

Potential drug therapy problems: identification and associated factors among Primary Health Care users

Potenciais problemas relacionados ao uso de medicamentos: identificação e fatores associados entre usuários da Atenção Primária a Saúde

Problemas potenciales de terapia con drogas: identificación y factores asociados entre usuarios de Atención Primaria de Salud

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Abstract

Cardiovascular diseases (CVD) and diabetes mellitus (DM) are chronic non-communicable diseases with high prevalence. Several factors contribute to its lack of control, especially those related to pharmacotherapy, often leading to problems related to the use of medication (DTP). Objective: To identify potential DTPs for the treatment of CVD and DM, as well as associated factors, using big data from users of the Unified Health System (SUS) in a municipality. Methods: A cross-sectional study was carried out based on big data of patients for whom at least one medication was dispensed in SUS pharmacies in the primary healthcare network in April 2019 (n = 4,800). Potential DTPs involving the treatment of CVD or DM were identified based on data on medications dispensed, demographic and clinical characteristics. To classify these potential PRMs, the Pharmacotherapy Workup method was used. Logistic regression analyzes were performed to identify factors associated with identifying at least one potential MRP. Results: The results showed that 25% of the population had at least one potential DTP, with a total of 1,914 potential PRMs being identified. In the multivariate model, age group was statistically associated with the identification of at least one potential DTP. Conclusions: This study allows tracing the frequency of important potential DTPs and associated factors, pointing out some priorities that must be addressed by the public primary health care system, supporting the planning of the implementation of drug therapy management services aimed at the studied population.

Keywords: Pharmaceutical services; Comprehensive medication management; Systemic arterial hypertension; Diabetes mellitus; Myocardial infarction; Cardiovascular diseases.

Resumo

As doenças cardiovasculares (DCV) e o diabetes mellitus (DM) são doenças crônicas não transmissíveis com alta prevalência. Vários fatores contribuem para o seu descontrole, principalmente aqueles relacionados à farmacoterapia, muitas vezes levando a problemas relacionados ao uso de medicamentos (PRM). Objetivo: Identificar os potenciais PRM para o tratamento de DCV e DM, bem como os fatores associados, utilizando big data de usuários do Sistema Único de Saúde (SUS) em um município. Métodos: Foi realizado um estudo transversal com base em big data de pacientes para os quais foi dispensado pelo menos um medicamento nas farmácias da rede básica de saúde do SUS em abril de 2019 (n = 4.800). Potenciais PRMs envolvendo o tratamento de DCV ou DM foram identificados com base nos dados sobre medicamentos dispensados, características demográficas e clínicas. Para a classificação desses

potenciais PRMs, foi utilizado o método Pharmacotherapy Workup. Análises de regressão logística foram realizadas para identificar fatores associados à identificação de pelo menos um potencial PRM. Resultados: Os resultados mostraram que 25% da população apresentavam pelo menos um potencial PRM, sendo identificado um total de 1.914 potenciais PRMs. No modelo multivariado, a faixa etária se mostrou estatisticamente associada à identificação de pelo menos um potencial PRM. Conclusões: O presente estudo permite traçar a frequência de PRMs potenciais importantes e fatores associados, apontando algumas prioridades que devem ser abordadas pelo sistema público de atenção primária à saúde, subsidiando o planejamento da implantação dos serviços de gerenciamento da terapia medicamentosa voltados para a população estudada.

Palavras-chave: Assistência farmacêutica; Gerenciamento de terapia medicamentosa; Hipertensão arterial sistêmica; Diabetes mellitus; Infarto agudo do miocárdio; Doenças cardiovasculares.

Resumen

Las enfermedades cardiovasculares (ECV) y la diabetes mellitus (DM) son enfermedades crónicas no transmisibles con alta prevalencia. Varios factores contribuyen a su falta de control, especialmente los relacionados con la farmacoterapia, que a menudo conducen a problemas relacionados con el uso de medicamentos (PRM). Objetivo: Identificar potenciales PRM para el tratamiento de ECV y DM, así como factores asociados, utilizando big data de usuarios del Sistema Único de Salud (SUS) en un municipio. Métodos: se realizó un estudio transversal basado en big data de pacientes a los que se les dispensó al menos un fármaco en las farmacias de la red de atención primaria del SUS en abril de 2019 (n = 4.800). Los posibles MRP que implican el tratamiento de la ECV o la DM se identificaron en función de los datos sobre los medicamentos dispensados, las características demográficas y clínicas. Para clasificar estos PRM potenciales, se utilizó el método de Evaluación de Farmacoterapia. Se realizaron análisis de regresión logística para identificar los factores asociados con la identificación de al menos un MRP potencial. Resultados: Los resultados mostraron que el 25% de la población tenía al menos un PRM potencial, identificando se un total de 1.914 PRM potenciales. En el modelo multivariado, el grupo de edad se asoció estadísticamente con la identificación de al menos un PRM potencial. Conclusiones: Este estudio permite rastrear la frecuencia de PRM potencialmente importantes y factores asociados, señalando algunas prioridades que deben ser atendidas por el sistema público de atención primaria de salud, apoyando la planificación de la implementación de los servicios de gestión de farmacoterapia dirigidos a la población estudiada.

