GSR

Cardiology
Volume 1 - Issue 1 - 12 pages

Research Article Open Access

Medication Prescribing, Compliance, and Adherence Among Cardiac Clinic Attendees in Trinidad

M Bahall[1]* and G Legall[1]

[1]School of Medicine, Faculty of Medical Sciences, University of the West Indies, Eric Williams Medical Sciences Complex, Mt Hope, Trinidad, Trinidad and Tobago.

[1]*vmandrakes@hotmail.com

Abstract

This study explored medication prescribing, compliance, and adherence among cardiac clinic patients in Trinidad. Convenience sampling was used to select patients treated at a cardiac clinic. Face-to-face interviews were utilized to collect data on select patient demographics, medication usage and availability, and adherence variables. A total of 345 patients participated. The mean number of drugs prescribed per patient was 4.2 ± 1.61 (range: 1-8); 2.9% of patients received no medication. The majority of patients were prescribed aspirin (77.7%), followed by Vastarel (55.1%), statins (42.9%), and beta-blockers (41.5%). The medication compliance rate was 61.2%. Overall adherence was 21.7% and was associated with education ($p = 0.040$), understanding the reasons for usage ($p = 0.017$), following instructions ($p = 0.023$), and number of drugs prescribed (0.015). Adherence was associated with compliance ($p \leq 0.001$). Aspirin is the most prescribed drug among adult cardiac clinic patients. While over 60% of patients are compliant with the required number of medications, less than 25% are adherent. Steps are needed to improve compliance and adherence, particularly among females.

Keywords: Medication prescribing, adherence, Morisky score, compliance, cardiac patients

Introduction

Medication adherence is defined as the “active, voluntary, and collaborative involvement of the patient in a mutually acceptable course of behaviour to produce a therapeutic result.” [1]. This concept is different from medication compliance, which the Oxford English dictionary defines as “acting in accordance with, or the yielding to a desire, request, condition, direction or consenting to act in conformity with or acceding to” [2]. Medication adherence lowers major adverse cardiovascular events, hospitalisations, and admission cost for hospitalised myocardial infarction patients [3]. An association also exists between the degree of adherence and outcome events [4]. Compliance is paternalistic and implies complying with advice or instructions [2]. Medication adherence is associated with better clinical, economic, and utilisation outcomes among chronic disease patients. However, this association varies for different categories of disease, whereas some diseases have a more intense relationship than other diseases (e.g., patients with diabetes or post-myocardial infarction) [5]. Global revenue loss results from non-adherence to medication and has increased from $564 billion in 2012 to $637 billion in 2015 for chronic illnesses [6]. As highlighted by the Commission of Enquiry’s most recent health report [7], the media, and customer feedback, Trinidad and Tobago has been experiencing medication issues over the decades. Though healthcare is free, many patients are confronted with medicine challenges of non-availability, inconsistent availability, generic substitution, and substantial use of complementary and alternative medicine [8] to complement conventional medicine. However, few local studies have explored these issues. In a study performed by Seecheran *et al.*, an adherence level of 27.1% was found among cardiac patients [9]. The objective of this study was to examine medication prescribing, compliance, and adherence among car-

diac attendees at a leading tertiary health institution in Trinidad and Tobago.

Materials and Methods

Study Design and Participant Selection

A cross-sectional study was conducted among cardiac clinic attendees from the second largest teaching hospital in Trinidad and Tobago. Serving clients mainly from the southern region, this public health care institute provides free healthcare to all citizens. Cardiac patients account for about 20% of all medical admissions.

The target population included all cardiac patients treated at the teaching hospital. The minimum sample size (with a 5% margin of error) required to estimate the proportion of patients who describe themselves as independent and in charge of their medication was determined to be 350 [10]. Systematic sampling was used to select participants; every 10th patient was selected from a list of clinic attendees who had appointments the following day. Patients were contacted by telephone, informed of the study, and asked about their willingness to participate. Patients who declined to participate were not replaced. Consenting patients were asked to provide samples of medication or prescriptions to assist in medicine disclosure. On the morning of their clinic visit, all selected patients were identified and screened a second time in a private consultation room. We explained the purpose of the study to the patients and asked them to re-confirm their willingness to participate. We included adults who were over the age of 18 years, not confused (e.g., able to understand, think clearly, and make meaningful understandable statements), and able to communicate. We excluded patients who had difficulty remaining attentive during the 20 minutes of interview, had recall problems, or did not bring their medication.

