history of mortality due to hypertension raised concerns about importance of medication

Table (5) Logistic regression analysis of risk factors for poor medication adherence:

	β	AOR	95% C.I.		p
			Lower	Upper	
Clerk, semi/professional¥					0.044*
Not working/unskilled	-2.196	0.111	0.018	0.696	0.019*
Skilled/free business	-1.934	0.145	0.03	0.692	0.016*
Education (secondary education and higher)	-4.438	0.012	0.002	0.093	<0.001**
Medication numbers (3-4)	1.001	2.721	1.166	6.351	0.021*
BMQ general overuse (>15)	1.796	4.741	1.914	11.742	0.001**
BMQ specific necessity (≤9)	0.955	2.599	1.207	5.596	0.015*
Duration (>5 years)	-2.463	0.085	0.019	0.388	0.001**
Causal factors (stress)¥					<0.001**
Causal factors (Lifestyle)	2.259	0.176	0.049	0.634	0.008*
Causal factors (Hereditary)	1.219	0.148	0.051	0.43	<0.001**

*AOR adjusted odds ratio CI Confidence interval *p<0.05 is statistically significant **p≤0.001 is statistically highly significant ¥ reference category*

adherence and optimal blood pressure control as appeared in this research. Increased BIPQ scores denoted that hypertension is perceived as life threatening condition which is considered double edged weapon. However, in our patients, it was protective factor of both poor adherence and control. Using minimal number of drugs significantly protected against poor adherence and control. This can reassure patients that adverse effects will be less and decreases risk of forgetfulness of using drugs.

Regarding type of drug uses, both beta blockers and ACEI/ARBs protected against poor blood pressure control while diuretics increased risk of poor medication adherence and hence poor blood pressure control. Diuretics are known to be linked with many adverse effects as electrolyte imbalance and social embracement in the form of repeated micturition.

Perceiving lifestyle and hereditary as causes of hypertension increased risk of poor control as the patient felt that getting the disease is inevitable while perceiving it as a consequence of bad lifestyle made patients feel empowered. Also, lifestyle modifications are not so easy. Perception of need of lifestyle modification and further changes may appear as obstacles for poor control but not adherence. On the other hand, both protect against poor medication adherence.

Education and occupation had unpredictable effect on outcome measures. Increasing education level, and hence occupation is supposed to improve medication adherence via increasing awareness. Also, high education and working as professional or semiprofessional are also associated with high stress especially in type A personality which if increased medication adherence yet, it undermines blood pressure control. In the current study, in logistic regression analysis, occupation either not working/unskilled, skilled/free business protected against poor medication adherence. While both increased risk of poor blood pressure control. There are many confounders, including income, act as an obstacle facing medication adherence which neutralize protective effect of higher education and occupation

Previous, qualitative study revealed that perceiving hypertension as benign disease increased risk of poor control.[24]

In a previous research, non-significant association was found between blood pressure control and the BMQ- specific-necessity subscale in disagreement with our study.[25]

Poor medication adherence acts a significant risk factor for poor adherence which is axiomatic. Patients with poor adherence were found to be at 1.4 times more likely to have uncontrolled hypertension.[26] This agreed with the current study.

Beliefs about medicines alone were found to be responsible for 22.4% of non-adherence to chronic drug therapy.[27] In the same context, Jamous et al.[28] reported a significant association between adherence and both specific necessity and specific concern.

Horne et al.[19] concluded that higher adherence was associated with stronger perceptions of necessity of treatment (OR = 1.742), and fewer concerns about treatment (OR = 0.504).

In a previous study in Oman, less than half of patients had adequate adherence. In that study, there is significant negative correlation between perceived severity, overuse, and medication adherence. There was significant positive correlation between specific necessity and adherence.[7]

Rajpura and Nayak[10] conveyed that about two thirds of their patients were non-adherent. Perceptions about illness and beliefs about medication jointly played a significant role in the prediction of compliance.

A study in Nigeria has shown that there was statistically significant relationship between patients' beliefs about antihypertensives and adherence to treatment. Patients who were adherent had strong belief that their medicines are effective in protecting them from complications.[34]

Several factors associated with poor or non-adherence had also been identified in many studies. These include socio-demographic factors, such as sex, age, education level, occupational status, or even race[2,23]; socio-economic status,[23]; and family history, number of prescribed drugs, comorbidity, and duration of hypertension as clinical disease-related factors.[36-37] Psychosocial factors also impact medication adherence, including depressed mood, perceived disease severity, self-rated health, and self-efficacy.[7,38] Awareness and patient literacy[32,39] were also found to be predictors of compliance.

Beliefs about medications play a fundamental role in adherence patterns. Higher levels in beliefs of drugs' harm and higher concerns about pharmacological hypertensive treatment were related to low adherence. Beliefs of necessity and overuse did not influence adherence levels in a prior study.[40]

Control of illness was the most significant predictor of a favorable outcome[41] Patients who believed in their own ability to control illness and had strong confidence in management plan reported better medication adherence in many studies.[10, 16, 42]

Hsiao and colleagues[43] reported that there is a negative association between patients' beliefs about their control of illnesses, emotional representation and medication adherence.

Illness perceptions are influenced by information that patients receive from health care professionals and the satisfaction with the information received. Once patients report symptoms after a diagnosis, inconsistency between symptom attributions of patients and health professionals may arise. Eventually, patients may adopt the perspective of professionals, but they will continue to try to understand their symptom. Experience based on personal perceptions, not the illness entity can create more barriers to adherence to therapeutic regimens.[42] Therefore, it is important to assess patients' views about their illness, symptoms, treatments and also their satisfaction with information received prior to and during treatment.

Patients seemed more concerned about becoming drug dependent. Low adherence level is higher among patients with more concerns about medications. This throws shades on importance of identifying such fears and probing their hidden agenda when evolving a plan of care.

A negative association was reported between patients' beliefs about illness control, emotional representation, and

medication adherence. This may be attributed to the fact that patients of this study had high numbers of symptoms and negative emotional responses towards their illness.[38]

Among significant findings within the current study that some factors which impaired blood pressure control were protective from poor adherence as causal item of BIPQ and occupation. This can be explained that adherence is not the sole factor that affects blood pressure control. In addition, medication adherence was subjective which may not reflect the precise patients' act.

This study had many strength points. Both adherence and blood pressure control were measured as adherence is not the sole factor that can predict control. Importance of patient perception of disease and medication were assessed in relation to both adherence and illness control. To our knowledge, no other study in Egypt highlighted these points. This acts as a ground study to develop programs targeting perception and medication beliefs to empower patients and optimize blood pressure control. This will benefit patient, family, and the whole community. Addressing patient hidden agenda is an inevitable item in management

Conclusion

Belief about medications and degree of illness perception were among the predictors of poor medication adherence and blood pressure control as well. Both can affect blood pressure control directly or indirectly via influencing adherence. Poor medication adherence posed a significant risk for poor control of hypertension

Hence; assessment of medication beliefs and illness perception are important for success of management strategies. Health care providers should address the patient's beliefs about medications in the hope of improving medication adherence and patients' outcome.

Limitation of the study: Being cross sectional in nature, utilizing subjective tools for measuring adherence, illness perception and belies about medications with possible recall bias, being single center study on relatively small number of patients were the most significant boundaries.

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