Effect of Health Education Intervention on Improving Compliance to Treatment among Hypertensive Patients: Application of Health Belief Model

Marwa B Awad Allah[*] and Wael A khalil[**]

[*]Department of Community, Environmental and Occupational Medicine.[**]Department of Cardiology. Faculty of Medicine – Zagazig University, Egypt.

Abstract

Background: The Health Belief Model is trusted that a patient who feels susceptible to hypertension and its complications is more likely to abide to treatment as opposed to the subject who doesn't belief this idea. **Objectives:** to determine level of participants' knowledge about hypertension. Then to assess factors affecting treatment compliance with antihypertensive treatment guided by the use of Health Belief Model variables among hypertensive patients. Finally evaluate the effectiveness of using health education applying HBM on knowledge and compliance to treatment. **Methodology**: an intervention study was carried out using two groups. The two groups include: "The health belief model Group": received educational intervention sessions based on the HBM conceptual framework, "Comparison Group": received the traditional health education on knowledge about hypertension and compliance to medication and life style regimen. The target group was hypertensive patients in the hypertension clinic at Zagazig University Hospital. All patients attending the clinic over one month were included in the study as a comprehensive sample. **Results:** Marked improvement in the HBM group in overall compliance (61.3% to 79.6%) in contrast to the ordinary health education group no marked improvement. The percentages of Perceived susceptibility, Perceived severity, Perceived benefits, Perceived barriers, Self-efficacy cues to action show changes between pretest and post test results with a statistical difference in HBM group. For control group comparing pretest and post test results was of no significant difference except for Perceived severity, Perceived benefits, and self-efficacy. **Conclusions:** the findings support the hypothesis that using health education based on HBM has better results in adherence to treatment than traditional health education.

Key words: hypertension, compliance to treatment, Health belief model, health education program.

Corresponding author: Marwa Bayomi Awad Allah,. Email: tartourm@yahoomail.com

Introduction

Hypertension is a serious health problem in developed and developing countries; its increasing prevalence is a serious warning to take more consideration to this quiet disease [1].In many studies, the prevalence of hypertension in Middle Eastern countries and Mediterranean has been reported from 10% to 17% [2]. Approximately In Egypt 15 million experiencing hypertension and about 7 million will need regular follow-up and lifelong drug treatment. The issue is complicated by the low awareness rates[3].

Many clinical trials in hypertension have demonstrated that decrease of blood pressure (BP) is associated with huge declines in the occurrence of stroke, congestive heart failure ,ischemic heart disease,   and renal failure, regardless of age, sex, or race, severity of   hypertension   or   sort   of antihypertensive used. Studies all over the world show that despite the accessibility   of   effective   medical therapy,   more   than   half   of   all hypertensive   do   not   take   any treatment[4].

Uncontrolled   hypertension   is brought on by non-adherence to the antihypertensive medications, patients understanding   their   medications regimens enhance their adherence, thus will help prevent the complications of hypertension that are debilitating and if not anticipated can increase the burden of an illness that is as of now on the increase [5].

Non-adherence   can   be   as inadvertent (such forgetting) or can be intentional, whereby patients settle on a choice not to take treatment taking into account their own beliefs about their disease and treatment[6].

The Health Belief Model (HBM) is a psychological model that is utilized to predict and change health behaviors and spotlights on an individual's beliefs and attitudes[7].The HBM is a prominent conceptual framework of health behavior and serves as an aide for many public health   interventions[8].The   HBM depends   on   the   hypothesis   that   a person's willingness to change their health behaviors is essentially due to perceived   severity   susceptibility, perceived   susceptibility,   perceived barriers and perceived benefits [7].

Perceived susceptibility refers is an individual's assessment of their chances of developing a specific condition. The Health Belief Model trusted that a patient   who   feels   susceptible   to hypertension and its complication is more likely to abide to treatment as opposed to the subject who doesn't belief this idea. Perceived severity is the idea by which a disease can cause disability, morbidity or mortality. The Health   Belief   Model   believes   that persons who accept hypertension to be a serious illness will be more compliant with   lifestyle   modifications   and medication than the ones who don't feel this perception[9].

Perceived   barriers   refer   to   the outstanding   hindrances   towards   the method for getting to the required health behavior   like   compliances   health behavior. It is further accepted that patients with more perception of barriers are less likely to reveal compliance behavior than those who believe that the benefits   outweigh   the   barriers,   The perceived benefits correspond to the belief that, patients hold that a proposed course of action will be effective in get rid of the potential risks. The Health Belief Model speculates that patients who see benefits from adopting specific health behavior are more likely to demonstrate the required health behavior than individual who don't. Cues to action another component of the HBM they are things such as television, radio programs,   and   advice   from   friends, relatives and health providers. These are essential cues that can play an important role in compliance behavior conduct by reminding   patients   to   take   their medicines [7].

Hypertension   management behaviors incorporate high consumption of   vegetables   and   fruits,   decreasing sodium   intake,   avoiding   tobacco   use, engaging in physical activity, checking

blood pressure and keeping up a healthy weight [10]**.** Performance of hypertension management behaviors helps to decrease both systolic and diastolic blood pressure and enhance general wellbeing [11].

Objectives: To determine level of participants' knowledge about hypertension, to assess factors affecting treatment compliance with antihypertensive treatment guided by the use of Health Belief Model variables among hypertensive patients and to evaluate the effectiveness of health education intervention applying HBM on knowledge and compliance to treatment.

