

Using the Health Belief 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 remains a public-health challenge globally. Its prevention, early detection, proper and adequate treatment and control should be given high consideration to prevent occurrence of cardiovascular disease and stroke. This study is guided by the Health Belief Model (HBM) to investigate the influence of treatment compliance using HBM constructs among elderly hypertensive patients in 3 regional hospitals in Dar es Salaam, Tanzania.

Methods: An analytical cross-sectional study was conducted in 3 region hospitals in Dar es Salaam from April to May 2012. The study included patients who were on antihypertensive medications. Simple Random Sampling was used to enrol the study participants. Data was collected using structured questionnaire. Data was analysed using SPSS version 20. Linear Multiple Regression analysis was performed to identify variables which are strongest predictor of treatment compliance among variables of the Health belief Model.

Results: A total of 135 participants were enrolled of whom 56% were compliant to hypertensive treatment. Multivariate analysis indicated significant model fit for the data ($F=11.19$ and $P\text{ value} < .001$). The amount of variance in treatment compliance that was explained by the predictors was 30.3% ($R^2=0.303$) with perceived barrier being the strongest predictor of treatment compliance ($\beta=-0.477$; $p < .001$). Other predictor variables were not statistically associated with treatment compliance.

Conclusion: The study showed that 56% of study participants had hypertensive treatment compliance and perceived barrier to treatment was the strongest predictor. Innovative strategy on improving patients' perception of barrier to treatment is recommended in order to improve treatment compliance.

BACKGROUND

Hypertension remains a public-health challenge globally. It is the main modifiable independent risk factor for development of cardiovascular disease, stroke and renal failure which increase significantly with age¹. Prevention, early detection, proper and adequate treatment and control should be given high consideration to prevent occurrence of cardiovascular disease and stroke.² Control and prevention of hypertension complications can only happen when individuals recognise the benefits of changing lifestyle behaviour and believe that they are susceptible to hypertension complications.³

Health Belief Model (HBM) has been used to explain and predict individuals health behaviours for preventing and/or controlling diseases and their complications by including perception of susceptibility, seriousness, severity, benefits and barriers to a health behaviour and cues to action.³ The global burden of hypertension projects indicate that the number of adults with hypertension will increase by 60% to a total of 1.56 billion in 2025.⁴ For Sub-Saharan Africa,

the prevalence of hypertension has been projected to be 125.5 million among adults in 2025.⁵

In Tanzania, hypertension related diseases are the second cause of hospital admission and cause of deaths.⁶

Tanzania particularly in the cities like Dar es Salaam, people are experiencing urbanisation and modernisation. This has brought about changes in their lifestyle especially their diet intake and physical activity. This has led to overweight, obesity and physical inactivity which altogether increase the risk for hypertension and cardiovascular diseases.^{7,8}

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 and quitting smoking.⁹ These lifestyle modifications and taking medication properly are examples of therapeutic behaviours.⁹ The treatment guideline of hypertension in Tanzania are either non-pharmacological or pharmacological treatment. Non-pharmacological treatment calls for life style modifi-

ation which includes weight reduction, adopting dietary approaches to stop hypertension (DASH) such as eating diet rich in fibre-fruits, vegetable, unrefined carbohydrate and low-fat dairy products with reduced content of saturated and total fat. Also, reduction in dietary sodium intake, involvement in regular physical activity such as a brisk walking for at least 30 min/day 3 days a week, stop the use of all tobacco products and reducing alcohol consumption.¹⁰ Pharmacological treatment includes combination of drugs including diuretics, Angiotensin-Converting Enzyme Inhibitor (ACEI), Angiotensin Receptor Blocker-ARB, Beta-blocker and Calcium Channel Blocker.¹⁰

Uncontrolled hypertension is caused mainly by non-adherence to the antihypertensive drugs¹¹ and lifestyle.¹² Understanding drug regimens by the patients helps to improve their adherence, and thus preventing the complications related to hypertension which are debilitating and if not prevented may increase the burden of cardiovascular diseases.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 and thus causing an increase in cardiovascular and cerebrovascular risks and consequently causing population health problems in the quality of life as well as health economics. Non-adherence to pharmaceutical therapy is a major problem all over the world. Studies on drug adherence to chronic diseases such as hypertension show that adherence is about 67.2%.¹¹

According to Rosenstock et al, the HBM constructs reported were perceived susceptibility, perceived severity, perceived barriers, perceived benefits and cues to action hypothesises that health-related action depends upon an individual’s motivation, belief of being vulnerable to a disease and one’s belief to certain health recommendations that is important in befitting health and reduce disease complications.¹⁵ (Figure 1).

