UNIVERSITY OF KWAZULU-NATAL

INVESTIGATION OF THE MEDICATION ADHERENCE BEHAVIOUR OF PRIVATE SECTOR PATIENTS WITH COMMUNICABLE AND NON-COMMUNICABLE DISEASES

By

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A dissertation submitted in fulfillment of the requirements for the degree of

Master of Pharmacy

In the Discipline of Pharmaceutical Sciences, School of Health Sciences, University of KwaZulu-Natal.

Supervisor: Dr. P Naidoo

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PREFACE

"Drugs Don't Work in Patients who don't take them" (C. Everett Koop)

Medication adherence continues to be a vital factor contributing towards the achievement of patient treatment goals. This study was conducted to provide some insight into the medication adherence behaviour of private sector patients afflicted with communicable and non-communicable chronic diseases.

DECLARATION

I, Mrs. Kooveshni Suklal, declare that

(I) The research stated in this dissertation, except where otherwise indicated, is my original work.

(II) This dissertation has not been submitted for any degree or examination at any other university.

(III) This dissertation does not contain other persons' data, pictures, graphs or other information, unless specifically acknowledged as being sourced from other persons.

(IV) This dissertation does not contain other persons' writing, unless specifically acknowledged as being sourced from other researchers.

Name: Kooveshni Suklal

Signed: _____ Date: 05 May 2017

Supervisor: Dr. P Naidoo

Signed: ____ _____ Date: 05 May 2017

DEDICATION

I dedicate this work to my family and friends whose continuous love and support have helped me achieve my academic aspirations.

ACKNOWLEDGEMENTS

My sincere appreciation goes out to the following people for their contributions towards this study:

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- The General Practitioners in eThekwini for allowing the use of their practices as a study site.
- Participants who surrendered their time and information towards this study.
- Mr Sham Moodley, my employer, for allowing me the time to conduct this study.

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LIST OF ACRONYMS

ACE – Angiotensin Converting Enzyme

ARB- Angiotensin Receptor Blocker

ART – Anti-Retroviral Treatment

CAM- Complementary and alternative medicine

CMS- Council for Medical Schemes

DPP4 – Dipeptidyl peptidase-4

DYS- Dyslipidemia

EDL- Essential Drug List

FDC- Fixed Dose Combination

GLP1- Glucagon-like peptide-1

GP-General Practitioner

HAART – Highly Active Anti-Retroviral Treatment

HIV- Human Immunodeficiency Virus

HTN-Hypertension

KZN – KwaZulu-Natal

NCD – Non- communicable disease

T2D- Type 2 Diabetes Mellitus

WHO- World Health Organisation

ABSTRACT

Background

Medication adherence continues to be a vital factor contributing towards the achievement of treatment goals in patients with chronic diseases. There is a sparse amount of data available on the adherence behaviour and the types of medications used in private sector patients with communicable and non-communicable diseases in South Africa but this is limited and dated. This study was directed at providing information on the medication adherence rates of such patients and the factors that influence such behaviour.

Aim and Objectives

To investigate the medication adherence behaviour of patients suffering from non-communicable and communicable diseases in the private health care sector of the eThekwini Municipality of KwaZulu-Natal and to describe the reasons for such behaviour.

Methods

A self-reported anonymous medication adherence questionnaire was used to obtain data, from 233 private sector patients afflicted with HIV, Type 2 Diabetes Mellitus, Hypertension and Dyslipidaemia in the eThekwini Municipality of KwaZulu-Natal. The questionnaire focused on the adherence behaviour of these participants and factors that influenced their adherence behaviour. Medication adherence was determined by the number of days of medication missed during the last 30 days. Data was collected and analysed using SPSS.

Results

Majority of participants were aged between 51-60 years (26.6%), and were of male gender (52.8%). An almost equal number of participants were afflicted with single disease (n=116) or multiple diseases (117). Hypertension was the most prevalent ailment (n=167), followed by Type 2 Diabetes (n=113), Dyslipidaemia (n=94) and HIV (n= 26). Over 62% of participants reported not missing any medication during the last 30 days. More than 21% had stated missing 1-2 days of their medication and 15.9% reported missing 3 or more days of medication during the last 30 days. With regards to single ailment, the highest percentage of adherence was reported in participants afflicted with Hypertension (60.6%), and Type 2 diabetes (58.3%). HIV and Dyslipidaemia had the lowest rates of adherence as 45% (n=9) of HIV only and 57.1% (n=4) of Dyslipidaemia only afflicted participants reported missing 1 or more days of their medication. The highest rate of non-adherence was found amongst the age group of participants 51-60 years old, while the highest rate of adherence was found in the group aged 70 years+. Reasons for non-adherence included cost, forgetting to take medication, running out of

medication, stopping medication because it made them feel worse or gave a side effect and having difficulty with time schedules or having medication with/without food.

Conclusion

Participants afflicted with communicable and non-communicable diseases in the private health care sector have sub-optimal medication adherence. Although no significant correlations were found between having a particular disease and the rate of adherence, participants afflicted with HIV and Dyslipidaemia alone were the least adherent to their medication. Reasons for their non-adherence were similar to other studies reported.

CHAPTER 1

1. INTRODUCTION

1.1 Background and literature review

South Africa is heavily burdened with both communicable and non-communicable diseases (NCD) [1, 2, 3]. Known as the country with the largest Human Immunodeficiency Virus (HIV) epidemic, South Africa was estimated to have 6.19 million people infected in 2015. This was a prevalence rate of approximately 11.2% of the total population [4, 5]. Although great focus has been placed on the fight against HIV and Acquired Immunodeficiency Syndrome (AIDS), the Government has equally recognised the contributing burden of NCDs on the Health care system [3] as it is occurring simultaneously with an ageing HIV-positive population [6].

The World Health Organisation (WHO) estimated that in 2014, 43% of the total deaths in South Africa were due to NCDs [7]. In February 2016 the South African government introduced sin taxes on sweetened beverages in addition to ongoing taxes on alcohol and tobacco to discourage the population from participating in consumption of these unhealthy products. This is in line with governmental action world-wide, as such activities are linked to NCDs which cause tremendous financial strain on the health care system. The combined and growing burden of HIV/AIDS and NCD's require an extraordinary response from the South African health care system [8] to treat these diseases and reduce the risk of the complications that ensue. Even though HIV is infectious in origin, it is a chronic condition that requires the same management as NCDs [9, 10].

One method of tackling the growing burden of these diseases and preventing the complications that ensue is addressing the issue of medication adherence. Medication adherence has been defined as the extent to which patients take medications as prescribed by their health care providers [11, 12]. The rate of adherence is frequently described as a percentage of the prescribed doses of the medication taken over a specified period of time [10]. Positive treatment outcomes have been associated with high adherence to prescribed medication regimens. Low or sub-optimal adherence is associated with numerous shortcomings such as higher health care costs, increased hospitalisation rates and pre-mature deaths [13].

It has been said that if adherence interventions were improved, this would add far more greatly to the health of the population than any advancement in medicinal treatment [9]. The complete benefit of prescribed medications can only be achieved if patients abide to their medication therapies [12]. However many patients experience difficulty in following prescribed regimens [9] due to various reasons. Common reasons for not adhering to prescribed medication as identified in previous studies include: forgetfulness , other priorities , decision to omit , lack of understanding, complexity of regimen , side effects, costs and emotional factors [14,15,16].

Medication adherence rates have been found to be higher in patients with acute ailments as it is easier to abide to prescribed regimens for shorter periods [12]. Adherence rates may be low in

patients afflicted with asymptomatic conditions such as Hypertension, Diabetes, HIV and Dyslipidaemia as they do not experience physical symptoms of illness until the later stages of the disease [17]. Previous studies have also revealed variable results on adherence rates in patients afflicted with communicable and non-communicable diseases. Coherence is that adherence rates are below optimal for patients with chronic ailments [9, 18,19,20,21.]

Numerous international studies have varying results with regards to adherence in patients with NCDs. For example, in the Heart and Soul Study (2000 and 2002), the risk of cardiovascular events associated with self-reported medication non-adherence were prospectively evaluated in 1015 outpatients. Non-adherence was defined as taking medications as prescribed for 75% of the time or less. Participants were asked a single question: "In the past month, how often did you take your medications as prescribed by the doctor?" Eighty three of 1015 patients (8.2%) where found to be non-adherent to their regimens, and 146 (14.4%) developed cardiovascular events. The authors concluded that self-reported medication non-adherence was linked with a greater than 2-fold increased rate of ensuing cardiovascular events [22].

In another study conducted in Ontario in 2002 among elderly patients, 25% of patients prescribed a statin therapy for acute coronary syndrome or chronic coronary artery disease had discontinued their therapy at 6 months after initiation. Patients were evaluated on their medication adherence over two years and it was suggested that many patients initiating statin therapy may receive little or no benefit from statins because of early discontinuation [20].

A Ugandan study conducted between the years 2012-2013 at two general hospitals (n=521) revealed that one in every five respondents did not adhere well to their diabetic medication (n=88). This was based on patients' self-reports at an adherence index of 80%. Factors that contributed towards adherence included length of time on treatment, drug availability and receiving prior diabetic education. Social demographic factors did not have any association with adherence rates in this study population [23].

Local studies conducted at public health facilities have also revealed sub-optimal rates of medication adherence. Peltzer et al conducted a study in 2007 investigating the Anti-Retroviral Treatment (ART) adherence behaviour of patients from 3 public hospitals in KwaZulu-Natal. Five hundred and nineteen patients were interviewed on their adherence behaviour taking into consideration adherence to time, dose and food. The results revealed that 82.9% (n=427) of the participants where 95% adherent to their regimens using a 30 day visual analogue scale. About 72.4% were adherent to the time advised to take their medication and 71.7% were adherent to taking their medication as prescribed with regards to food [24].

Similar adherence rates were found in a chronic medication adherence survey, conducted by Mathevula in 2013 at the Waterberg District hospital. Three hundred and seven patients afflicted with communicable diseases such as HIV and NCDs such as Diabetes, and Hypertension were interviewed regarding their adherence to medication regimens. Patients with more than one chronic disease had the lowest adherence rate in this group. The highest rate of adherence was found in patients with HIV. The results were as follows: 81% of the respondents said they never missed to take their treatment as prescribed in the previous month. Forty two (21%) of the respondents taking Anti-Retroviral (ARV) drugs indicated that they missed a dose at least once

in the previous month. Fifteen (31%) of those on anti-hypertensives said they missed a dose in the previous month. Ten (28%) of those taking anti-diabetics had missed a dose in the previous month. Among those on both anti diabetics and anti-hypertensive's, eight (34%) said they missed a dose in the previous month. Adherence was calculated as taking 95% and above of the prescribed medication for a period of one month [25].

A literature search has revealed a paucity of studies in South Africa with regards to medication adherence in the private health care sector, particularly in patients with NCDs. To date no medication adherence studies investigating adherence rates in patients afflicted with NCDs were conducted in the private health care sector of South Africa. One study investigating the use of prescribed medication for common chronic ailments in patients who receive health care from both public and private health facilities in South Africa does exist, but this did not examine patients' medication adherence rates [26]. Only one self-reported adherence study investigating the medication adherence rates of private sector HIV patients was identified. This study was conducted by Naidoo in 2005 and investigated factors influencing Highly Active Antiretroviral Treatment (HAART) medication adherence in the private health care sector of eThekwini. This study revealed sub-optimal medication adherence rates of HIV patients as forty nine out of fifty five (89.1%) were non-adherent to their medication regimes. Non-adherence was regarded as missing one day or more of their therapy [15].

Low adherence is of concern for patients with both communicable and non-communicable diseases as it increases the risk of complications, increases health care costs and may ultimately result in death [14]. Poor adherence in communicable diseases like HIV is of extreme concern, as non-adherence leads to poor viral suppression, increased viral resistance, increased risk of opportunistic infections and treatment failure [27]. Although no consensual average compliance level has been designated to represent high or low adherence, numerous studies have used an adherence rate of greater than or equal to 80% as an indicator of optimal compliance or high adherence for NCDs [12, 14, 28]. An adherence rate of no less than 95% is indicated for HIV as this is crucial for viral suppression and the deterrence of resistance and treatment failure [29].

1.2 Core Research Problem and Clinical Significance

International studies have produced immense data on the medication adherence behaviour of patients in both private and public health facilities, whilst local studies have focused and given more insight into the medication adherence behaviour of public sector patients with chronic ailments. There is a lack of data regarding the medication adherence behaviour of patients receiving care from the private health care sector in South Africa, especially in patients afflicted with communicable and non-communicable diseases.

There is inadequate data regarding the following about patients receiving care from the private health care sector in KwaZulu-Natal such as:

- The types of medications patients are prescribed
- The factors affecting medication adherence
- The level of adherence to prescribed therapies.

Thus a medication adherence survey was conducted by interviewing patients receiving care from private health care facilities in eThekwini using a questionnaire. The null hypothesis is that patients in the private health care sector adhere to their medication in both communicable and non-communicable diseases.