Palabras clave: Servicios farmacéuticos; Manejo de terapias con medicamentos; Hipertensión arterial sistêmica; Diabetes mellitus; Infarto del miocardio; Enfermedades cardiovasculares.

1. Introduction

Cardiovascular diseases (CVD) and diabetes mellitus (DM) are chronic non-communicable diseases (NCDs) diseases of high prevalence that stand out among the others and generate considerable impacts on health systems (Filha *et al.*, 2015). In 2019, it was estimated that 18.6 million people died from cardiovascular disease worldwide, representing the leading cause of disease burden in the world as it has been in Brazil (Roth, 2020; Oliveira *et al.*, 2020). Also in 2019, approximately 463 million people were living with DM in the world and 16,8 adults in Brazil, which puts the country in the fifth place among the top ten countries with the highest number of individuals with the disease (Atlas IDF, 2019). In addition, deaths and complications resulting from these NCDs range from vascular lesions to heart diseases and severe kidney diseases, which end up requiring significant expenditures from a country's annual health budget (Dib, 2010; Brasil, 2010). The estimated cost of DM in Brazil, for example, was US\$ 22 billion in 2015, with a projection of US\$ 29 billion for 2040 (Bahia *et al.*, 2011). For CVDs, in the same period, it was estimated at a cost of R\$ 56.2 billion for the country (Stevens *et al.*, 2018).

Several factors contribute to the lack of control for CVDs and DM, especially those related to medication use. As pharmacological treatments for these diseases are continuous and often complex, it is common to identify drug therapy problems (DTPs) among their bearers (Obreli-Neto *et al.*, 2015). DTP are any undesirable event that involves, or is suspected to involve, pharmacotherapy and that interferes with achieving its desired goals. Their prevention, identification and resolution are one of the main focuses of comprehensive medication therapy management (CMM) services (Ramalho de Oliveira, 2011; Cipolle, Strand & Morley, 2012), that, in turn, are based on the theoretical framework of Pharmaceutical Care (Ramalho de Oliveira, 2011; Cipolle, Strand & Morley, 2012).

CMM services have demonstrated a considerable impact on the control of chronic diseases such as CVD and DM, contributing significantly to the improvement of patients' clinical results (Cid, 2008; Borges *et al.*, 2010; Mendonça *et al.*,

2016; Souza *et al.*, 2017; Santos *et al.*, 2018; Santos *et al.*, 2019; Neves, *et al.*, 2019). However, for planning new health actions and implementing new services, including CMM, it is necessary to evaluate the pharmacotherapeutic demands of the population that will be benefited by those services as well as their drug utilization profile (Silva *et al.*, 2016).

In this context, this study aimed to assess the profile of medication dispensing for CVDs and DM, to identify potential DTPs for the treatment of CVD and DM, as well as the associated factors, using big data from users of the primary health care.

2. Methodology

Type and Place of Study

This is a cross-sectional study based on big data of adult primary health care users residing in the municipality of Congonhas, Minas Gerais, in which it is expected that further studies can bring longitudinal perspectives on the impact of the GTM service in this Congonhas scenario (Yang, West-Strum, 2013). Congonhas is a medium-sized municipality in the central region of Minas Gerais, located 70 kilometers from Belo Horizonte, the state capital (IBGE, 2018).

Congonha's inhabitants have their registration in the primary health care of the Brazilian Unified Health System (Sistema Único de Saúde - SUS) updated annually by the community health agents. This registration contains sociodemographic and health characteristics, including self-reported diagnosis of diseases, such as CVD and DM. Medication dispensing occurs free of charge in the pharmacies of the primary health care of SUS, which are located at primary health care center. Dispensation is registered in an electronic dispensing system that is integrated throughout the municipality.

Study Population and Data Source

The present study was based on data collected through the crossing of two big data sources: the registration of individuals in the primary health care of Congonhas; and the reports of medication dispensing from the SUS' primary health care pharmacies.

At the time of the study (2019), Congonhas' inhabitants had their registration last updated in April 2019 and this database showed 37,085 adults (aged 18 years or more). In the same month of their registration updates (from April 1 to 30, 2019), all inhabitants that had at least one medication dispensed to them in the SUS primary health care pharmacies of Congonhas were identified, accounting for a total of 4.800 patients, that composed the study population.

The data on medication dispensing (active ingredients, dosage, pharmaceutical form and quantity dispensed) were taken from the reports of the electronic dispensing system of Congonhas (*Viver System*). In the studied period, a total of 11,749 dispensations were identified for the 4,800 patients included in the present study. The data on socio-demographics and of self-reported diseases were collected from registration of the individuals in the primary health care.

Study Variables

During the joining of the individual registration and medication dispensing databases in a Microsoft Excel® software spreadsheet, the following variables were maintained: age; sex; self-report of HT, AMI or DM; number and types of medications dispensed. From the data on medications and self-reports of diseases in the unified database, potential DTPs were identified, taking into account the classification proposed in the Pharmacotherapy Workup (PW) method (Cipolle, Strand & Morley, 2012). To this end, 11 types of potential DTPs were investigated, which are described according to their classification within the PW method in Table 1.