Subjects and Methods

I. Technical design:
A) Study design: an intervention study was carried out using two group pre-post designs during 2015. Data was collected from the 2 groups before and 3 months after the intervention.
B) Study setting: The study was conducted in the hypertension clinic at Zagazig University Hospital - Sharkia governorate.
C) Subjects: The study population was hypertensive patients, who were using antihypertensive treatment and visiting the clinic regularly to get their treatment.
D) Sample: The total number of patients attending the clinic over one month four days in the week from 9 am to 2 pm (186) all were included in the study as a comprehensive sample. As they attend the clinic regularly to get their free treatment, also one month only was taken due to high flow rate and to avoid repetition.
Inclusion criteria: Patients of age 18 years and more, participants with a diagnosis of hypertension for at least one month with or without other existing medical conditions,   participants who have been taking antihypertensive

treatment for at least one month ago and patients who consented and agreed to participate in the study
Exclusion criteria: Patients who could not respond appropriately e.g. too sick to be interviewed and patients who refuse to participate in the study.
E) Tools for data collection:
1- Questionnaire: In the present study, data was collected using a modified self administered questionnaire; questions were developed by the researcher according to the research objectives, the literature review, and previously validated relevant study tools as well as the theoretical framework of the study using Health belief model. Questionnaire consisting of closed ended questions was used during the interviews. The structured data collection instrument permitted the researcher to ask the same questions to all participants. The time used to complete one form was approximating 10 minutes .This questionnaire consists of five sections, namely:
• **Section A:** Medical and personal history includes:
- Sociodemographic variables including sex, age, education, occupation, marital status.
- Past medical history as (health complaints other than high blood pressure. How many kinds of medicine are you taking for high blood pressure?)
• **Section B:** Knowledge evaluation part included (25 item)**:**
1-Meaning of HTN 2- What's the normal blood pressure 3- Is HTN a non-communicable disease 4- Does Hypertension needs lifelong treatment 5- Which of them can lead to hypertension: heredity, High-salt diet, Stress, Excess coffee and tea, obesity, Smoking? 6- What are the Common symptoms of hypertension   headache,   dizziness,

palpitation, fatigue, tinnitus, confusion, blurred vision, nausea, vomiting. 7- If blood pressure is not controlled what are the complications of hypertension: Cerebral infarction, cerebral hemorrhage, renal failure, Coronary heart disease. 8- What's hypertension treatment Antihypertensive medication, Diet, lifestyle modifications?

• **Section C: Compliance with Medication regimen:** (a) Do you forget to take your medicine? (b) Do you stop taking your medicine because you feel better? (c) Do you stop taking your medicine because you feel worse? (d) Do you stop taking the medication because you believe that they are ineffective? (e) Do you stop taking your medicine because you fear side effects? (f) Do you stop medication because of cost of medication?

• **Section D: Compliance with Lifestyle Modification regimen:** that includes 4 questions :(a) Do you smoke? (b) Are you engaged in physical exercise? (c) Eat table salt more than 5 gm/day (one teaspoon)? (d) Do you eat high fat diet (meat with high animal fat, egg yolk, butter)?

• **Section E: HBM constructs which is formed of:**

1-Perceived susceptibility [6items] that includes*:* rating their agreement with the following risks happen as a result of high blood pressure as 1-having stroke 2-developing visual impairment 3-developing heart problems 4- developing kidney problems 5-becoming a burden for my family 6-Career being negatively affected

2-Perceived severity [6 items] that includes*:* rating their agreement with the following 1-My blood pressure condition is serious 2- I am worried about my blood pressure condition. 3- Getting hypertension would be so serious. 4- Getting hypertension complication would be so dangerous. 5- Being permanently disabled due to hypertension would be so dangerous 6- Dying due to hypertension complications would be so dangerous.

3- Benefit [6 items] that includes*:* rating their agreement with the following benefits of complying with treatment:1- keeping my blood pressure under control 2-Increasing my quality of life 3-Increasing my sense of well-being 4-Protecting me from complications 5-Avoiding added financial burden to treat complications 56-Decrease my chance of dying .

4- Barriers [5 items] that includes: think the following hinder you from complying with your treatment? 1-Ineffective of the medicine to stabilize my blood pressure 2-Lack of motivation because I cannot be cured 3-Not having enough time to exercise 4-Lack of discipline to comply with the dietary restrictions 5-Lack of motivation to stop smoking

5-Cues to action (To what extent do you remember to comply with your blood pressure treatment): TV or radio programmes on high blood pressure, Advice from my doctor, family member or friends, death of a relation or friend due to high blood pressure.

6- Self efficacy [2 items]: How confident are you that you can: 1-Do all the things necessary to manage your high blood pressure on a regular basis? 2- Judge when changes in your high blood pressure mean you should visit a doctor.

Scoring of the questionnaire:
Knowledge evaluation part one point was allocated to correct answers or behaviors and no points were considered for wrong behaviors or answers. The total score was computed by adding the correct answers 0 to 25.

Medication regimen compliance was composed of 7 items. The responses were measured on a 4-point Likert scale: (1) Every day (2) frequently, (3) rarely (4) never.

For compliance to life style was having 4 items, participants were asked to respond to a single question based on a 4 point Likert scale, The responses were: (1) Every day,(2) frequently, (3) rarely (4) never. Some questions were set such that the highest score didn't reflect the worst situation of none-compliance. To resolve these problem scores were reversed. As, how often do you engage in physical exercise (4) every day, (3) frequently, (2) rarely or (1) never.

The 11 items measuring treatment compliance and life style compliance were added up to get sum index from0 to 44 cut-off point at 50% was used to classify subjects into two groups i.e. 1 = those who are not compliant to treatment and 2 = treatment compliant .

HBM variables were measured as described below.

Perceived susceptibility of being at risk of hypertension complications, perceived severity of having hypertension, and perceived benefit were each measured by six items. Participants were then asked to respond: (1) strongly disagree, (2) disagree, (3) agree or (4) strongly agree. The items measuring different item were added to get their sum 50% was used as a cut point. Dichotomization was done into two frequency groups, into 1=, those with low perception and 2= those with high perception. The reminder (cues to action) was measuring by seven items, Seven items measuring cues to action were added up to get sum index , then dichotomized into two groups those with low perceived cues to action and those with high cues to action. Perceived barriers measured by five items and self-

efficacy measured by two items. Five items measuring perceived barriers were added up to get the sum then dichotomized into, those with low perceived barrier and those with high perceived barrier.

II. Operational design: it includes two stages namely pilot study and field work stage.

A) Pilot study: The questionnaire was pilot tested using 10 hypertensive patients by the researcher to find out unclear or ambiguous questions. Ambiguous questions were removed or modified. The pilot testing of the questionnaire helped to estimate the time that could be taken to respond to the questionnaire which was on average of 20 minutes.

All patients were interviewed face to face in the reception area of the hypertension clinic at Zagazig university hospital.