1.3 Purpose of the study

The main purpose of this study was to determine if medication adherence is a problem in private sector patients afflicted with communicable and non-communicable diseases. Four disease groups where investigated in this study namely HIV, a communicable disease in which South Africa has the largest epidemic, and the following three non-communicable diseases, Type 2 Diabetes Mellitus, Hypertension and Dyslipidaemia. The latter three diseases are the highest prevalent chronic diseases insured by medical aid schemes according to Council of Medical Schemes (CMS) [30].

1.4 Aims of the study

The study aimed to achieve the following:

To investigate the medication adherence of patients suffering from non-communicable and communicable diseases in the private health care sector of the eThekwini Municipality of KwaZulu-Natal whilst the,

Secondary aim of the study was to determine if medication adherence differed amongst patients with communicable and non-communicable diseases such as Type 2 Diabetes Mellitus, Hypertension, Dyslipidaemia and HIV.

1.5 Specific Objectives

The following objectives were identified as goal points for this study:

-To describe the demographic details of patients in the study.

-To document the medical conditions that patients have.

-To document the medication therapies patients are prescribed.

-To determine patients' adherence to medicine therapies.

-To determine the factors influencing medication adherence and report any barriers to adherence that patients may experience

-To determine if adherence rates differ amongst patients with different diseases.

-To disseminate the information.

1.6 Methodology

1.6.1 Study design

This study was a cross sectional, analytical and descriptive study. Quantitative data was collected using a self-reported medication adherence questionnaire. Questions were closed ended to facilitate data collection and analysis. A self-reported medication adherence survey was chosen as the tool as it was easy to implement and not very costly to administer.

1.6.2 Study population

The study population consisted of patients who were receiving health care treatment from private sector doctors practising in the eThekwini Municipality of KwaZulu-Natal. Participants had to be afflicted with one or more of the following diseases: HIV, Type 2 Diabetes, Hypertension and Dyslipidaemia.

1.6.3 Study period

The study was conducted over a period of two months from 18 October 2017 – 18 December 2017. Patients were interviewed while receiving care from various General Practitioners (GP) rooms across the eThekwini Municipality.

1.6.4 Sampling strategy

Study participants were recruited into the study via stratified sampling. Access to study participants was granted via the random and convenient sampling of doctors.

A list of general practitioners was obtained from the med pages section of the yellow pages directory available in the eThekwini region. Doctors in the med pages of this book are separated according to speciality. The General practitioners details were transferred to a list from which doctors were then randomly selected to invite to participate. A letter (Appendix 3) was sent via email or fax to each of the doctors' practices after telephonically contacting the rooms, informing them of the study, its aims and the data needed to be gathered from this study. The letter (Appendix 3) also requested permission from the practitioners to allow the researcher to meet patients receiving care at the practitioners practice. Only 5 doctors agreed to participate via this sampling method.

Due to a lack of positive responses from doctors, with only 5 agreeing to participate, and the limited number of participants available to sample via randomly sampling, doctors were then conveniently asked to participate in this study. Nine doctors had agreed to participate via this method of convenient sampling. A total of 14 General practitioners agreed to participate in this study.

After doctors had signed the consent form (Appendix 3), a time and date to randomly interview patients at their practices were agreed upon. Participants were randomly selected at each practice and interviewed after consenting to participate (See Appendix 4 for Patient Consent Form). Bias was avoided in the selection process as neither the doctor nor researcher had any influence over who chose to receive care on that particular day.

1.6.5 Statistical planning

The study questionnaire used closed ended questions to extract information from participants regarding the following

- Demographic Information
  - Age
  - Gender
  - Race
  - Level of education
  - Chronic disease diagnosis
- Medication regimen
  - Prescribed medication usage
  - Self-medication usage
- Adherence Behaviour
  - Reasons for taking medication
  - Reasons for not taking medication
  - Storage of medication
  - Number of missed pills

1.6.6 Sample Size

A sample size, representing the population of interest, was calculated after consulting with a statistician from the University of Kwa-Zulu Natal. A between –subjects ANOVA was used to determine the sample size of the study population. The total sample was distributed among 4 disease groups, namely patients afflicted with Type 2 Diabetes, Hypertension, Dyslipidaemia and HIV.

The following was used to determine the sample size:

1. Effect size: 0.25 (medium strength of phenomenon)
2. Type 1 error: 0.05 (Recommended for medical studies)
3. Type 2 error: 0.2 (Recommended for medical studies)
4. Power: 0.80
5. Critical F value: 2.655 (value which F should be over to get a significant result)

A total Sample size of 232 participants was calculated to make an inference.

1.6.7 Inclusion Criteria

The inclusion criteria for participants in the study were as follows:

-Patients needed to be 18years and older

-Patients had to be diagnosed with any individual or combination of the following 4 diseases namely HIV, Type 2 Diabetes, Hypertension and Dyslipidaemia.

-Patients had to be receiving treatment, from the private health care sector in the eThekwini Municipality region.

- Patients had to be on prescribed medication treatment for a period of 6 months or more.

-Patients were required to provide signed informed consent.

1.6.8 Exclusion Criteria

The following patients were excluded from the study:

-Patients younger than 18 years

-Patients not afflicted with any of the 4 diseases under investigation

-Patients not on prescribed medication for a minimum period of 6months.

1.6.9 Data analysis techniques

The data collected from the questionnaire was coded into numerical input and captured electronically onto Microsoft excel ®. The coded data was then exported to SPSS ® statistical package 24 and analysed. The demographic details were analysed using frequency tables and cross tabulation descriptive statistics to generate summaries. Associations between variables were correlated using Pearson Chi and Spearman Rho Correlation coefficients to determine significance. A p value of 0.05 or less and ρ value of +0 or – 0 was considered statistically significant.

1.6.10 Ethical considerations

This study had been ethically reviewed and approved by the University of KwaZulu-Natal Biomedical Research Ethics Committee, approval number BFC307/16

1.7 Dissertation structure

Chapter 1:

- Introduction: Background and literature review
- Core research problem and Clinical significance of the study

- Purpose of the study

- Formulation of aims and specific objectives of the study

- Research Methodology

- Ethical Considerations

Chapter 2:

- Presentation of manuscript titled, “Investigation of the medication adherence behaviour and the factors that influence such behaviour amongst private sector patients with certain communicable and/or non-communicable diseases.”

Chapter 3:

- Presentation of manuscript titled, “Medication usage and adherence behaviour of patients with communicable and non-communicable disease in the private health care sector of eThekwini, KwaZulu-Natal.”

Chapter 4:

- Synthesis

-Limitations of the study

- Recommendations

- Conclusion

CHAPTER 2

This paper has been prepared according to the instructions for authors and submitted to The African Journal of Primary Health Care & Family Medicine [PHCFM]

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ABSTRACT

Background

Medication adherence is a significant factor contributing towards the achievement of treatment goals. This study was conducted to provide insight into the medication adherence behaviour of private sector patients afflicted with communicable and non-communicable chronic diseases.

Objectives

To investigate the medication adherence behaviour of patients suffering from Non-Communicable diseases and Communicable diseases in the private health care sector of the eThekwini Municipality of KwaZulu-Natal.

Methods

A self-reported medication adherence questionnaire was used to obtain data, from 233 patients afflicted with Human Immunodeficiency Virus (HIV), Type 2 Diabetes Mellitus, Hypertension and Dyslipidaemia. The questionnaire focused on factors that influence medication adherence as well as the number of days of medication missed during the last 30 days. Data were collected and analysed using SPSS.

Results

Majority of participants were aged between 51-60 years (26.6%), and were of male gender (52.8%). An almost equal number of participants were afflicted with single disease (n=116) or multiple diseases (117). Hypertension was the most prevalent ailment (n=167), followed by Type 2 Diabetes (n=113), Dyslipidaemia (n=94) and HIV (n= 26). Over 62% of participants reported not missing any medication during the last 30 days. More than 21% had stated missing 1-2 days of their medication and 15.9% reported missing 3 or more days of medication during the last 30 days. With regards to single diagnosis, the highest percentage of adherence was reported in participants afflicted with Hypertension (60.6%), and Type 2 diabetes (58.3%). HIV and Dyslipidaemia had the lowest rates of adherence as 45% (n=9) of HIV only afflicted participants and 57.1% (n=4) of Dyslipidaemia only afflicted participants reported missing 1 or more days of their medication. The highest rate of non-adherence was found in the age group of participants 51-60 years old, while the highest rate of adherence was found in the group aged 70 years+. Reasons for non-adherence included cost, forgetting to take medication, running out of medication, stopping medication because it made them feel worse or gave a side effect and having difficulty with time schedules or having medication with/without food.

Conclusion

Participants afflicted with communicable and non-communicable diseases in the private health care sector have sub-optimal medication adherence. No significant correlations were found between having a particular disease and the rate of adherence, but participants afflicted with HIV only and Dyslipidaemia only where the least adherent. Reasons for non-adherence were similar to other studies.

INTRODUCTION

South Africa is burdened with high rates of communicable and non-communicable diseases (NCD) [1- 3]. One method of tackling the growing burden of these diseases and preventing the complications that ensue is addressing the issue of medication adherence. Medication adherence has been defined as the extent to which patients take medications as prescribed by their health care providers [4, 5]. The rate of adherence is frequently described as a percentage of the prescribed doses of the medication taken over a specified period of time [6].

The complete benefit of prescribed medications can only be achieved if patients abide to their medication therapies [5]. However many patients experience difficulty in following prescribed regimens [7] due to various reasons. Common reasons for not adhering to prescribed medication include: forgetfulness, other priorities, decision to omit, lack of understanding, complexity of regimen, side effects, and costs [8-10].

International studies have produced immense data on the medication adherence behaviour of patients in both private and public health facilities. Whilst local studies have focused and given more insight into the medication adherence behaviour of public sector patients with chronic ailments.

For example, in the Heart and Soul study, the risk of cardiovascular events associated with self-reported medication non-adherence were prospectively evaluated in 1015 outpatients. Eighty three patients (8.2%) where found to be non-adherent to their regimens and one hundred and forty six (14.4%) developed cardiovascular events. Non-adherence was defined as taking medications as prescribed 75% of the time or less. It was concluded that medication non adherence is associated with a 2 fold increase in acquiring cardiovascular events [11].

In another study conducted in Ontario in 2002 among elderly patients, 25% of patients prescribed a statin therapy for acute coronary syndrome or chronic coronary artery disease had discontinued their therapy at 6 months after initiation. Patients were evaluated on their medication adherence over two years and it was suggested that many patients initiating statin therapy may receive little or no benefit from statins because of early discontinuation [12].

In Africa it was revealed that one in every five respondents did not adhere well to their diabetic medication (n=88). This study was conducted in Uganda between the years 2012-2013 at two general hospitals (n=521).The results were based on patient's self-reports at an adherence index of 80%. Factors that contributed towards adherence included length of time on treatment, drug availability and receiving prior diabetic education [13].

South African studies conducted at public health facilities have revealed sub-optimal rates of medication adherence as well. Peltzer et al conducted a study in 2007 investigating the Anti-Retroviral Treatment (ART) adherence behaviour of patients from 3 public hospitals in KwaZulu – Natal (KZN). Five hundred and nineteen patients were interviewed on their adherence behaviour taking into consideration adherence to time, dose and food. The results revealed that 82.9% (n=427) of the participants where 95% adherent to their regimens using the 30-day visual analogue scale. About 72.4% were adherent to the time advised to take their

medication and 71.7% were adherent to taking their medication as prescribed with regards to food [14].

A self-reported chronic medication adherence survey conducted by Mathevula in 2013 at the Waterberg District hospital interviewed 307 Patients afflicted with Human Immunodeficiency Virus (HIV), Diabetes, and Hypertension (HTN) regarding adherence to their medication regimens. Patients with more than one chronic disease had the lowest adherence rate in this group. The highest adherence was found in patients with HIV. Eighty one percent of the respondents said they never had missed to taking their treatment as prescribed in the previous month. Forty two (21%) of the respondents taking ARTs indicated that they missed a dose at least once in the previous month. Fifteen (31%) of those on anti-hypertensives said they missed a dose in the previous month. Ten (28%) of those taking anti-diabetics had missed a dose in the previous month. Among those on both anti-diabetics and anti-hypertensive's, eight (34%) said they missed a dose in the previous month. Adherence was calculated as taking 95% and above of the prescribed medication for a month [15].

A literature search has revealed a paucity of studies in South Africa with regards to medication adherence in private sector patients afflicted with NCDs. To date no medication adherence studies investigating adherence rates in patients afflicted with NCDs were conducted in the private health care sector of South Africa. Only one study investigating the medication adherence of private sector HIV patients was identified. This study was conducted by Naidoo in 2005 and investigated factors influencing Highly Active Anti-Retroviral Treatment (HAART) medication adherence in the private health care sector in eThekwini. This study revealed sub-optimal medication adherence rates as forty nine out of fifty five (89.1%) private sector HAART patients were non-adherent to their medication regimes, where non-adherence was regarded as missing one day or more of their therapy [9].