Table 1. Types of potential Drug Therapy Problems (DTP) identified and their classification according to the Pharmacotherapy Workup (PW) method.

Potential DTPs - Indication
Potential DTP 1 - Unnecessary drug therapy
1.1) Potential therapeutic duplicity identified when there was a simultaneous dispensing of ACEI and ARB, whose simultaneous use does not bring therapeutic advantage (SBC, 2016; AHA, 2017).
1.2) Potential unnecessary medication identified when the patient was over 70 years old, without self-report of AMI or stroke and collected ASA, whose use is not recommended for primary prevention in this age group (ASCEND, 2018; ARRIVE, 2018; ASPREE, 2018).
Potential DTP 2 - Needs additional drug therapy
2.1) Potential additional drug need identified when the patient had a history of AMI, but did not collect a β -blocker at the SUS pharmacy, whose use is recommended in these circumstances (SBC, 2016; AHA, 2017).
2.2) Potential additional drug need identified when the patient had a history of AMI, but did not collect ASA, whose use is recommended in these circumstances (SBC, 2015).
2.3) Potential additional drug need identified when the patient had a history of AMI, but did not collect statin, whose use is recommended in these circumstances (ACC, 2019).
2.4) Potential additional drug need identified when no dispensing of medication for HT was identified, but there was a self-report of HT in the patient's record (AHA, 2017).
2.5) Potential additional drug need identified when dispensing medication for DM was not identified, but there was self-report of DM in the patient record (ADA, 2020).
2.6) Potential additional drug need identified when no drug dispensing was identified for ACEI or ARB, but there was self-report of HT and CKD in the patient's record (SBC, 2016; AHA, 2017).
2.7) Potential additional drug need identified when no medication dispensing for ACE inhibitors or ARB was identified, but there was self-report of HT and DM in the patient's record (SBC, 2016; AHA, 2017).
Potential DTP - Effectiveness
Potential DTP 3 - Ineffective drug
3.1) Potential effectiveness problem identified when the patient presented self-report of HT, but not AMI, and the dispensing of at least one of the drugs was not identified: ACEI, ARB, thiazide diuretic or dihydropyridine CCB, which are drugs of first choice for the treatment of HT (SBC, 2016; AHA, 2017).
Potential DTP - Safety
Potential DTP 5 - Adverse drug reaction
5.1) Potential safety problem identified when the patient aged 60 years or more and self-reported DM collected glyburide, the use of which is potentially dangerous for the elderly (AGS, 2019).

* ASA= Acetylsalicylic acid; ARB= AT1 subtype angiotensin II receptor antagonist; CCB= calcium channel blocker; DM= Diabetes mellitus; CKD= chronic kidney disease; HT= Hypertension; AMI= acute myocardial infarction; ACEI= Angiotensin-converting enzyme inhibitor.
Source: Cipolle, Strand e Morley (2012).

Through the Pharmacotherapy Workup (PW) method, with technical knowledge of pharmacotherapy, the professional is able to assess the indication, effectiveness, safety and convenience of medications being used by the patient, identifying problems related to the use of medications. Those identified in this study were described in Table 1.

The identification of at least one potential DTP for a patient was defined as the dependent variable. As independent variables, the following were investigated:

- Sex: female versus male;
- Age: the variable was divided into three categories according to the median and 75% interquartile range, generating the categories 18 to 54 years old, 55 to 64 years old, and 65 or more years old;

- Number of drugs dispensed: the variable was divided into two categories according to the 75% interquartile range, generating the categories of 0 to 2 drugs, and 3 or more drugs.

Data analysis

Two unit of analysis were used in the present study: dispensed medication, to describe the profile of medications that were dispensed in the studied period; and individuals, to describe the population characteristics, the prevalence of medication use or the prevalence of the identification of DTP. Categorical variables were presented through the distribution of absolute and relative frequencies. Quantitative variables were described using numerical synthesis measures - mean, minimum and maximum standard deviation (SD).

The factors associated with the presence of at least one potential DTP (dependent variable) were analyzed using univariate and multivariate models of logistic regression and logistic regression with sequential deletion respectively, with estimation of the odds ratios (OR) and their respective confidence intervals of 95% (CI 95%). The significance level of 0.05 was adopted in all tests. All analyses were performed using the R® statistical software, version 4.0, to which the data contained in the unified database in Microsoft Excel® software were transferred.

Ethical aspects

This study is an integral part of the project “Clinical and economic results, humanistic, cultural and educational aspects of medication therapy management services in the Unified Health System”, approved by the Federal University of Minas Gerais (UFMG) Research Ethics Committee - COEP, on May 28, 2014, under registration CAAE-25780314.4.0000.5149.

3. Results

Table 2. Characteristics of the patients that had at least one medication dispensed to them in the primary health care pharmacies. Congonhas, Minas Gerais, April/ 2019. (N= 4,800).

