

Anti-Hypertensive Drug Treatment and Lifestyle Modifications among Patients with Hypertension: Factors Affecting Adherence

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ABSTRACT

Background: The adherence to antihypertensive drugs and life style modifications is a major mean to control hypertension. **Aim:** The current study aimed to; identify the level of adherence to both the antihypertensive drug treatment and lifestyle modifications among hypertensive patients and factors affecting adherence. **Subject and Methods:** Descriptive cross-sectional design was used. The study was conducted with convenient sample of 100 hypertensive patients in medical departments of two university hospitals, Cairo and Minia 50 patients from each hospital; using a structured interview questionnaire tool which developed by the investigator based on Modified Health Belief model (HBM). **Results:** patients in Cairo hospital only who had high level of adherence to drugs (77.17%) while all patients had low level of adherence to life style modification (<75%), Individuals with high level of adherence were male, married, urban and aged between 45 and 64 years. HBM variables (perceived severity, perceived susceptibility, perceived benefit, perceived barrier, internal factors and health care provider factors) were statistically significant; the cues to action did not show statistical significance. **Conclusion:** the majority of patients had low levels of adherence, high levels of uncontrolled hypertension, obesity and The reported levels of perceptions to HBM variables support the interplay of other contributory factors to non-adherence. **Recommendations:** The study recommends Nurses/Doctors to educate patients about adherence necessity, benefits and behaviors and also, recommends policy makers to review and solve problems of cost for drug and medical advice. Further researches are needed in adherence behavior regarding barriers and factors for improvement.

Key words: Hypertension, Adherence, Health belief model, treatment, Blood pressure control

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INTRODUCTION

Hypertension (HTN) is characterized by sustained increases in systemic blood pressure. Chronically, this elevation is associated with a higher risk of renal, cardiac, and brain damage, as well as with

other diseases (Mathunjwa-Dlamini, Mathunjwa,, Gary and Yarandi, 2011). The control of HTN could be achieved by pharmacological and non- pharmacological treatment in order to maintain arterial blood pressure (BP) below 140mmHg for systolic pressure (SBP) and 90mmHg for

diastolic pressure (DBP) (Mancia et al., 2013).

However, the effectiveness of antihypertensive agents has improved considerably; poor adherence with medication treatment remains a major problem among hypertensive patients, and has been identified as one of the main causes of failure in achieving blood pressure control (Mancia, et.al, 2013). Low level of adherence to antihypertensive treatment; both pharmacological and non pharmacological, is a major public health challenge. Adherence to treatment has been defined as the extent to which patients' behaviors coincide with health care providers' recommendations for health and medical advice (Chrostowska and Narkiewicz , 2010).

Poor adherence has been attributed to unnecessary over-prescription of drugs, substantial worsening of diseases, avoidable increases in hospital admission rates, longer hospital stays, leading to a significant medical burden (Edwards, and Banos, 2013). There are multiple factors can affect treatment adherence include complex medication regimens, dosing frequency, behavioral factors, side effects of treatment, lack of knowledge about safe life style behaviors, patient's knowledge and attitudes towards medications (Europe PubMed Central, 2012).

Antihypertensive treatment adherence has been extensively evaluated in many developed countries in the West using different methods of medication adherence measurement (Bovet, Gervasoni, Mkamba, and Balampama, 2008); however there is a need for more studies to improve control of hypertension among Egyptian population(Friedman, et al., 2010).

The aim of this study was to identify the level of adherence to both the antihypertensive drug treatment and lifestyle modifications among hypertensive patients and factors affecting adherence. The findings of this study could provide more comprehensive information for Nurses/Doctors and health care policy makers with targets to improve treatment adherence.

SIGNIFICANCE OF THE STUDY

Hypertension is an increasingly important health issue worldwide. From 1999 to 2009 the death rate from high blood pressure (HBP) increased 17.1 percent, and the actual number of deaths rose 43.6 percent. Almost a quarter of the world's adult population has hypertension, and the prevalence is projected to rise to 29% by 2025 (Ibrahim, 2014) About one third of adults in most communities in the developed and developing world have hypertension (Ibrahim, and Damasceno, 2012).

