Using the Health Believe Model to Explain the Patient's Compliance to Anti-hypertensive Treatment in Three District Hospitals - Dar Es Salaam, Tanzania: A Cross Section Study

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Abstract

Background Hypertension is one of the most important cardiovascular risk factors; but compliance to anti-hypertensive medications remains to be a public health challenge worldwide. Health belief model have been used to explain adoption of preventive measures to health problems. This study used the health belief model as a framework to explain the compliance to anti-hypertensive drugs among elderly hypertensive patients. The study aimed at finding the influence of health belief model in treatment compliance among elderly hypertensive patients in three district hospitals in Dar es Salaam, Tanzania.

Methods We conducted an analytical cross-sectional study in three District hospitals in Dar es Salaam Region. We included patients who were on antihypertensive medications. Simple random sampling was used to enrol study participants. Data were collected using structured questionnaires. Data were analysed using SPSS. Frequency distribution and Multivariate analysis was done using Linear Multiple Regression to identify variables which are strongest predictor of treatment compliance among variables of Health Believe Model.

Results: A total of 135 participants were enrolled, 56% were compliant to treatment. Multiple linear regression was used to operationalize the Health Belief Model with treatment compliance being dependant variable. The predictor variables were perceived benefit, perceived barriers and cues to action. Multivariate analysis indicated significant model fit for the data ($F = 11.19$ and $P \text{ value} < 0.001$). The amount of variance in treatment compliance that is explained by the predictors is 30.3% ($R^2 = 0.303$) with perceived barrier being the strongest predictor of treatment compliance ($\beta = -0.477$; $p < 0.001$). A negative beta coefficient indicates a negative association between perceived barriers and treatment compliance. Other predictor variables were not statistically associated with treatment compliance.

Conclusion: The study showed that almost half of study participants had hypertensive treatment compliance, with the use of health believe model the important strongest variable was perceived barrier to treatment. An innovative strategy on improving patients' perception of barrier to treatment is recommended to increase treatment compliance.

Key words: Hypertension, Treatment compliance, lifestyle

Background

Hypertension remains a public-health challenge globally. It is the main modifiable risk factor for cardiovascular disease and stroke, which increasing significant with age [1] and chronic kidney disease [2]. Prevention, early detection, proper and adequate treatment, and control should be given high consideration to prevent occurrence of cardiovascular disease and stroke [3].

Global burden of hypertension projected that the number of adults with hypertension will increase by 60% to a total of 1.56 billion (1.54 billion–1.58 billion) in 2025 [4]. Sub Saharan Africa the prevalence of hypertension is projected to be 125.5 million African adults in 2025 [5]. In Tanzania, hypertension related diseases are the second cause of hospital admission and the cause of deaths [6]. Tanzania particularly in the cities including Dar es Salaam, people experiencing urbanisation and modernisation which cause changes in lifestyle especially in diet intake and physical activity. This lead to overweight, obesity

inadequate physical activities [7] which increase the risk factor of hypertension and cardiovascular diseases [8].

Management of hypertension requires medication and lifestyle compliance. The lifestyle modification includes increase in exercise, lowering of body mass index, reduced-sodium diet, moderation of alcohol consumption or quitting smoking requires much effort and determination [9]. These lifestyle modifications and taking medication properly are examples of therapeutic behaviors [9].

The risk factors for hypertension are smoking and consuming a lot of alcohol. These and other factors such as sedentary lifestyle, obesity, consumption of fatty foods and resultant dyslipidemia are highly prevalent in the population and these factors contribute to the epidemic [8].

Uncontrolled hypertension is caused mainly by non-adherence to the antihypertensive drugs [10], patients understanding their drug regimens help to improve their adherence, thus will help prevent the complications of hypertension which are debilitating and if not prevented can increase the burden of a disease that is already on the increase [11]. Non-adherence to pharmaceutical therapy is a major problem all over the world. Studies on drug adherence to chronic diseases such as hypertension show adherence is about 67.2% [12].

Adhering to antihypertensive drugs remains to be an important modifiable factor towards management of hypertension. Non adherence to antihypertensive agents seriously affect the effectiveness of treatment causing increase in cardiovascular and cerebrovascular risk [13], causing population health problems in the quality of life as well as health economics.

