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FACTORS INFLUENCING ADHERENCE TO ANTIHYPERTENSIVE MEDICATIONS: A COMPHRENSIVE SURVEY ON HYPERTENSIVE PATIENT COMPLIANCE

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ABSTRACT The ideal management of a hypertensive patient include not only the pharmacological treatment but also a good compliance from the patient side. Some measures can be undertaken by the patient which can help to control or even reverse hypertension. Measures like decreasing weight, minimal or no salt intake, low carbs intake, physical exercise, etc. This article talks about a survey on patient compliance which was taken under Dr. Pravin Kahale in his clinic at Kokilaben Dhirubhai Ambani hospital, Mumbai (India). To understand the psychology of hypertensive patient regarding the disease of hypertension through a survey, a survey of 300 patient was done when they came to dr. Kahale's clinic for check-up/follow-up. Some survey forms were filled by doing home visits too. The questions in the survey highlighted the compliance of the patient towards the prescribed drugs. The questions are mentioned later in this article. There was a set of 17 questions which are discussed in the article along with their results But, vividly speaking hypertensive patients don't pay necessary attention when it comes to compliance. The data exclaimed that only 50% subjects were successful to decrease their body weight. Quite a good number of patients forget to take medicines on time. About one-third of our patients were frustrated to take medicines regularly. This study has revealed that a good number of people having hypertension are not compliant to their drug therapy. The article focuses on the importance of compliance in management of hypertension.

INTRODUCTION:
HYPERTENSION:

A persistent rise in the systolic or diastolic or both blood pressure is known as hypertension. Hypertension is now regarded as the worldwide pandemic. The world health report of the year 2002 measuring the factors responsible for disability adjusted life years, hypertension ranked 3rd in the list. Today an estimated of 1.13 billion people have hypertension. the WHO clearly stated that 1 in every 4 men and 1 in every 5 women have hypertension. Nearly a 22% prevalence has been recorded for hypertension in 18 years or above (2014) and according to the World Health Organizations the highest recorded prevalence for elevated blood pressure was in Africa which comes to about 30% while lowest prevalence was seen in United States Of America about 18% (Alefan et al., 2019). The famous rule of halves for hypertension states, "out of total hypertensive population only ½ are aware of this disease. Out of the aware population only ½ are diagnosed. Out of the diagnosed only ½ are treated. Out of the treated only ½ are adequately treated." By 2025 the number of adults with hypertension is predicted to rise to about 1.56 billion (Akoko BM et al 2017).

The principal motive of this article is to spread awareness about hypertension and what is the role of the patient to manage this disease. The WHO global target of a 25% relative reduction in the risk of premature mortality from non communicable diseases by 2025 and the SDG (sustainable development goals) target of reduction of 1/3 premature deaths by 2030 could be highly contributed by reducing the average blood pressure of the community (Nakwafila et al., 2022). Sackett and Haynes defined patient compliance as "the extent to which a person's behaviour in terms of taking medications, following diet or executing life style changes coincides with medical or health advice" (Manal et al., 2012) usually, a three drug regimen is enough for controlling blood pressure but about 15 to 16% of patients require 5 to 7 anti-hypertensive agents to control their blood pressure (Avataneo et al., 2018). A study in bureau, Cameroon showed only 33.3% compliance (Adidja et al., 2018). While, only 32.1% compliance seen in a resource poor setting in Nigeria (Busari et al., 2010) on the other hand in Pakistan with again resource poor setting the compliance was at 48.3% (Ahmed et al., 2008) this being an example of the fact that compliance depends on a lot of variables. Here, we have tried to formulate the variables.

MATERIALS AND METHOD:
SURVEY ON HYPERTENSIVE PATIENT COMPLIANCE:

Mumbai, the commercial capital of India with a population of 18 million is one of the most populated and extravagant places in the world. The incidence of hypertension every year in Mumbai is 200,000.

A survey was taken from February to September of the year 2020. The survey was taken at Dr. Kahale's clinic and also some home visits were done along with telephone surveys. Around 400 patients were interviewed but only 300 of them met our criteria and were selected for the survey. The survey question revolved around the term patient compliance which simply means how correctly does a patient follow the medical advice given to him to treat his specific disease.

For the development of the questionnaire the existing literature was kept in mind and the questions were finely formulated, some advices from the cardiology consultants of the city helped make these questions hence, we hope the knowledge, adherence and community practice will be represented in this study.