Data from the Egyptian National Hypertension Project (NHP) (Weber, et al., 2014) showed that hypertension is common among Egyptians. In the years (1991–1993), 26.3% of adult Egyptians have high blood pressure. More than 50% of individuals older than 60 years suffered from hypertension. At present, if the same prevalence rates did not change, it is predicted that with an Egyptian population of more than 80 millions, there are approximately 15 millions with hypertension and about 7 millions will be in need of lifelong drug treatment and regular follow-up (Ibrahim, and Damasceno, 2012). The problem is complicated by the low awareness rates, only 38% of hypertensive Egyptians were aware of having high blood pressure, only

24% were receiving treatment, whereas control rates (<140/90 mmHg) were 8%. Other cardiovascular risk factors namely hypercholesterolemia, increased LDL-cholesterol, low HDL-cholesterol, hypertriglyceridemia, diabetes, impaired glucose tolerance and obesity were present in 60% of hypertensive patients (Mittal and Singh, 2010).

Target organ damage was present in patients with more than stage I hypertension (160/100 mmHg), e.g. ECG-LVH in 20%, coronary artery disease (CAD) 16%, systolic heart failure in 5% and renal failure in 3.2% (Whiting, Guariguata, Weil and Shaw, 2011). Egyptians have one of the highest mortality rates secondary to CAD worldwide (Ibrahim, Elamragy, Girgis, and Nour, 2011; Hermida, Ayala, Mojón, and Fernández, 2010) Hypertension is an established major risk factor for CAD.

Because of its high prevalence, the treatment of hypertension puts economic pressure on Egyptian economy. Drug cost is the major determinant of cost of care, responsible for around 80% of total cost of hypertension care within the first year of treatment (Mendis, Puska, and Norrving, 2011; Lovibond, Jowett, Barton, Caulfield, Heneghan, Hobbs, 2011). In Egypt, the drug cost of hypertension (total antihypertensive market) during the year 2011 was more than one billion Egyptian pounds, a dramatic increase from 600 million in 2007 (Lovibond, et al., 2011).

These epidemiologic data imply the need for finding out factors affecting adherence as a major mean to improving the control of hypertension.

AIM OF THE STUDY

The aim of the current study had two folds; 1) Identify the level of adherence (to the antihypertensive drug treatment and lifestyle modifications) of hypertensive patients. 2) Identify factors affecting adherence (to antihypertensive drug treatment and lifestyle modifications) of hypertensive patients.

RESEARCH QUESTION

1. What is the level of adherence to the antihypertensive drug of hypertensive patients?
2. What is the level of adherence to the lifestyle modifications of hypertensive patients?
3. What are the factors affecting adherence to antihypertensive medication and lifestyle modifications necessary to maintain hypertension control?.

SUBJECT AND METHODS

Research design:

A descriptive cross-sectional design was utilized to achieve the aim of the current study.

Setting:

The study was conducted at medical departments in a University Hospitals in Cairo and Minia -Egypt. Cairo university Hospital was tagged as Hospital (1) and Minia university Hospital was tagged as Hospital (2)

Sample

The study was conducted with a convenient sample of 100 patients with Hypertension at age of ≥ 18 years with conformed diagnosis of hypertension for at least 6 months with or without other co-existing medical conditions. Patients unwilling to share personal, social or medical information were excluded from the study sample. Half of the study sample were from hospital 1 (Cairo university hospital) and another half were from hospital 2 (Minia university hospital).

Data collection tool

One data collection tool was used to collect data pertinent to the study variables; structured interview questionnaire was developed by the investigator based on Modified Health Belief model (HBM). The questionnaire was translated from English to Arabic language that is understood and well spoken by all Egyptians. The structured data collection instrument permitted the researcher to ask the same questions to all participants and mark their responses using predetermined response options in 11 sections that were extracting socio-demographic and medical information of patient in first two sections and answer of research questions in view of the following sections that were of 4-point Likert scales including the following: 3) Level of adherence to drug treatment regimen. 4) level of adherence to lifestyle modifications. 5) Perception of severity. 6) Perception of risk. 7) Perception of benefits. 8) Perception of barriers. 9) Internal factors. 10) Health care provider factors (HCPFs). 11) Cues to action.

For data management, the score for each item in the sections 3-11 was obtained by calculating the mean so, the score ranges from 1 to 4 with corresponding level 25% to 100%. The cut point determined by mean score 3 at level of 75%. Treatment adherence in current study points to both drug treatment and life style modifications. In sections 3-4 was the adherent subject those of $\geq 75\%$ level in which negative behaviors such as smoking was reversed in coding.