The *Health Belief Model* (HBM) was used in this study to explain the factors which influence hypertensive treatment compliance. The HBM is an approach that is used to describe social behavior as well as individual's cognition. It was introduced in 1950s by Social psychologists so as to facilitate in reasoning individual's participation in health programs such as health checkup and immunization [14] The HBM was also widely used to explain a range of health behavior. The Model also bases on studying compliances with lifestyle modification and antihypertensive medication. It also bases on understanding that high blood pressure involves both drug treatment and lifestyle changes.

A person may take a preventive action when he/she has a positive expectation that by taking a recommended action, he/she will avoid a negative health condition (for instance, a belief that using antihypertensive is effective in preventing complications). Furthermore, to perform a healthy action, one has to believe that there are fewer barriers to successfully take a recommended health action. Moreover, verbal and nonverbal signals (such as seeing a person died due to complications of hypertension) may act as a reminder to individual's performance of a healthy behavior.

The model has strength such as a patient diagnosed with hypertension will have to consider his or her severity and vulnerability to hypertension and its consequences before making decision as to whether the benefit to be gained from a particular (compliance) behavior is worth the cost [14].

In this study the behavior examined is compliance with prescribed antihypertensive medication and lifestyle modifications. The HBM variables used are perceived susceptibility, perceived severity, perceived barriers, perceived benefits and cues to action while the outcome of interest was compliance with antihypertensive treatment.

Little is documented on the influence of health belief model variable on compliance to hypertensive treatments. Therefore, this study aimed at explaining the influence of health belief model variable on hypertensive treatment compliance among hypertension patients in three District Hospitals - Dar es Salaam, Tanzania.

Methods

Study design

We conducted descriptive Cross-sectional design from April to May 2012.

Setting

The study was conducted in three District hospitals in Dar es Salaam Region: Amana, Mwananyamala and Temeke hospitals which are located in Ilala, Kinondoni and Temeke Municipalities respectively. The study sites were chosen because majority of hypertensive patients who are diagnosed from dispensaries and health centres are referred to these hospitals for expertise and availability of antihypertensive drugs.

Study population

The study population included patients with hypertension, who were using antihypertensive treatment and attending at Amana, Temeke and Mwananyamala hypertension clinics.

Sample size and sampling procedure

Sample size: sample size estimated were 135 calculated using kish and Leslie formula (1965).

$n = \frac{Z^2 p(1-p)}{e^2}$. The prevalence used was 34% compliance [1] in Temeke- Dar es Salaam

Sampling procedure

Simple random sampling was used to select study participants. The researcher established a sampling list from patients attended hypertensive clinics to the respective study hospitals to obtain eligible participants who fit inclusion criteria. There were pieces of paper that were written YES or NO, the word YES was used to represent the targeted study population, and NO was used to represent the population that was not going to participate in the study. The procedure of drawing papers from the box by each study participant was used. Once the piece of paper was chosen, it was not included in the sample again and each participant was allowed to **pick** only once.

The inclusion criteria and Exclusion criteria

All patients aged 18 years and above with a diagnosis of hypertension for at least one month with or without other co-existing medical conditions and consent to participate in the study. Participants who have been taking antihypertensive treatment for at least one month ago before the beginning of the study were included in the study.

All patients who had not started antihypertensive and could not respond eg too sick to be interviewed were excluded from the study.

Measures of outcome

The outcome variable was treatment compliance, which comprised of medication regimen compliance and lifestyle modification. Medication regimen compliance was composed of 8 items, asking how often you forget to take your medicine. The responses were measured on a 4-point Likert scale: (1) Every day (2) frequently (3) rarely or (4) never. For life style compliance was having 5 items, participants were asked to respond to the single question based on a 4-point Likert scale: how often do desirable or undesirable behaviors related to control of hypertension. The responses were: (1) Every day (2) frequently (3) rarely or (4) never. Some questions were set such that the highest score did not reflect the worst scenario of none-compliance. To resolve these scores were reversed. Example, how often do you engage in physical exercise (4) every day, (3) frequently, (2) rarely or (1) never? The 13 items measuring treatment compliance and life style compliance were added up to get sum index with a distribution ranging from 33 to 52 with mean 44.2963 (SD =3.32578), the median split was used (44.4), which was dichotomized into two groups i.e. 0 = those who are non-treatment compliant and 1 = treatment compliant which was 34-43 and 44-51.