DATA COLLECTION

There was a list of 17 question starting from the patient's age to some specific questions which reflect the compliance. Each survey session lasted for about 10 minutes. The questions were translated to Hindi by the interviewer if the interviewee did not speak English.

Blood pressure was measured with the Richter Sphygmomanometer after a rest of 5 to 10 minutes in the sitting position. A suitable size cuff was used, systolic blood

pressure was taken at Korotkoff phase I and diastolic at Korotkoff phase V. Mean of the 3 blood pressure readings were considered as the patients blood pressure. Patients age, sex, age of hypertension detection was also included in the survey. Consent of each subject was taken prior to taking the survey, subjects were given the freedom to hide certain information like their mobile number, name, address.

Post survey some steps that are really crucial are asking the non-compliant patients about the main reason for their noncompliance while, for the compliant patients with elevated or low blood pressure we asked about their last visit and asked them to visit their doctor for therapy alteration.

The No Objection Certificate from Dr. Kahale and the Kokilaben Dhirubhai Ambani Hospital was taken well in advance, all aspects of the rules and regulations of the institution were kept in mind and we tried our best not to cause any inconvenience.

STATISTICAL ANALYSIS
For the statistical data the software used were SPSS, Microsoft excel and google statistics for the beginning, the survey details were entered in an excel file, the file with the entire data was uploaded to SPSS. The variables to make certain complicated but informative graphs were assigned and the graphs were extracted following this the excel sheet was uploaded to google statistics software in forms which gave easy to understand and to the point pie charts for a better idea of the results.

RESULTS & DISCUSSION
The graphical presentation of the result is given below. The article will now follow the list of 17 question along with the result that was derived

Patient sex: 62.4% of the patients were male with 37.6% female, the explanation for this number can be the high prevalence of hypertension among males.

patient age: around 40% of our patients were aged between 55 to 75 years of age, 20% patient were more than 75 years of age and the remaining less then 55 years.

Questions 1 and 2 talk about demography refer **figure 1.**

Age at detection of hypertension: 48.1% patients voted for 50 to 70 years while 50% voted for 30 to 50 years. The other 2 criteria those are less than 30 and more than 70 years only had 0.9% of patients.

Did the patient visit a doctor as soon as he/she noticed high blood pressure: 73.1% population consulted a doctor after seeing a rise in their blood pressure. The remaining percentage of subjects avoided a visit but later in time they got themselves checked.

If the answer to the above question is "no" after what number of days did the patient visit a doctor: 41.9% patients who said no for the above question visited the doctor within a period of 6 months, 37.2% visited the doctor within a month, 11.6% within a week and the remaining which is a minuscule number went to the doctor after a year.

Whom did you consult: 42% of the patients consulted a specialist i.e. a cardiologist. The remaining 58% consulted a general practitioner (M.B.B.S.). For a disease like hypertension a specialist must be consulted at the very beginning but a large chunk of population goes to a general practitioner to escape from the burdening fees of a specialist doctor. Epidemiological studies on therapy compliance of outpatients state that 63-66% of patients who are referred to general physicians are non compliant to their meds (Pirasath

S, et al., 2017).

The questions 4,5 and 6 gives us an idea about the behaviour of the patients towards hypertension.

Figure 1. : Demographics And History:

Variables	Options	Percentage/ no. of people (n=300)
SEX	MALE FEMALE	62.4% / 187 37.6% / 113
AGE	LESS THAN 55 55-75 MORE THAN 75	40% / 120 40% / 120 20% / 60
AGE AT DETECTION	LESS THAN 30 30-50 50-70 MORE THAN 70	0.5% 50% / 150 48.1% / 144 0.4%
QUALIFICATON OF THE CONSULTANT	SPECIALIST (CARDIOLOGIST) GENERAL PRACTITIONER	42% / 126 58% / 174
H/O MYOCARDIAL INFARCTION	YES NO	21% / 63 79% / 237
COMPLIANT WITH DRUGS	YES NO MOST OF THE TIMES	83% / 249 6.8% / 21 10.2% / 30

H/O of myocardial infarction: 21% of our subjects had a history of MI. This question signifies the close and strong relationship between hypertension and MI. hypertension is an independent variable for myocardial infarction.