Perceived factors of adherence derived from HBM variables, sections 5-11 were negative or positive factors in which the satisfactory level of each was 75% and above. The total mean and level % of each scale score of individual respondents' score was used to facilitate correlational and inferential statistics by categorizing the respondents into two distinct groups of $\geq 75\%$ and $< 75\%$.

The content validity was examined by three experts who were affiliated to Faculty of Nursing, Cairo University at medical surgical nursing department. The instrument was examined for content coverage, clarity, relevance, applicability, wording, length, format, and overall appearance. Based on experts' comments and recommendations; minor modifications had been made such as rephrasing and rearrangements of some sentences.

Reliability: Internal consistency of interview questionnaire was assessed with the Cronbach's alpha coefficient as represented in table (A).

Table (A): Conbach's alpha for the interview questionnaire subscale:.

Subscale title	Cronbach's Alpha
Level of adherence to antihypertensive drug	0.882
Level of adherence to lifestyle modifications	0.739
Perception of severity	0.850
Perception of risk	0.841
Perception of benefits	0.823
Perception of barriers	0.737
Internal factors	0.800
HCPFs	0.760
Cues to action	0.773

Pilot study

Random selection of 10% (10 patients) of total number of patients was done to investigate and ensure the feasibility, objectivity, applicability, clarity, adequacy, content validity, and internal consistency of the study tools and to determine possible problems in the methodological approach or instrument. The results of the pilot study will be used to test the proposed statistical and data analysis methods. The tools were completed without difficulty, adding support to the validity of the instrument. Little modification was done e.g. rephrasing and rearrangements of some sentences. The time required for completion of the interview questionnaire didn't exceed 25 minutes. Cases involved in the pilot study were excluded from the main study sample. Pilot testing helped the investigator plan for data collection.

Data collection procedure:

An official permission from the managers of each hospital was obtained. Patients were interviewed individually to explain the purpose and the nature of study and a written informed consent was obtained. The investigator informed them that participation was voluntary, and the possibility of withdrawing at any time. Confidentiality of the information was assured. The period of conducted interview questionnaire was maximally 25 minutes and at rate of 2 to 4 study subjects per week. Physiological parameters of Blood pressure, height and weight were measured for all participants with the same instrumental devices throughout the data collection period of the study. Data collection was conducted over a seven months period extending from November 2013 till June 2014.

Ethical Considerations

A written approval was obtained from the Ethical Committee at the Faculty of Nursing, Cairo University. Each patient was informed about the purpose of the study and its importance. The researcher emphasized that, participation in the study was entirely voluntary and possibility to withdraw at any time. Confidentiality was also assured through coding the data. An informed written consent was obtained from patients accepted to be included in the study.

RESULTS:

The results were presented in the following sequence: Distribution of socio-demographic and medical characteristics of participants and adherent proportions, summary of treatment adherence levels and factors in response to research questions; 1) levels of adherence to antihypertensive drugs, 2) levels of adherence to the lifestyle modifications; 3) perceived factors affecting adherence derived from 7 scales of the 7 HBM variables. Then Statistical Relationships and Correlations were presented.

Table 1 presented that the highest proportions in demographics of participants in Cairo hospital were to age group of 55 – < 65 yrs (28%), female gender (52%), urban resident (68%), married status (68%), unemployed participants (34%) and secondary educated participants (46%). In hospital of Minia; the highest proportions in demographics of participants were to age group of 45 – < 55 yrs (30%) and 55 – < 65 yrs (30%), female gender (68%), rural residence (58%), married status (64%), unemployed participants (58%) and Illiterate participants (28%). Regarding to Person's worth from family income per

month 200- < 300 LE occupied the highest proportions in Cairo hospital (30%) and Mina hospital (38%). It also showed that the highest adherence proportions in Cairo were to age of (55-≤65yrs) (64.28%), male participants (54.17%), urban (58.82%), governmental employee (75%), read and write (66.66%) and those of worth from family income per month ≥ 500 (75%). In Minia; were the highest adherence proportions also to male participants (43.75%), urban (42.86%), but differed to be for age of (45-≤55yrs) (53.33%), unemployed (44.83%), university educated (60%) and those of worth from family income per month (300-< 400) (60%).