Little is documented on the influence of health belief model variable on compliance to hypertensive treatments. Therefore, this study aimed at assessing the influence of Health Belief Model variable on hypertensive treatment compliance among hypertension patients in 3 region Hospitals in Dar es Salaam, Tanzania.

METHODS

Study Design and Setting

We conducted an analytical cross-sectional study design from April to May 2012 using quantitative approach. The study included data from 3 regional hospitals in Dar es Salaam; Amana, Mwananyamala and Temeke hospitals which are located in Ilala, Kinondoni and Temeke Municipalities respectively. The estimated population in these municipalities is 1,220,611, 1,775,049 and 1,368,881 people for Ilala, Kinondoni and Temeke Municipalities respectively.¹⁶ The study sites were selected because majority of hypertensive patients who are diagnosed from primary health facilities are referred to those hospitals for expert management.

Study Population

The study population included patients with hypertension who were using antihypertensive treatment and were attending hypertension clinics from the selected hospitals. Each Hospital has 2 days per week of clinic for non-communicable diseases including hypertension. All 3 hospitals have inpatient and outpatient services.

Sample Size and Sampling Procedure
Sample Size

Sample size of 135 participants was calculated using kish and Leslie formula (1965).

$$n = \frac{Z^2 p(1-p)}{e^2}$$

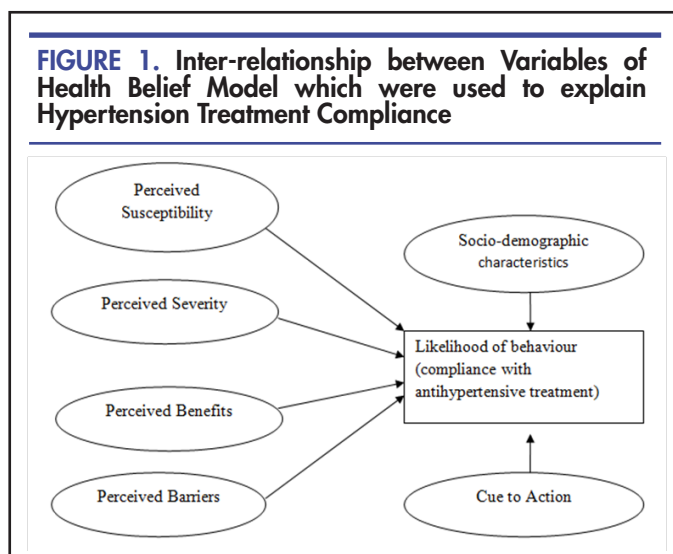
The prevalence used was 34% compliance in Temeke-Dar es Salaam.¹⁷

- Where: n = the required minimum sample size
- ε = margin of error (5%)
- p = estimated proportion of compliance 34%
- z = standard normal deviate corresponding to 95% confidence level=1.96

Considering a margin error of 5% and a 95% confidence level, the minimum required sample size obtained was 135.

Sampling Procedure

The 3 regional hospitals were selected purposively because most of the patient who have hypertension and hypertensive complications are referred to these hospitals from the Primary Health Facilities. We reviewed the records of hypertensive patients attending in each of the 3



HBM is an approach that is used to describe social behaviour as well as individual’s cognition. It was introduced in the 1950s by Social psychologists so as to facilitate in reasoning individual’s participation in health programs such as health check-ups and immunisation.¹⁴ The HBM was also widely used to explain a range of health behaviour. The model also base on studying compliances with lifestyle modification and antihypertensive medication, including understanding that high blood pressure involves both drug treatment and lifestyle changes.

hospitals for the period of 1 month. We found that 366, 583 and 340 patients attended Amana hospital, Mwanayamala hospital, and Temeka hospital respectively. The 135-sample size calculated was proportionally allocated to 3 hospitals based on the above records. Thus, 39 participants were selected from Amana, 60 from Mwanayamala and 36 from Temeka hospital. Simple random sampling was used to select the study participants. The researcher established a sampling list from patients attending hypertensive clinics to the respective study hospitals to obtain eligible participants that meet the inclusion criteria. There were pieces of paper that were written on; 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 a piece of paper was picked, 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 consented to participate in the study. Participants who had been taking antihypertensive treatment for at least one month before the beginning of the study were included. All patients who had not started antihypertensive treatment and could not respond because of reasons such as being 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 behaviours 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 non-compliance. To resolve these, scores were reversed. For 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 dichotomised 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 constructs included perceived severity of having hypertension, perceived susceptibility of being at risk of hypertension complications and perceived benefit were each was measured by 6 items. The reminders (cues to action) were measured by 7 items. Participants were then asked to respond: "1" strongly agree, "2" agree, "3" disagree or "4" strongly disagree.