how often does the patient forget to take medicines: for this question the options, were: Never, Rarely, Often, more often, always and following are the results (**figure 2.**).
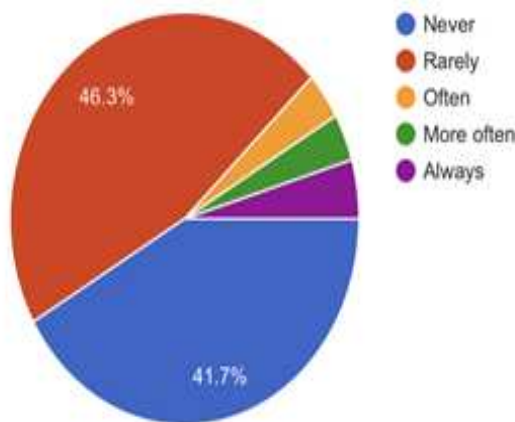
Figure 2: pie chart representing forgetfulness to take medicines

Is the patient taking medicines as per prescribed doses at prescribed time. (compliance with drugs): 83% of patients in our study were compliant with the drugs, 10.2% changed the doses once in a while. Remaining people are not taking the prescribed doses.

How often does the patient go for follow-up: This question 'got' the most variable answers among all. It can be understood because a lot of factors play a role here viz. economic status, education, good or bad control over hypertension, distance from the hospital, and many more. **figure 3**
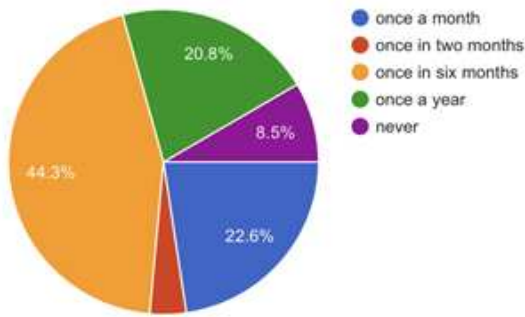
Figure 3 Pie Chart Representing Follow Up Visits

Has the patient tried reducing weight after detection of hypertension: One of the strongest risk factors for hypertension is increased body weight. moreover, according to the national guidelines and many research papers, decrease in the weight can lower both systolic and diastolic blood pressure. For every 20 pounds loss there is decrease of about 5 to 10 mm of hg of blood pressure. This is how one can reverse their hypertension. among our subjects half of them reduced their weight but on the other hand 19.2% tried to reduce their weight but failed to do so. The remaining did not try to reduce their weight at all.

what dietary modifications are made by the patients: decrease intake of carbohydrates and increase in fibres helps one reduce weight and eventually controls hypertension. following are the dietary modifications made by the patients. Subjects were allowed to choose multiple answers from the following and there was also an option for people who did not make any changes in their diet. **Figure 4.**
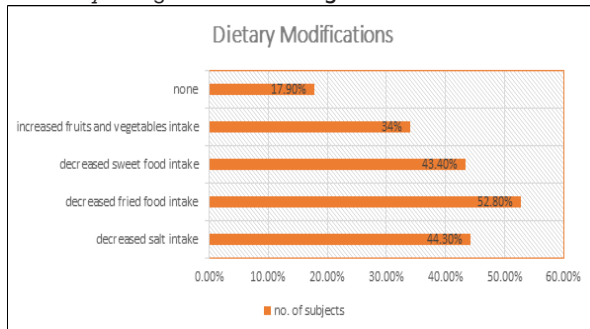

Figure 4.: Graph Representing Dietary Modifications Made By Patients.

Does the patient feel frustrated taking medicines daily: Results for this question was quite satisfactory- a major chunk of 66% of patient did not feel frustrated, however, 12% patients were sometimes annoyed taking medicines and the remaining group of patients were having a hard time to continue their drug therapy.

Has the patient suffered from a myocardial infarction or stroke despite taking medicines regularly: This question actually is more of an impression and ability of the doctor's management for hypertension but, surely it does depend on the patient too because, it is the patient who is responsible to make changes in their diet and get physically active perhaps, these two factors play a major role in hypertension management. Here the data says, a teensy bit of the subjects (6.4%) suffered from an MI despite taking medicines correctly. Rest of the subjects either suffered from an MI or Stroke before starting the drug therapy. Possibly, the pathology was a starting point for their pharmacotherapy. This category also includes patient who did not suffer from any sort of attack or stroke in the first place.