Table 2 showed the highest proportions of participant subjects in Cairo hospital were with high BMI (64%), with high BP value during interview (76%), with noted uncontrolled BP during last month (64%), with > 5yrs disease period (42%), with Kidney disease (52%), with one co-morbidity (60%) and who are taking one drug for HTN (42%) and ≥ three drugs for co-morbidities (82%). Regarding to participant subjects in Minia hospital had a near description as the highest proportions were with high BMI (98%), with high BP value during interview (72%), with noted uncontrolled BP during last month (68%), with > 5yrs disease period (42%), with diabetes disease (48%), one co-morbidities (42%) and who are taking one drug for HTN (54%) and ≥ three drugs for co-morbidities (46%). It also showed that the highest adherence proportions in Cairo were to with high BMI (56.52%), with normal BP value during interview (66.66%), with non noted uncontrolled BP during last month (66.66%), with one year disease period (71.43%), with Kidney disease (73.08%), of non co-morbidities (100%) and who are taking ≥ three drug for HTN (80.00%) and

no drugs for co-morbidities (100%). In Minia; were the highest adherence proportions also to high BMI (40.82%), with normal BP value during interview (71.43%), with non noted uncontrolled BP during last month (43.75%) and who are taking \geq three drugs for HTN (50%) but it differed to be for with less than one year disease period (100%), with liver disease (75%), of one co-morbidities (52.38%) and one drugs for co-morbidities (71.43%).

Table 3 showed that the participant subjects in Cairo hospital tend to be adherent to antihypertensive drug treatment with level of adherence 77.17% in contrast to participant subjects in Minia hospital tend to be non-adherent with level of adherence 68.92%. It also indicates that participant subjects in both hospitals were less adhered to lifestyle modifications without significant difference in the level of adherence between Cairo hospital 70.21% and Minia hospital 73.83%.

Table 4 showed that participants in both hospitals matched high levels of perception of benefits; (82.92%) in Cairo hospital and (78.50%) in Minia hospital; and matched low level of perception to other HBM variables.

Table 5 showed that the participants in both hospitals had poor perception to knowledge of non adherence hazards, ability to control HBP factors, Role of mass media (TV, Radio), Role of education means (Leaflets, posters), concept of being primary responsible, nurse's explanation of HBP management, treatment in hospital is effective. It also showed that death of others with HBP and effective treatment in hospital didn't affect participants in Cairo hospital while contact with doctor didn't affect participants in Minia hospital.

Table 6 showed that the participants in both hospitals had poor perception to feeling better, Underestimation of disease risk, ineffective medicine, thinking in natural herbs for cure and Lack of clarity and simplicity.

Table 7 represented correlations between treatment adherence (drug treatment and lifestyle modifications) and participants' demographics. There is significant relation between drug treatment adherence and married participant subjects in Minia hospital. Adherence to lifestyle modification had significant relation in both hospitals with male and unemployed participant.

Table 8 represented the correlations between treatment adherence (drug treatment and lifestyle modifications) and participants' medical data. In Minia hospital; there is significant negative relation between drug treatment adherence and high BP value during interview, high BMI, \geq 5 yrs Period of disease and \geq 3 co-morbidities. Adherence to lifestyle modification had significant relation in Minia hospital with normal BP value during interview.

Table 9 presented the correlations between treatment adherence (drug treatment and lifestyle modifications) and HBM variables. In Cairo hospital; there is significant positive relation between perception of severity, perception of risk, perception of benefits, internal factors and treatment adherence; significant negative relation with perception of barriers and no relation with health care provider factors and cues to action. In Minia hospital; there is significant positive relation between Perception of severity, Perception of benefits, internal factors, health care provider factors and treatment adherence;

**Anti-Hypertensive Drug Treatment and Lifestyle Modifications among Patients with Hypertension:
Factors Affecting Adherence Nursing**

significant negative relation with and perception of risk and cues to action. perception of barriers and no relation with

Table1: Frequency and Percentage Distribution of demographics & adherent participants (n= 100)