6 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-off point. Dichotomisation was done into 2 frequency groups; those who had low perceived severity and those who had high perceived severity. 6 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 dichotomised into 1= those with low perceived susceptibility and 2= those with high perceived susceptibility.

6 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) and median split 51.1. Then dichotomised into; those with low perceived benefit and those with high perceived benefit. 7 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 dichotomised into 2 frequency groups; those with low perceived cues to action and those with high cues to action.

5 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 dichotomised 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.

Bivariate analysis using Chi-square and Pearson correlation between HBM variables were performed. Multiple linear regression analysis was performed with treatment compliance as the outcome variable (behaviour) and the rest of HBM variables as predictors of the behaviour.

Data Analysis

Data was analysed using SPSS software programme 17.0 version. The chi-square test was used to compare proportions. Multivariate analysis was performed using Linear Multiple Regression to obtain strongest predictor variable between variables of HBM. A p-value less than 0.05 was considered statistically significant.

Ethical Approval

Muhimbili University of Health and Allied Sciences (MUHAS) approved the study (Ref. NO. MU/PGS/SAEC/Vol. VI). All participants gave their written consent to participate and were informed that they could terminate their participation at any time without incurring any cost.

RESULTS

A total of 135 participants were included in the study. The mean age of participants was 56.3, ±13.1 years. Most of the participants 76 (56.3%) were females aged between 33 to 84 years. Majority of participants 82 (60.7%) were married. With respect to education level, most of the participants 74 (54.8%) had primary education. Regarding occupation, most of the participants 75 (55.6%) were unemployed (Table 1).

Factors Associated with Treatment Compliance

The association between socio-demographic factors and -

treatment compliance was explored. Treatment compliance was significantly associated with sex. Female participants had higher proportion of treatment compliance (63%) than males (46%) ($P=.044$). Participants with less than 64 years of age 50 (56.8%) had higher proportion of treatment compliance than participants with 65 and above years (53.2%) $p=.686$. Participants with secondary education had 10 (62.5) compliance compared to those with informal education 25 (55.6%). However, the difference was not statistically significant (Table 2).

Association of Health Belief Model Variables with Treatment Compliance

Participants with high perceived severity were more compliant 39(57.4%) to hypertension treatment compared to those with low perceived severity who had only 36(53.7%) complaint to hypertensive treatment. However, the difference was not significant ($p=.672$). Those with high perceived susceptibility to hypertension complications were more compliant 45(66.2%) to hypertensive treatment compared to those with low perceived susceptibility, who had complaint of 30(57.4%) only and the difference was significant ($p=.012$). Participants with high perceived benefit of using antihypertensive treatment were more complaint 44(66.7%) to hypertensive treatment compared to those with low perceived benefit 31(44.9%) and the difference was significant ($p=.011$). Regarding perceived barrier, those with low perceived barrier were more complaint 57(77%) to treatment compared to those with high perceived barrier to hypertensive treatment (18(29.5), the difference was significant ($p=.000$). Regarding cues to action, those who had high reminders were more complaint 52(66.7%) to treatment compared to those with low reminders of using hypertensive treatment 23(40.4%) and difference was significant ($p=.002$) (Table 3).

Health Belief Model Factors Predicting Treatment Compliance

Treatment compliance showed significant positive association with perceived benefit ($r=0.27$; $P=.001$) 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 ($r=-0.53$; $P=.000$), indicating that the higher the perceived barrier the lower the compliance. Treatment compliance showed positive association with cues to action ($r=0.19$; $P=.022$) which means that when people receive more reminders of the importance of adhering with treatment, they become more compliant.

Perceived severity of hypertension showed significant positive association with perceived susceptibility of getting hypertension complications ($r=0.29$; $p=.001$) indicating that 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 ($r=0.2$; $p=.019$) indicating that the higher the perception of severity of hypertension the higher the following of the cues to action (reminders). Perceived benefit of using medication showed significant negative association with perceived barrier ($r=-0.45$; $p=.000$), 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 ($r=0.32$; $p=.000$), meaning that the higher the perception of benefit the higher the perception of following reminders (Table 4).