Variable	N (%)
Sex	
Female	3,161 (65.9)
Male	1,639 (35.1)
Age (years)	
18 to 39	1,178 (24.5)
40 to 59	1,789 (37.3)
60 to 79	1,572 (32.8)
80 to 100	261 (5.4)
Self-report of hypertension	2,495 (54.35)
Self-report of diabetes	895 (19.7)
Self-report of hypertension and diabetes	722 (16.1)
Self-report of history of acute myocardial infarct	91 (2.1)
Self-report of chronic kidney disease	86 (2.0)

* NA: no answer. Source: Database of individual registration of people in primary health care in Congonhas, Minas Gerais (2019).

A female majority (65.9%) was identified in the studied population, with a mean age of 52.7 years (SD= 17.3) and ranging between 18 and 100 years, with greater frequency in the range of 40 to 59 years (37.3%). Regarding self-reports of

NCD, 2,096 (46.0%) patients reported the diagnosis of hypertension (HT); 895 (20.0%) of DM; and 722 (16.0%) reported both. History of acute myocardial infarct (AMI) was reported by 91 patients (2.1%) and CKD by 86 (2.0%) (Table 2).

Table 3. Prevalence of use and dispensing frequency of medications used to treat cardiovascular diseases and diabetes mellitus. Congonhas, Minas Gerais, April/ 2019. (N= 4,800 individuals; N = 11,749 dispensations).

Active principle	N ⁽¹⁾	% Users ⁽¹⁾	% Dispensing ⁽²⁾
Cardiovascular disease	2,977		n= 4,613
Losartan 50 mg	1,174	62.8	39.4
Hydrochlorothiazide 25 mg	990	53.0	33.2
Simvastatin 20 mg	762	68.8	25.6
Acetylsalicylic acid 100 mg	555	50.1	18.6
Furosemide 40 mg	289	15.5	9.7
Captopril 25 mg	234	12.5	7.9
Nifedipine 20 mg	233	12.5	7.8
Propranolol 40 mg	142	20.4	4.8
Methyldopa 500 mg	56	3.0	1.9
Spirolactone 25 mg	30	1.6	1.0
Amlodipine 10 mg	6	0.3	0.2
Diabetes Mellitus	899	18.7	n= 1,148
Metformin 850 mg	409	45.5	35.6
Metformin 500 mg	140	15.6	12.2
Glyburide 5 mg	169	18.8	14.7
NPH Insulin	394	43.8	34.3
Regular Insulin	36	4.0	3.1

⁽¹⁾Not necessarily distinct. ⁽²⁾Distinct. Source: Database reports of the electronic dispensing system of Congonhas (Viver System) (2019).

The prevalence of use among the patients and dispensing frequency of the medications used to treat CVDs and DM are described in Table 3. The most frequently dispensed medications for patients with HT were losartan and hydrochlorothiazide; and for DM, metformin.

Table 4. Frequency of drug therapy problems (DTP) identified in the studied population. Congonhas, Minas Gerais. April/ 2019. (N= 4,800)

Potential DTP type	Frequency N (%)
Potential DTP 1 - Unnecessary drug therapy	
1.1) Duplicity with ACEI and ARA	1 (0.1)
1.2) Use of aspirin in patient > 70 years	154 (8.0)
Potential DTP 2 - Needs additional drug therapy	
2.1) History of AMI without using β -blocker	88 (4.6)
2.2) History of AMI without using aspirin	61 (3.2)
2.3) History of AMI without using statin	65 (3.4)
2.4) HT but no antihypertensive drug dispensed	727 (38.0)
2.5) DM but no anti-diabetic dispensed	289 (15.1)
2.6) HT and CKD but no ACEI or ARB dispensed	34 (1.8)
2.7) HT and DM but no ACEI or ARB dispensed	398 (20.8)
Potential DTP 3 - Ineffective drug	
3.1) HT without a history of AMI and without use of ACEI, or ARB, or thiazide diuretic or dihydropyridine CCB	14 (0.7)
Potential DTP 5 - Adverse drug reaction	
5.1) Patient \geq 60 years old with glyburide dispensed	83 (4.3)
TOTAL	1,914 (100)

* ARA = AT₁ subtype angiotensin II receptor antagonist; CCB= calcium channel blocker; DM= Diabetes mellitus; CKD= chronic kidney disease; HT= Hypertension; AMI= acute myocardial infarction; ACEI= Angiotensin-converting enzyme inhibitor. Source: Crossing of two big data: the registration of individuals in the primary health care of Congonhas and the reports of medication dispensing from the SUS' primary health care pharmacies (2019).

A total of 1,914 potential DTPs were identified. The identification of non-dispensing of antihypertensive drugs for patients with HT (727 potential DTP; 38.0% of the total potential DTP) or non-dispensing of antidiabetics for patients with diabetes (n= 289; 15.1%) represented the majority of the potential DTP identified (sum= 1,016; 53.08%). Also noteworthy was the non-prescription of an angiotensin II converting enzyme inhibitor (ACE inhibitor) or AT₁ subtype angiotensin II receptor antagonist (ARB) for patients with DM or CKD (sum= 432 potential DTP; 22.57%) (Table 4).