The HBM variables were measured as described below. Perceived severity of having hypertension, perceived susceptibility of being at risk of hypertension complications and perceived benefit were each measured by six items. The reminders (cues to action) were measured by seven items. Participants were then asked to respond: (1) strongly agree, (2) agree, (3) disagree or (4) strongly disagree.

Six items measuring perceived severity were added up to get sum index with a distribution ranging from 7 to 24 with mean 20.10 (SD =2.85), the median split 50.4 was used as a cut point. Dichotomization was done into two frequency groups, those who had low perceived severity and those who had high perceived severity. Six items measuring perceived susceptibility were added up to get sum index ranging from 6 to 19 with mean of 10.79 (SD =2.83), the median split was 49.6. The sum index for perceived susceptibility was dichotomized into 1=, those with low perceived susceptibility and 2= those with high perceived susceptibility.

Six items measuring perceived benefit were added up to get sum index with a distribution ranging from 12 to 24 with mean (SD) 20.24(2.87) median split 51.1, then dichotomized into, those with low perceived benefit and those with high perceived benefit. Seven items measuring cues to action were added up to get

sum index with a distribution ranging from 15 to 28 with mean (SD) 24.27(2.65) median split 42.2, then dichotomized into two frequency groups those with low perceived cues to action and those with high cues to action.

Five items measuring perceived barriers were added up to get sum index with a distribution ranging from 5 to 15 with mean (SD) 8.36 (2.48), median split 54.8, then dichotomized into, those with low perceived barrier and those with high perceived barrier. The aspects that might hinder respondents to comply with their treatment included not having enough time to do exercise. Responses were (1) strongly not a problem (2) not a problem (3) problem and (4) strongly a problem.

Frequency distributions were done then bivariate analysis using chi-quire and Pearson correlation between HBM variables were done. Multiple linear regressions were done with treatment compliance as the outcome variable (behavior) and the rest of HBM variables as predictors of the behavior.

Data entry and analysis

Data were entered into the computer using SPSS software programme 17.0 version. Data were cleaned before being subjected to analysis. Data analysis was performed using SPSS software programme. Information was summarized using frequency tables and cross tabulations. The chi-square test was used to compare proportions; bivariate correlation (Pearson correlation) analysis was done. Multivariate analysis was done using Linear Multiple Regression to obtain strongest predictor variable between variables of HBM. A P-value of equal or less than 0.05 was considered a statistically significant.

Ethical issues

Ethical clearance was sought from the Research and Publication Ethical Committee of the Muhimbili University of Health and Allied Science. The permission to conduct the study was obtained from Municipal Medical Officer In charge of respective municipal. Written informed consent was obtained, for those who cannot read and write was requested to provide their signature by putting thumb print as signature. The participants were free to withdraw from the research at any stage without incurring any consequences

Results

This study was conducted from April to May 2012; a total number of 135 hypertensive patients attending hypertension clinics in Temeke, Ilala and Kinondoni were enrolled. The socio-demographic characteristics of the respondents were 59(43.7%) males and 76 (56.3%) females, aged 33 to 84 years with mean age (SD) of 56.3 (±13.1) years, most of participants were married 82(60.7%), with respect to education level, most had primary education 74(54.8%), followed by no formal education 45(33.3%) and secondary education 16(11.9%). Regarding occupation, 75(55.6%) were unemployed (Table 1).

Table 1: Socio-demographic characteristics of respondents N=135

Factors associated with treatment compliance

The association between socio-demographic factors and treatment compliance was explored. As presented in Table 2, treatment compliance was significant associated with sex; females participants had higher proportion of treatment compliant (63%) than males (46%) with ($P = 0.044$), Participants with less than 64 years of age (56.8%) had higher proportion of treatment compliance than participants with 65 and above (53.2%), those with primary education had (60%) compliance, followed by those with no formal education (56%) and those with secondary education (38%). However, the difference was not statistically significant (Table 2).