Due to the lack of data on medication adherence behaviours in the private health care sector of South Africa, this study was conducted to provide insight on this subject. This study aimed to investigate the medication adherence behaviour of patients suffering from communicable and NCDs in the private health care sector of the eThekwini Municipality of KZN.

METHODOLOGY

Study design

A cross sectional, analytical and descriptive study was conducted. Quantitative data was collected using a closed ended self-reported medication adherence questionnaire.

Study population

The study population consisted of patients receiving health care treatment from private sector doctors practising in the eThekwini Municipality of KZN. The required sample size to make an inference was 232.

Study period

The study was conducted over a period of two months from 18 October 2017 – 18 December 2017.

Sampling strategy

Study participants were recruited into the study via stratified sampling. Access to study participants was granted via random and convenient sampling of doctors. A list of General Practitioners (GP) was obtained from the med page section of the yellow pages directory available in the eThekwini region. A letter was sent via email/fax to each of the doctors' practices after telephonically contacting the rooms to inform them of the study. The letter requested permission from the GPs to allow the researcher to meet patients receiving care at the GPs practice. A total of 14 GPs consented to participate in the study, 5 doctors via random sampling and 9 doctors via convenient sampling. A time and date to randomly interview patients at practices was agreed upon with the GP. Bias was avoided in the selection process as neither the GP nor researcher had any influence over who chose to receive care on that particular day.

Inclusion Criteria

Study participants needed to be 18years and older, diagnosed with any single or combination of the following 4 diseases namely HIV, Type 2 Diabetes (T2D), Hypertension (HTN) and Dyslipidaemia (DYS). Participants had to be receiving treatment from the private health sector in the eThekwini Municipality region and had to be on prescribed medication treatment for a period of 6 months or more. Patients not meeting these criteria were excluded.

Data analysis techniques

Data collected from the questionnaires were coded numerically, captured electronically onto Microsoft excel ®, exported to SPSS ® statistical package version 24 and analysed. Demographic details were analysed using frequency tables and cross tabulation descriptive statistics. Associations between variables were correlated using Pearson Chi and Spearman Rho Correlation coefficients to determine significance. A p value of 0.05 or less and ρ value of +0 or – 0 was considered statistically significant.

Ethical considerations

Ethical approval was granted from the University of KwaZulu-Natal Biomedical Research Ethics Committee, approval number BFC307/16.

Main Outcome measures.

To extract information on participants' demographic details, factors contributing to medication adherence and the number of missed days of medication during the last 30 days. For the purposes of this study medication adherence was categorised as follows:

0 days missed - 100% adherent
1-2 days missed - 96.6-93.3% adherent
3 or more days - 90% adherent, and less

Since patients were afflicted with a combination of diseases and HIV requires an adherence rate of 95% or more to suppress virus replication and prevent resistance, an adherence rate of 0 days missed or 100% was deemed acceptable.

RESULTS

Table 1:Demographic data

Age		
Category	**N**	**Percentage**
18-30	7	3.0
31-40	33	14.2
41-50	54	23.2
51-60	62	26.6
61-70	53	22.7
71-80	23	9.9
81-90	1	.4
Gender		
Category	**N**	**Percentage**
Female	110	47.2
Male	123	52.8
Highest level of Education		
Category	**N**	**Percentage**
Tertiary	75	32.2
Secondary	81	34.8
Primary	68	29.2
No formal Education	9	3.9

Bulk of participants were distributed between age groups 51-60 years. Majority of participants were of male gender. Majority of participants had secondary or tertiary education qualifications.

Table2: Types of Diseases

	Multiple Conditions	**T2D only**	**HTN only**	**HIV only**	**DYS only**
N = 233	116	24	66	20	7
%	49.8%	10.3%	28.3%	8.6%	3%

An almost equal amount of participants were diagnosed with single (n=117) and Multiple (n=116) ailments. Hypertension was the most common chronic ailment (n=167), followed by Type 2 Diabetes (n=113), Dyslipidaemia (n=94) and HIV (n= 26). With regards to single disease, ranking followed the same order apart for a higher number of participants afflicted with HIV than Dyslipidaemia, as seen in table 2.

Factors affecting medication adherence

Table 3: Factors that affect adherence negatively

Question	N	%
Ever stopped taking medication when feeling better	40	17.2
Stopped medication because it made you feel worse / gave a side effect	49	21.0
Ever felt you do not need the medication	45	19.3
Ever felt that skipping a few doses will not make a difference	67	28.8
Ever not taken medication because it's too expensive	22	9.4
Sometimes forget to take medication by mistake	127	54.5
Not taken medication because forgot to pick up a refill	42	18
Not taken medication because it ran out	60	25.8
Ever forgot to take medication with when travelling away from home	36	15.5
Ever not taken medication because did not want anyone to see	14	6
Struggle with taking medication as prescribed for example at a specific time / with or without meals	46	19.7
Ever leave out pills because they too many	28	12
Ever leave out pills because you feel they too strong	32	13.7
Ever not taken medication because did not know how to take correctly	15	6.4

With regards to factors that contribute negatively towards adherence, 20.1% of participants stopped their medication as it made them feel worse or gave them a side effect. 28.8% felt that skipping a few doses of their medication will not make a difference and more than half reported forgetting to take their medication. Greater than one fourth reported not taking their medication

as it ran out and more than one eighth of participants reported forgetting to take their medication with them when they travelled away from home. One fifth of participants found it difficult to take their medication at a specific time or with/without meals.

Table 4: Factors that affect medication adherence positively

Question	N	%
Think it's important to take medication exactly as prescribed by Doctor	216	92.7
Family knows about medication you take	225	96.6
Family helps remember to take medication	176	75.5
Feel get enough support from family to manage disease	209	89.7

With regards to factors contributing positively towards adherence, majority (92.7%) agreed that it is important to take their medication exactly as prescribed by their doctor. Almost all participants stated that their family knew about the medication they take, however only 89.7% felt that they get enough support from their family to manage their conditions and only 75.5% stated that their family helped them remember to take their medication.

Table 5: Factors affecting medication adherence in participants with single diseases vs multiple

Question	T2D only (n=24)	HTN only (n=66)	DYS only (n=7)	HIV only (n=20)	Single (n=117)	Multiple (n=116)
Stopped taking medication when felt better	4 (16.6%) p=0.945	14(21.2%) p=0.303	3(42.9%) p=0.067	6 (30%) p=0.111	27(23.1%) p=0.016	13(11.2%) p=0.016
Stopped medication because made patient feel worse / gave side effect	6(25%) p=0.614	13(19.7%) p=0.754	2(28.6%) p=0.619	5(25%) p=0.649	26(22.2%) p=0.654	23(19.8%) p=0.654
Ever felt that they did not need to take medication	5(20.8%) p=0.842	15(22.7%) p=0.407	2 (28.6%) p=0.529	5(25%) p=0.500	27(23.1%) p=0.144	18(15.5%) p=0.144
Felt that skipping a few doses will not make a difference	5(20.8%) p=0.365	18(27.2%) p=0.753	3(42.9%) p=0.403	7(35%) p=0.519	33(28.2%) p=0.852	34(29.3%) p=0.852
Ever not taken medication because it's too expensive	0 (0%) p=0.095	4(6.1%) p=0.267	1(14.3%) p=0.656	6(30%) p=0.001	11(9.4%) p=0.983	11(9.5%) p=0.983
Do not think it is important to take medication exactly as prescribed by doctor	2(8.3%) p=0.837	6(9.1%) p=0.508	1(14.3%) p=0.470	0(0%) p=0.189	9(7.7%) p=0.815	8(6.9%) p=0.815

Sometimes forget to take medication by mistake	15(62.5%) p=0.406	37(56.1%) p=0.765	5(71.4%) p=0.361	10(50%) p=0.672	67(57.3%) p=0.396	60 (51.7%) p=0.396
Not taken medication because forgot to pick up a refill	3(12.5%) p=0.457	8(12.1%) p=0.140	2(28.6%) p=0.461	6(301111 510 p=0.145	19(16.2%) p=0.476	23(19.8%) p=0.476
Not taken medication because it ran out	4(16.6%) p=0.283	12(18.2%) p=0.097	3(42.9%) p=0.293	8(40%) p=0.127	27(23.1%) p=0.348	33(28.4%) p=0.348
Ever forgot to take medication with when travelling away from home	1(4.2%) p=0.106	10(15.2%) p=0.937	1(14.3%) p=0.931	6(30%) p=0.060	18(15.3%) p=0.978	18(15.5%) p=0.978
Ever not taken medication because did not want anyone to see	0(0%) p=0.191	1(1.5%) p=0.070	0(0%) p=0.497	7(35%) p=0.000	8 (6.8%) p=0.593	6(5.2%) p=0.593
Family does not know about medication participant is taking	0(0%) p=0.329	3(4.5%) p=0.558	0(0%) p=0.612	2(10%) p=0.092	5(4.2%) p=0.479	3(25.9%) p=0.479
Family does not help patient remember to take medication	6(25%) p=0.949	12(18.2%) p=0.161	3(42.9%) p=0.250	5(25%) p=0.953	26(22.2%) p=0.424	31(26.7%) p=0.424
Feel they do not get enough support from their family to manage disease	1(4.2%) p=0.297	9(13.6%) p=0.292	0(0%) p=0.363	4(20%) p=0.136	14 (11.9%) p=0.401	10(8.6%) p=0.401
Struggle with taking medication as prescribed for example at a specific time / with or without meals	5(20.8%) p=0.887	8(12.1%) p=0.066	2(28.6%) p=0.551	8(40%) p=0.017	23(19.7%) p=0.974	23(19.8%) p=0.974
Ever leave out pills because they feel there are too many	0(0%) p=0.056	4(6.1%) p=0.079	0(0%) p=0.321	3(15%) p=0.668	7(5.9%) p=0.004	21(18.1%) p=0.004
Ever leave out pills because they feel the medication is too strong	3(12.5%) p=0.853	6(9.1%) p=0.196	1(14.3%) p=0.966	3(15%) p=0.836	13(11.1%) p=0.243	19(16.4%) p=0.243
Ever not taken medication because did not know how to take correctly	0(0%) p=0.175	3(4.5%) p=0.459	0(0%) p=0.481	4(20%) p=0.014	7(5.9%) p=0.776	8(6.9%) p=0.776

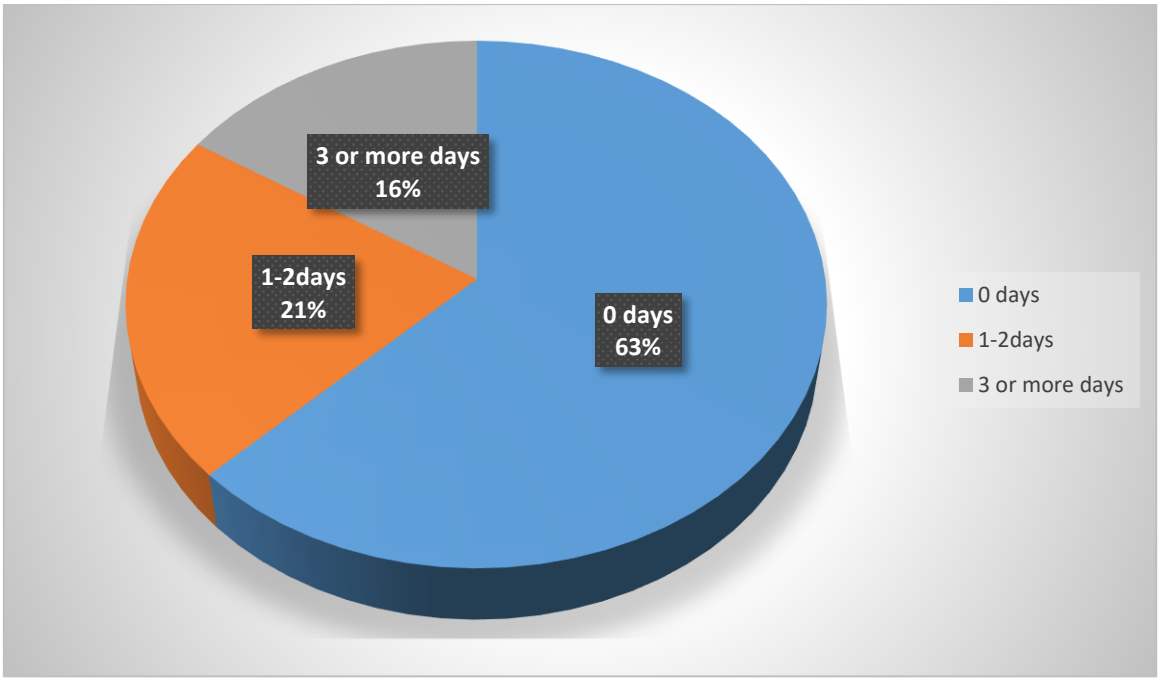
A significant difference was found among participants with single vs multiple diseases. More participants with single diseases (n = 27) reported not taking their medication once they felt better. And more participants with multiple diseases (n=21) reported leaving out pills because they felt there were too many.