Table 5. Number of potential drug relation problems (DTP) in the study population. Congonhas, Minas Gerais, April/ 2019. (N= 4800)

Number of potential DTPs	N	%
0	3,590	74.79
1	707	14.73
2	271	5.65
3	181	3.77
4	21	0.44
5	10	0.21
6	11	0.23
7	7	0.15
8	2	0.04

Source: Based on the Pharmacotherapy Workup (PW) method. Cipolle, Strand e Morley (2012).

Approximately 25% of the studied population had at least one potential DTP (n=1.210), with the majority of these having only one potential DTP (n= 707; 14.73%) (Table 5).

Table 6. Univariate and multivariate analyses of factors associated with the identification of at least one potential drug therapy problem (DTP). Congonhas, Minas Gerais, April/ 2019. (N= 4800).

	Univariate Analysis		Multivariate analysis	
	OR (95% CI)*	p-value**	OR (95% CI)**	p-value***
Male	1.19 (0.04-1.36)	0.012	-	-
Age group (years)				
18 to 54	-	-	-	-
55 to 64	3.93 (3.28-4.71)	<0.001	3.93 (3.28-4.71)	<0.001
65 or more	8.34 (7.01-9.91)	<0.001	8.34 (7.01-9.91)	<0.001
Number of drugs dispensed				
0 to 2	-	-	-	-
3 or more	1.45 (1.27-1.65)	<0.001	-	-

* Odds Ratio (OR) and 95% Confidence Interval (95% CI) estimated by logistic regression;

** p-value estimated by logistic regression;

*** Estimated by logistic regression with automatic deletion.

Source: Crossing of two big data: the registration of individuals in the primary health care of Congonhas and the reports of medication dispensing from the SUS' primary health care pharmacies (2019).

In the multiple logistic regression model, only the age group variable was positively and independently associated with the identification of at least one potential DTP in a statistically significant way (Table 6).

4. Discussion

The analyses on the medication dispensing profile for CVDs and/ or DM presented in this study contribute to expand the knowledge about the most used medications in the municipality for these conditions, in addition to allowing the identification of potential DTPs among primary health care users. In turn, through the inferences made about the potential DTPs identified, it is possible to assess indirectly the potential inadequacy in medication prescription and the factors associated with these problems.

The most dispensed medications for the treatment of HT (losartan and hydrochlorothiazide) and DM (metformine) corroborates with the first line treatments propose in important guidelines (AHA, 2017; ADA, 2020). On the other hand, a considerable number of potential DTPs was identified (n= 1,914) and for a considerable part of the studied population (25%). This scenario is worrying since the present study was limited to assessing few types of potential DTP and related only to CVD and DM. Thus, it can be projected that the proportion of the population with actual DTPs might be considerably higher, since for their identification in CMM services, a complete assessment of all health problems and all medications used by patients is carried out. (Cipole, Strand & Morley, 2012; Ramalho de Oliveira, 2010). For comparison purposes, no studies were identified in the literature evaluating multiple potential DTPs from dispensing records at a population level, demonstrating the pioneering nature of the present study.

A large part of the potential DTPs (n= 1,125; 53.08%) were related to the absence of anti-hypertensive and anti-diabetic dispensing for patients who self-reported HT and DM. In view of this result, it is relevant to emphasize that the therapeutic classes recommended as the first choice for the treatment of HT (ACEI, ARB, thiazide diuretic and calcium channel blocker) and DM (metformin, insulins and sulfonylureas) in national and international guidelines, have multiple representatives in the municipal list of essential medications and are available for dispensing at SUS pharmacies. Moreover, in April 2019, when this study was carried out, there was no shortage of any of these medicine classes in the municipal pharmacies.

Thus, some hypotheses can be raised as to why these patients have not taken their medication from the pharmacy. The first hypothesis would point out the need for health education strategies, since, considering that HT and DM can be asymptomatic or little symptomatic, patients often have little understanding of their risk or the relevance of regular use of medications to control these conditions (Osterberg, & Blaschke, 2005). The complexity of continuous pharmacotherapeutic regimes such as these diseases' can also contribute to hinder treatment adherence (Coleman *et al.*, 2012; Coelho *et al.*, 2017), as well as the number of drugs prescribed and the adverse effects resulting from their use. Failing to properly follow up or abandoning prescriptions leads to increase in the number of hospitalizations and treatment costs, decrease in effectiveness, loss of quality of life and less productivity for the country (Lessa, 2006).

Since the present study is based on secondary data, it is not possible to state whether patients with CVD and DM got their medications in any way other than SUS pharmacies. However, it is noteworthy that only registered patients who had collected at least one drug from municipal pharmacies were included in the study, which minimizes the chance of having included a population with low dependence on SUS. In addition, in the municipal registry, it was identified that a small portion of the respondents (about 24% - results not shown previously) had health insurance, which reinforces the notion that the population of Congonhas considerably relies on SUS.

Another frequent DTP was the non-use of ACEI or ARB among patients who self-reported CKD or DM (n= 432; 22.56%). The use of these classes of drugs is preferred among patients with such diseases, once the literature points out that they promote the reduction of morbimortality (Mishima *et al.*, 2019; LV *et al.*, 2018).