Data Collection

Data were collected between March 1, 2016 and July 31, 2016 via face-to-face interviews conducted at the clinic. The data collection instrument was a 126-item questionnaire that sought to measure selected sociodemographic variables (age, sex, ethnicity, marital/civil status, employment status, monthly income, and highest level of education), medical history (30 items), patient support mechanisms (4 items), patient perspective/information/knowledge (8 items), compliance with treatment (19 items), medication non-compliance (9 items), medication/health issues (8 items), personal issues (18 items), social/cultural/economic issues (8 items), health care provider issues (5 items), reasons for compliance (6 items), general information (6 items), and associated lifestyle issues (5 items). We incorporated questions from the Morisky's Medication Adherence Scale (MMAS-4), which is a validated questionnaire, but which has not been tested in Trinidad. The MMAS-4 and variations of the tool (MMAS-8 and MMAS-6) have been used in similar studies to assess medication adherence [11-13]. Patients were asked to respond 'Yes' or 'No' to each of the following questions: "Do you ever forget to take your medicine", "Are you careless at times about taking your medicine", "When you feel better, do you sometimes stop taking your medicine", and "Sometimes if you feel worse when you take your medicine, do you stop taking it". A score of 0 was assigned to a 'No' response and a score of 1 was assigned to a 'Yes' response. The lower the total score, the higher the level of adherence. Based on Morisky's scoring, patients with a total score of 0, 1 or 2, or 3 or 4 were classified as having high adherence, medium adherence, or low adherence, respectively. To explore predictors of adherence, patients were assigned to one of two binary categories (adherent, total score ≤ 1; non-adherent, total score > 1) based on their total score [14] to facilitate the use of binary logistic regression analysis in identifying predictors of adherence. An adherence score of at least 80% (or Morisky score of ≤ 1) was considered acceptable [15].

Statistical Analysis

Data were entered and analysed using IBM Statistical Package for the Social Sciences (SPSS) (IBM Corp. Version 21.0. Armonk, NY). Both descriptive and inferential methods were used. Inferential methods included calculation of 95% confidence intervals, chi-squared tests of association, and binary logistic regression. P-values < 0.05 were considered statistically significant.

Results and Discussion

Patient Characteristics

Of the 350 patients selected to be surveyed, 345 (98.6%) agreed to participate. The reliability (Cronbach's alpha) of the questionnaire was 0.714. Patients

Table 1: Frequency and Percentage Distribution of Selected Sociodemographic Variables for the Total Study Population and Adherent Population of the Study

Variables	Total Study Population n = 345	Adherent Patients n = 75
	n (%)	n (%)
Sex		
Male	145 (42.0)	29 (38.7)
Female	200 (58.0)	46 (61.3)
Age		
≤ 35	9 (2.6)	2 (2.7)
36 – 50	37 (10.7)	4 (5.3)
51 – 65	154 (44.6)	30 (40.0)
66 – 80	132 (38.3)	33 (44.0)
> 80	13 (3.8)	6 (8.0)
Ethnicity		
African	70 (20.3)	11 (14.7)
Indian	270 (78.3)	61 (81.3)
Other	5 (1.4)	3 (4.0)
Marital Status		
Single	76 (22.0)	15 (20.0)
Married	181 (52.5)	33 (44.0)
Divorced/Separated	10 (2.9)	3 (4.0)
Common Law	6 (1.7)	0 (0.0)
Widowed	72 (20.9)	24 (32.0)
Employment Status		
Employed	61 (17.7)	8 (10.7)
Unemployed	284 (82.3)	67 (89.3)
Monthly Income (T&T Currency)		
< $3000	101 (29.3)	15 (20.0)
$3000 – 5000	234 (67.8)	59 (78.7)
> $5000	10 (2.9)	1 (1.3)
Highest Education Level		
Less than primary school	13 (3.8)	5 (6.7)
Primary school	236 (68.4)	58 (77.3)
Secondary	78 (22.6)	9 (12.0)
Tertiary	18 (5.2)	3 (4.0)

Table 2: Frequency and Distribution of Cardiovascular Disease by Sex

CVD	Total N (%)	Sex		p-value
		Male	Female	
CVD	Total N (%)	Male	Female	p-value
Ischaemic Heart Disease	209 (60.6)	102 (70.3)	107 (53.5)	0.002*
Congenital Heart Disease	1 (0.3)	0 (0.0)	1 (0.5)	0.580
Valvular Heart Disease	17 (6.1)	7 (4.8)	10 (5.0)	0.575
Cardiomyopathy	21 (6.1)	3 (2.1)	18 (9.0)	0.005*
Heart Failure	82 (23.8)	29 (20.0)	53 (26.5)	0.101
Cardiac Arrhythmia	21 (6.1)	7 (4.8)	14 (7.0)	0.275

Note: * p-values < 0.05 are statistically significant.

were predominantly female (n = 200; 58.0%), aged 51-56 years (n = 154; 44.6%), of Indo-Trinbagonian ethnicity (n = 270; 78.3%), married (n = 181; 52.5%), unemployed (n = 284; 82.3%), earned a monthly income of TT$3000-$5000 (n = 234; 67.8%), and had primary school level education (n = 236; 68.4%) (Table 1). Other patient history included previous heart attack (n = 138; 40.0%) and family history of heart disease (n = 235; 68.1%). Comorbidities among patients included hypertension (n = 285; 82.6%), diabetes (n = 180; 52.2%), hypercholesterolemia (n = 121; 35.1%), and renal insufficiency (n = 18; 5.2%) (data not shown in the table).