Statistical significance was also found in participants afflicted with HIV alone (n=20) who reported not taking their medication because it's too expensive (30%), not taking their medication because they did not want anyone to see (35%), struggling to take their medication at specific times / with or without food (40%) and not taking their medication because they did not know how to take them correctly (20%).

Zero participants afflicted with Type 2 diabetes reported leaving out pills because they felt there were too many (p=0.056).

Medication adherence: Number of missed days of medication during the last 30 days

Graph 1: Number of days missed of medication



With regards to number of missed days of medication, a large percentage (n=146) had reported no days of missed medication. 50 participants stated they had missed 1-2 days of their medication and 37 reported having missed 3 or more days of medication during the last 30days.

Table 6: Number of missed days of Medication: Single vs Multiple Diseases

		T2d only	HTN only	DYS Only	HIV only	Single condition	Multiple conditions
how many days of medication not taken during last 30days	0 days	14(58.3%)	40(60.6%)	3(42.9%)	11(55%)	68(58.1%)	78(67.2%)
	1-2 days	8(33.3%)	13(19.7%)	2(28.6%)	3(15%)	26(22.2%)	24(20.7%)
	3 or more days	2(8.3%)	13(19.7%)	2(28.6%)	6(30%)	23(19.7%)	14(12.1%)
Total		24	66	7	20	117	116
p value		0.247	0.594	0.508	0.185	0.229	

Participants afflicted with multiple diseases had higher adherence rates than participants with single diseases. In all categories of days missed, patients with multiple diseases reported less missed days than patients with single diseases as seen in Table 6.

With regards to participants afflicted with single diseases, the highest percentage of adherence, with 0 days of missed medication, was reported in participants with Hypertension (60.61%), followed by Type 2 diabetes (58.33%), HIV (55%) and Dyslipidaemia (42.86%). Participants afflicted with dyslipidaemia alone and HIV alone had the highest rate of non-adherence as 28.6% of participants with dyslipidaemia alone and 30% of participants with HIV alone had reported missing 3 or more days of their prescribed medication.

Table 7: Number of days of medication missed according to Age

Age		**18-40years (n=40)**	**41-50years (n=54)**	**51-60 years (n=62)**	**61-70 years (n=53)**	**70+ Years (n=24)**
How many days of medication did you not take during the last 30days	0days	22(9.44%)	32(13.73%)	33(14.16%)	39(16.74%)	20(8.58%)
	1-2 days	9(3.86%)	10(4.29%)	20(8.58%)	8(3.43%)	3(1.29%)
	3 or more days	9(3.86%)	12(5.15%)	9(3.86%)	6(2.58%)	1(0.43%)
p value			0.063			
ρ value			-0.181			

The relationship between age and number of days of missed medication was found to be significant having a spearman's rho correlation of -0.181 .The highest rate of overall non-adherence was found in the group of participants aged 51-60 years old. Participants aged 41-50years old had a higher rate of missing 3 or more days of their medication. While the highest rate of adherence was found in the group aged 70+ years.

DISCUSSION

This study found that adherence rates were sub-optimal for participants with communicable and non-communicable diseases as only 63% had missed zero days of their medication during the last 30 days. Although no significant difference amid adherence rates were found amongst participants with a particular disease, participants with Hypertension alone and Type 2 Diabetes alone were the most adherent and while participants with dyslipidaemia alone and HIV alone were the least adherent.

The adherence rates found in this study concur with international studies that have found that 20-50% of patients do not adhere to their prescribed medications [16] but is variable when compared to local studies. For example a private sector HAART study [9] found that only 10.9% of participants were one hundred percent adherent to their HAART medication. While public sector self-reported adherence studies have found higher rates of medication adherence as more

than 80% of participants had taken more than 95% of their medication during the previous thirty days [14, 15].

Significant factors affecting medication adherence in this study with participants afflicted with HIV alone were not taking medication because it's too expensive, not taking medication because they did not want anyone to see, struggling to take medication at specific times / with or without food and not taking medication because they did not know how to take them correctly. These findings correlate with that stated by Emamzadeh-Fard et al [18], where factors that reduce the rate of adherence in Sub-Saharan Africa were identified as cost, not informing patient's spouse and family about his/her disease, fear of stigma and complications following medication regimens. Naik et al had also found cost and poor medication knowledge to be factors contributing to poor adherence in their study as 75% of patients reported the cost of HAART to be an obstacle to adherence. Patients who understood their medication and how to use them were more adherent to their therapies than patients who did not [17].

In this study, participants afflicted with multiple diseases were more adherent to their therapies than participants with single diseases. Participants with single diseases were more likely to stop their therapy when they felt better compared to participants with multiple diseases. Jin [19] et al and DiMatteo [20] et al have proposed that greater disease severity is attributed to better compliance. This may be accurate in the sense that patients may perceive themselves as being at higher risk having more chronic illness diagnoses than a single diagnosis thus leading to better medication compliance.

The relationship between age group and number of days of missed medication was found to be significant having a spearman's rho correlation of -0.181.The highest rate of adherence was found in the group of participants aged 70 years old and above. This is consistent with systematic reviews conducted by Jin et al and Erickson et al who proposed that increasing age was a significant predictor of an increased likelihood of being adherent to medication therapies such as statins, antihypertensives, and antidiabetics [20, 21] .

Common reasons recognised for poor adherence in this cohort, similar to other studies [8-10, 19], were forgetting to take medication, running out of medication, stopping medication because it made them feel worse or gave a side effect and having difficulty sticking to time schedules or having medication as prescribed with/without food. The effect of these factors on medication adherence can be reduced by individualising patient regimens to suit patients' lifestyle and minimising known side effects of drugs. Technology such as short message service's or apps on cell phones can be used as reminders to take medication daily or pick up medication refills. Dosage simplification has been found to be effective in increasing medication adherence rates [16] where practitioners prescribe regimens that require the lowest dosing frequency and are the least complex to administer.

Although majority of participants felt that it is important to take their medication exactly as prescribed by their doctor, more than one fourth of participants felt that skipping a few doses of their medication would not make a difference to their health. Jin et al [19] have found that a patient's understanding of their disease and treatment may not always be optimal. Some patients may not understand the effect medication therapies play in their treatment while some lack knowledge about the disease and the consequences of poor compliance. Others may be under

the impression that the need for medication was intermittent and stop their treatment presumptively.

Family support has been shown to positively affect adherence. Although almost all participants in this study stated that their family knew about the medication they take, only 75% stated that their family helps them remember to take their medication. Greater effort may need to be placed on involving family members in therapy regimens as the risk of non-adherence has been stated to be 1.35 times higher in patients who do not receive emotional support [22]. Social support has been identified as a stress buffer, may help change emotional states, increase self-efficacy, and influence change in adverse health behaviours [23].

LIMITATIONS

The rate of adherence was measured categorically as the number of days missed in a 30 day cycle and not individually. In this study the sample population consisted of a minority of patients afflicted with dyslipidaemia and HIV.

RECOMMENDATIONS

Further research needs to be conducted to determine if age is a significant predictor of adherence. The stigma of taking HIV medication seems to still be a prevalent issue affecting patients with HIV/AIDS. This along with the cost of therapy and understanding how their medication works and how to take them correctly need to be addressed when deciding to treat.

CONCLUSIONS

This study found that participants afflicted with communicable and non-communicable diseases in the private health care sector have sub-optimal medication adherence. Although no significant correlations were found between having a particular disease and adherence, participants afflicted with HIV and Dyslipidaemia alone were the least adherent to their medication. Patients with HIV still struggle with cost of their medication, taking their medication at particular times and have to take their medication covertly so people do not see. In this study age was proposed to be a predictor of adherence however its effects should be investigated further.

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A second manuscript focusing on medication adherence rates in patients with single and multiple diseases as well as the types of medication they use has been prepared for publication. This paper is titled “Medication usage and adherence behaviour of patients with communicable and non-communicable diseases in the private health care sector of eThekwini, KwaZulu-Natal. It is believed that the second manuscript will be able to shed even more light on the topic of medication adherence behaviours of patients in the private health sector of South Africa.

CHAPTER 3

This paper has been prepared according to the instructions for authors and submitted to The African Journal of Primary Health Care & Family Medicine [PHCFM]

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Title: Medication usage and adherence behaviour of patients with communicable and non-communicable diseases in the private health care sector of eThekwini, KwaZulu-Natal.

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ABSTRACT

Background

Information regarding the medication usage behaviour of private sector patients afflicted with HIV, Type 2 Diabetes, Hypertension and Dyslipidaemia remain sparse in South Africa. A small amount of dated information does exist about the types of medication commonly prescribed to patients with non-communicable chronic diseases but further research is needed. Although it is assumed that patients would be prescribed similar medications according to treatment guidelines, this needs to be confirmed.

Objectives

To determine the type of medication prescribed to patients afflicted with communicable and non-communicable diseases in the private health care sector of eThekwini as well as to determine the adherence behaviour of patients with single and multiple diseases.

Methods

Data on medication usage, factors influencing adherence and the number of days of medication missed were extracted from 233 private sector patients using a self-reported medication adherence questionnaire. Data was collected and analysed using SPSS.

Results

Majority of participants were male and aged between 51-60 years (26.6%). An almost equal number of participants were afflicted with single disease (n=116) or multiple diseases (117). Hypertension was the most prevalent ailment (n=167), followed by Type 2 Diabetes (n=113), Dyslipidaemia (n=94) and HIV (n= 26). Biguanides (89.38%) and Sulphonylureas (46.02%) were the most common prescribed classes of medication used in Type 2 diabetics. The most commonly prescribed class of drugs for hypertension were the diuretics (42.73%), fixed dose combination drugs (29.34%), ACE inhibitors (28.74%) and Calcium channel blockers (25.75%). All participants afflicted with dyslipidaemia were prescribed a statin therapy (100%) and more than half (56.38%) were prescribed low dose aspirin. With regards to HIV, 92.3% of participants were on combination drug therapy. More participants with single diseases (23.1%) stopped taking their medication when they felt better compared to participants with multiple diseases (11.2%). While more participants with multiple diseases (18.1%) left out pills because they felt there were too many when compared to single diseases (5.9%).

Conclusion

Patients in the private sector are prescribed similar classes of drugs for their conditions in line with treatment guidelines. Patients with multiple diseases are more likely to leave out pills because they feel there are too many, while patients with single diseases are more likely to stop taking their medication when they feel better.

INTRODUCTION

Information regarding the medication usage and adherence behaviour of patients afflicted with chronic diseases in the private health care sector of South Africa remain unclear. To date, only one study investigated the types of medication commonly prescribed to patients with chronic ailments in both the public and private health care sectors in South Africa [1] and none focusing on private health care sector patients only.

In 1998, Steyn et al conducted a national chronic medication usage study in South Africa. This study investigated the chronic medication usage of both public and private health care sector patients with Non-communicable diseases (NCDs). The findings revealed that patients were not prescribed medications according to recommended national treatment guidelines but were prescribed more expensive and irrational drugs. The most common class of drugs prescribed for diabetes were ranked sulphonylureas, biguanides and insulins. While for hypertensives the most common classes of drugs prescribed were ranked diuretics, renin-angiotensin inhibitors and calcium channel blockers. The authors suggested that the use of an essential drug list (EDL) could result in a more rational and cost-effective pattern of chronic drug use in the country [1]. The current assumption is that prescribing patterns have transformed over the last 8 years and that patients, more specifically in the private health care sector, would be prescribed medications according to recommended treatment guidelines set by professional societies.

Chronic medication adherence studies have revealed sub-optimal rates of medication compliance, with patients missing pills, sometimes intentionally, for various reasons. Non-adherence rates have been found to be higher in patients' who are often prescribed new therapy as compared to those with existing medication regimens [2]. This may suggest that patients with single diagnosis have lower adherence rates than those with co-morbid diseases. However a study conducted at a public health facility in South Africa found that patients with co-morbid conditions such as diabetes, hypertension and HIV had lower adherence rates than those with single diagnosis.

Human Immunodeficiency Virus (HIV), Hypertension (HTN), Type 2 Diabetes (T2D) and Dyslipidaemia (DYS) are the most prevalent chronic diseases afflicting medical scheme patients in South Africa according to the Council of Medical Schemes (CMS), however there have not been many studies aimed at extracting information on these conditions [3]. This study aimed to investigate the medication usage behaviour of patients afflicted with communicable and non-communicable diseases in the private health care sector of eThekwini, KwaZulu-Natal (KZN). This paper focuses on the types of medication prescribed to patients afflicted with any of the four disease i.e. HIV, Type 2 Diabetes Mellitus, Hypertension and Dyslipidaemia as well as to determine if rates of adherence differ amongst patients afflicted with single and multiple diseases.

METHODOLOGY

Study design

A cross sectional, analytical and descriptive study was conducted. Quantitative data was collected using a closed ended self-reported medication adherence questionnaire.

Study population

The study population consisted of patients receiving health care treatment from private sector doctors practising in the eThekwini Municipality of KwaZulu-Natal. The required sample size to make an inference was 232.