B) Field work stage
BI-   *Pre-intervention   (assessment phase):* Baseline knowledge regarding hypertension was assessed using a pilot-tested questionnaire. Data was collected through a face-to-face interview with the patients then data were analyzed and used to guide designing health education**.** Physiological measurements which include: measurement of blood pressure. BLP was measured with a sphygmomanometer in a sitting position after 5 min of rest, and the mean of two measures taken 2 min apart was used.

BII-   *Intervention   phase   (Health education sessions):*
Objectives of health education were to educate the patients in order to increase their knowledge and to improve their compliance to treatment.
-HBM Group: they received health education intervention sessions based on

the HBM conceptual framework. *Educational content* for this group included not only information about hypertension but also focused on raising their perception about their susceptibility to it, its severity and how to overcome the these threats by improving their confidence in their ability to control it . Similarly increase their positive beliefs towards the benefits of controlling hypertension.

- Comparison Group: received the traditional health education on hypertension for comparison group stressed on increasing knowledge about hypertension risk factors, clinical presentation, its severity, the value of early diagnosis.

The used educational methods were lectures demonstrated by PowerPoint.

The educational program was given in the form of person to person *or* small groups by direct personal communication during their waiting. Additional time was allowed for open discussion and answering questions.

C- Post intervention (evaluation phase):

In evaluating the effectiveness of the educational intervention, 3 months later a post-test questionnaire identical to preliminary questions in the pre-test was used with re-assessment of blood pressure.

III. Administrative Design and Ethical Aspects:

- Written administrative permission from Zagazig hospital manager and another one from cardiovascular department manager to perform the study were obtained.
- Informed Verbal consent was obtained from patients to participate in this study**.**

- The participants were free to withdraw from the research at any stage without incurring any consequences
- They were reassured about the strict confidentiality of any obtained information, and the study result will be used only for purpose of research.
- Approval was obtained from Zagazig University Institution and review board (IRB)

Statistical management: Data were analyzed using SPSS (the Statistical package for Social Sciences for Windows) version 20.0. Frequency and percentages used for qualitative data, chi square and McNemar tests were used to test association and difference in paired observation together with independent groups and paired t-test.

Results

Regarding the socioeconomic characteristics of studied hypertensive patients in both group; where for the age group of our participants; the highest percentage was in the category between 40-50 years old; (35.5 %) in the HBM group, 45.2% in the comparison group, most of them were skilled workers 31.2% in the HBM group, and 30.1% in comparison, male and married concerning education it was observed that higher percentages of HBM group read and write but in the other group the higher percentages (30.1%) graduated. There was no statistical significant difference between two groups of all previous items.

Regarding Medical History of the studied sample in the 2 groups; 66.7% of the HBM group don't have any other diseases while in the comparison group more than half of them have other diseases (54.8%) with statistical significant difference between two groups (p=0.003), 63.4%,50.5% in HBM group and other group respectively succumbed to the disease since less than 5 year also more than half of both groups receive one or two types of drugs only there was , no

statistical significant difference was observed between two groups in the previous two items.

Table (1) shows Association between patient compliance and their socio-demographic characteristics and medical history before intervention the majority of who were compliant to treatment are in the age group 40-50,male,married,read and write and skilled workers with no statistical significant difference .also most of compliant patients have no other disease ,develop the disease since less than 5 years and receive one or two drugs only no statistical significant difference in the first item while high statistical difference found in the other two items (P value =0.00 and 0.003 respectively).

Regarding optimal level of knowledge about hypertension among HBM group before and after intervention, figure (1) demonstrates that the lowest level of knowledge was the general knowledge about hypertension(69.9%) which increased markedly after intervention reaching (89.2%), all other items have approximately equal percent and all also increased after intervention with high statistical difference except for the level of knowledge about symptoms of disease , the level of total knowledge increased from 67.7 %reaching 92.4% with statistical significant difference (p<0.001).

About the level of knowledge about hypertension among ordinary health education group before and after intervention, fig (2) represented that similar to the HBM group the lowest level of knowledge was the general knowledge about hypertension (69.9%) followed by knowledge about complication, symptoms and TTT and the highest level of knowledge was the knowledge about risk factors all these percentages increased in the posttest with statistical difference in the

knowledge about symptoms, complication, treatment in contrast, no difference in the general knowledge and risk factors, although the level of total knowledge changed from 72.0% in pretest to 82.7% after education no statistical difference was observed .

Table (2) presents the comparison of life style, medication compliance and overall compliance to treatment among two groups first the compliance to life style was increased after intervention in both group (55.9% to 65.5% in HBM group, 52.7% to 55.9% in comparison group). A significant difference was present by comparing pre & post test results in HBM group (p <0.05). Marked improvement in the HBM group in medication compliance (59.9% to 79.6%) and overall compliance (61.3% to 79.6%) in contrast to the ordinary health education group no marked improvement, statistical significant difference was observed by comparing pre & post test results in HBM group and when post test results of the two groups were compared.

HBM variables change among participants was presented in table (3), where the percentages of Perceived susceptibility, Perceived severity, Perceived benefits, Perceived barriers, self-efficacy cues to action show changes between pretest and post test results with a statistical significant difference(p = 0.00) between the results of all items except

As regard cues of action in HBM group; for control group comparing pretest and post test results was of no significant difference except for Perceived severity, Perceived benefits, and self-efficacy. When comparing pretest and post test results of two groups; it was found that the pretest results were of no significant difference, while it was of significant

difference in all items in comparing posttest except in Perceived severity and cues to action.

Table (4) shows the association between HBM variables with treatment compliance as the behavior of interest by use Chi-square. There was association between perceptions of severity with treatment compliance. Participants with high perceptions of susceptibility of having hypertension or hypertension complications had higher proportion of treatment compliance than those with low perceived susceptibility. The result had further revealed that participants who were having high perceptions of benefit of using antihypertensive treatment had higher proportion of individuals who are compliant than those with low perception of benefit. Participants with low perception of barriers to treatment had higher proportion of individuals who are compliant compare with those with high perception of barrier, and participants who had high perception of cues to action had higher compliant rate compared to those with low cues to action.

Also those with high self-efficacy more compliant to treatment than those with low self-efficacy, all the previous finding was found in the both group before and after intervention.