Demographic variables	HOSPITAL (1) (n=50)		HOSPITAL (2) (n=50)	
	participants No (%)	Adherent No (%)	participants No (%)	Adherent No (%)
Age group (yrs)				
< 25	2 (4)	1 (50.00%)	0 (0)	0 (0.00%)
25-	4 (8)	1 (25.00%)	2 (4)	0 (0.00%)
35 -	11 (22)	6 (54.54%)	6 (12)	3 (50.00%)
45-	11(22)	6 (54.54%)	15 (30)	8 (53.33%)
55 -	14 (28)	9 (64.28%)	15 (30)	5(33.33%)
≥ 65	8 (16)	4 (50.00%)	12 (24)	4(33.33%)
Mean ± SD	50.94 ± 11.334		54.64 ± 10.95	
Gender				
Male	24 (48)	13(54.17%)	16 (32)	7(43.75%)
Female	26 (52)	14(53.85%)	34 (68)	14(41.18)
Residence				
Urban	34 (68)	20(58.82%)	21 (42)	9 (42.86%)
Rural	16 (32)	7 (43.75%)	29 (58)	11(37.93%)
Marital status				
Single	3 (6)	1 (33.33%)	1 (2)	1(100%)
Married	34 (68)	19(55.88%)	32 (64)	16 (50.0%)
Divorced /Widowed	13 (26)	7 (53.85%)	17 (34)	3 (17.65%)
Type of work				
Governmental	8 (16)	6 (75.00%)	12 (24)	4(33.33%)
Non – governmental	12 (24)	5 (41.67%)	1 (2)	1(100%)
Daily wages	7 (14)	2(28.57%)	7 (14)	2 (28.57%)
Retired	6 (12)	2(33.33%)	1 (2)	0(0.00%)
Unemployed	17 (34)	12(70.59%)	29 (58)	13(44.83%)
Level of education				
Illiterate	4 (8)	2 (50.00%)	14 (28)	7(50.0%)
Read and write	12 (24)	8(66.66%)	8 (16)	2(25.00%)
Elementary	3 (6)	1(33.33%)	8 (16)	1(12.50%)
Secondary	23 (46)	11(47.83%)	10 (20)	4(40.00%)
University	8 (16)	5(62.50%)	10 (20)	6(60.00%)
Person's worth from family income per month (LE)				
< 100	8 (16)	3(37.50%)	2 (4)	0(0.00%)
100 -	10 (20)	4(40.00%)	11 (22)	5(45.45%)
200 -	15 (30)	8(53.33%)	19 (38)	8(42.10%)
300 -	9 (18)	5(55.55%)	5 (10)	3(60.00%)
400 -	4 (8)	1(25.00%)	3 (6)	0(0.00%)
≥ 500	8 (16)	6 (75.00%)	10 (20)	4(40.00%)

Table 2: Frequency and Percentage distribution of medical characteristics & adherent participants (n=100)

Medical variables	HOSPITAL (1) (n=50).		HOSPITAL (2) (n=50)	
	No (%)	Adherent No (%)	No (%)	Adherent No (%)
Body mass index				
Healthy weight	4 (8)	1(25.00%)	1 (2)	0 (0.00%)
Obese	46 (92)	26 (56.52%)	49 (98)	20 (40.82%)
BP value during interview				
Normal BP	12 (24)	8 (66.66%)	14 (28)	10 (71.43%)
High BP	38 (76)	19 (50.00%)	36 (72)	10 (27.78%)
uncontrolled BP last month				
Yes	32 (64)	15 (46.87%)	34 (68)	13 (38.32%)
No	18 (36)	12 (66.66%)	16 (34)	7 (43.75%)
Known Period of HTN disease (yrs)				
< 1	5 (10)	1 (20.00%)	2 (4)	2 (100%)
1	7 (14)	5 (71.43%)	3 (6)	2 (66.66%)
2	2 (4)	1 (50.00%)	3 (6)	1 (33.33%)
3	6 (12)	3 (50.00%)	10 (20)	4 (40.00%)
4	4 (8)	1 (25.00%)	5 (10)	2 (40.00%)
5	5 (10)	3 (60.00%)	6 (12)	2 (33.33%)
> 5	21 (42)	13 (61.90%)	21 (42)	7 (33.33%)
No. of medicines for HBP				
One	21 (42)	11(52.80%)	27 (54)	13 (48.15%)
Two	19 (38)	8 (42.10%)	17 (34)	4 (23.52%)
≥ Three	10 (20)	8 (80.00%)	6 (12)	3 (50.00%)
Other co-existing medical conditions*				
Diabetes	17 (34)	7 (41.18)	24 (48)	11(45.83%)
Kidney	26 (52)	19 (73.08%)	9 (18)	1 (11.11%)
Heart	20 (40)	10 (50.00%)	10 (20)	3 (30.00%)
Respiratory	2 (4)	0 (0.00%)	14 (28)	3(21.43%)
Liver	2 (4)	1 (50.00%)	4 (8)	3 (75.00%)
Nervous system	1 (2)	0 (0.00%)	2 (4)	0 (0.00%)
No. of co-morbidities				
Nothing	1 (2)	1 (100%)	8 (16)	4 (50.00%)
1	30 (60)	15 (50.00%)	21 (42)	11(52.38%)
≥ 2	19 (38)	11 (57.89%)	21 (42)	5 (23.81%)
No. of medicines for co-morbidities				
None	1 (2)	1 (100%)	7 (14)	4 (57.14%)
One	3 (6)	0 (0.00%)	7 (14)	5 (71.43%)
Two	5 (10)	2 (50.00%)	13 (26)	5 (38.46%)
≥ Three	41(82)	24 (58.54%)	23 (46)	6 (26.09%)