Study period

The study was conducted over a period of two months from 18 October 2017 – 18 December 2017. Patients were interviewed while receiving care from General Practitioners in the eThekwini Municipality.

Sampling strategy

Study participants were recruited into the study via stratified sampling. Access to study participants was granted via random and convenient sampling of doctors. A list of General Practitioners (GP) was obtained from the med page section of the yellow pages directory available in the eThekwini region. A letter was sent via email/fax to each of the doctors' practices after telephonically contacting the rooms to inform them of the study. The letter requested permission from the GPs to allow the researcher to meet patients receiving care at their GPs practice. A total of 14 GPs consented to participate in the study (5 doctors via random sampling and 9 doctors via convenient sampling). A time and date to randomly interview patients at practices was agreed upon with the GP. Bias was avoided in the selection process as neither the GP nor researcher had any influence over who chose to receive care on that particular day.

Inclusion Criteria

Study participants needed to be 18 years and older, diagnosed with any single or combination of the following 4 diseases namely HIV, Type 2 Diabetes, Hypertension and Dyslipidaemia. Participants had to be receiving treatment, from the private health care sector in the eThekwini Municipality region and had to be on prescribed medication treatment for a period of 6 months or more. Participants were required to provide informed consent. Patients not meeting these criteria were excluded.

Data analysis techniques

Data collected from the questionnaires were coded numerically and captured electronically onto Microsoft excel ®. The coded data was then exported to SPSS ® statistical package version 24 and analysed. The demographic details were analysed using frequency tables and cross tabulation descriptive statistics. Associations between variables were correlated using Pearson Chi coefficients to determine significance. A p value of 0.05 or less was considered statistically significant.

Ethical considerations

Ethical approval was granted from the University of KwaZulu-Natal Biomedical Research Ethics Committee, approval number BFC307/16.

Main Outcome measures

To extract information on participants' demographic details, medication usage, factors contributing to medication adherence and the number of missed days of medication during the last 30 days. For the purposes of this study medication adherence was categorised as follows:

0 days missed - 100% adherent
1-2 days missed - 96.6-93.3% adherent
3 or more days - 90% adherent and less

Since patients were afflicted with a combination of diseases and HIV requires an adherence rate of 95% or more to suppress virus replication and prevent resistance, an adherence rate of 0 days missed or 100% was deemed acceptable.

RESULTS

Demographics

Table 1:Demographic data

Age		
Category	**N**	**Percentage**
18-30	7	3.0
31-40	33	14.2
41-50	54	23.2
51-60	62	26.6
61-70	53	22.7
71-80	23	9.9
81-90	1	.4
Gender		
Category	**N**	**Percentage**
Female	110	47.2
Male	123	52.8
Highest level of Education		
Category	**N**	**Percentage**
Tertiary	75	32.2
Secondary	81	34.8
Primary	68	29.2
No formal Education	9	3.9

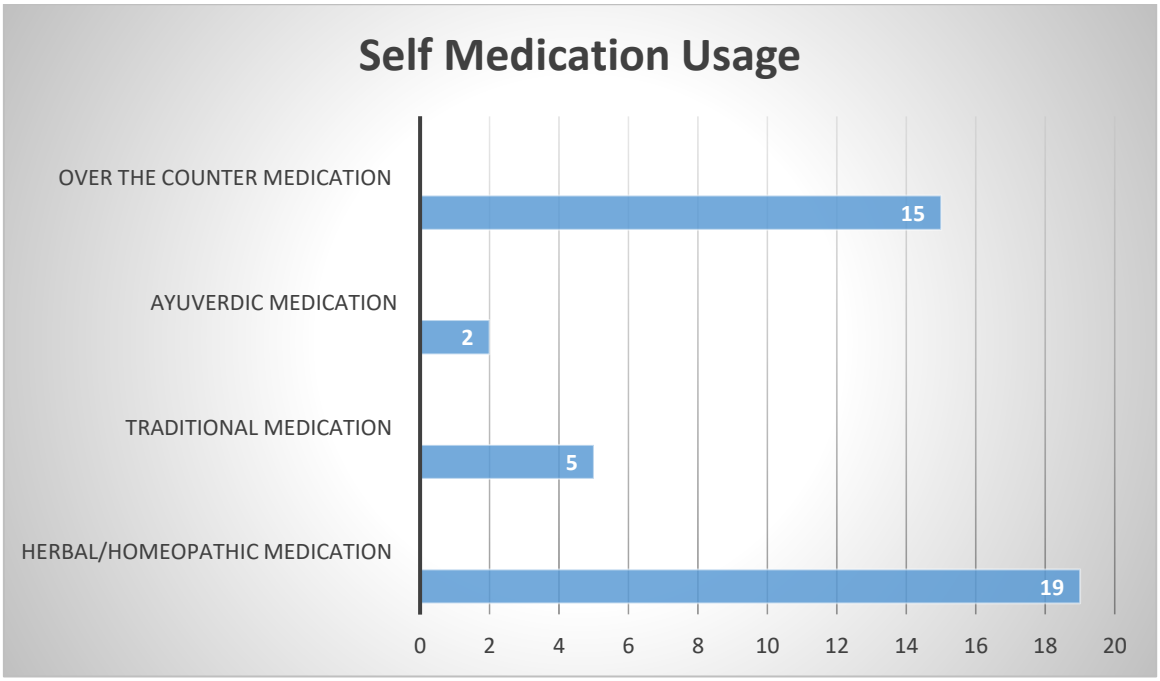
Table 2: Types of Diseases

	Multiple Conditions	Type 2 diabetes Only	Hypertension Only	HIV only	Dyslipidaemia only
N = 233	116	24	66	20	7
%	49.8%	10.3%	28.3%	8.6%	3%

An almost equal amount of participants were diagnosed with single (n=117) and Multiple (n=116) ailments. Hypertension was the most common chronic ailment (n=167), followed by Type 2 Diabetes (n=113), Dyslipidaemia (n=94) and HIV (n= 26). With regards to single disease, ranking followed the same order apart for a higher number of participants afflicted with HIV than Dyslipidaemia, as seen in table 2.

Self-Medication usage

Graph 1: Self-medication usage of Participants

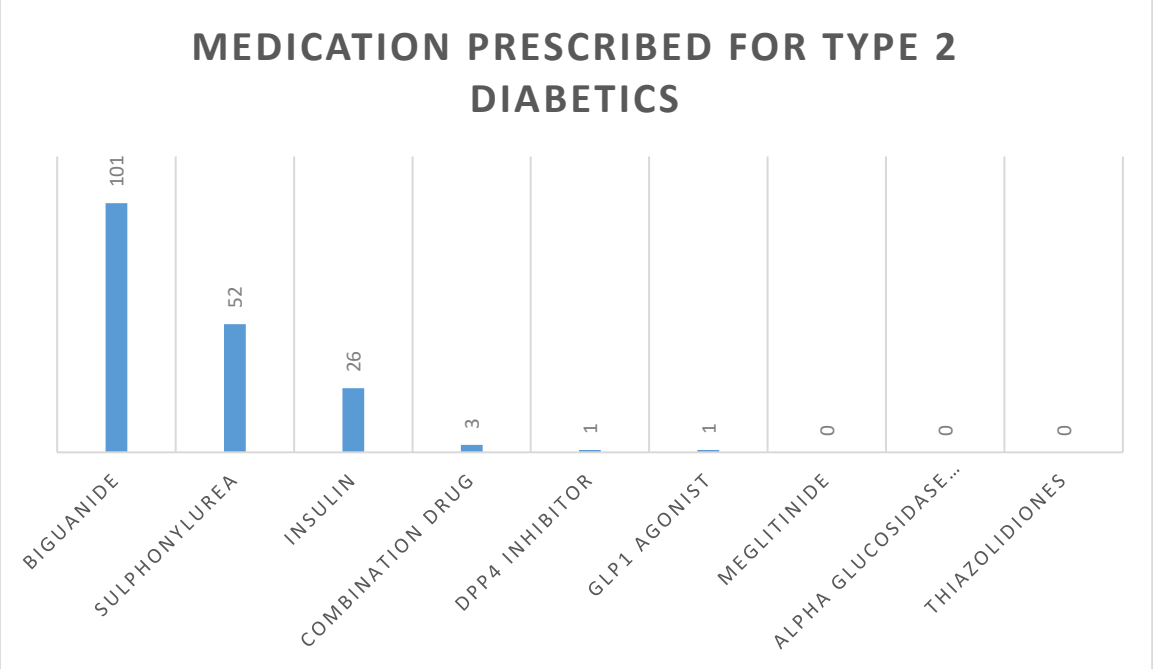


A very small percentage of the cohort were using self-medication. The types of self-medication used are indicated in graph 1.

Prescribed Medication usage

Type 2 Diabetes

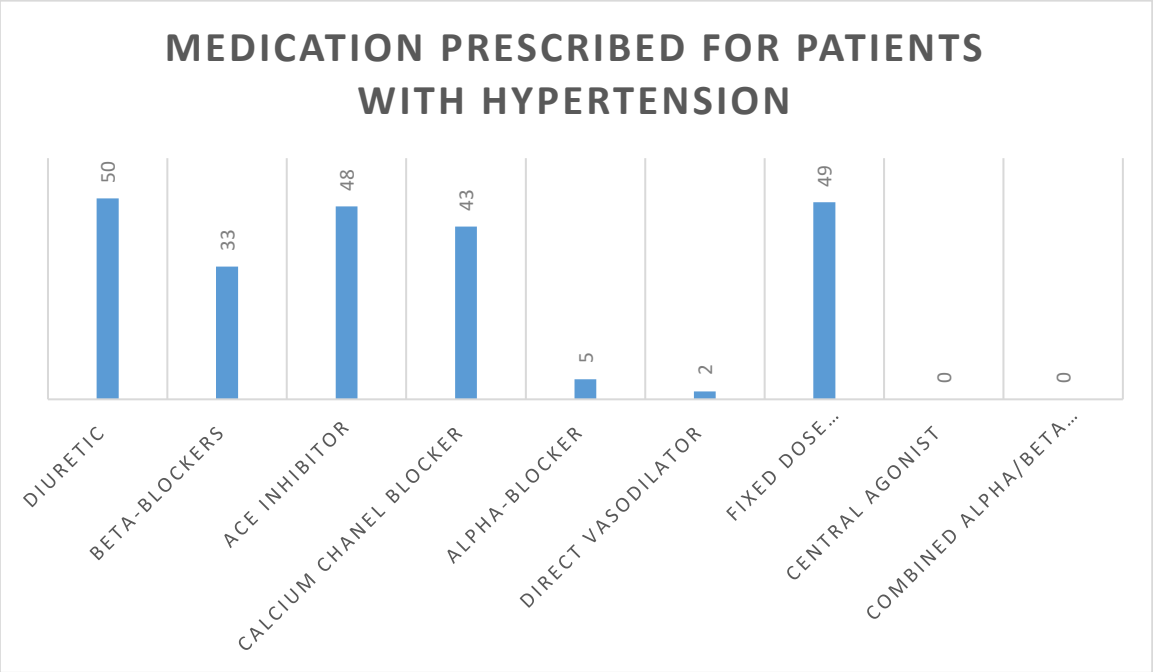
Graph 2: Medication Prescribed for Type 2 Diabetes



A total of 113 participants were afflicted with Type 2 Diabetes. Patients were prescribed one or more of the following classes of drug as seen in graph 2. The most common class of drug prescribed was Biguanides, in which the drug Metformin (n=101) falls categorically. This was followed by the group Sulfonylureas (n=52), insulins (n=26), Combination Therapies (n=3), Dipeptidyl peptidase (DPP) - 4 inhibitors (n=1) and Glucagon-like peptide (GLP)-1 agonists (n=1). No patients where prescribed Meglitinides, Alpha Glucosidase inhibitors or Thiazolidiones.