Drug availability in Trinidad varied with glyceryl trinitrate (GTN) being the most available drug (n = 159; 96.4%) and clopidogrel (n = 48, 38.1%) being the least available drug. Other drugs available for use in treating cardiovascular disease were beta-blockers (n = 126; 88.1%), aspirin (n = 221; 82.5%), angiotensin-converting enzyme (ACE) inhibitors (n = 106; 79.7%), and statins (n = 105; 70.9%).

Ischaemic disease was the leading heart condition (n = 209; 60.6%) (Table 2). The prevalence of ischaemic heart disease was greater among male patients (70.3%) than among female patients (53.5%) (p = 0.002), while the prevalence of cardiomyopathy was greater among female patients (9.0%) than among male patients (2.1%) (p = 0.005).

Drug Prescriptions

Only 10 (2.9%) of the 345 patients were not prescribed any medication. The majority of the medications prescribed were related to treating hypertension. The most commonly prescribed drug was aspirin (77.7%), which was prescribed at least twice as frequently as any other medication (Table 3). Other medications that were prescribed far less frequently included Aldactone (9.3%), Warfarin (5.2%), Isordil (25.5%), and Lasix (27.5%).

The number of drugs prescribed per patient ranged from 1 to 8 (mode = 4, mean = 4.3 ± 1.61). The mean among male patients was 4.5 ± 1.61, and the mean among female patients was 4.1 ± 1.60. As the number of drugs increased from 1 to 4, so did the percentage of patients who received that number of drugs (Figure 1).

Conversely, as the number of drugs increased from 5 to 8, the percentage of patients who received that number of drugs decreased. The highest percentage of patients received 4 drugs. Further analysis showed a positive correlation between the number of medications prescribed and the number of medications taken (Spearman's rho: 0.954; $p \leq 0.001$). An interval plot (95% confidence interval [CI]) for the mean number of drugs prescribed per patient by monthly income group is shown in Figure 2.

There was no significant difference between the means of the two lower income categories; however, there was a difference between the upper and lower categories (p = 0.026). Table 4.

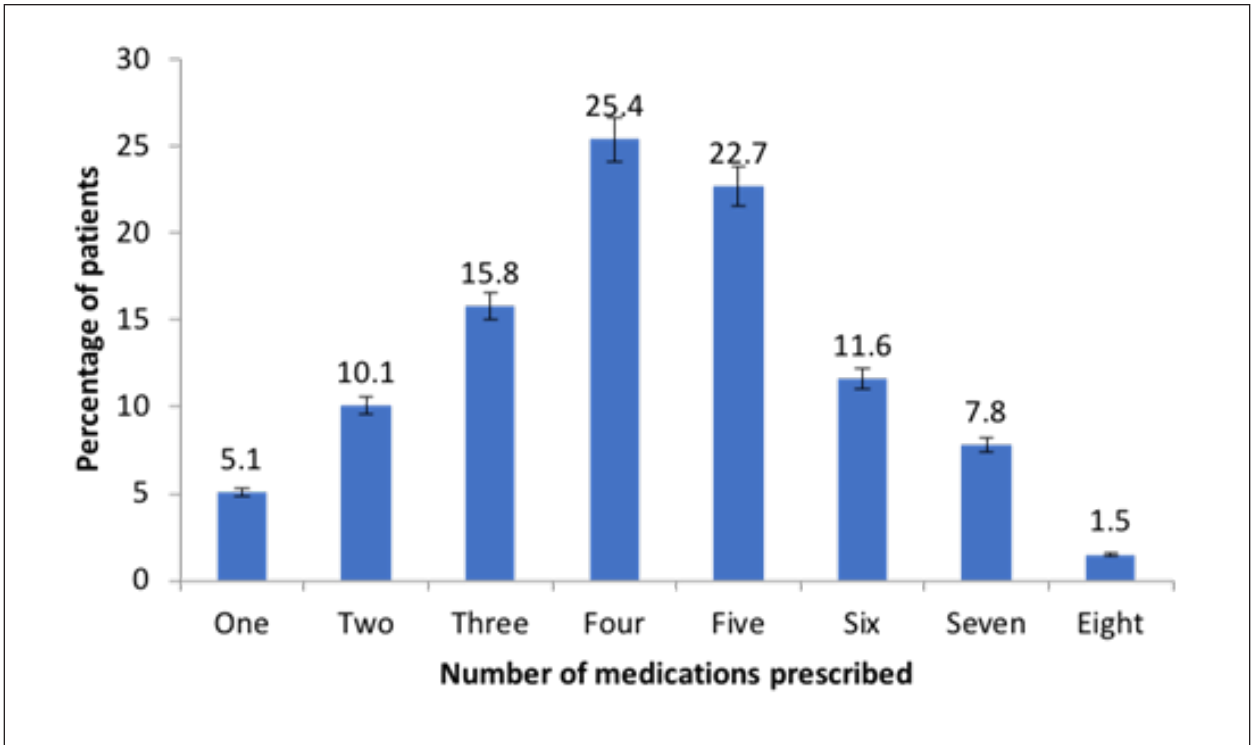
Analysis of variance between the number of drugs prescribed and sex, age category, and monthly income category is shown in Table 4. Significant differences for the number of drugs prescribed were