Table 2: Relationship between social demographic characteristics and treatment compliance

Distribution of participant's treatment compliance by HBM variables

As presented in table 3, treatment compliance was significant associated with perceptions of susceptibility ($P = 0.012$), perceived benefit ($P = 0.011$), perceived barrier ($P < 0.001$) and cues to action ($P = 0.002$). Regarding perceived susceptibility, treatment compliance was observed to participants with high perceptions of susceptibility of having hypertension or hypertension complications (66%) followed by those with low perceived susceptibility (45%). Regarding perception of benefit, majority of participants who were having high perceptions of benefit of using antihypertensive treatment had higher proportion of individuals who are compliant (67%) followed by those with low perception of benefit (45%). With respect to perception of barriers, those with low perception of barrier to treatment had low proportion of individuals who are compliant (77%) followed by those with high perception of barrier (30%). Participants who had high perception of cues to action had higher compliant rate (67%) followed by those with low cues to action.

Table 3: Distribution of participant's treatment compliance by HBM variables

Correlation between HBM variables

Treatment compliance showed significant positive association with perceived benefit ($r = 0.27$; $P = 0.001$) which means the higher the perceived benefit of using medicine the higher the treatment compliance. Treatment compliance showed significant negative association with perceived barrier to treatment ($r = -0.53$; $P = 0.000$), indicating the higher the perceived barrier the lower the compliance. Treatment compliance showed positive association with cues to action ($r = 0.19$; $P = 0.022$) which means that when

people get more reminders of the importance of adhering with treatment become more compliant to treatment.

Perceived severity of hypertension showed significant positive association with perceived susceptibility of getting hypertension complications ($r= 0.29$; $p= 0.001$) indicating the higher the perceived severity of hypertension disease the higher the perception of being vulnerable to hypertension complications. Perceived severity showed positive significant association with cues to action ($r=0.20$; $p =0.019$) indicating the higher the perception of severity of hypertension the higher the following the cues to action (reminders). Perceived benefit of using medication showed significant negative association with perceived barrier ($r= -0.45$; $p 0.000$), this meant that the higher the perception of benefit the lower the perception of barriers. Also perceived benefit of using medication showed positive association with cues to action ($r=0.32$; $p= 0.000$), meant that the higher perception of benefit the higher the perception of following reminders (Table 4).

Table 4: Pearson correlation between HBM variables

Health Belief Model factors associated with treatment compliance

Multiple linear regression was used to operationalize the Health Belief Model with treatment compliance being dependant variable. The predictor variables were perceived benefit, perceived barriers and cues to action. Multivariate analysis indicated significant model fit for the data ($F = 11.19$ and $P \text{ value} = 0.000$). The amount of variance in treatment compliance that is explained by the predictors is 30.3% ($R^2 = 0.303$) with perceived barrier being the strongest predictor of treatment compliance ($\beta = -0.477$; $P = 0.000$). A negative beta coefficient indicates a negative association between perceived barriers and treatment compliance. Other predictor variables were not statistically associated with treatment compliance (Table 5).

Table 5: Health Belief Model factors for treatment compliance

Discussion

This study explored factors affecting treatment compliance among hypertensive patients attended hypertension clinics at Dar es Salaam guided by health belief model. Data were obtained through self-reporting using questionnaires on compliance to medication regimen and lifestyle modification revealed the proportional of treatment compliance was 55.6%, the result was similar to study conducted at Lebanon and Jordan which was an observational study, reported 55.9% of respondents were compliant to antihypertensive medications [16].

Our findings showed compliance was higher than that of study conducted in Mumbai, reported 39.4% were compliant to their treatment [17]. The compliance was lower than that reported to the previous study in Korea and India [18,19]. The possible reason for the discrepancy observed could be explained by the

types of hospitals included in our study, we included district hospitals, where participants attended are average Tanzanian compared to participants enrolled in the study conducted at Korea and India whom were from tertiary hospitals with higher income and education, this could account for the difference observed.