Hypertension

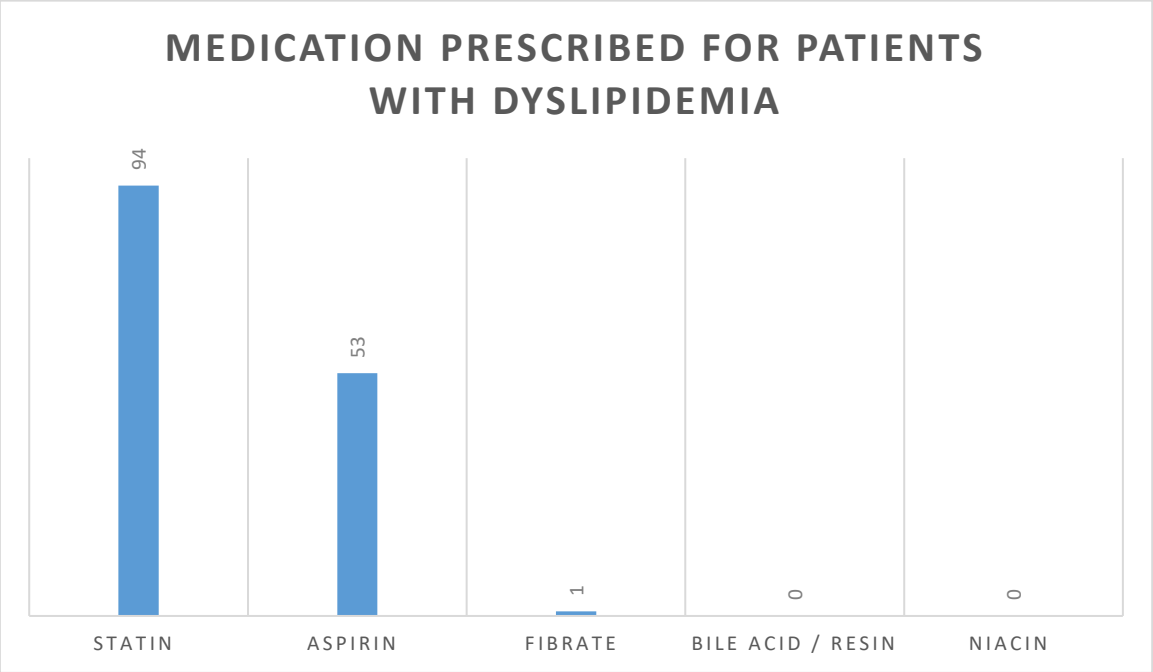
Graph 3: Medication prescribed for Hypertension



A total of 167 participants were afflicted with Hypertension. Patients where prescribed one or more of the following medication classes as seen in graph 3. Diuretics (42.7%), fixed dose combination therapy (29.3%), ACE inhibitors (28.7%) and Calcium channel blockers (25.7%) were the most popular therapies prescribed for hypertension as seen in graph 3.

Dyslipidaemia

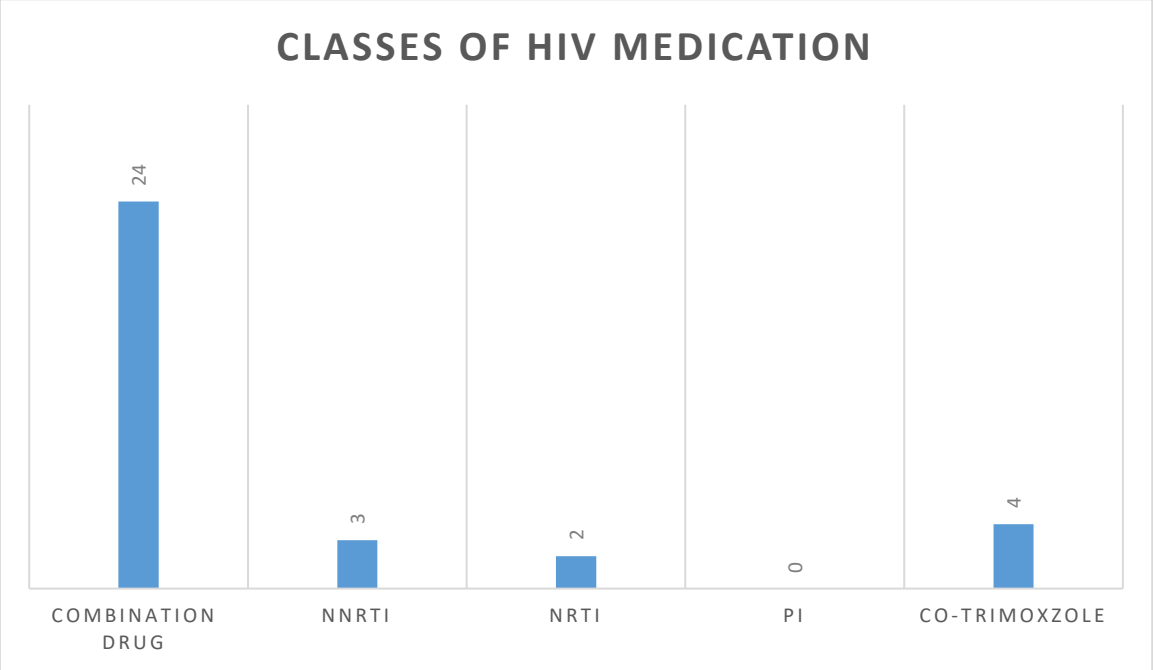
Graph 4: Medication Prescribed for Dyslipidaemia



A total of 94 participants were afflicted with dyslipidaemia and were all prescribed a statin. Fifty three participants were prescribed aspirin to prevent blood clots and only 1 participant was prescribed a fibrate. No participants were prescribed drugs from the niacin or bile acid resin class of medication.

HIV

Graph 5: Medication prescribed for HIV



Majority of the participants afflicted with HIV were prescribed one or more of the following classes of drugs: a fixed dose regimen (92.3%), a Non-nucleoside reverse transcriptase inhibitor (NNRTI) regimen (11.5%) and a Nucleoside reverse transcriptase inhibitor (NRTI) regimen (7.7%) and 15.4% of participants were on Co-Trimoxazole therapy. No participants were prescribed a Protease inhibitor (PI).

Factors affecting medication adherence

Table 3: Factors affecting medication adherence in participants with single diseases vs multiple

Question	Single (n=117)	Multiple (n=116)	p value
Stopped taking medication when participant felt better	27(23.1%)	13(11.2%)	0.0016
Stopped medication because made patient feel worse / gave side effect	26(22.2%)	23(19.8%)	0.654
Participant ever felt that they did not need to take medication	27(23.1%)	18(15.5%)	0.144
Felt that skipping a few doses will not make a difference	33(28.2%)	34(29.3%)	0.852
Ever not taken medication because it's too expensive	11(9.4%)	11(9.5%)	0.983

Do not think it is important to take medication exactly as prescribed by doctor	9(7.7%)	8(6.9%)	0.815
Sometimes forget to take medication by mistake	67(57.3%)	60 (51.7%)	0.396
Not taken medication because forgot to pick up a refill	19(16.2%)	23(19.8%)	0.476
Not taken medication because it ran out	27(23.1%)	33(28.4%)	0.348
Ever forgot to take medication with when travelling away from home	18(15.3%)	18(15.5%)	0.978
Ever not taken medication because did not want anyone to see	8 (6.8%)	6(5.2%)	0.593
Family does not know about medication participant is taking	5(4.2%)	3(25.9%)	0.479
Family does not help patient remember to take medication	26(22.2%)	31(26.7%)	0.424
Feel they do not get enough support from their family to manage disease	14 (11.9%)	10(8.6%)	0.401
Struggle with taking medication as prescribed for example at a specific time / with or without meals	23(19.7%)	23(19.8%)	0.974
Ever leave out pills because they feel there are too many	7(5.9%)	21(18.1%)	0.004
Ever leave out pills because they feel the medication is too strong	13(11.1%)	19(16.4%)	0.243
Ever not taken medication because did not know how to take correctly	7(5.9%)	8(6.9%)	0.776

A significant difference was found among participants with single vs multiple diseases. A higher number of participants with single diseases (n = 27) reported not taking their medication once they felt better while more participants with multiple diseases (n=21) reported leaving out pills because they felt there were too many.

Storage of medication in household

Table 4: Storage of medication

Place in home	**N**	**%**
Kitchen	91	39.1
Bathroom	5	2.1
Bedroom	112	48.1
Handbag	12	5.2

Refrigerator	20	8.6
Lounge	8	3.4
Dining room	6	2.6
Work draw	1	0.4

The three most frequent areas of the home for the storage of medication were the bedroom, kitchen and refrigerator as seen in table 6.

Medication adherence according to number of missed days of medication during the last 30 days

Table 5: Number of missed days of medication: Single vs Multiple Diseases

		Single condition	**Multiple conditions**
how many days of medication not taken during last 30days	0 days	68(58.1%)	78(67.2%)
	1-2 days	26(22.2%)	24(20.7%)
	3 or more days	23(19.7%)	14(12.1%)
Total		117	116
p value		0.229	

Participants afflicted with multiple diseases had higher adherence rates than participants with single diseases. In all categories of days of medication missed, patients with multiple diseases reported less missed days of medication than patients with single diseases as seen in table 7.

DISCUSSION

To date very little data exists with regards to patients' medication usage behaviour in the private health care sector of South Africa. In this cohort, the most prevalent diseases were ranked as follows: Hypertension, Type 2 Diabetes, Dyslipidaemia and HIV. This is similar to the pattern reported by the Council for Medical Schemes in their 2015 report where Hypertension took the number one ranking for most prevalent disease and HIV the fourth with regards to diseases afflicting medical scheme beneficiaries in South Africa. Although more participants were afflicted with Type 2 Diabetes than Dyslipidaemia in this cohort, the opposite was true for majority of medical scheme beneficiaries in South Africa [3].

Medication usage Behaviour

Self-medication usage was evident in this study, though less than 10% of participants admitted to using this type of therapy to manage their diseases. This varies with higher rates of complementary and alternative medication (CAM) usage found in a study conducted in KZN, South Africa [4] and a study conducted in the United States [5]. It is evident that patients are

becoming more responsible and independent with regards to their health, especially in the sense of the CAM they use over the counter to help regulate their diseases. Self-medication when practised correctly, can lead to savings for patients and the healthcare system as stated by Menton and Van Schoor [6]. Questions do exist as to whether healthcare practitioners are aware of the self-medications patients use simultaneously with prescribed regimens and if their use impacts therapeutic outcomes.

With regards to medications prescribed to treat communicable and non-communicable diseases in this study, similar patterns of prescribing corresponding to recommended treatment guidelines was evident. This is contrary to that found in by Steyn et al [1], were prescribing patterns were erratic and not following patterns recommended by treatment guidelines.

With regards to diabetes, Biguanides and Sulphonylureas were the most common prescribed medication classes in this study. When compared to 1998, Sulphonylureas were more commonly prescribed than biguanides during that era. Metformin is the recommended drug of choice for monotherapy, while sulphonylureas are the drug of choice in patients who are intolerant to the side effects of metformin. This is endorsed by the Society of Endocrinology, Metabolism and Diabetes of South Africa in 2012 [7].

Participants afflicted with hypertension were frequently prescribed a diuretic, combination drug, Angiotensin Converting Enzyme (ACE) inhibitor or Calcium channel blocker in this study. This is consistent with practice guidelines outlined by the Southern African Hypertension Society in 2014 [8], were first-line drug therapy for uncomplicated hypertension consists of low-dose diuretics, calcium channel blockers or an ACE inhibitor /Angiotensin Receptor Blocker (ARB). Combination therapy has been recommended as the drug of first choice in patients were the blood pressure measurement is more than 20/10 mmHg above goal. It is notable to mention the increasing use of combination therapy in this disease group as compared to usage during 1998 [1].

For dyslipidaemia, the drug of choice in this study was a statin regimen. The second most commonly prescribed drug in this group was aspirin therapy. These findings correlate with the dyslipidaemia treatment guidelines set by the South African Heart Association (SA Heart) and the Lipid and Atherosclerosis Society of Southern Africa (LASSA) [9]. Low dose aspirin has been shown to reduce rates of cardiovascular events [10] which may explain the frequent use in these patients.

Fixed-dose combinations (FDCs) were the most prevalent medicines used in patients afflicted with HIV in this study. This is in accordance with treatment guidelines issued by the Southern African HIV clinicians' society in 2015 [11]. HIV is a chronic ailment that requires high adherence rates to suppress viral replication and prevent treatment failure [12]. Fixed dose combination drugs have been recognised to increase adherence rates among patients with chronic ailments [13].

Rates of adherence single vs multiple disease

An interesting finding in this study was that medication adherence differed among participants according to the number of diseases they were afflicted with. Participants afflicted with multiple diseases in this study were more adherent to their therapies than participants with single diseases. Participants with single diseases were more likely to stop their therapy when they felt

better as compared to participants with multiple diseases. This finding is in contrast to a study conducted by Mathevula in 2013 [14] but ties in with the findings of Jin [15] and Di Matteo [16]. In Mathevulas study, public sector patients afflicted with similar chronic conditions, were found to be more adherent if they were afflicted with a single condition rather than multiple conditions, a direct contrast to this study. Jin [15] et al and DiMatteo [16] et al have proposed that patients with greater disease severity have better compliance to their treatment regimens. Reasons for this maybe that patients perceived themselves as being at a higher risk, having more chronic illnesses and may thus may have better compliance than those with single diseases.

Another interesting finding was that patients with multiple diseases were more likely to leave out pills as they felt there were too many. This issue should be taken into consideration when prescribing regimens for patients with co-morbid ailments. The use of combination therapy should be preferred in such patients to reduce pill burden.

Medication Storage

Popular storage areas for medication as evident in this study remain the bedroom and kitchen. This is similar to results found in numerous Middle Eastern studies [17-19] on home medication storage, where the bedroom, refrigerator and kitchen were the most frequently used areas to store medication at home. Keeping medication in areas of the home which are frequently used will help schedule medication taking into daily activities which promote adherence. Due to the absence of medication storage studies in South Africa, future studies should be conducted to elucidate more information on this topic, as storage areas can accelerate medication degradation and affect medication performance [17].