Table 3: Drugs Prescribed to Participants

Drug	of Patients	%
Aspirin	268	77.7
Beta-blockers (atenolol/carvedilol)	143	41.5
Clopidogrel	126	36.5
ACE inhibitor (enalapril/ lisinopril)	136	39.4
Statins (simvastatin/Crestor)	148	42.9
Vastarel	190	55.1
GTN	165	47.8
Lasix	95	27.5
Isordil	88	25.5
Warfarin	18	5.2
Aldactone	32	9.3

Note: ACE, angiotensin-converting enzyme; GTN, glyceryl trinitrate.

Figure 1: Proportion of Patients Who were Prescribed 1-8 Total Drugs



found among sex (p = 0.014) and monthly income categories (p = 0.026) but not among age categories (p = 0.427).

Drug Prescription by Chronic Disease and Chronic Cardiac Complications

Aspirin was the most commonly prescribed drug for all

Figure 2: Mean Number of Drugs Prescribed for Each Level of Monthly Income

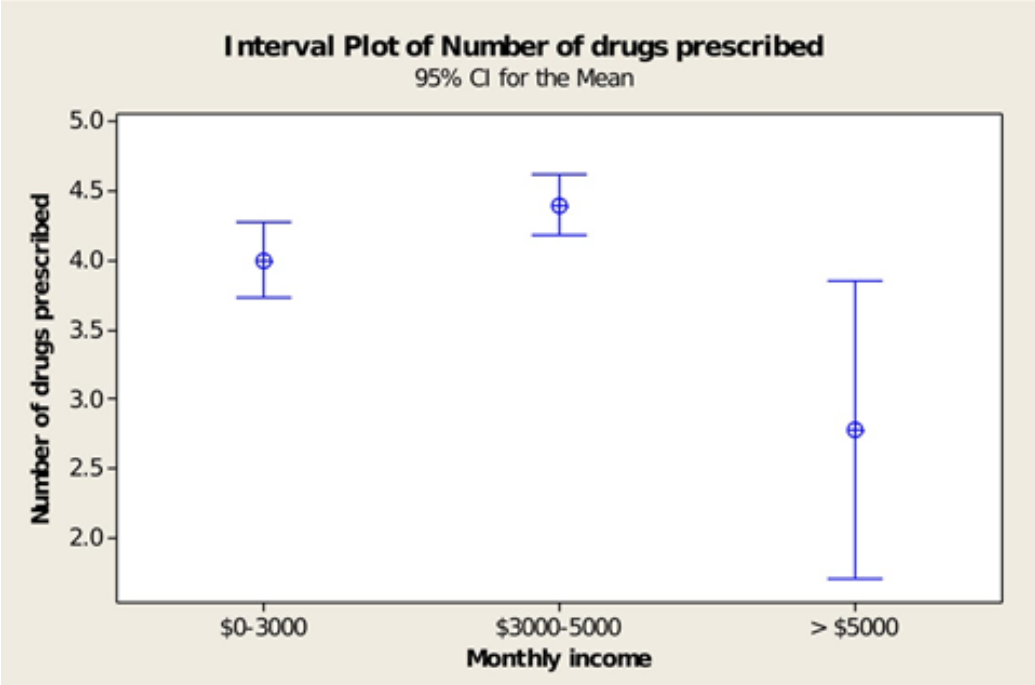


Table 4: Analysis of Variance (ANOVA): Number of Drugs Prescribed

Source	Sum of Squares	df	Mean Square	F	P
Sex	15.320	1	15.320	6.150	0.014*
Age group	9.616	4	2.404	0.965	0.427
Monthly income	18.362	2	9.181	3.686	0.026*
Error	814.510	327	2.491		
Total	868.896	334			

Note: * p-values < 0.05 are statistically significant.

diseases except for cardiomyopathy. (Table 5). Drugs prescribed to patients with ischaemic heart disease included aspirin (82.3%), ACE inhibitors (43.3%), statins (47.6%) and beta-blockers (44.8%).