* Total percentage exceeds 100% that a participant may have more than one disease.

**Anti-Hypertensive Drug Treatment and Lifestyle Modifications among Patients with Hypertension:
Factors Affecting Adherence Nursing**

Table 3: Levels of adherence to drug treatment & adherent distribution (n=100):

	HOSPITAL(1) (n=50)		HOSPITAL (2) (n=50)	
	Level of adherence	Adherent No (%)	Level of adherence	Adherent No (%)
1. Drug treatment	77.17	32(64%)	68.92	20 (40%)
2. Lifestyle modifications	70.21	12(22%)	73.83	30(60%)
3. Treatment adherence	73.69	27(54%)	71.37	20(40%)

Table 4: Levels of perception to HBM variables and high scored participants (n=100):

	HOSPITAL(1) (n=50)		HOSPITAL (2) (n=50)	
	Level of perception	High scored No (%)	Level of perception	High scored No (%)
Perception of severity	70.17	29(58%)	71.33	25(50%)
Perception of risk	66.17	18(36%)	58.00	8(16%)
Perception of benefits	82.92	36(72%)	78.50	30(60%)
Perception of barriers	50.15	0(0%)	56.06	4(8%)
Internal factors	69.65	18(36%)	68.34	18(36%)
HCPFs	69.29	14(28%)	71.67	19(38%)
cues to action	57.84	4(8%)	67.115	14(28%)

Table 5: Perceived factors positively affect adherence (n=100):

	HOSPITAL(1)(n=50)	HOSPITAL(2)(n=50)
1. reminding actions	32 (64%)	30(60%)
2. estimation of benefits	36 (72%)	30 (60%)
3. knowledge of non adherence hazards	22 (44%)	22 (44%)
4. know necessity of drug adherence	45 (90%)	38 (76%)
5. ability to refine blood pressure readings	36 (72%)	29 (58%)
6. ability to control HBP factors	16 (32%)	17 (34%)
7. ability to determine harmful meal	25 (50%)	37 (74%)
8. quick seeking medical care	42 (84%)	40 (80%)
9. contact with doctor	29 (58%)	20 (40%)
10. medical staff advice	48 (96%)	48 (96%)
11. Public advice (family members, friend)	40 (80%)	43 (86%)
12. Role of mass media (TV, Radio)	20 (40%)	17 (34%)
13. Role of education means (Leaflets, posters)	24 (48%)	28 (56%)
14. feeling unwell	32 (64%)	49 (98%)
15. Death of others with HBP	21 (42%)	39 (78%)
16. doctors ask about satisfaction with drugs	41 (82%)	37 (74%)
17. concept of being primary responsible	25 (50%)	23 (46%)
18. no latency in getting medical care	42 (84%)	30 (60%)
19. doctor's explanation of HBP management	34 (68%)	38 (76%)
20. nurse's explanation of HBP management	29 (58%)	28 (56%)
21. positive expectation of care in hospital	14 (28%)	40 (80%)
22. availability of medicine in hospital	39 (78%)	17 (34%)
23. social support	25 (50%)	47 (94%)

Table 6: Perceived factors negatively affect adherence (n=100):