LIMITATIONS

The rate of adherence was measured categorically as the number of days of medication missed in a 30 day cycle and not individually.

RECOMMENDATIONS

Future studies investigating chronic medication adherence should focus on information regarding which drugs patients leave out intentionally and why. The effect of self-medication usage on therapeutic outcomes and health practitioners' knowledge of such should be investigated.

CONCLUSIONS

This study found that patients in the private health care sector are prescribed medication that align with treatment guidelines. Patients with single diseases are more likely to stop treatment once they feel better while those with multiple diseases are more likely to leave out pills as there are too many.

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CHAPTER 4

4.1 Synthesis

The value of medication therapy in the treatment of chronic diseases can only be gained in patients who adhere to their prescribed therapies. Medication adherence can be affected by numerous psychosocial factors which affect patients with Communicable and Non-communicable diseases alike.

This study found that adherence rates were sub-optimal for participants with communicable and non-communicable diseases. Six in every ten patients in this study reported being one hundred percent adherent to their treatment. More than thirty seven percent of participants had sub-optimal medication adherence, with close to sixteen percent having missed three or more days of their therapy in a thirty day cycle. This result concurs with international studies that have found 20-50% of patients do not adhere to their prescribed medications [31] but is variable when compared to local studies. For example a prior private sector HAART study [15] found that only 10.9% of participants were one hundred percent adherent to their medication. Whereas public sector self-reported adherence studies have found higher rates of medication adherence where more than 80% of participants had taken more than 95% of their medication during the last thirty days [24, 25]. Similar to this study, participants in the HAART study were deemed non adherent if they missed one or more days of their therapy during the last 30 days and while those in the public sector studies were deemed non- adherent if they missed two days or more of their medication.

Although no significant difference was found among participants with a particular disease in this study, participants with Hypertension alone were more adherent to their therapies than participants in other disease groups investigated. Participants with HIV and Dyslipidaemia were among the two disease groups with lowest adherence. This is in contrast to that found in the Mathevula study [25] where South African HIV public sector participants were the most adherent to their regimens compared to participants with Hypertension and Diabetes.

Thirty percent of participants with HIV alone reported missing 3 or more days of their medication in the present study. This result is similar to a study conducted in Mumbai by Naik et al where 30% of HAART participants were non-adherent to their medication having missed a week of treatment [32]. Poor adherence in communicable diseases like HIV is of extreme concern, as non-adherence leads to poor viral suppression, increased viral resistance, increased risk of opportunistic infections and treatment failure [28]. Methods to increase medication adherence in these patients should be reviewed and modified to factors that affect these patients.

In the present study, significant factors affecting medication adherence in participants afflicted with HIV alone were not taking medication because it's too expensive, not taking medication because they did not want anyone to see, struggling to take medication at specific times / with or without food and not taking medication because they did not know how to take them correctly. These findings correlate with those of Emamzadeh-Fard et al [29], who found that factors reducing the rate of adherence in Sub-Saharan Africa were cost, patients not informing their spouse and family about his/her disease, patients fear of stigma and complications following medication regimens. HIV patients who hide their status report greater treatment

interruptions as they have to take medication secretly to avoid taking them in the presence of others [29]. Naik et al also found cost and poor medication knowledge to be factors contributing to poor adherence rates in their study as 75% of patients reported the cost of HAART to be the greatest obstacle to adherence. Patients who understood their medication and how to use them were more adherent to their therapies than patients who did not[32].

In this study participants afflicted with multiple diseases were more adherent to their therapies than participants with single diseases. The low number of participants with HIV and Dyslipidaemia have to be considered when interpreting the above. Participants in these two groupings were the least adherent to their regimens. The study also found that participants with single diseases were more likely to stop their therapy when they felt better compared to participants with multiple diseases. Jin [33] et al and DiMatteo [34] et al have proposed that greater disease severity is attributed to better compliance. This may be the case in this study as patients may perceive themselves as being at a higher risk of having more chronic illnesses and may thus have better compliance than those with single diseases.

The relationship between age group and number of days of missed medication in this study was found to be significant having a spearman's rho correlation of -0.181.A high rate of non-adherence was found in the group of participants aged 41-50 years old, who missed 3 or more days of their medication. While those 70 years and above were the most adherent. This is consistent with systematic reviews conducted by Jin et al and Erickson et al who proposed that increasing age was a significant predictor of an increased likelihood of being adherent to medication therapies such as statins, antihypertensives, and antidiabetics. [33, 35]

As mentioned earlier the full benefits of medication therapy can only be achieved in patients with optimal adherence, however patients experience various obstacles that prevent them from adhering entirely to their regimens. Common reasons recognised for poor adherence in this study , were similar to those found in numerous other studies [14,15,16,33] , such as forgetting to take medication, running out of medication, stopping medication because it made them feel worse or gave a side effect and having difficulty sticking to time schedules or having medication as prescribed with/without food. The effect of these factors on medication adherence can be reduced by individualising patient regimens to suit patients' lifestyles and minimising known side effects of drugs. Technology such as short message service's or apps on cell phones can be used as reminders to take medication daily or pick up medication refills. Dosage simplification has been found to be effective in increasing medication adherence rates [29] where practitioners prescribe regimens that require the lowest dosing frequency and are least complex to administer.

Although majority of participants felt that it is important to take their medication exactly as prescribed by their doctor, more than one fourth of participants felt that skipping a few doses of their medication would not make a difference to their health. Jin et al [33] have found that patients' understanding about their disease and treatment may not always be optimal. Some patients may not understand the effect medication therapies play in their treatment while some patients lack knowledge about their disease and the consequences of poor compliance. Some patients may be under the impression that the need for the medication prescribed was intermittent, thus stopping their medication presumptively. These factors need to be addressed by health care physicians during routine check-ups and at pharmacy visits for refills.

Family support has been shown to positively affect adherence. Although almost all participants stated that their family knew about the medication they take, only 75% stated that their family helps them remember to take their medication. Greater effort may need to be placed on involving family members in therapy regimens for patients as the risk of nonadherence has been stated to be 1.35 times higher in patients who do not receive emotional support [36]. Social support has been identified as a stress buffer, which helps change emotional states, increase self-efficacy, and influence change in adverse health behaviours [37].

Self-medication usage was evident in this study, although less than 10% of participants admitted to using this type of therapy to manage their diseases. This varies with high rates of complementary and alternative medication (CAM) usage that was found in two studies, one conducted during 2008 in KZN, South Africa [38] and the other conducted during 2002 in the United States [39]. Menton and Van Schoor [40] stated that patients are becoming more responsible and independent for their own health care, especially with regards to the CAM medication they use over the counter. When practised correctly, self-medication can offer savings for patients and the healthcare system. Prospective studies need to investigate patients' self-medication usage and knowledge of such use by their GPs more comprehensively. Determination of the effect CAMs have on therapeutic outcomes also need to be investigated.

With regards to medications used to treat communicable and non-communicable diseases in the private health care sector, similar patterns of prescribing corresponding to treatment guidelines is evident. This was contrary to results found by Steyn et al [26] in 1998, where prescribing patterns were more erratic, consisted of more expensive and irrational drugs and did not follow treatment guidelines. Biguanides and Sulphonylureas remain the most common prescribed therapies for patients with Type 2 Diabetes. This is similar to guidelines sets by the Society of Endocrinology, Metabolism and Diabetes of South Africa in 2012 [41], where metformin is the drug of choice for monotherapy in type 2 diabetics and sulphonylureas the drug of choice for monotherapy in patients intolerant to the effects of metformin . Participants afflicted with hypertension were most commonly prescribed a diuretic, combination drug, Angiotensin Converting Enzyme (ACE) inhibitor or Calcium channel blocker. This is also consistent with practice guidelines outlined by the Southern African Hypertension Society in 2014 [42], where first-line drug therapy for uncomplicated hypertension comprises of low-dose thiazide-like diuretics, calcium channel blockers or an ACE inhibitor /Angiotensin Receptor Blocker (ARB). Combination therapy should be considered first line in patients where blood pressure measurements are above 20/10 mmHg of the goal. Similarly the drug of choice for patients afflicted with dyslipidaemia was a statin, indicated by dyslipidaemia guidelines set by the South African Heart Association (SA Heart) and the Lipid and Atherosclerosis Society of Southern Africa (LASSA) [43]. With regards to HIV, FDCs were the most prevalent medicines used. This is in accordance with guidelines issued by the HIV clinicians' society in 2015 [44].

Popular storage areas for medication at home remain the bedroom and the kitchen as seen in the results of this study. This is similar to results found in numerous Middle Eastern studies [45, 46, 47] on home medication storage, where the bedroom, refrigerator and kitchen were the most frequently used areas to store medication at home. Due to the absence of medication storage studies in South Africa, future studies should be conducted to elucidate more information on this topic. Storage areas play an important role in the integrity of medications which can be degraded faster by humidity or high temperatures [45].

4.2 Limitations

The rate of adherence was measured categorically as the number of days missed in a 30 day cycle and not individually. In this study the sample population consisted of a minority of patients afflicted with dyslipidaemia and HIV. A larger population of study participants afflicted with these diseases would have contributed to more concrete findings with respect to determining patterns of medication adherence. However the GPs and researcher had no control over which type of patient would be receiving care on any particular day during the study period.

4.3 Recommendations

Further research needs to be conducted to determine if age is a significant predictor of adherence. The stigma of taking HIV medication seems to still be a prevalent issue affecting private sector patients with HIV/AIDS. This along with the cost of therapy and understanding how their medication works and how to take them correctly need to be addressed when deciding to treat. Future studies investigating chronic medication adherence should focus on information as to which drugs patients leave out intentionally and why. Identifying and addressing these issues during routine check-ups may improve therapeutic outcomes. Patients concerns regarding particular medications can be addressed, so that patients do not deliberately take medication holidays. Patients' understanding and knowledge of correct medication storage areas should also be a focus area for prospective studies. Certain storage areas in households have higher humidity or temperature rates, which may accelerate medication degradation. Patients' self-medication usage and the effect of such on therapeutic outcomes should be investigated. Drugs interactions may exist between such products affecting therapeutic outcomes and exacerbating medication side effects.

4.4 Conclusions

This study found that participants afflicted with communicable and non-communicable diseases in the private health care sector have sub-optimal medication adherence. Although no significant correlations were found between having a particular disease and adherence, participants afflicted with HIV and Dyslipidaemia alone where the least adherent to their medication. Patients in the private sector are prescribed medication that abide to treatment guidelines. Self-medication usage in private sector patients is evident. Patients with HIV still struggle with factors such as cost of their medication, taking their medication at particular times and having to take their medication covertly so people do not see. Age was proposed to be a predictor of adherence in this study. Reasons for non-adherence include cost, forgetting to take medication, running out of medication, stopping medication because it made them feel worse or gave a side effect and having difficulty sticking to time schedules or having medication as prescribed with/without food. The use of generics, technology, dosage individualisation and

dosage simplification may aid to improve adherence. The stigma attached to being diagnosed with HIV is still evident and needs to be addressed on a social level.

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APPENDICES

Appendix 1: Survey Questionnaire

Investigation of the Medication Adherence Behaviour of private sector patients with Communicable and Non-communicable diseases. Principal investigator: Kooveshni Suklal	
Patient Medication adherence Survey Demographic details	
Patient no :	
Age	
	18-30 ☐
	31-40 ☐
	41-50 ☐
	51-60 ☐
	61-70 ☐
	71-80 ☐
	81-90 ☐
	91-100 ☐
Gender	
	Male ☐
	Female ☐
	Other ☐
Race	African ☐
	Asian ☐
	Coloured ☐
	Caucasian ☐
	Other , please specify
Highest level of Education completed	
	Primary education ☐
	Secondary education ☐
	Tertiary education ☐
	None ☐
Chronic disease	
	Type 2 Diabetes ☐
	Hypertension ☐
	Dyslipidaemia ☐
	HIV ☐

Medication regimen			
Type 2 Diabetes Medication		**Hypertension Medication**	
Biguanides	☐	Diuretics	☐
Sulfonylureas	☐	Beta-blockers	☐
Meglitinide derivatives	☐	ACE inhibitors	☐
Alpha-glucosidase inhibitors	☐	Angiotensin II receptor blockers	☐
Thiazolidinediones	☐	Calcium channel blockers	☐
GLP-1 agonists	☐	Alpha blockers	☐
DPP-4 Inhibitors	☐	Central agonists	☐
Combination drug	☐	Combined alpha and beta-blockers	☐
Insulins	☐	Direct vasodilators	☐
		Fixed dose combination	☐
Dyslipidaemia medication		**HIV medication**	
Statin	☐	NNRTI	☐
Fibrate	☐	NRTI	☐
Niacin	☐	PI	☐
Bile acid resin / Bile acid Sequestrants	☐	Co-Trimoxazole	☐
Aspirin	☐	FDC	☐
Self – Medication			
Herbal / Homeopathic medication	☐	Ayurveda Medicine	☐
Over the counter medication	☐	Other , Please Specify	
Traditional medicines	☐		
Adherence behaviour			
1. Do you stop taking your medication when you feel better or normal?		Yes ☐	No ☐
2. Have you ever stopped taking your medication because it made you feel worse because of a side effect?		Yes ☐	No ☐
3. Have you not taken prescribed medication because you felt you did not need it?		Yes ☐	No ☐
4. Do you feel skipping a few doses of your medication will not make a difference?		Yes ☐	No ☐

5. Have you ever not taken medication because it was too expensive to buy it?	Yes ☐	No ☐
6. Do you think it is important to take your medication exactly as prescribed by your doctor?	Yes ☐	No ☐
7. Do you sometimes forget to take your medication by mistake?	Yes ☐	No ☐
8. Have you ever not taken your medication because you forgot to pick up a refill?	Yes ☐	No ☐
9. Have you ever not taken your medication because it ran out?	Yes ☐	No ☐
10. Do you ever forget to take your medication with you when you travel away from home?	Yes ☐	No ☐
11. Have you ever not taken your medication because you did not want anyone to see?	Yes ☐	No ☐
12. Do your family or spouse know about the medication you take?	Yes ☐	No ☐
13. Do your family or spouse help you remember to take your medication?	Yes ☐	No ☐
14. Do you feel you get enough support from your family to help manage your disease?	Yes ☐	No ☐
15. Do you struggle with taking your medication as prescribed by your doctor? For example: With meals , at a specific time	Yes ☐	No ☐
16. Do you ever leave out pills because you feel they are too many?	Yes ☐	No ☐
17. Do you ever leave out pills because you feel they are too strong?	Yes ☐	No ☐
18. Did you ever not take your medication because you did not understand how to take them or use them correctly?	Yes ☐	No ☐
19. Where do you keep your medication?		