Medication Compliance

For the purposes of this study, compliance was defined as always taking the number of medications prescribed. The overall compliance rate was 61.2% (205/335) and was significantly higher among male patients (61.8%) than among female patients (55.7%) (p = 0.01). (Data not shown). The proportion of patients prescribed 2 and 5 drugs was higher in female patients compared to male patients; however, this difference was not significantly different (Table 6).

Medication Adherence

Overall, 75 (21.7%) patients were found to be adherent using the Morisky 4-item diagnosis tool (Morisky score of 0 or 1). These patients were predominantly female (n = 46; 61.3%), 66 – 80 years of age (n = 33; 44.0%), of Indo-Trinbagonian ancestry (n = 61;

Table 5: Frequency of Drug Prescribed by Chronic Disease and Chronic Cardiac Complication

	Drug Prescribed: % of Patients							
Disease/Disease Complication	**Aspirin**	**Vastarel**	**GTN**	**Atenolol/ Carvedilol**	**Clopidogrel**	**Enalapril/ Lisinopril**	**Simvastatin/ Crestor**	**Lasix**
Chronic Disease								
Diabetes (n = 180)	82.8	62.8	48.9	42.8	42.2	39.5	40.5	33.3
Hypertension (n = 285)	78.6	56.5	47.7	45.3	38.6	43.5	43.5	29.5
Hypercholesterolemia (n = 121)	82.6	56.2	49.6	38.0	42.1	43.8	45.5	33.9
Chronic cardiac complication								
Ischaemic heart disease (n = 210)	82.3	59.8	49.8	44.8	38.8	43.3	47.6	30.1
Cardiac arrhythmia (n = 21)	46.7	23.8	23.8	38.1	4.8	19.0	42.9	4.8
Cardiomyopathy (n = 21)	52.4	66.7	23.8	52.4	47.6	23.8	33.3	23.8
Valvular heart disease (n = 17)	64.7	11.8	41.2	29.4	11.8	29.4	35.3	23.5

Note: GTN, glyceryl trinitrate.

Table 6: Medication Compliance by Sex

Number of Drugs Prescribed/Taken	Sex: a/n (%)		All (%)	p-value
	Male	Female		
1 / 1	5/5 (100)	8/12 (66.7)	13/17 (76.5)	0.014*
2 / 2	11/15 (73.3)	19/31 (82.6)	30/46 (56.2)	0.520
3 / 3	15/26 (57.7)	22/48 (45.8)	37/74 (50.0)	0.456
4 / 4	26/41 (63.4)	22/40 (55.0)	48/81 (59.3)	0.520
5 / 5	19/30 (63.39)	24/36 (66.7)	43/66 (65.2)	0.801
6 / 6	7/9 (77.8)	9/18 (50.0)	16/27 (59.3)	0.231
7 / 7	11/12 (91.7)	4/5 (80.0)	15/17 (88.2)	0.515
8 / 8	3/3 (100.0)	0/0 (0.0)	3/3 (100)	-

Note: * p-values < 0.05 are statistically significant. a/n; the ratio of "a", which represents the number of patients taking prescribed drugs to "n", which represents the total number of patients who were prescribed drugs.

81.3%), married (n = 33; 44.0%), unemployed (n = 67; 89.3%), had a monthly income of TT$3000-5000 (n = 59; 78.7%), and educated up to the primary school level (n = 58; 77.3%) (Table 1).

Adherence was significantly associated with level of education (χ^2 = 8.296, *df* = 3, *p* = 0.040), whether or not patient believed that it was important to understand reasons for taking the medication (χ^2 = 10.1986, *df* = 3, *p* = 0.017), whether or not patients felt that it was important to follow the physician's instructions (χ^2 = 8.296, *df* = 4, *p* = 0.023), and the number of drugs prescribed (χ^2 = 5.962, *df* = 1, *p* = 0.015), but was not significantly associated with self-reported health status. Binary logistic regression methods did not iden-

tify any predictors of adherence among the significant variables that were found to be associated with it (data not shown).

In addition, 42 (20.5%) of the total 205 patients were found to be adherent, whereas 42 (59.2%) of the total 71 adherent patients were found to be compliant. McNemara's test of paired proportions showed that adherence and compliance were associated ($p \leq 0.001$). Specifically adherence increased with increasing compliance.