Factors	HOSPITAL(1) (n=50)	HOSPITAL(2) (n=50)
1. Forgetfulness	15 (30%)	20(40%)
2. feeling better	35 (70%)	28 (56%)
3. Underestimation of disease risk	32(64%)	42(84%)
4. low knowledge of healthy behaviors	29 (58%)	27 (54%)
5. low financial ability to buy a medicine	17 (34%)	23 (46%)
6. Ineffective medicine	29 (58%)	25 (50%)
7. hassled about sticking to treatment	19 (38%)	16 (32%)
8. Fear of addiction / habituation	10 (20%)	25 (50%)
9. Fear of treatment side effects	16 (32%)	29 (58%)
10. frequent change of medication prescription	11 (22%)	19 (38%)
11. Large number of all medications	5 (10%)	7 (14%)
12. Concept that disease is curable	12 (24%)	15 (30%)
13. Concept that treatment for symptoms only	20 (40%)	21 (42%)
14. thinking in natural herbs for cure	43 (86%)	30 (60%)
15. Distant medical clinic	16 (32%)	27 (54%)
16. Differing views of doctors in treatment	23 (46%)	23 (46%)
17. Mistrust in doctor's capabilities	9 (18%)	17 (34%)
18. concept that doctor is the primary responsible	24 (48%)	23 (46%)
19. High cost of medical advice	4 (8%)	14 (28%)
20. Lack of clarity and simplicity	39 (78%)	37 (74%)
21. lack of time to exercise	24 (48%)	12 (24%)
22. Lack of time to relax	14 (28%)	20(40%)
23. sleeping problems	16 (32%)	26 (52%)

Table 7: Pearson's Correlation between treatment adherence and patients' demographics:

	Drug treatment adherence		lifestyle modification adherence	
	Hospital 1	Hospital 2	Hospital 1	Hospital 2
Age	.097	-.044	-.027	.005
Gender	-.116	-.048	.391**	.324*
Marital status	-.043	-.300-*	.091	-.036-
Residence	-.200	.019	.029	.138
Education	.075	.199	-.231	-.021
Type of work	-.027	-.035	.994**	.285*
Person's worth LE	.077	.104	-.112	.046

*correlation is significant at $p < 0.05$

**correlation is significant at $p < 0.01$

**Anti-Hypertensive Drug Treatment and Lifestyle Modifications among Patients with Hypertension:
Factors Affecting Adherence Nursing**

Table 8: Pearson’s Correlation between treatment adherence and patients’ medical data:

	Drug treatment adherence		lifestyle modification adherence	
	Hospital 1	Hospital 2	Hospital 1	Hospital 2
BP during interview	-.137	-.449**	-.027	-.335*
BMI	.193	-.479**	-.133	-.255
Period of disease	.143	-.328*	.019	-.064
Drugs for HTN	.054	-.122	.144	-.037
Uncontrolled BP	.173	.130	-.162	.201
No. of co-morbidities	-.063	-.293*	-.033	.006
Drugs for co-morbidities	.104	.195	.193	-.025

*correlation is significant at $p < 0.05$

** correlation is significant at $p < 0.01$

Table 9: The Correlation between treatment adherence and Health belief model variables:

Health belief mode variables	Treatment adherence			
	HOSPITAL (1)		HOSPITAL (2)	
	r	P- value	r	P- value
Severity perception	.461*	.001	.599**	.000
Risk perception	.488**	.000	-.123	.395
Benefit perception	.372**	.008	.285*	.045
Barrier perception	-.637**	.000	-.413**	.003
Internal factors	.613**	.000	.759**	.000
Health care providers	.231	.107	.369**	.008
Cues to actions	-.022	.877	.242	.090

*correlation is significant at $p < 0.05$

**correlation is significant at $p < 0.01$

Discussion

The purpose of this study was to identify the level of adherence to both the antihypertensive drug treatment and lifestyle modifications among hypertensive patients and factors affecting adherence using a structured interview questionnaire.

Regarding demographic characteristics of the participants, the mean age (SD) of all included hypertensive patients was (50.94 ± 11.334 years in Cairo hospital and 54.64 ± 10.95 years in Minia hospital); this is not surprising since hypertension is more common in older people. A study done by **Joho (2012)** on treatment compliance among hypertension patients in three district hospitals - dar

essalaam in Iran found mean age of 56.3 (±13.1) years of hypertensive patients.

The current study shows that, participants who were at age of 45- 64 years had higher level of treatment adherence compared to those with 65 and above years of age. These results are comparable to those reported from by **Gupta , Arshad & Poulter (2010)**. The possible explanation of these results might be the truth that, the young people have higher income since they are able to work and thus can afford to buy medication compared to older people. Another possible reason is that older people might have more than one disease due to aging reason, which might have led them using many drugs which make them tired, hence, stop

taking drugs. Cognitive and functional impairment in elderly patients increases their risk of poor drug adherence, so they need a family to remind, support and assist them in taking drugs.