Health Belief Model Factors Associated with Treatment Compliance

Multivariate analysis indicated significant model fit for the data ($F=11.19$ and $P\text{ value}=.000$). The amount of variance in treatment compliance that was explained by the predictors was 30.3% ($R^2=0.303$) with perceived barrier being the strongest predictor of treatment compliance ($\beta=-0.477$; $P=.000$). 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).

DISCUSSION

This study explored factors affecting treatment compliance among hypertensive patients who were attending hypertension clinics in Dar es Salaam. This study was guided by Health Belief Model. The key findings in this study include positive association between age, sex, level of education, marital status and treatment compliance. We also found that the significant predictors of using HBM constructs were perceived susceptibility of being at risk of getting hypertension complications, perceived benefit of using medicine, perceived barrier to treatment and cues to action. After control of all factor variables among the construct of the HMB, the strongest predictor was perceived barrier.

The study revealed the percentage of treatment compliance to be 55.6% among study participants. Similarly, Imad et al reported that 55.9% of hypertension patients had good adherence to antihypertensive medication.¹⁸ The compliance rate of 55.6% in the present study was low compared to the findings in the study conducted by Okello et al in Uganda and Adidja et al in Cameroon in which the compliance rate was 85% and 67.7%, respectively.^{19,20}

Our findings showed that compliance to antihypertensive was higher than that of the study conducted by Pallangyo et al in tertiary hospitals in Tanzania which reported that 25.3% were compliant to their hypertensive treatment.²¹ Study conducted by Bovet et al in Temeke Dar es Salaam, reported low (34%) adherence of patients to antihypertensive treatment.¹⁷ Similar to a study by Goweda and Shatla.²² The possible reason for the discrepancy observed in treatment compliance could be explained by the nature and type of hospitals included in our study. Our study considered hypertensive patients with no other complications while the study conducted by Pallangyo et al involved admitted patients with heart failure as a complication of uncontrolled hypertension.²¹

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. The results are comparable to those reported in the study conducted by Demoner et al in the city of Maringá and Choi et al in Korea which reported that young age group showed association with treatment compliance and older

TABLE 1: Socio-Demographic Characteristics of Respondents N=135

Characteristics	Frequency (n)	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		
informal 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		<i>P-value</i>
	Non-compliance No (%)	Compliance n=60 No (%)	
Age			
≤ 64	38 (43.2)	50 (56.8)	.686
≥ 65	22 (46.8)	25 (53.2)	
Sex			
Male	32 (54.2)	27 (45.8)	.044
Female	28 (36.8)	48 (63.2)	
Marital status			
Married	32 (39.0)	50 (61.0)	.287
Separate	13 (52.0)	12 (48.0)	
Widower	15 (53.6)	13 (46.4)	
Education level			
Informal education	20 (44.4)	25 (55.6)	.277
Primary education	30 (40.5)	44 (59.5)	
Secondary education	6 (37.5)	10 (62.5)	
Occupation			
Employed	27 (44.0)	33 (56.0)	.908
Unemployed	33 (45.0)	42 (55.0)	

patients showed poor adherence to antihypertensive treatment.^{23,24} The possible explanation of these results may be that young people have higher income since they are able to work and thus can afford to buy medications when compared to older people. Another possible reason is that older people are more likely to have more than one disease due to aging which may have exposed them to using multiple drugs and in turn they become

frustrated and, hence, stop taking drugs.²⁵ Also cognitive and functional impairment in elderly patients increase their risk of poor drug compliance, thus they may require to have someone to remind, support and assist them in taking their drugs.²⁶

Our study results revealed that female patients were more compliant to antihypertensive medication (63.2%)

TABLE 3: Association of Health Belief Model Constructs with Treatment Compliance

HBM variables	Treatment compliance		P- value
	Non-compliant n= 60 n (%)	Compliant n =75 n (%)	
Perceived Severity			
Low	29 (42.6)	39 (57.4)	.672
High	31 (46.3)	36 (53.7)	
Perceived Susceptibility			
Low	37 (55.2)	30 (44.8)	.012
High	23 (33.8)	45 (66.2)	
Perceived Benefit			
Low	38 (55.1)	31 (44.9)	.011
High	22 (33.3)	44 (66.7)	
Perceived Barrier			
Low	17 (23.0)	57 (77.0)	.000
High	43 (70.5)	18 (29.5)	
Cues to action			
Low	34 (59.6)	23 (40.4)	.002
High	26 (23.3)	52 (66.7)	