Concerning changes of systolic and diastolic blood before and after intervention table (5) demonstrates that moderate changes occur in the mean of systolic blood pressure among two group from (169.3 to 150.2) in HBM group and from (167.1to 155.5) in the other group, regarding diastolic blood pressure marked change occur between pre & post intervention in HBM (97.6 to 87.1) and moderate change in the group of ordinary HE (96.1 to 91.5) with high

statistical significant difference between pre & post in both group(P value=0.00) and also between the two groups in the posttest (P = 0.01),with no difference between the two groups before education.

Table (6) shows that there is statistical significant difference between blood pressure and compliance to treatment in the two groups before and after intervention.

Discussion

Controlling of Blood pressure among hypertensive patients considered as a long-standing challenge. Many studies showed that those who achieved the target blood pressure represent less than 25% of patients who were treated for hypertension. [12] Non-adherence to medications is recognized as a major public health concern and leads to patient morbidity, mortality and healthcare costs. [13].

Knowledge of the participants about hypertension were lower in the pretest than the posttest especially for general knowledge about hypertension which includes(Meaning of HTN, what's the normal blood pressure, is HTN a non-communicable disease, is Hypertension needs lifelong treatment)as only 69.9 in HBM group and 66.6% in the other group have optimal level of knowledge about these questions,80.6% in both group have satisfactory level of knowledge about risk factors the highest percentages were to high salt intake and excess tea and coffee, in HBM group (83.8%,81.7%,83.3%) and IN ordinary HE group (78.4%,73.1%, 78.4%) have sufficient knowledge about symptoms ,complication and treatment, the majority of them reported that headache and blurred vision are the most common symptoms, cerebral hemorrhage is the

most common complication and in treatment antihypertensive drugs. Regarding total level of knowledge it was 67.7% in HBM group and 72.0% in the other all these results were improved in posttest in experimental and comparison groups with significant differences. No statistical significant difference observed before and after intervention between two groups except in the total knowledge in the posttest. These results are consistent with other studies on the knowledge of patients about hypertension who reported that 54% patients had good knowledge followed by average (30%), excellent (14%) and poor knowledge (2%) regarding hypertension also reported that headache and cerebral hemorrhage is one of the main symptoms and complication.[14] in contrast to our finding another study found different results as about 30% had sufficient general knowledge about hypertension, 32% about complication, 15% about symptoms but all these percentages increased after intervention reaching approximately similar results to ours ,but their participant reported like ours that smoking and excess salt intake two of the main risk factors to hypertension.[15] Agreeing with improvement the level of the knowledge in HBM group more than the other group in another study the findings showed that mean score of knowledge increased after intervention in the case group who received education based on health belief model education while no significant change was observed in the other group after training. [16]

Concerning compliance to treatment our study represented that In HBM group life style, medication compliance and overall compliance to treatment was before intervention

55.9%, 59.95 and61.3% respectively increased after intervention with statistical difference in the three items, in the ordinary HE group the compliance was 52.7%,51.6% ,54.8% in the same order increased also after intervention but with no statistical significant difference, comparing different items of compliance between two groups no statistical significant difference was observed in the pretest in contrast to high statistical significant difference in the posttest in the medication compliance and overall compliance to treatment this indicates the positive impact of the intervention based on HBM on their health behavior.

The compliance to treatment among all participant was 58.1%, the result is similar to other studies [17, 18] found that 54%, 57% of hypertensive patients were having good compliance and approximately similar to [18] the adherence was 48.7%, in contrast to our finding in an Iranian study [19] only 39.6% of the patients were compliant his variation may be due to the difference in socio demographic profile of two countries. Our compliance to treatment increased after application of messages reaching 68.2% with high statistical difference (P <0.001). This indicates the positive effect of the Educational intervention that increased knowledge on compliance to medication and life style. These results were in agreement with the other relevant literature emphasizing that increasing knowledge has an effect on intention and performance.

Regarding the relation between adherence and different sociodemographic variables in our study, adherence was higher among people (40-50) years of age and above 50 years similarly in [19] older patients were more compliant. Another study carried out in

Pakistan showed that adherence increases with age. [6]

In this study no association was found between sex and patient adherence with no statistical significance, matching with results of [1], [19],but some contradictory researchers have found that female patients have better compliance to treatment. [20], [21]

The finding showed that patients without intermediate or high education level had high treatment compliance compared to those with intermediate high education level. In Tanzania, a study found that patients without formal education qualifications had better compliance with medication. [22] This result may be due to the reason that patients with lower educational level may have more trust in physician's advice compared to those with higher level of education. From these conclusions, it seems that educational level may not be a good predictor of treatment compliance. In contrary to many studies found that patients with higher educational level might have higher compliance [23], [24] while other studies found no association [25], [26]. As regards occupation no, association was found between occupation and compliance which is different to [22] there Participants who were employed had high proportion of treatment compliance compared to those who were not employed.

The relationship between marital status and treatment compliance was observed, married participants were more compliant with treatment (45.2%) than non-married participants (35.0%), and this result was comparable with results of other studies[22], [27] marital status might impact patients compliance with medication positively, the assist and support from a spouse could be the cause

why married patients were more compliant to treatment than unmarried patients. patients with no other diseases having the disease since less than 5years and receiving one or two drugs only are more compliant than others matching to the another study [1] which mentioned that monotherapy and once per day medication had a positive role in adherence compared to poly therapy and more than once a day. Similarly in a study carried out in Brazil among 231 hypertensive, 36.2% of patients on mono therapy and 36.2% of patients on mono therapy and 36.6% of patients receiving two medication had controlled blood pressure only 5.9% of patients using three or more antihypertensive drugs had the same outcome. [28] Educational interventions have significantly desirable effects on lifestyle modification and BP control.