In the multivariate analysis, only age groups were positively and in a statistically significant way associated with the identification of at least one potential DTP (age group 55-64 years - OR= 3.93; 95% CI= 3.28-4.71; 65 or more - 8.34; 95% CI= 7.01-9.91). This demonstrates a strong association between the possibility of identifying at least one potential DTP in the pharmacotherapy used and the different age group corresponding to older patients. Therefore, the present study reinforces the notion that a priority and holistic evaluation of the pharmacotherapy used by the elderly is extremely important. The definition of age groups associated with the identification of potential DTPs makes it possible to establish the prioritization of these patients, being an important criterion for inclusion in CMM services (Santos *et al.*, 2019). CMM enables the identification of situations that can cause DTPs among these patients with knowingly complex pharmacotherapy, guiding the implementation of preventive action to the occurrence of negative clinical results through a complete clinical pharmaceutical service (Zermanski *et al.*, 2001).

The study has a limitation in fact that it is based on self-reported diagnoses recovered from a secondary database for patients who may be uncertain of their diagnosis or even uncomfortable in mentioning them during registration service. Despite the limitations related to the use of secondary data, however, it is important to highlight it makes it possible to assess the full population of medication users in primary care and allowed the use of a considerable number of data coming from different databases to provide a diagnosis of the potential pharmacotherapeutic needs in the healthcare system. Also, even though the results are based on local Brazilian data, the steps used for the identification of potential DTP proposed in the present study delimits an easily reproducible methodology for evaluating large databases that can help the planning and implementation of CMM services, which will probably encounter CVD and DM as the most prevalent diseases among their patients.

Therefore, the study makes an important population diagnosis, highlighting the need for qualification of the prescription and points out the direction for the implementation of CMM services in the municipality directed at patients diagnosed with CVD or DM, that may then provide identification, prevention and resolution of actual DTPs.

5. Final Considerations

This study allowed tracing the frequency of potential DTPs and associated factors, pointing out some priorities that should be addressed by the public primary health care system. It also made an important population diagnosis, highlighting the need for qualifying prescriptions in the city and a holistic evaluation of the pharmacotherapy used by patients diagnosed with chronic non-communicable diseases.

With it, it was possible to perceive criteria that can be used to prioritize the inclusion of patients in the CMM service, supporting the planning of the implementation of these services aimed at the studied population.

Considering the elderly as a large part of drug consumers and with a strong association with at least one potential DTP, there is a need for investments in the management of pharmacotherapy for these patients, through a service that provides rationality in the use of medication.

Offering CMM services, a practice in the process of being implemented in several health establishments that have the performance of pharmacists, is challenging. The present study represents an important step in the demonstration of aspects that precede and contribute to the implementation of a new clinical service, identifying relevant inclusion criteria to it and, in addition, being able to use the results obtained for the introduction of a new work routine by pharmacists and their managers.

References

- American Diabetes Association (2015). Diagnosis and Classification of Diabetes. *Diabetes Care*. 38(1), S8-S16.
- American Geriatrics Society (2019). Updated AGS Beers Criteria® for Potentially Inappropriate Medication Use in Older Adults. *J Am Geriatr Soc*; 67, 674-94.
- Arnett, D. K., Co-Chair, R. S. B., Co-Chair, M. A. A., Andrew, B. B., Zachary, D. G., Ellen, J. H., Cheryl, D. H., Amit, K., Donald, L. J., William, M., Erin, D. M., Michael, D. M., Daniel, M., Sidney, C. S., Salim, S. V., Kim, A. W., Joseph, Y. & Boback, Z. (2019). ACC/AHA Guideline on the Primary Prevention of Cardiovascular Disease. <<http://ahajournals.org>>.
- ATLAS IDF (2019). <<https://diabetesatlas.org/en/resources/>>
- Bahia, L. R., Araujo, D. V., Schaan, B. D., Dib, S. A., Negrato, C. A., Leão, M. P. S., Ramos, A. J. S., Forti, A. C., Gomes, M. B., Foss, M. C., Monteiro, R. A., Sartorelli, D. & Franco, L. J. (2011). The costs of type 2 diabetes mellitus outpatient care in the Brazilian public health system. *Value Health*. 14, S137-40.
- Borges, A. P. S., Guidoni, C. M., Ferreira, L. D., Freitas, O. & Pereira, L. R. L. (2010). The Pharmaceutical care of patients with type 2 diabetes mellitus. *Pharm World Sci*. v.32 n.6 p.730-6.
- Bowan, L., Mafham, M. & W., Karl (2018). Effects of Aspirin for Primary Prevention in Persons with Diabetes Mellitus. The ASCEND Study Collaborative Group*. *The New England Journal of Medicine*. 379, 1529-39.
- BRASIL. (2010). Ministério da Saúde. Hipertensão arterial sistêmica – HAS e Diabetes mellitus – DM PROTOCOLO. *Cadernos de Atenção Básica*. Brasília: Ministério da Saúde.
- Gaziano, J. M., Brotons, C., Coppolecchia, R., Cricelli, C., Daruis, H., Gorelick, P. B., Howard, G., Pearson, T., Rothwell, P. M., Ruilope, L. M., Tenders, M. & Gianni Tognoni (2018). Aspirin to Reduce Risk of Initial Vascular Events – ARRIVE. 392, 988-990.
- Cid, Annaline (2008). *Avaliação da Efetividade da Atenção Farmacêutica no Controle da Hipertensão Arterial*. Dissertação de mestrado. Universidade Federal de Ouro Preto, Minas Gerais, Brasil.
- Cipolle, R. J., Strand, L. M., & Morley, P. C. (2012). *Pharmaceutical Care Practice: The Patient-Centered Approach to Medication Management Services*. McGraw-Hill Medical Publishing; Ed.3
- Coelho, A., Vilar, C., Silva, M., Rodrigues, C., Costa, M., Gordicho, S. & Caetano, P. (2017). Investigação sobre adesão à terapêutica na população portuguesa: uma revisão de âmbito. *Revista Portuguesa de Medicina Geral e Familiar*, 33, 262-276.
- Coleman, C., Limone, B., Sobieraj, D. M., Lee, S., Roberts, M. S., Kaur, R. & Tawfikul, A. (2012). Dosing frequency and medication adherence in chronic disease. *J Manag Care Pharm*. 18(7): 527-39.
- Dib, M., Riera, R., Ferraz, M. (2010). Estimated annual cost of arterial hypertension treatment in Brazil. *Rev Panam Salud Pública/Pan Am J Public Health*. 27, 125-31.
- Filha, M. M. T., Junior, P. R. B. S., Damascena, G. N., Szwarcwald, C. L. (2015). Prevalência de doenças crônicas não transmissíveis e associação com autoavaliação de saúde: Pesquisa Nacional de Saúde, 2013. *Rev Bras Epidemiol*; 18, 83-96.
- Instituto Brasileiro de Geografia e Estatística. (2018). <<https://cidades.ibge.gov.br/brasil/mg/congonhas/panorama>>.
- Lessa, I. (2006). Impacto social da não adesão ao tratamento da hipertensão arterial. *Rev Bras Hipertens*. 2006; 13(1): 39-46.