TABLE 4: Correlation of Health Belief Model Variables with Treatment Compliance

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

*p < 0.05, **- p < 0.001

TABLE 5: Health Belief Model Factors Predicting Treatment Compliance

HBM variables	Beta	P- value
Perceived severity	0.092	.238
Perceived susceptibility	0.147	.062
Perceived Benefit	0.050	.557
Perceived barriers	0.477	.000
Cues to action	0.035	.671

R² = 0.303; F = 11.19 (P = .000)
Behaviour = Compliance to treatment.

compared to male patients ($P=0.044$). Female patients have been reported to be better at adhering to antihypertensive treatment as compared to male patients.^{27,28}

Impotence is the likelihood side effect which affects

men's compliance with antihypertensive medications. This could be the reason why males showed low level of treatment compliance compared to females.^{28,29} The findings from the current study revealed that patients wi-

th secondary level of education had a higher level of treatment compliance to antihypertensive medications as compared to those with informal education (62.5 vs 37.5%). However, the difference was not significant. The probable reason could be that patients with high education level are likely to be more complaint to antihypertensive medications, due to the fact that having high education level make an individual to think critically about hypertension complications and also to have informed decision making about use of antihypertensive medications.³⁰ This is similar to the study done by Saruna et al who reported that the level of education was significantly associated with treatment compliance.³⁰ The same was reported by Yan et al in the study conducted in China.²⁸ Also, Goweda and Shatla reported that patients with high level of education might be adherent to antihypertensive medication and life style modification since they understand the adverse effect of not being complaint to medication.²²

The association between marital status and treatment compliance was revealed, in the current study, married participants were more compliant to medications (61%) when compared to single participants. Abbas et al also found that divorce was associated with poor adherence to antihypertensive medication (OR=2.14, 95% CI=1.31–5.48).³¹ Marriage might have a positive effect on compliance to medications. Partners might help each other in reminding each other the time for taking medications and also give moral support on the importance of treatment.

Perceived barrier was an important predictor in non-compliance to antihypertensive drugs and physical exercises.

This finding agreed with the study conducted by Yang et al in rural area of China which reported that adherence to antihypertensive medications is higher with less perceived barriers³² a scale based on the HBM, and the four-item Morisky Medication Adherence Scale. Results 745 hypertensive patients participated in the study (345 men, 400 women). The perceived barrier to antihypertensive medication was also reported by Obirikorang et al in the study conducted in Ghana.³³ This is true according to the Health Belief Model: when a person perceives there is an obstacle of taking medication, he will not comply to his medication and exercise as supposed to and this will lead to complications and/or death.

Barriers of not complying with antihypertensive medication were determined. The reasons were; stopping medication due to cost of the medications^{20,34}, fear of the side effect^{35,36}, feeling well (asymptomatic)³⁷, avoiding addiction to drugs^{38,39} and use of traditional medicine.²⁸

CONCLUSION

This study reported compliance to antihypertensive treatment of (55.6%) among study participants. Perceived barrier to treatment of hypertension was the strongest predictor among the constructs of HBM. Patients need advice, support and information from health professionals in order to understand the importance of using drugs as prescribed.

It is recommended that health care providers should be aware that hypertensive patients need to be educated on

how to manage the disease and also be reminded continuously for better control of hypertension and improving the quality of their lives. This education and reminders should focus on the importance of complying to antihypertensive medications, physical exercises, diet and salt intake restriction. However, the HBM variables do not provide for advising patients the importance of treatment adherence, thus there is a need to use more than one theoretical model to provide adherence to antihypertensive advice to patients. Further studies should be conducted to assess why people have perceived barriers to treatment compliance.

Limitation of the study

This study was conducted in Tanzania government regional hospitals in 3 Municipals of the Dar es Salaam region only. A cross sectional study design was used. Therefore, results cannot be generalised to all hypertension patients in Dar es Salaam because of the nature of the study design. Self-reporting of treatment compliance could introduce recall bias by either over reporting or under reporting depending on the patient's behaviour in the recent past. Based on the reason that this was a cross-sectional study, there is a possibility of recall bias in our study. In the current study HBM, remain descriptive and does not suggest the action for patients to change their behaviour. HBM should be used with other models so that patients can be advised to change their behaviours.

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