In assessing the different items of the health belief model, a significant increase in the perceived susceptibility and perceived severity scores before and after intervention was observed in the experimental group, which agrees with the results of other similar studies [16] ,[29].which also believed that perceived susceptibility and perceived severity scores had statistically significant difference after the intervention compared to before intervention, the perceived benefits, barriers and self-efficacy scores for the same group show a significant increase before and after intervention, these results were similar to other studies based on health believe model which reported the same finding [16],[30] they also mentioned that those individuals with low self-efficacy immediately lose their self-confidence in dealing with problems and barriers; however, those individuals with high self-efficacy may have high self-

management. Thus, increasing self-efficacy can lead to self-management and high self-care behaviors in hypertensive patients. Cues to action are considered one of the most powerful parameter affecting protective health-related behaviors no statistical significant difference was observed between pre & posttest. In the intervention group, in which we considered it as one of the important indicators of effective intervention. all HBM parameters was also significant in the ordinary HE group before and after training except for perceived susceptibility and cues to action , this is may be due to the effect of educational intervention which they received. No statistical significant difference was observed between the two groups before intervention but there is statistical difference in the posttest between them in all items except perceived severity and cues to action which already didn't show any difference in any group or stage.

A relationship between HBM constructs and treatment compliance; all the constructs were significantly showing relationship in the two groups and before, after intervention. The present result corresponds closely to those of a past study [31] which perceived barrier was the strongest predictor of non-compliance to treatment and in Iranian study [19] which reported that having a positive attitude toward antihypertensive drugs was independent predictors of compliance also [32] mentioned that Positive beliefs regarding medications are also essential for forming adherence behavior of elderly hypertensive individuals. Threatening views of illness and stronger beliefs of the necessity of medications contribute considerably to positive medication

adherence. also other previous studies [1, 22] similarly found that perceived susceptibility, perceived benefit of using the medicine and perceived barrier to treatment shows show a significant relationship with treatment compliance .
Blood pressure control is the main finding in the present study which revealed significant decline in systolic and diastolic blood pressure among patients in the two group at the three months evaluation. This may be justified by the fact proven in this study that education on lifestyle patterns and compliance to medication correlated significantly with control of systolic and diastolic blood pressure which means that high adherence to treatment associated with better blood pressure control. The previous findings are consistent with the findings of study in Egypt [33], who reported reduction in blood pressure measurement in the study after life style intervention, a study in Australia [34] reported the effectiveness of the intervention to control blood pressure among older adults.

Conclusion: the majority of the participant had satisfactory level of knowledge about hypertension also the study showed that compliance to antihypertensive treatment was (58.1%) among study participants which improved after intervention especially in HBM group, the majority of who were compliant to treatment are in the age group 40-50,male,married, read and write and skilled workers, most of them have no other disease, develop the disease since less than 5 years and receive one or two drugs. Changes of systolic and diastolic blood before and after intervention occur in both groups which represent importance of educational intervention. The findings support the hypothesis that using health

education based on HBM has better results in adherence to treatment which include life style modification and medication than traditional health education as it impresses not only the knowledge but also improves beliefs and attitude of the people as it significantly changed perceived susceptibility of being at risk of getting hypertension complications and severity , perceived barriers to treatment, benefit of using medicine and self-efficacy among studied sample.

Recommendation
Counseling of hypertensive patients should be every time whenever they visit physician to improve their compliance for better control of hypertension.

A far reaching treatment arrangement is to be organized before the patient is released from the clinic to help the patient and his caregiver to comprehend and take after precisely the required remedial regimen.

Follow up visits is vital keeping in mind the end goal to assess the advancement of patient's condition and persuade them to follow with preventive measures through advancing promoting healthy lifestyle to anticipate complications.

The Ministry of health ought to provide training to health provider on the most proficient method to advice patients in a useful and non-judgmental way to help them to go along better with the treatment regimen.

References
1. Kamran A, Sadeghieh A S, Biria M, Malepour A, Heydari H. Determinants of Patient's Adherence to Hypertension Medications: Application of Health Belief Model Among Rural Patients.Ann Med Health Sci Res. 2014 ;4(6):922-7.
2. Noohi F, Maleki M, Orei S ,Azizi F, Hatami H, Janghorbani M. Epidemiology and Control of Common Disorders in Iran. 2nd ed. Tehran: Eshtiagh Press; 2001. pp. 23–30
3. Mohsen M. Problem of hypertension in Egypt. The Egyptian heart journal. 2013;65(3):233-234.
4. Chobanian A, Bakris G, Black H, Cushman W, Green L, Izzo J, et al. (2003). The seventh report of the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure. Hypertension , 42, 1206-1252.
5. Kumar P N, Halesh LH. Antihypertensive treatment: A study on correlates of non-adherence in a tertiary care facility. Int J Biol Med Res. 2010;1:248–52
6. Hashmi SK, Afridi MB, Abbas K, Sajwani RA, Saleheen D, Frossard PM, Ishaq M, Ambreen A, Ahmad U. Factors associated with adherence to anti-hypertensive treatment in Pakistan.PLoS One. 2007; 2(3):280.
7. Green LW, Kreuter MW. What is the health belief model? Health promotion and planning: an educational and ecological approach. 3rd ed. Mountain View: Mayfield Publishing Company, 1999.
8. Fitzpatrick S, Reddy S, Lommel TS, Fischer JG, Speer EM, Stephens H, Park S, Johnson MA and the Georgia Community Intervention. Physical activity and physical function improved following a community-based intervention in older adults in Georgia senior centers. J Nutr Elder 2008;27:135-54.
9. Glanz K, Rimer BK, Lewis FM. (2002):Health behaviour and health education: theory, research and practice, 3rd ed. (Jossey-Bass, Ed.) San Francisco,2002.
10. Fan AZ, Mallawaarachchi DSV, Gilbertz DLY, Mokdad AH. Lifestyle behaviors and receipt of preventive health care services among hypertensive Americans aged 45 years or older in 2007. Prev Med 2010;50:138-42.
11. Forman J, Stampfer M, Curhan G.Diet and lifestyle risk factors associated with incident hypertension in women. JAMA 2009;302:401-11.
12. Brown MT, Bussell JK. Medication adherence: WHO cares? Mayo Clin Proc 2011;86:304-14.

13. Cutrona SL, Choudhry NK, Fischer MA, Servi AD, Stedman M, Liberman JN, et al. Targeting cardiovascular medication adherence interventions. J Am Pharm Assoc .2012;52:381-97.

14. Ludhiana KK,Suresh K.Sharma, Harpreet Jhajj, Gagandeep Kaur,Harpreet Bajwa.Knowledge and learning needs of hypertensive patients visiting O.P.D. at D.M.C & H. Nursing and Midwifery Research Journal.2007;3(1).