From findings related to level of adherence in accordance to level of education, it seems that educational level may not be a good predictor of treatment adherence that patients without formal education level had high adherence to life style modifications in Cairo hospital compared to those with high education. This may be due to the reason that patients with lower educational level might have more trust in physicians' advice compared to those with higher level of education. In contrary to studies done by **Valdeoriola (2011)**, **Goldfarb-Rumyantzev (2011)** and **Theofilou (2012)** found that patients with higher educational level might have higher adherence as in Minia hospital. While **Aggarwal (2010)** and **Liu (2013)** found no association.

Low levels of perception to HBM variables except perception to benefits; it might be due to poor or ineffective exposure to the factor. Distribution of participants by reasons of non adherence to antihypertensive treatment were determined, the reasons were stopping medication because hypertension is symptomatic, curable, treatment is required with symptoms, underestimation of risk for developing the complications of hypertension, High cost of medical advice, lack of knowledge resources of healthy behaviors, Distant medical clinic, sleeping problems and low financial ability to buy a medicine, beliefs in cure with natural herbs, less explanation of nurses for HBP management, low positive perception of care expectation in hospital, low role of Mass media (TV, radio, newspaper and

journals) and other health education means (posters, leaflet and internet). **Koçkaya & Wertheimer (2011)** support the points above.

From current study; the relationship between HBM constructs and treatment adherence was observed; the constructs which were significantly showing relationship were perceived susceptibility of being at risk of getting hypertension complications, perceived benefit of using medicine, perceived barrier to treatment and cues to action. The perceived severity to hypertension did not show significant relationship with treatment adherence.

Uncontrolled hypertension is caused by non adherence to the antihypertensive drugs; Poor adherence compromises the effectiveness of treatment making this a critical issue in population health both from the perspective of quality of life and of health economics. The complications of uncontrolled hypertension are cerebrovascular, cardiovascular and kidney disease. When those complications arise patients end up in ICU leading to increased work load to both nurses and doctors. Those patients in critical condition especially with myocardial infarction or stroke stay longer in ICU causing increased cost of hospitalization. This has a poor outcome to their quality of life as it may cause permanent disability or death which increasing the burden to their family, community and nation as a whole. Patients understanding their drug regimens help to improve compliance to treatment thereby preventing complications of hypertension and the debilitating outcomes. **Kumar and Halesh** agree with points above.

The relationship between marital status and treatment adherence was observed, treatment adherence level of

married participants were more than non married participants, the help and support from a spouse could be the reason why married patients were more compliant to treatment than single patients.

In this study male participants were more adherent compared with female it was statistical significance (P 0.005 in cairo hospital and 0.022 in Minia hospital with lifestyle modifications). In contrary, Female patients have found by **Jing (2008) and Korb-Savoldelli (2012)** to be better adherence to treatment; this might be due to cultural weight of male gender in Egypt by which family care might be higher for male more than female.

Conclusions

This was a quantitative descriptive-correlational study aimed to; identify the level of adherence to both the antihypertensive drug treatment and lifestyle modifications among hypertensive patients and factors affecting adherence. The Health Belief Model was applied to investigate the interrelationships between various variables in the model and adherence. The study revealed unacceptably high levels of uncontrolled hypertension, obesity and low levels of adherence. The reported levels of perceptions to variables of health belief models support the interplay of other contributory factors to non-adherence in addition to uncontrolled hypertension.

RECOMMENDATIONS

In the light of the findings of the present study, the following are recommended:

- Nurse/Doctors must educate hypertensive patients about their

disease on the importance of adherence to hypertensive medications, the consequences of non- adherence to treatment. Patients should be told that the drugs are for long term use (for life).

- Health providers should orient themselves towards patients' behaviours (i.e barriers to adherence) that may interfere with adherence to therapy.
- Ministry of health and social welfare should review the policy of cost sharing, there is a need of free treatment to hypertensive patients, and also should plan strategies to improve antihypertensive adherence such as improving education campaign on the importance of adherence to antihypertensive medications, by the media, posters, and religion centres e.g. church and Mosque.
- More research should be done on negative beliefs and perceptions that hinder treatment adherence. No doubt, evidence from such studies would act to motivate not only patients to adhere but also health care professionals to intensify strategies to improve level of adherence.

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