Did the patient try to halt their pharmacotherapy seeing a good control of blood pressure, without even consulting a doctor: In a country like India, this is one of the crucial problems challenging a good patient compliance. Some people who are burdened under the cost of medicines also the people who show hard negligence towards hypertension usually stop taking medicines after seeing a good control of blood pressure. Our study shows about 15% of people on the dark side of the pie chart while, the rest either continued the therapy or consulted a doctor to make changes in their doses.

On a scale of 10 how severe does the patient think the disease of hypertension is: The data that was derived here was indeed shocking, 26% of subjects voted for the number "4" which was the highest voted option. Followed by 16.2% for the number "5" and eventually the number of people showed a fall till the number "10". Just 7% of people from our study voted for 10. The set of people who voted for the numbers 1,2&3 were in total 14% of all the subjects we interviewed.

what class of drug was the patient prescribed with: This question has nothing to 'do' directly with patient compliance but, the way the patient answers to this question gives a lot of idea about his/her knowledge for hypertension (for instance, on asking this question to a patient if he/she replies that initially they were on ACE inhibitors but due to dry cough which is a side effect of this drug the doctor changed it to an ARB class of drug, this is an answer which clearly shows how aware and attentive the patient is at the doctors clinic. On the other hand, if a patient doesn't remember the drug name, it is clearly a point to judge his/her concern about hypertension) according to the data derived majority of the subjects were under the treatment of CCB's followed by ACEI/ARB and took diuretics in combination therapy.

Firstly, to give an outline to the discussion we have to keep in mind that, the survey was done in the city of Mumbai, which is one of the most developed cities of India. Henceforth, the results derived here may be far better or in other words the number of compliant patients will be more than villages reason being the high literacy rate, High income, better education, etc. However, the results Derived here are quite not satisfactory despite of it being from a metro city. The result that we observe shows that majority of hypertensive patient are of the age of 50 to 70 years with male predominance. The subjects are aware about hypertension and its complications but, fail to take the disease seriously, this can be justified by spotting that some patients do not go for consultation at the beginning and wait for the blood pressure to go down on its own, which can be really fatal. Furthermore, we found that about half of the subjects were not successful in losing weight which possibly proves the result of the question which was concerned about the diet changes which says overall less than 50% people made good changes in their diet (i.e. at least 2 or 3 options from that question)

Moving further, about one-third subjects are frustrated taking medicines daily because of which, often they may forget to take medicines which was the case for about 15% to 20% of people we interviewed. Now let's discuss about the questions where patients were supposed to rate hypertension on scale of 1 to 10**.** The question that sums up the patient compliance from all aspects is the one discussed here. If one thinks of hypertension as a very severe disease, he/she will without any doubt take the medicines as per the prescribed doses, will meet the doctor for follow up regularly and keep track of blood pressure and associated possible complications. Only about a quarter of all subjects voted for the numbers 7 and above which is very disappointing.

Now, for putting the findings in a more detailed representation graphs of 2 as well as 3 variables are plotted as follows:
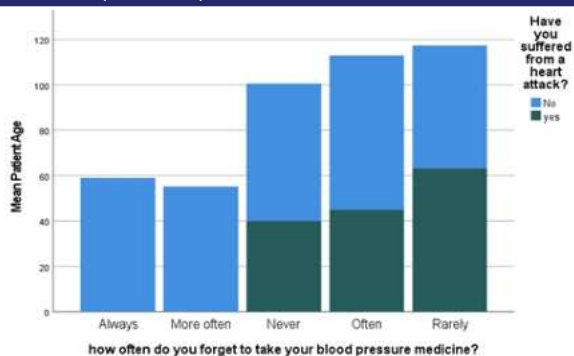
Figure 5. Mean Patient Age X Forgetfulness Of Taking Pills X History Of Heart Attacks

Mean Patient Age X Forgetfulness Of Taking Pills X History Of Heart Attacks:

The **Figure 5** shows mean age on the y-axis, forgetfulness of taking pills on x-axis and the green colour stands for proportion of subjects who suffered from a heart attack regardless of before or after starting antihypertensive therapy while blue shows proportion of subjects with no history of heart attacks. The graphs depicts that the subjects who have a history of heart attacks either rarely forget or don't forget to take their antihypertensive medications while the ones who have no history of heart attacks very often or always forget to take their medications. A Straightforward reasoning for the above results can be the fear of impending death that they experienced during their episode of heart attack has made them aware of the seriousness of this disease and henceforth, they take medications regularly to avoid such an episode again. On the other hand, those who have no history of heart attack often forget to take medications possibly because of lack of knowledge about this disease. If we look closely, the proportion of people who can be considered as having a good compliance and awareness could be the subjects in the upper blue coloured region of the bars of never, often, rarely on x-axis. These are the subjects who don't usually forget to take medications despite of no history of heart attack.
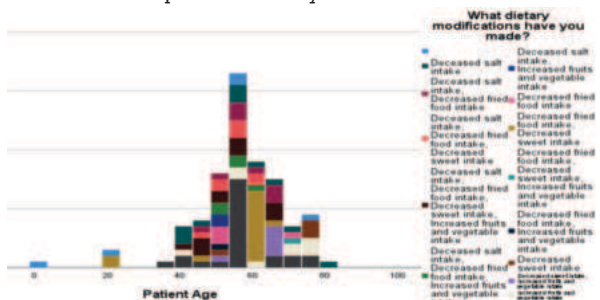

Figure 6. Patient Age X Dietary Modifications Made

Patient Age X Dietary Modifications Made:

The **figure 6** shows patients age on x-axis and the different colours represent the group of dietary modifications that were made by the subjects. Majority of modifications were made by the subjects who are in 5th to 7th decade of their life. The group of modification that was most commonly made was the one in grey colour, which depicts decreased fried food intake with increased fruit and vegetable intake. Also, the combination of decreased fried food intake with decreased sweet intake was undertaken by many.

1 to 10 scale of disease seriousness x history of heart attack:

The **figure 7** shows scale of 10 for disease seriousness on x-axis and blue of no history of heart attack while green for history of heart attack. The findings derived here are quite odd and unexpected. The graph shows that the majority of subjects who have a history of heart attack have marked numbers from

4 to 6, which can have to possible explanation, one being they are still unaware of the risks of this disease regardless of having an episode of myocardial infarction or the second one which has more chances to be true is, as in **figure 5** we saw the ones who have suffered a heart attack rarely forget to take their medications which ultimately leads to a good control of blood pressure and eventually no symptoms which has led them to think of their disease is of moderate risk.
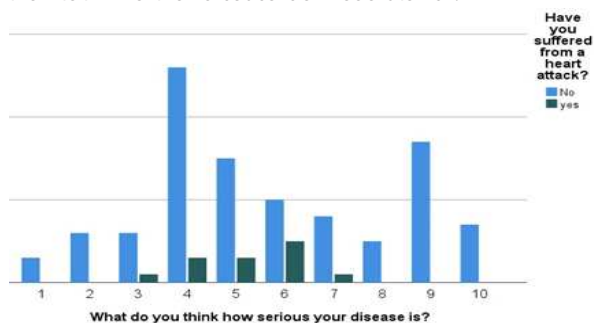

Figure 7. 1 to 10 scale of disease seriousness x history of heart attack

OTHER RESEARCHES DONE IN SAME FIELD:

Factors associated with hypertensive patient compliance with recommended lifestyle behaviours.

Based on above study by (Heymann et al., 2011) half population of the given study of hypertensive patient were reported doing regular exercise and were adhere to special diet, from those 13% of the patients smoked. About 50% reported receiving counselling on diet and smoking cessation and around one third on physical exercises.

Out of total number of patients quarter reported to be counselled regarding measuring blood pressure regularly by themselves and deterioration signs were also well explained. Multiple studies along with their analysis showed that patients viewpoint about their knowledge on hypertension and its management, along with physician counselling on self-care and living healthy lifestyle which included diet modification of patients diet , regular physical exercise, have an independent effect on patients compliance with suggested lifestyle manners.

Determinant factors of medication compliance in hypertensive patient of Shiraz, Iran; The study done by (Negin Hadi et al., 2004) revealed that medication noncompliance is one of the major factors contributing to uncontrolled hypertension. Method used in this research carried out standard interview with hypertensive patients who met the study criteria. Major Data collected during the interview included socio-demographic variables, variables Related to disease and the treatment, and individual patients knowledge and attitude toward taking medication for hypertension.

Compliance definition for this study was the amount of drugs used by the patients compared to the amount prescribed by the physician.