15. Mohammad ABB, Mohammad J Z , Kamran A , Abutaleb J , Shahnaz S , Hajar K. The Effect of Educational Programs on Hypertension Management. Int Cardiovasc ResJ.2014 ;8(3):94-98.

16. Behzad J, Ghodratollah S , Khoda B K , Mohammad HH. Effect of self-care behaviors education on hypertensive patients in ahwaz; based on health belief model World Journal of Pharmaceutical Research.2015;4(5): 109-120.

17. Nazir A, Muhammad A, Syed HS, Waqas A. Compliance to antihypertensive drugs, Salt restriction, Exercise and Control of systemic hypertension in hypertensive patients at Abbottabad. Ayub med. 2008;20(2) :66-68.

18. Al-Dabbagh S, Aswad S. Compliance of hypertensive patients to management in Duhok governorate using morisky-green test. Duhok Med J 2010;4:28-39.

19. Hadi N. Determinant factors of medication compliancein hypertensive patients of Shiraz, Iran. Arch Iran Med2004;7:2926.

20. Jin J, Sklar GE, Min Sen Oh V, Chuen L S. Factors affecting therapeutic compliance: A review from the patient's perspective. Ther Clin Risk Manag 2008;4:26986.

21. Fodor GJ, Kotrec M, Bacskai K, Dorner T, Lietava J, Sonkodi S. Is interview a reliable method to verify thecompliance with antihypertensive therapy? An international 22.central-European study. J Hypertens 2005;23:1261-6.

23. Joho AA. Factors affecting treatment compliance among hypertension patients in three district hospitals. Dar es Salaam: Muhimbili University of Health and Allied Sciences;2012.

24. Yavuz, A., Tuncer, M., Erdogan, O., et al. (2004). Is there any effect of compliance on clinical parameters of renal transplant recipients? Transplant Proc, 2004;36:120–1.

25. Ghods AJ, Nasrollahzadeh, D. Noncompliance with immunosuppressive medications after renal transplantation. Exp Clin Transplant,2003; 1:39–47.

26. Stilley CS, Sereika S, Muldoon MF, et al. Psychological and cognitive function: predictors of adherence with cholesterol lowering treatment. Ann Behav Med,2004; 27:117–24.

27. Wai CT, Wong ML, Ng S, et al. (2005). Utility of the Health Belief Model in predicting compliance of screening in patients with chronic hepatitis B. Aliment Pharmacol Ther,2005; 21:1255–62.

28. Carpenter R. Perceived threat in compliance and adherence research. Nursing Inquiry ,2005; 12 (3): 192-199.

29. Oliveira AD, Barreto JA, Neves SJ, Lyra JDP.Association between the 8-item Morisky Medication Adherence Scale (MMAS-8) and blood pressure control. ArqBras Cardiol. 2012;99:649-58.

30. Krumholz HM, Amatruda J, Smith GL, Mattera JA, Roumanis SA, Radford MJ, etal. Randomized Trial of an Education and Support Intervention to Prevent Readmission of Patients With Heart Failure. Journal of the American College of Cardiology 2002; 39(1): 83–9.

31. Shojafard J, Nadrian H, Baghiani Moghadam M, Mazlumi Mahmudabad S, Sanati H, Asgar Shahi M. Effects of an educational program on self-care behaviors and its perceived benefits and barriers in patients with Heart Failure in Tehran. payavard. 2009; 2 (4) :43-55.

32. George J, Shalansky SJ. Predictors of refill non-adherence in patients with heart failure. Br J Clin Pharmacol. 2007;63:488-93.

33. Rajpura J, Nayak R. Medication adherence in a sample of elderly suffering from hypertension: evaluating the influence of illness perceptions, treatment beliefs, and illness burden. J Manag Care Pharm. 2014;20:58-65.

34. Adel A, Soad HA, Doaa AE. Effect of Lifestyle Intervention Program on Controlling Hypertension among Older Adults. Journal of Education and Practice .2014;5(5):61-71.

35. Burke V, Beilin LJ, Cutt HE, Mansour J, Williams A, Mori TA . A lifestyle program for treated hypertensives improved health-related behaviors and cardiovascular risk factors, a randomized controlled trial. Journal of Clinical Epidemiology.2007; 60:133-41.

Table (1): Association between patient compliance and their socio-demographic characteristics and medical history before intervention:

	Compliant		Not compliant		Chi	P
	N=78	%	N=108	%	square	value
Age:					2.6	0.45
• **18-30**	13	16.7	15	13.9		
• **30-<40**	13	16.7	12	11.1		
• **40-<50**	32	41.0	75	69.3		
• **>50**	20	25.6	58	53.7		
Sex:					0.9	0.335
• **Male :**	46	58.9	56	51.2		
• **Female:**	32	41.1	52	48.8		
Education:					13.2	0.01
• **Illiterate**	13	16.7	18	16.7		
• **Read & write**	26	33.3	14	12.9		
• **Primary passed**	10	12.8	12	11.1		
• **Intermediate education**	14	18.0	30	27.8		
• **Graduated**	15	19.2	34	31.5		
Occupation:					13.6	0.08
• **not working**	6	7.7	18	16.7		
• **unskilled workers**	18	23.1	31	28.7		
• **skilled workers**	33	42.3	20	18.5		
• **semiprofessional**	20	25.6	26	24.1		
• **professional**	8	10.3	13	12.0		
Marital status:					1.75	0.18
• **unmarried**	21	26.9	39	36.1		
• **married**	57	73.1	69	63.9		
Other disease:					1.16	0.28
• **yes**	38	48.7	44	40.7		
• **no**	40	51.3	64	59.3		
Duration of disease:					24.6	0.00
• **less than 5 years**	61	78.2	45	41.7		
• **5 years or more**	17	21.8	63	58.3		
Numbers of medicines:					4.36	0.03
• **One or two**	51	65.4	54	50.0		
• **More than two**	27	34.6	54	50.0		

Table (2): Comparing life style, medication compliance and overall compliance to treatment among two groups