Discussion

The number of drugs prescribed per patient varied from 1 to 8, with a median of 4.3. The mean number of drugs prescribed per patient was significantly higher among male patients. The lowest number of drugs prescribed per patient was found in patients with the highest income. The highest income patients may have received prescriptions from their private physicians. Aspirin (77.7%) was the most prescribed drug, which is similar to the findings of Jyothi et al. (69.7%) [16], but contrasts to the 24.5% found in another study [17]. Compared to our study, Baskota et al. reported much lower aspirin usage (12.58%) and atenolol use (4.04%) in heart failure patients [18]. Such variations may reflect lack of enforcement of evidence-based guidelines or lack of knowledge by health care providers regarding evidence-based guidelines. In keeping with the guidelines, ischaemic heart disease patients are generally prescribed aspirin, a beta-blocker, an ACE inhibitor, and a statin [19]. In the current study, patients were prescribed aspirin (82.3%), ACE inhibitors (43.3%), statins (47.6%), and beta-blockers (44.8%) for ischaemic heart disease. Other studies conducted in West Nigeria, Nepal, and India revealed that 10.9% of patients were prescribed beta-blockers [17], 11.8% of patients were prescribed enalapril [18], 37% of patients were prescribed beta-blockers [20], and 31.0% of patients were prescribed statins [21]. Patients with diabetes, which is a cardiovascular risk factor, are prescribed aspirin, an ACE inhibitor or angiotensive receptor blocker ARB for hypertensive diabetic patients or patients with diabetic nephropathy (American Diabetes Association, 2018) [22], and a statin for atherosclerotic cardiovascular disease patients (American Diabetes Association, 2018) [22]. The percentages of prescribed aspirin, ACE inhibitor, and statin from our study were 82.8%, 39.5%, and 40.5% respectfully.

The present study revealed that medication compliance was 61.2%. This was based on a narrow definition of compliance (e.g., taking the required number of prescribed medication). Non-compliance may be related to the unavailability of drugs, which ranged from 38.1% to 97.5%, and patients with more serious conditions perceived the importance of taking the required drugs. One study found that 80.3% of patients with diabetes and ischaemic heart disease were adherent to cardioprotective medication [23]. This contrasts with findings from a study among heart patients that reported 27.3% compliance [24]. Differences in results vary partly from context, methodology, and subjective interpretation of definitions for compliance. In general, compliance was significantly higher among male patients; however, for 2 or 5 drugs prescribed or taken, compliance was higher in female patients. One study reported that 31% of respondents admitted that too much medication was a barrier to medication adherence [25]. However, our study revealed a positive correlation between adherence and the number of drugs taken (Spearman's rho: 0.954; $p \leq 0.001$). Patients may perceive that those who are prescribed more medications are sicker, and thus, the fear of having a negative impact if they are not adherent increases their likelihood of taking their prescribed medication.

Adherence in our study (MMAS of 0 and 1) was 21.7%, which is far less than the 68.8% reported by Irvin et al. [14] who used a similar best adherence MMAS score of 0. Adherent patients were predominantly female (n = 43; 60.6%), 51 – 60 years of age (n = 62; 87.4%), of Indo-Trinbagonian ancestry (n = 58; 81.7%), married (n = 29; 40.8%), unemployed (n = 65; 91.5%), had a monthly income of TT$3000 –5000 (n = 56; 79.9%), and had primary school level education (n = 54; 76.1%). Profile of patients from a similar study [9] reveals that highly adherent patients were predominantly male (n = 81; 55.9%), East Indian (n = 89; 61.4%), had primary school level education (n = 68; 46.9%), and had an income of <TT$5000 (n = 104, 71.7%).

Our study revealed a significant association between adherence and education ($p = 0.040$), adherence and the importance in understanding reasons for taking medication ($p = 0.017$), adherence and the importance to follow physician's instructions ($p = 0.023$), and adherence and the number of drugs prescribed ($p = 0.015$). There was no relationship with self-related

health status. Zhao et al. [13] also found associations in hypertensive patients between medication adherence and knowledge/education. Wariva et al. [26] found associations between medication adherence and age (p = 0.0059), marital status (p = 0.015), average monthly income (p = 0.0002), support group (p = 0.027), and knowledge (p = 0.0058). Predictors identified in other studies were ethnicity [27] and financial status [28]. However, no useful predictors were identified in our study.

There were a few limitations to this study. For instance, this study relied heavily on recall and the honesty of patient's revelations. This may lead to over- or underestimation of medication usage. Moreover, the use of prescribed medication did not clearly address compliance issues in terms of dosage and frequency, which would clearly affect clinical outcome. Furthermore, patients may claim they are compliant in using the drug, but may not be taking the drug as prescribed. In addition, the sample size was too small to perform subgroup analysis for different types of cardiac patients. Lastly, the use of substitute or complementary medication was not explored.

Conclusion

In summary, less than 3% of cardiac patients received no medication. Most were prescribed at least 4 medications, and nearly all were not prescribed the desired medication. Except for aspirin, all medication failed to attain at least 80% desired adherence. Though compliance with the required number of medications was high (61.2%), adherence rates were low (21.7%). Adherence was associated with level of education, importance of understanding the reasons for taking medication, importance of following physician/s instructions, and number of drugs prescribed. However no predictors were found. Adherence may be a sociocultural issue as much as it is an evidence-based issue. The Trinbagonian society is unique, with a mix of
behavioural patterns being influenced by friends, diseases, traditions, and perceptions. This issue requires further research.