In this current study the mean age (SD) of all included hypertensive patients was 56.3 (± 13.1) years, this is not surprising since hypertension is more common in older people. Our result was similar to results from study conducted to hypertensive patients on treatment compliance, attending the outpatient department of a tertiary care hospital in Mumbai, reported that the mean age of participants was 55.2 (± 12.6) years [17].

The current study shows that, participants who were 64 and below years of age had higher level of treatment compliance compared to those with 65 and above years of age. These results are comparable to those reported from the study done in North America and Korea, reported older age showed association with treatment compliance [19,20]. 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 medications than older people. Another possible reason is that older people might have more than one disease due to aging process, which might have led them using many drugs which make them tired, hence, stop taking drugs. Also, cognitive and functional impairment in elderly patients increases their risk of poor drug compliance, so they need a family to remind, support and assist them in taking drugs [21].

Our study results revealed that female patients were statistically significantly more compliant (63.2%) to antihypertensive medication compared to male ($P = 0.044$). Female patients have been found by some researchers to be better compliance to antihypertensive treatment as compared to male patients [17]. Impotence is the likely hood side effect which affects men on complying with antihypertensive medications; this might be the reason why male had low level of treatment compliance compared to female.

The findings from the current study revealed that, patients without formal education level (57%) had a higher level of treatment compliance to antihypertensive medications as compared to those with high education level (38%). The probable reason might be that patients without formal education are likely to be more compliant to antihypertensive medications, due to total reliance on instructions from health care providers. Those with a higher level of education are more likely to supplement health care providers' instructions with information from other sources.

Our study finding disagreed with study conducted at the Aga Khan University Hospital (AKUH) and National Institute of Cardiovascular Diseases, Karachi on factors associated with adherence to antihypertensive treatment in Pakistan, they reported adherence was increased with the increase in level of education. Patients with high level of education might be adherent to antihypertensive medication and life style modification since they know the adverse effect of not been compliant to medication.

The association between marital status and treatment compliance was revealed; in the current study married participants were more compliant to medications (61%) compared to single participants. Our findings agreed with those of study done by Bovet et al, who reported divorced and widowed patients demonstrated poor adherence to antihypertensive medication [16]. Marriage might have a positive effect on compliance to medications. Partners might help each other in reminding on time of taking medications and moral support on the importance of treatment.

From this study the relationship between HBM constructs and treatment compliance 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. Our study results concur with study conducted in India on determinants of patient's adherence to hypertension medications in a Rural population of Kancheepuram District in Tamil Nadu, South India reported that the respondents who perceived high susceptibility, severity, benefit had better adherence [22].

Perceived barrier was the important predictor in non-compliance to antihypertensive drugs this was agreed with study conducted on Health Beliefs and Medication Adherence in Patients with Hypertension, reported adherence to antihypertensive medications is higher with less perceived barriers [23]. This is true according health belief model when a person perceives there is a barrier of taking medication, he will not comply to his medication as supposed and this will lead to complications and/or death.

Distribution of participants by reasons of not complying with antihypertensive medication were determined, the reasons were stopping medication due to; cost of the medications, fear of the side effect [19,20], feeling well (asymptomatic), avoiding addiction of drugs [18] and use of traditional medicine [21].

Conclusions

The study showed that compliance to antihypertensive treatment was (55.6%) among study participants, with the use of HBM the important strongest variable was perceived barrier to treatment. Patients need advice, support and information from health professionals in order to be able to understand the importance of using drugs as prescribed.

It is recommended that, health care providers should be aware that, hypertensive patients need continuous education reminders, for the better control of hypertension and improving the quality of life. This education should focus on the importance of complying to antihypertensive medications, physical exercises and salt restriction.

More and wide research should be done to assess why people are having perceived barriers to treatment compliance, and why people with low education are more compliant than those with high education.

Limitations

This study was conducted in the government District Hospitals in three Municipal of Dar es Salaam only and did not include patients who attended private Hospitals. Therefore, results cannot be generalized to all hypertension patients in Dar es Salaam.

Self-reporting of treatment compliance could introduce recall bias by either over reporting or under reporting depending on patient's behaviour on the recent past. Since this was a cross-sectional study, there is a possibility of recall bias in our study.