- LV, X., Zhang, Y., Niu, Y., Song, Q. & Zhao, Q. (2018). Comparison of angiotensin-converting enzyme inhibitors and angiotensin II receptor blockers on cardiovascular outcomes in hypertensive patients with type 2 diabetes mellitus: A PRISMA-compliant systematic review and meta-analysis. *Medicine*. 97(15): e0256.
- Mcneil, J., Nelson, M., Woods, R. L., Lockery, J. L., Wolfe, R., Reid, C. M., Kirpach, B., Shah, R. C., Ives, D. G., Storey, E., Ryan, J., Tonkin, A. M., Newman, A. B., Williamson, J. D., Margolis, K. L., Ernst, M. E., Abhayaratna, W. P., Stocks, N., Fitzgerald, S. M., Orchard, S. G., Trevaks, R. E., Beilin, L. J., Donnan, G. A., Gibbs, P., Johnston, C. I., Radziszewska, B., Grimm, R. & Murray, A. M. (2018). For the ASPREE Investigator Group. Effect of Aspirin on All-Cause Mortality in the Healthy Elderly. *The New England Journal of Medicine*. 379, 1519-28.
- Mendonça, S., Melo, A. C., Pereria, G. C. C., Santos, D. M. S. S., Grossi, E. B., Sousa, M. C. B. V., Ramalho de Oliveira, D. & Soares, A. C. (2016). Clinical outcomes of medication therapy management services in primary health care. *Braz. J. Pharm. Sci.* 52, 365–373.
- Mishima, E., Hanura, Y. & Arima, H. (2019). Renin-angiotensin system inhibitors in hypertensive adults with non-diabetic CKD with or without proteinuria: a systematic review and meta-analysis of randomized trials. *Hypertens Res.* 42(4): 469-482.
- Neves, C. M., Nascimento, M. M. G., SILVA, D. A. M. & Ramalho de Oliveira, D. (2019). Clinical Results of Comprehensive Medication Management Services in Primary Care in Belo Horizonte. *Pharmacy*, 7(58).
- Obreli-neto, P. R., Marusic, S., Guidoni, C. M., Baldoni, A. O., Renovato, R. D., Pilger, D., Cuman, R. K. N. & Pereira, L. R. L. (2015). Economic Evaluation of a Pharmaceutical Care Program for Elderly Diabetic and Hypertensive Patients in Primary Health Care: A 36-Month Randomized Controlled Clinical Trial. *Journal of Managed Care & Specialty Pharmacy JMCP*. 21(1).
- Oliveira, G. M. M., Brant, L. C. C., Polanczyk, C. A., Biolo, A., Nascimento, B. R., Malta, D. C., Souza, M. F. M., Soares, G. P., Junior, G. F. X., Machline-Carrion, J., Bittencourt, M. S., Pontes-Neto, O. M., Silvestre, O. M., Teixeira, R. A., Sampaio, R. O., Gaziano, T. A., Roth, G. A. & Ribeiro, A. L. P. (2020). Cardiovascular Statistics – Brazil 2020. *Arq. Bras. Cardiol.*, 115, 308-439.
- Osterberg, L. & Blaschke, T. (2005). Adherence to medication. *N Engl J Med.* 353(5):487-97.
- Ramalho de Oliveira, D. (2011). Atenção Farmacêutica: da filosofia ao gerenciamento da terapia medicamentosa. RCN, 29 p.
- Ramalho de Oliveira, D., Brummel, A. & Miller, D. (2010). Medication therapy management: 10 years of experience in a large integrated health care system. *Journal of Managed Care Pharmacy*, 16, 185-195.