	HBM (N=93)				HE (N=93)				P2	P3
	pre		post		pre		post			
	N	%	N	%	N	%	N	%		
Life style compliance **Not compliant** **Compliant**	41 52	44.1 55.9	32 61	34.5 65.5	44 49	47.3 52.7	41 52	44.1 55.9	0.19 (0.66)	1.8 (0.18)
P 1 value	0.04				0.25					
Medication compliance: **Not compliant** **Compliant**	38 55	40.1 59.9	19 74	20.4 79.6	45 48	48.4 51.6	42 51	45.2 54.8	1.06 (0.3)	12.9 (0.00)
	0.00				0.25					
Compliant to TTT: **Not compliant** **Compliant**	36 57	38.7 61.3	19 74	20.4 79.6	42 51	45.2 54.8	40 53	43.1 56.9	0.8 (0.37)	10.9 (0.001)
P 1 value	0.00				0.5					

P1: p value of Mc Nemar test, P2: p value of pretest Chi square test between two groups, P3: p value of posttest Chi square test between two groups

Table (3): HBM variables change among participants

	HBM (N=93)				HE (N=93)				P2	P3
	pre		post		pre		post			
	N	%	N	%	N	%	N	%		
Perceived susceptibility:									0.56 (0.45)	14.4 (0.00)
- **Low**	34	36.6	17	18.3	39	41.9	41	44.1		
- **High**	59	63.4	76	81.7	54	58.1	52	55.9		
P 1 value	<0.001				0.625					
Perceived severity:									0.02 (0.88)	2.3 (0.125)
- **Low**	46	49.5	28	30.1	47	50.5	38	40.9		
- **High**	47	50.5	65	69.9	46	49.5	55	59.1		
P 1 value	<0.001				0.004					
Perceived benefits									0.09 (0.76)	15.6 (0.00)
- **Low**	36	38.7	18	19.4	38	40.9	42	46.2		
- **High**	57	61.3	75	80.6	55	59.1	51	53.8		
P 1 value	<0.001				0.125					
Perceived barriers									1.3 (0.53)	6.2 (0.01)
- **Low**	41	44.1	17	18.3	45	48.4	32	34.4		
- **High**	52	55.9	76	81.7	48	51.6	61	65.6		
P 1 value	<0.001				<0.001					
Cues to action									0.76 (0.54)	0.02 (0.87)
- **Low**	62	66.7	58	62.4	58	62.3	59	63.4		
- **High**	31	33.3	35	37.6	35	37.6	34	36.6		
P 1 value	0 .125				1.00					
Self-efficacy									1.1 (0.3)	11.2 (0.001)
- **Low**	35	37.6	7	7.5	42	45.2	24	25.8		
- **High**	58	62.4	86	92.5	51	54.8	69	74.2		
P 1 value	<0.001				<0.001					

P1: p value of Mc Nemar test, P2: p value of pretest Chi square test between two groups, P3: p value of posttest Chi square test between two groups

Table (4): Distribution of participant's treatment compliance by HBM variables

	HBM				HE			
	Pre		Post		Pre		Post	
	C N=57 N (%)	NC N=36 N (%)	C N=74 N (%)	NC C=19 N (%)	C N=51 N (%)	NC N=42 N (%)	C N=53 N (%)	NC N=40 N (%)
Perceived susceptibility -low -high	2 (3.5) 55 (96.5)	32 (88.9) 4 (11.1)	0 (0.0) 74 (100.0)	17 (89.5) 2 (10.5)	1 (1.9) 50 (98.1)	38 (90.5) 4 (9.5)	4 (7.5) 49 (92.5)	37 (92.5) 3 (7.5)
X^2 (P value)	69.3 (<0.001)		(<0.001)*		74.1 (<0.001)		66.7 (<0.001)	
Perceived severity -low -high	12 (21.1) 45 (78.9)	34 (94.4) 2 (5.6)	11 (14.8) 63 (85.2)	17 (89.5) 2 (10.5)	7 (13.7) 44 (86.3)	40 (95.2) 2 (4.7)	9 (83.0) 44 (17.0)	29 (72.5) 11 (27.5)
X^2 (P value)	47.5 (<0.001)		39.9 (<0.001)		61.2 (<0.001)		29 (<0.001)	
Perceived benefits -low -high	3 (5.3) 54 (94.7)	33 (91.7) 3 (8.3)	1 (1.4) 73 (98.6)	17 (89.5) 2 (10.5)	0 (0.0) 51 (100.0)	38 (90.5) 4 (9.5)	2 (3.7) 51 (96.3)	40 (100.0) 0 (0.0)
X^2 (P value)	69.4(<0.001)		75.2 (<0.001)		(<0.001)*		85.2 (<0.001)	
Perceived barriers -low -high	7 (12.3) 50 (87.7)	34 (94.4) 2 (5.6)	0 (0.0) 74 (100.0)	17 (89.5) 2 (10.5)	4 (7.9) 47 (92.1)	41 (97.6) 1 (2.4)	2 (3.7) 51 (96.3)	30 (75.0) 10 (25.0)
X^2 (P value)	60.4(<0.001)		(<0.001)*		73.3 (<0.001)		50.1 (<0.001)	
Cues to action -low -high	27 (47.3) 30 (52.7)	35 (97.2) 1 (2.8)	39 (52.7) 35 (47.3)	19 (100.0) 0 (0.0)	16 (31.4) 35 (68.6)	42 (100.0) 0 (0.0)	19 (35.8) 34 (64.2)	40 (100.0) 0 (0.0)
X^2 (P value)	24.7 (<0.001)		(0.01)*		(<0.001)*		(<0.001)*	
Self efficacy -low -high	3 (5.2) 54 (94.8)	32 (88.9) 4 (11.1)	0 (0.0) 74 (100.0)	7 (36.8) 12 (63.2)	3 (5.9) 48 (94.1)	39 (92.8) 3 (7.2)	2 (3.7) 51 (96.3)	22 (55.0) 18 (45.0)
X^2 (P value)	65.7 (<0.001)		(<0.001)*		70.3 (<0.001)		31.2 (<0.001)	

*C=Compliant, NC=Non Compliant, *Fischer exact test was computed*

Table (5): systolic and diastolic blood pressure before & after intervention among two groups:

		HBM		HE		P2	P3
		pre	post	pre	post		
Systolic Blood Pressure	Mean ±SD	169.3±19.4	150.2±14.5	167.1 ±18.5	155.5±12.6	0.4	<0.001
	P 1	<0.001		<0.001			
Diastolic Blood Pressure	Mean ±SD	97.6±7.3	87.1±6.4	96.1 ±7.1	91.5±4.5	0.156	<0.001
	P 1	<0.001		<0.001			

P1: p value of paired t-test, P2: p value of pretest t- test between two groups, P3: p value of posttest t- test between two groups

Table (6): Relation between blood pressure and compliance to treatment in the two groups before and after intervention:

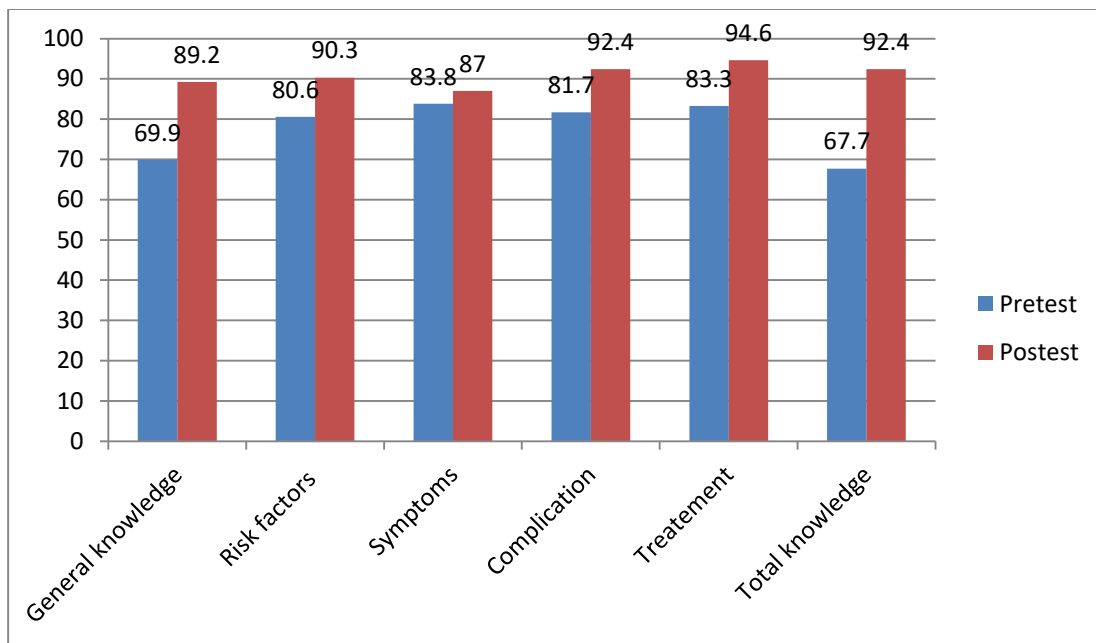|	HBM				HE			
	Pre		Post		Pre		Post	
	C N=57	NC N=36	C N=74	NC N=19	C N=51	NC N=42	C N=53	NC N=40
Systolic blood pressure Mean (SD)	155.7 (16.4)	173.4 (19.6)	145.6 (13.8)	153.6 (12.7)	157.4 (14.8)	163.1 (13.5)	152.3 (12.1)	162.7 (15.5)
T-test(P value)	0.001		0.02		0.05		<0.001	
Diastolic blood pressure Mean (SD)	93.1 (5.7)	98.7 (2.4)	89.6 (4.8)	91.8 (6.3)	94.7 (3.6)	96.4 (6.1)	91.7 (2.3)	93.9 (5.6)
T-test(P value)	<0.001		0.001		0.09		0.01	

Fig (1): Percent of patients who have optimal level of knowledge about hypertension among HBM group before and after intervention
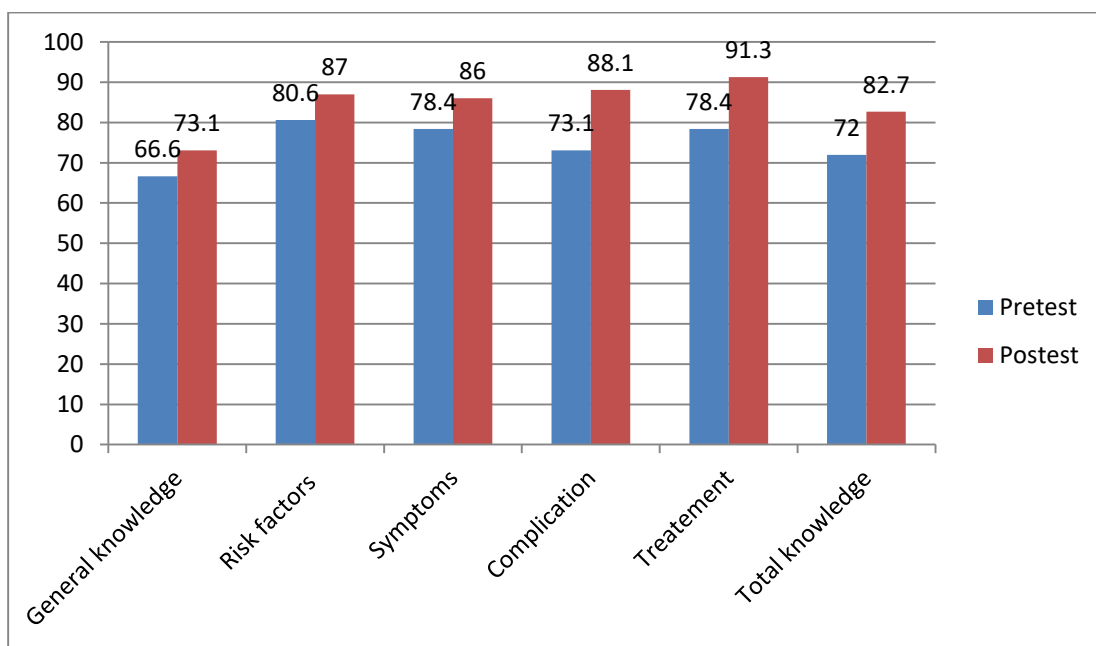

Fig (2): Percent of patients who have optimal level of knowledge about hypertension among ordinary health education group before and after intervention