Abbreviations

DMOs	Disstrict Medical Officers
HBM	Health Belief Model
SPSS	Statistical Package for the Social Sciences

Declarations

Ethical Approval

Muhimbili University of Health and Allied Sciences has approved the study (MUHAS). All participants gave their written consent to participate and were informed that they could terminate their participation at any time without incurring any cost.

Consent to publication

Not applicable

Availability of data and material

Data set is available upon request to the corresponding author.

Competing interests

The authors declare that there is no competing interest

Funding

Not applicable

Authors contributions

A.A.J led the conceptual, design, acquisition of data, analysis, interpretation of data, and drafting of the manuscript. S.L guide the conception, design and acquisition of the data, analysis and interpretation, and

critically revising of the manuscript for intellectual content and have given final approve for the version to be published. All authors read and approved the final manuscript.

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Tables

Table 1: Socio-demographic characteristics of respondents N=135

Characteristics	Frequency	Percentage
Age (years)		
≤ 64	88	65.2
≥ 65	47	34.8
Sex		
Male	59	43.7
Female	79	56.3
Marital status		
Married	82	60.7
Separate	25	18.5
Widower	28	20.7
Level of education		
No formal education	45	33.3
Primary education	74	54.8
Secondary education	16	11.9
Occupation		
Employed	60	44.4
Unemployed	75	55.6

Table 2: Relationship between social demographic characteristics and treatment compliance

Characteristics		Treatment Compliance		P-value
		Non-compliance n=60	Compliance n=75	
		No (%)	No (%)	
Age				
	≤ 64	38(43.2)	50(56.8)	0.686
	≥ 65	22(46.8)	25(53.2)	
Sex				
	Male	32(54.2)	27(45.8)	0.044
	Female	28(36.8)	48(63.2)	
Marital status				
	Married	32(39.0)	50(61.0)	0.287
	Separate	13(52.0)	12(48.0)	
	Widower	15(53.6)	13(46.4)	
Education level				
	No formal education	20(44.4)	25(55.6)	0.277
	Primary education	30(40.5)	44(59.5)	
	Secondary education	10(62.5)	6(37.5)	
Occupation				
	Employed	27(44.0)	33(56.0)	0.908
	Unemployed	33(45.0)	42(55.0)	

Table 3: Distribution of participant's treatment compliance by HBM variables

HBM variables	Treatment compliance		P- value
	Non-compliant n= 60 n (%)	Compliant n=75 n (%)	
Perceived Severity			
Low	29(42.6)	39(57.4)	0.672
High	31(46.3)	36(53.7)	
Perceived Susceptibility			
Low	37(55.2)	30(44.8)	0.012
High	23(33.8)	45(66.2)	
Perceived Benefit			
Low	38(55.1)	31(44.9)	0.011
High	22(33.3)	44(66.7)	
Perceived Barrier			
Low	17(23.0)	57(77.0)	0.000
High	43(70.5)	18(29.5)	
Cues to action			
Low	34(59.6)	23(40.4)	0.002
High	26(23.3)	52(66.7)	

Table 4: Pearson correlation between HBM variables

Variables	1	2	3	4	5	6
1. Treatment compliance	-	0.104	0.141	0.274**	-0.528**	0.197*
1. Perceived severity		-	0.285**	0.090	-0.090	0.202*
1. Perceived susceptibility			-	-0.062	-0.061	-0.180*
1. Perceived benefit				-	-0.449**	0.323**
1. Perceived barrier					-	0.323**
1. Cues to action						-

*: $P \leq 0.05$; **: $P \leq 0.01$

Table 5: Health Belief Model factors for treatment compliance

HBM variables	Beta	P- value
Perceived severity	0.092	0.238
Perceived susceptibility	0.147	0.062
Perceived Benefit	0.050	0.557
Perceived barriers	0.477	0.000
Cues to action	0.035	0.671

$R^2 = 0.303$; $F = 11.19$ ($P = 0.000$)

Behaviour = Compliance to treatment.

Figures

Figure 1

Inter-relationship between variables of Health Belief Model which were used to explain hypertension treatment compliance