Study showed medication compliance in patients >50years was better, and these patients had good knowledge about hypertension, even had good attitude towards mediation prescribed for hypertension, these patients kept follow up every 3months or less with physician . Patients with positive attitude towards antihypertensive drugs and visiting physician every short interval were two independent predictors for compliance. Medication compliance is multifactor based on patients beliefs, attitude, lifestyle, diet etc, important factors are patient-physician relation which plays a major role affecting patient behaviour and the method

of providing/delivering quality healthcare to individual patient.

Al-Mehza et al., 2009, Drug compliance among hypertensive patients; an area based study
This study was done in primary health care, Hadiya clinic, Kuwait. The study showed reasons for non-compliance were forgetfulness, due to side effects of the drug, shortage of drugs, poly pharmacy and some asymptomatic nature of hypertension.

This was concluded by comparing compliant and non-compliant patients visiting outpatient department at Hadiya clinic, Kuwait. In this study percentage of non-compliant had inadequate blood pressure control and lack of knowledge. This demanded awareness in people regarding the knowledge for compliance with medication, regular blood pressure control study and healthy lifestyle.

Lagi A et al., 2006, Study of compliance among hypertensive patient based on the variables of severity of the disease of the patient and the number of pills to be taken each day.

This study was conducted among 367 people at the hypertension clinic of the S. Maria Nuova Hospital, Italy for 24 months.

The study classified patient into 3 categories for 2 variables i.e.
1. Global cardiovascular risk (GVCR): 1,2 and 3 (1 being patient with less severe hypertension and comorbidity , 2 with moderately severe hypertension and comorbidity, 3 with very severe hypertension and comorbidity)
2. Number of pills prescribed: 1,2 and 3 (1 being patient prescribed with 1-2 pills/day, 2 corresponding to 3 pills/day, 3 corresponding to more than or equal to 4 pills/day)

The results showed that the compliance among patient with severe hypertension (GVCR 3- 76% compliant) was better compared to GVCR 1&2- 37% compliant. This shows that the patient who are aware of the severity of their disease and are well known of the complications following them are more compliant to the therapy. Similar trend was seen in patients after classification based on number of pills, the patient who were on more number of pills/day (pills 3) showed better compliance than the class pills 2 and 1. The results were pills 1- 47% compliant, pills 2- 59% compliant, pills 3- 66% compliant.

AJ Shah et al., 2018, Department of Community Medicine, Lokmanya Tilak Medical College and General Hospital, Mumbai, Maharashtra, India conducted a study over period of 8 weeks using a validated, pretested questionnaire including information on individuals sociodemographic profile, compliance to antihypertensive therapy and lifestyle.

At total of 330 individual were interviewed. A total of 189 females(57.3%) and 141(42.7%) males participated in the study. Age range of the participants was 19 - 85 years.

Compliance to the antihypertensive treatment along with lifestyle modifications was seen among 39.4% of the participants.

COMPLIANCE RATE SEEN AFTER THE STUDY FOR TREATMENT:
Monotherapy - 75.1%
Polytherapy – 69.2%
Below 40 years – 80.6%
Employed – 75%
Unemployed – 68.5%
Smokers – 21%
Alcohol consumers – 16%

Non-alcohol consumers – 81.1%

CONCLUSION:
Compliance drawn after this study was satisfactory if only the compliance to medication is kept in mind the results for medication compliance for our study was found to be 83%. Non compliance to antihypertensive medication were due to forgetfulness, avoidance due to feel of relief and betterment also majorly due to expenses. But predominantly, the non compliance was seen in factors of weight loss, diet restrictions and other lifestyle modifications. After the development of certain drugs with quite favourable side effects along with once a day regimen has led to a great help in patient compliance (Neutel JM, 2003). So finally, we propose to every doctor to make their patients aware about compliance, unfailingly give them appointments for next follow-up, educate them and help them control their disease better. Moreover, we suggest the patients to obey the suggestions their doctor gives. Overall, to sum up we can say that the principal factor for therapy compliance is awareness of the disease and its severity, in addition patients with a higher level of disease are more likely to be compliant.

Author Contribution:
Sagar Modh – survey and original draft writing.

Vidhita Dangre - survey and original draft writing.

Kanagarajan Umapathi – review and editing, survey administration.

Pravin Kahale – review and editing.

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