Acknowledgment

I wish to acknowledge Kristian Sookram and Kesley Rampersad, premedical students, who assisted with data collection; and the participants, who gave their time to enter the study.

References

1. Meichenbaum D, Turk DC. (1987) Facilitating Treatment Adherence: A Practitioner's Guidebook. New York, NY: Plenum Press
2. Aronson JK. Compliance, concordance, adherence. (2007) Br J Clin Pharmacol 63:4 383–384 383. Available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2203247/pdf/bcp0063-0383.pdf. Accessed 13 April 2018
3. Bansilal S, Castellano JM, Garrido E, Wei HG, Freeman A, Spettell C, Garcia-Alonso F, Lizano I, Arnold RJG, Rajda J, Steinberg G, Fuster V. (2016) Assessing the Impact of Medication Adherence on Long-Term Cardiovascular Outcomes. Journal of the American College of Cardiology 68:789-801. Available at https://doi.org/10.1016/j.jacc.2016.06.005 http://www.sciencedirect.com/science/article/pii/S0735109716335422 Accessed 10 November 2017
4. Ho PM, Bryson CL, Rumsfeld JS. (2009) Medication Adherence; Its Importance in Cardiovascular Outcomes. Circulation 119:3028-3035. Available at http://circ.ahajournals.org/content/119/23/3028. Accessed 13 April 2013
5. Boswell KA, Cook CL, Burch SP, Eaddy MT, Cantrell CR. (2012) Associating Medication Adherence With Improved Outcomes: A Systematic Literature Review. Available at http://www.ajmc.com/journals/issue/2012/ajpb_julyaug2012/associating-medication-adherence-with-improved-outcomes-a-systematic-literature-review?p=3. Accessed 10 November 2017
6. Health Prize Technologies. Estimated Annual Pharmaceutical Revenue Loss Due to Nonadherence. Available at https://healthprize.com/about-us/press-releases/pharmaceutical-companies-lose-637-billion-revenue-annually-due-medication-nonadherence/. Accessed 6 November 2017
7. Gafoor G, Hosein W, Pilgrim Y, Wilson G, Frankson G. (2007) Report of the Commission of Enquiry into the operation and delivery of public health care services in Trinidad and Tobago. Ministry of Health: Trinidad and Tobago
8. Bahall M. (2015) Complementary and alternative medicine usage among cardiac patients: a

descriptive study. BMC Complementary and Alternative Medicine 15:100 DOI 10.1186/s12906-015-0610-y. Available at https://bmccomplementalternmed.biomedcentral.com/articles/10.1186/s12906-015-0610-y. Accessed 13 April 2018

9. Seecheran N, Nandlal N, Nankissoon S, Nancoo C, Nelson C, Nkemakolam A, Noel N, Olivers K, Parasram R, Rodriguez M, Seecheran R, Seecheran V, Persad S, Ramlal R, Maharaj A, Boodhai B, Ramsaroop K, Motilal S. (2017) A Trinidadian cardiovascular medication adherence survey: the ADHERE TNT study. Int J Community Med Public Health. 10:3601-3606. Available at http://www.ijcmph.com/index.php/ijcmph/article/download/1935/1469. Accessed 13 April 2018

10. Lwanga, Stephen Kaggwa, Lemeshow, Stanley & World Health Organization. (1991) Sample size determination in health studies: a practical manual / S. K. Lwanga and S. Lemeshow.

11. Alakhali KM, Daniel PS, Noohu AM, Sirajudeenet SA. (2013) Patient Medication Adherence and Physician Prescribing among Congestive Heart Failure Patients of Yemen. Indian J Pharm Sci. 2013 Sep-Oct; 75(5): 557–562. Available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3877517/. Accessed 21 May 2018.

12. Altuwairqi HB. (2016) Barriers to medication adherence among cardiac patients following at King Fahad Medical City, Riyadh, Saudi Arabia. Saudi J Health Sci. 5(1):20-24. Available at http://www.saudijhealthsci.org/printarticle.asp?issn=2278-0521;year=2016;volume=5;issue=1;spage=20;epage=24;aulast=Altuwairqi;type=0. Accessed 21 May 2018

13. Zhao S, Zhao H, Wang L, Du S, Qin Y. (2015) Education is critical for medication adherence in patients with coronary heart disease. Acta Cardiol. 70(2):197-204. Available at https://www.ncbi.nlm.nih.gov/pubmed/26148380. Accessed 13 April 2018

14. Irvin MR, Shimbo D, Mann DM, Reynolds K, Krousel-Wood M, Limdi NA, Lackland DT, Calhoun DA, Oparil S, Muntner P. (2012) Prevalence and Correlates of Low Medication Adherence in Apparent Treatment-Resistant Hypertension. The Journal of Clinical Hypertension. Available at http://onlinelibrary.wiley.com/doi/10.1111/j.1751-7176.2012.00690.x/pdf. Accessed 11 November 2017