- Roth, G. A., Mensah, G. A., Johnson, C. O., Addolorato, G., Ammirati, E., Baddour, L. M., Barengo, N. C., Beaton, A. Z., Benjamin, E. J., Benziger, C. P., Bonny, A., Brauer, M., Brodmann, M., Cahill, T. J., Carapetis, J., Catapano, A. L., Chugh, S. S., Cooper, L. T., Coresh, J., Criqui, M., DeCleene, M., Eagle, K. A., Emmons-Bell, S., Feigin, V., Fernández-Solà, J., Fowkes, G., Gakidou, E., Grunsky, S. M., He, F. J., Howard, G., Hu, F., Inker, L., Karthikeyan, G., Kassebaum, N., Koroshetz, W., Lavie, C., Lloyd-Jones, D., Lu, H. S., Mirijello, A., Temesgen, A. M., Mokdad, L., Moran, A. E., Muntner, P., Narula, J., Neal, B., Ntsekhe, M., Oliveira, G. M., Otto, C., Owolabi, M., Pratt, M., Rajagopalan, S., Reitsma, M., Ribeiro, A. L. P., Rigotti, N., Rodgers, A., Sable, C., Shakil, S., Sliwa-Hahnle, K., Stark, B., Sundström, J., Timpel, P., Tleyeh, I. M., Valgimigli, M., Vos, T., Whelton, P. K., Yacoub, M., Zuhlke, L., Murray, C. & Fuster, V. (2020). Global Burden of Cardiovascular Diseases and Risk Factors, 1990–2019: Update From the GBD 2019 Study. *J Am Coll Cardiol.* 2020 Dec, 76 (25) 2982–3021.
- Santos, F. T. C., Silva, D. L. M. & Tavares, N. U. L. (2018). Pharmaceutical clinical services in basic care in a region of the municipality of São Paulo. *Braz j pharmsci.* 54, 1-11.
- Santos, T. O., Nascimento, M. M. G., Ramalho de Oliveira, D., Nascimento, Y. A., Oliveira, C. B., Martins, U. C. M. & Silva, D. F. (2019). Interações medicamentosas entre idosos acompanhados em serviço de gerenciamento da terapia medicamentosa da Atenção Primária. *Einstein (São Paulo)*, 17.
- Silva, C. S. S. L., Koopmans, F. F., Daher, D. V. (2016). O Diagnóstico Situacional como ferramenta para o planejamento de ações na Atenção Primária a Saúde. *Revista Pró-UniverSUS*. 7. 30-33.
- 7ª Diretriz Brasileira de Hipertensão Arterial (2016). Sociedade Brasileira de Cardiologia. 107, 3.
- Souza, I. G., Oliveira, G. C., Brum, G. A., Neves, C. M., Nascimento, M. M. G., SILVA, D. A. M. & Ramalho de Oliveira, D. (2017). Resultados Clínicos do Serviço de Gerenciamento da Terapia medicamentosa em um Ambulatório de Diabetes. *Rev. Bras. Farm. Hosp. Serv. Saúde* 8(3): 19-24.
- Stevens, B., Pezzullo, L., Verdian, L., Tomlinson, J., George, A. & Bacal, F. (2018). Os Custos das Doenças Cardíacas no Brasil. *Arq Bras Cardiol.* 111, 29-36.
- V Diretriz da Sociedade Brasileira de Cardiologia sobre Tratamento do Infarto Agudo do Miocárdio com Supradesnível do Segmento ST (2015). *ArqBrasCardiol.* 105(2):1-105.
- Whelton, P., Carey, R. M., Aronow, W. S., Casey Jr, D. E., Collins, K. J., Himmelfarb, C. D., DePalma, S. M., Gidding, S., Jamerson, K. A., Jones, D. W., MacLaughlin, E. J., Muntner, P., Ovbigele, B., Smith Jr, S. C., Spencer, C. C., Stafford, R. S., Taler, S. J., Thomas, R. J., Williams, K. A., Williamson, J. D. & Wright Jr, J. D. (2017). ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *J Am CollCardiol.*
- Yang, Y; West-Strum, D. (2013). Compreendendo a farmacoe epidemiologia. *AMGH*. 198 p.
- Zemansky, A. G., Petty, D. R., Raynor, D. K., Freemantle, N., Vail, A. & Lowe, C. J. (2001). Randomised controlled trial of clinical medication review by a pharmacist of elderly patients receiving repeat prescriptions in general practice. *Brit. Med. J.* 323, 1-5.