Kitchen	
Bathroom	
Bedroom	
Handbag	
Refrigerator	
Other	Please Specify

20. During the last 30 days how many days of your medication have you not taken?	0 ☐	1 – 2 ☐ 3 or more ☐

Appendix 2: BREC Approval Letter

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

14 October 2016

Mrs K Suklal (207510607)
83 Putnam Ave
Apt 2
Cambridge, MA 02139
USA
kooveshni@yahoo.com

Dear Mrs Suklal

Protocol: Investigation of adherence to therapies in patients suffering from non-communicable and communicable diseases in the private healthcare sector of the eThekwini Metro of KZN. Pre and post intervention study.
Degree: PhD
BREC reference number: BFC307/16

The Biomedical Research Ethics Committee (BREC) has considered the abovementioned application at a meeting held on 14 June 2016.

The study was provisionally approved by BREC pending appropriate responses to queries raised. Your responses dated 04 August 2016 to queries raised on 27 June 2016 have been noted and approved by the Biomedical Research Committee at a meeting held on 11 October 2016. The conditions have now been met and the study is given **full ethics approval** and may begin as from 14 October 2016.

This approval is valid for one year from **14 October 2016.** To ensure uninterrupted approval of this study beyond the approval expiry date, an application for recertification must be submitted to BREC on the appropriate BREC form 2-3 months before the expiry date.

Any amendments to this study, unless urgently required to ensure safety of participants, must be approved by BREC prior to implementation.

Your acceptance of this approval denotes your compliance with South African National Research Ethics Guidelines (2015), South African National Good Clinical Practice Guidelines (2006) (if applicable) and with UKZN BREC ethics requirements as contained in the UKZN BREC Terms of Reference and Standard Operating Procedures, all available at http://research.ukzn.ac.za/Research-Ethics/Biomedical-Research-Ethics.aspx.

BREC is registered with the South African National Health Research Ethics Council (REC-290408-009). BREC has US Office for Human Research Protections (OHRP) Federal-wide Assurance (FWA 678).

Pg. 2/...

Biomedical Research Ethics Committee
Professor J Tsoka-Gwegweni (Chair)
Westville Campus, Govan Mbeki Building
Postal Address: Private Bag X54001, Durban 4000
Telephone: +27 (0) 31 260 2480 Facsimile: +27 (0) 31 260 4609 Email: brec@ukzn.ac.za

The following Committee members were present at the meeting that took place on 14 June 2016:

Prof J Tsoka-Gwegweni	Chair
Rev. S D Chili	External – Community member
Dr R Harrichandparsad	Neurosurgery
Dr T Hardcastle	Surgery
Dr M Khan	Obstetrics and Gynaecology
Prof TE Madiba	General Surgery
Dr T Maistry	External – Microbiology
Ms T Makhanya	External – Community member
Dr G Nair	HIV Medicine
Dr S Paruk	Psychiatry
Dr A Noorbhai	Surgery
Prof V Rambiritch	Pharmacology (Deputy Chair)
Dr D Singh	Critical Care
Prof D Wassenaar	Psychology (Deputy Chair)

We wish you well with this study. We would appreciate receiving copies of all publications arising out of this study.

Yours sincerely

PROFESSOR JOYCE TSOKA-GWEGWENI
Chair: Biomedical Research Ethics Committee

cc supervisor: [redacted]
cc postgraduate administrator: [redacted]

Appendix 3: Doctors information sheet and consent form

Doctors Information Sheet and Consent to Participate in Research

18 October 2016

Dear Doctor

My name is Kooveshni Suklal. I am a researcher from the University of Kwa-Zulu Natal, Discipline of Pharmaceutical Sciences, School of Health Science and I am currently conducting research towards a Masters in Pharmacy Degree. My contact details are as follows:

Cell: 0734202003, Fax: 031 4612702 and Email: kooveshni@yahoo.com.

You are being invited to consider participating in a study that entails the investigation of medication adherence in the eThekwini Metro. The aim and purpose of this research is to investigate the medication adherence behaviour of patients with Communicable and Non-Communicable diseases in the private health care sector of eThekwini. Medication adherence is defined as the extent to which patients take medication as prescribed by their health care professional with respect to timing, dosage and frequency. For the purpose of this study Medication Adherence will be calculated using the number of days of missed doses.

The study is expected to enrol a total of 232 patients, and will comprise of patients from each of the following disease groups: HIV, Type 2 Diabetes, Hypertension and Dyslipidaemia. The study will involve the random selection of patients, from various private practitioners' offices in the eThekwini Metro, who are afflicted with one of the above diseases. Patients will be contacted at point of care and informed of the study. Those who volunteer to participate will be asked to partake in a survey to determine their adherence behaviour. The expected duration of the survey is 15 minutes per patient. It is hoped that data collection will be completed in a month. It is hoped that the study will create the following benefits for the participants:

- Promote patient self-reflection on their current medication adherence behavior.
- Identify problems hindering medication adherence
- Assist in the dissemination of information on Medication adherence which could be used to improve patient outcomes.

This study has been ethically reviewed and approved by the UKZN Biomedical research Ethics Committee (approval number BFC307/16). If you choose to participate in this study, you will be consenting to the researcher interacting with your patients at your consultation office. Your details and the details of your patients will remain strictly confidential and will only be known to me, the researcher. Each patient enrolled in the study will be given a number and will be referred to using the numbers allocated. Only myself, the researcher will have access to the information during this study and after the necessary information has been gathered, the unprocessed data will be locked away and destroyed after 5 years.

In the event of any problems or concerns/questions you may contact me at 0734202003 / kooveshni@yahoo.com or the UKZN Biomedical Research Ethics Committee, contact details as follows:

BIOMEDICAL RESEARCH ETHICS ADMINISTRATION

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KwaZulu-Natal, SOUTH AFRICA

Tel: 27 31 2604769 - Fax: 27 31 2604609

Email: BREC@ukzn.ac.za

Supervisor

Dr P.Naidoo

Cell: 0839645429

naidoopj@ukzn.ac.za

Please take note that you and your patients are not obliged in any manner to participate in this study and may choose to withdraw from the study at any point with no consequence.

CONSENT

I, Dr _____have been informed about the study entitled *Investigation of the Medication Adherence Behaviour of private sector patients with Communicable and Non-communicable diseases* by Kooveshni Suklal.

I understand the purpose and procedures of the study. I understand that by consenting to participate, I am giving my permission to the researcher to have access to survey patients at my consultation practice. I understand that the researcher will randomly survey patients at my consultation offices on a date and time agreed upon by both myself and the researcher. Patients will be surveyed only after the patient has agreed to voluntarily participate. I agree that I have been given an opportunity to answer questions about the study and have had answers to my satisfaction.

I declare that my participation in this study is entirely voluntary and that I or my patients may withdraw at any time with no consequence.

If I have any further questions/concerns or queries related to the study I understand that I may contact the researcher at 0734202003 / kooveshni@yahoo.com. If I have any questions or concerns about my rights as a study participant, or if I am concerned about an aspect of the study or the researchers then I may contact:

BIOMEDICAL RESEARCH ETHICS ADMINISTRATION

Research Office, Westville Campus

Govan Mbeki Building
Private Bag X 54001
Durban
4000

KwaZulu-Natal, SOUTH AFRICA

Tel: 27 31 2604769 - Fax: 27 31 2604609

Email: BREC@ukzn.ac.za

_____ _____

Signature of Participant **Date**

_____ _____

Signature of Witness **Date**

(Where applicable)

_____ _____

Signature of Translator **Date**

(Where applicable)

Appendix 4: Patient information sheet and consent form

Patient Information Sheet and Consent to Participate in Research towards a Masters in Pharmacy Degree

18 October 2016

Dear Sir or Madam

My name is Kooveshni Suklal. I am a researcher from the Discipline of Pharmaceutical Sciences, School of Health Science at the University of Kwa Zulu Natal, and I am currently conducting research towards a Masters in Pharmacy Degree. My contact details are as follows: Cell: 0734202003, fax: 031 4612702 and email: kooveshni@yahoo.com.

You are being invited to consider participating in a study that involves the investigation of medication adherence in the eThekwini Municipality. The aim and purpose of this research is to investigate the medication adherence behaviour of patients with Communicable and Non-Communicable diseases in the private health care sector of eThekwini. Medication adherence is defined as the extent to which patients take medication as prescribed by their health care professional with respect to timing, dosage and frequency. For the purpose of this study Medication Adherence will be calculated using the number of days of missed doses.

The study is expected to enroll a total of 232 patients who are being treated in the private health care sector of eThekwini Metro. This group will comprise of patients who have type 2 Diabetes, hypertension, high blood cholesterol and HIV. The study will involve you answering a questionnaire administered by myself, the researcher, regarding your treatment. The duration of your participation if you choose to enroll is 15 minutes, which is the estimated time needed to answer the questionnaire.
It is hoped that the study will create the following benefits for you:

- Make you rethink your current medication usage behavior
- Identify concerns that impede your complete adherence to your regimen.
- Assist in the provision of information on Medication Adherence which could be used to improve outcomes in patients with Communicable and Non-communicable diseases.

You are not obliged in any manner to participate in this study and you may choose to withdraw from the study at any point with no penalty to you. This study has been ethically reviewed and approved by the UKZN Biomedical research Ethics Committee (approval number BFC307/16).Your details will remain strictly confidential and will only be known to me the researcher. Each patient enrolled will be given a number and will be referred to using the numbers allocated. Only the researcher will have access to the information during this study and after the necessary information has been gathered, the unprocessed data will be kept locked away and destroyed after 5 years.

In the event of any problems or concerns/questions you may contact the researcher at 0734202003 / kooveshni@yahoo.com or the UKZN Biomedical Research Ethics Committee, contact details as follows:

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Email: BREC@ukzn.ac.za
Supervisor
Dr P.Naidoo
Cell: 0839645429
naidoopj@ukzn.ac.za

CONSENT

I _____ have been informed about the study entitled *Investigation of the Medication Adherence Behaviour of private sector patients with Communicable and Non-communicable diseases* by Kooveshni Suklal.

I understand the purpose and procedures of the study. I understand that I will be asked questions regarding my disease, medication regimens, factors that may influence my medication adherence and the number of missed days of medication. I have been given an opportunity to answer questions about the study and have had answers to my satisfaction. I declare that my participation in this study is entirely voluntary and understand that I may withdraw at any time without affecting any treatment or care that I would usually be entitled to.

If I have any further questions/concerns or queries related to the study I understand that I may contact the researcher at kooveshni@yahoo.com or 0734202003.If I have any questions or concerns about my rights as a study participant, or if I am concerned about an aspect of the study or the researchers then I may contact:

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Email: BREC@ukzn.ac.za

_____ _____

Signature of Participant **Date**

_____	_____
Signature of Witness (Where applicable)	**Date**
_____	_____
Signature of Translator (Where applicable)	**Date**

Appendix 5: TREE certificates

TRREE

Zertifikat
Certificat
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du programme de formation TRREE en évaluation éthique de la recherche
of the TRREE training programme in research ethics evaluation

July 15, 2016

Professeur Dominique Sprumont
Coordinateur TRREE Coordinator

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du programme de formation TRREE en évaluation éthique de la recherche
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Coordinateur TRREE Coordinator

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du programme de formation TRREE en évaluation éthique de la recherche
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July 16, 2016

Professeur Dominique Sprumont
Coordinateur TRREE Coordinator

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