15. Karve S, Cleves M, Helm M, Hudson TJ, West DS, Martin BC. (2009) Good and poor adherence: Optimal cut-point for adherence measures using administrative claims data. Current Medical Research and Opinion, 9:2303-2310. Available at https://www.ncbi.nlm.nih.gov/pubmed/19635045. Accessed 14 April 2018

16. Jyothi K, Saleem TSM, Vineela L, Gopinath C, Yadavender Reddyet KB. (2015) A Retrospective Drug Utilization Study of Antiplatelet Drugs in Patients with Ischemic Heart Disease. World Academy of Science, Engineering and Technology. International Journal of Pharmacological and Pharmaceutical Sciences. Available at http://waset.org/publications/10003287/a-retrospective-drug-utilization-study-of-antiplatelet-drugs-in-patients-with-ischemic-heart-disease. Accessed 10 November 2017

17. Omole MK, Ma'aji HU. (2012) A Ten Year Study of Management of Ischemic Heart Disease in a Tertiary Hospital in South West Nigeria. Global Journal of Medical Research. Available at https://globaljournals.org/GJMR_Volume12/3-A-Ten-Year-Study-of-Management.pdf. Accessed 10 November 2017

18. Baskota M, Rao BS, Shakya R. (2006) Study on the prescribing patterns of drugs used in heart failure. Kathmandu University Journal of Science, Engineering and Technology

19. WHO WT. (2002) Secondary Prevention of noncommunicable diseases in low- and middle-income countries through community-based & health service interventions World Health Organization. Available at http://apps.who.int/iris/bitstream/handle/10665/42567/WHO_MPN_CVD_2002.01.pdf?sequence=1&isAllowed=y. Accessed 21 April 2018

20. Rao A, Kumar SK, Rai M. (2017) Prescription pattern in patients having heart failure in a south Indian tertiary care hospital: A retrospective study. International Journal of Comprehensive and Advanced Pharmacology 2(2):50-55. Available at https://www.innovativepublication.com/admin/up-

loaded_files/IJCAP_2(2)_50-55.pdf. Accessed 23 April 2018

21. Gnavi R, Migliardi A, Demaria M, Petrelli A, Caprioglio A, Costa G. (2007) Statins prescribing for the secondary prevention of ischaemic heart disease in Torino, Italy. A case of ageism and social inequalities. European Journal of Public Health. Available at https://academic.oup.com/eurpub/article/17/5/492/538837. Accessed 23 April 2018
22. American Diabetes Association. Executive Summary: Standards of Medical Care in Diabetes – 2018. Available at http://care.diabetesjournals.org/content/41/Supplement_1/S86. Accessed 28 April 2018
23. Ho P, Magid D, Masoudi F, McClure DL, Rumsfeld JS. (2006) Adherence to cardioprotective medications and mortality among patients with diabetes and ischemic heart disease. BMC Cardiovascular Disorders. Available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1762024/. Accessed 6 November 2017.
24. Mujtaba S, Masood T, Saad M. (2010) Reasons of medical noncompliance in heart failure patients. Pakistan Heart Journal. 43(3-4). Available at https://www.researchgate.net/publication/256979520_REASONS_OF_MEDICAL_NONCOMPLIANCE_IN_HEART_FAILURE_PATIENTS. Accessed 29 September 2017
25. Pharmacy Times. 3 Common Barriers to Cardiac Medication Adherence. Available at http://www.pharmacytimes.com/news/3-common-barriers-to-cardiac-medication-adherence. Accessed 10 November 2017
26. Wariva E. January J. Maradzika J. (2014) Medication Adherence Among Elderly Patients with High Blood Pressure in Gweru, Zimbabwe. Journal of public health in Africa. Available at http://www.publichealthinafrica.org/index.php/jphia/article/view/304/187. Accessed 10 November 2017
27. Wu JR, Lennie TA, De Jong MJ, Frazier SK, Heo S, Chung ML, Moser DK. (2010) Medication adherence is a mediator of the relationship between ethnicity and event-free survival in patients with heart failure. J Card Fail. 16(2):142-9. Available at https://www.ncbi.nlm.nih.gov/pubmed/20142026. Accessed 21 May 2018
28. Wu JR, Lennie TA, Moser DK. (2007) Predictors of Medication Adherence Using a Multidimensional Adherence Model in Patients with Heart Failure. J Card Fail. 13(6);75. Available at https://www.onlinejcf.com/article/S1071-9164(07)00503-9/fulltext. Accessed 21 May 2018

Citation: M Bahall and G Legall, *"Medication Prescribing, Compliance, and Adherence Among Cardiac Clinic Attendees in Trinidad", Global Scientific Research Journal Cardiology, 1(1), 2018, pp. 9-20.*