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Short cognitive screening in elderlies as a part of advanced pharmaceutical care in Slovak community pharmacies - The pilot study KOGNIMET-SK

Original Paper

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Abstract The aim of this study is to evaluate the implementation of a simple, easy-to-use cognitive screening test in the pharmaceutical care of elderly patients (aged 60 years and over) in community pharmacies and to test whether cognitive decline is associated with metabolic syndrome (MetS).

Current research has reported the increasing prevalence of MetS with age and indicated a link between cardiovascular risk factors and impairment of cognitive functions. We hypothesized that the short cognitive test realised in pharmaceutical care in community pharmacies could help identify risk groups of patients with potential cognitive decline. Because of the increasing pressure on primary care, collaboration between community pharmacists and general practitioners is essential, especially in preventive programmes and regarding chronically ill patients.

The study included 222 elderly patients aged 60 years and over reached between February 2018 and February 2019 in 16 community pharmacies in Slovakia. Criteria for the classification of MetS were used, following the International Diabetes Federation Worldwide Definition of MetS (2005) for European populations. Cognitive performance was evaluated using the Slovak version of the Montreal Cognitive Assessment. The scale range of the MoCA test is 0–30 points, and the cut-off for cognitive impairment is ≤ 24 points.

Our outcomes show that the presence of metabolic syndrome only slightly contributes to the impairment of cognitive functions of patients receiving routine pharmaceutical care in community pharmacies. Cognitive assessment might be an important tool for identifying risk groups of patients that would benefit from a specific approach within the framework of pharmaceutical care.

Keywords *metabolic syndrome – cognitive impairment – elderly – pharmaceutical service – community pharmacy*

INTRODUCTION

Metabolic syndrome (MetS), as a cluster of cardiometabolic disorders, is associated with the elevated prevalence of morbidity and mortality (Liu et al., 2015). Current research reports an increasing prevalence of MetS with age (Assuncao et al., 2018; Liu et al., 2015) and indicates a link between cardiovascular risk factors, cerebrovascular disease, and the deterioration of cognitive function (Leritz et al., 2011). MetS affects cognitive function by a variety of means, as it increases the development of neurodegenerative disorders (Ricci et al., 2017), the occurrence of neuroinflammation, CNS dysfunction, risk for ischemic stroke, intracranial arteriosclerosis, and white matter lesions and causes a deficit in memory, attention, language and learning abilities, processing speed, executive functions, and overall intellectual functioning (Assuncao et al., 2018; Maiuolo et al., 2021; Rouch et al., 2014; Wooten et al., 2019).

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The estimated cognitive impairment prevalence in population aged 60 years and over ranges from 18.9% to 22.4% (Ren et al., 2018), and it predicts an increasing risk of medication errors, drug adverse events, preventable drug-related hospital admissions, lower adherence to prescribed treatment, failures in medication management, and dependence on the help of another person who helps with medicine management (Elliott et al., 2015; Liu et al., 2015). Especially, impaired attention, poor executive skills, and memory performance are in strong correlation with the presence of MetS (Rouch et al., 2014; Wooten et al., 2019), and these features of cognitive functioning may affect the accuracy and safety of self-management of medication. A patient´s ability to manage medication is not assessed routinely, and it often remains unrecognised (Elliott et al., 2015).

We hypothesised that the short cognitive test realised under pharmaceutical care in community pharmacies could help identify risk groups of patients with potential cognitive decline and help to avoid further complications. Because of the increasing pressure on primary care, collaboration between community pharmacists and general practitioners is essential, especially in preventive programmes and regarding chronically ill patients (Ramos et al., 2021).

The aim of this pilot study is to evaluate the implementation of a simple, easy-to-use cognitive screening test within the framework of pharmaceutical care of elderly patients (aged 60 years and over) in community pharmacies and to test the influence of MetS and its particular components on cognitive decline in this age group.

MATERIALS AND METHODS

The data were collected between February 2018 and February 2019. In the study, 222 patients aged 60 years and over receiving pharmaceutical care from 16 community pharmacies in Slovakia were included. Inclusion criteria were as follows: 60+ years of age, agreement to participate in the study, willingness to provide input data, and the listing of one's medications. Exclusion criteria were the following: serious physical or mental difficulties that did not allow us to carry out a cognitive screening test and incomplete questionnaires. The study was approved by the Ethics Committee of Faculty of Pharmacy, Comenius University in Bratislava (EK FaF UK 01/2018). All respondents completed a simple questionnaire. The first part of the questionnaire contained particular sociodemographic data of subjects (age, gender, education), as well as smoking habits, physical activity, and presence or absence of abdominal obesity. In the second part, the data about medications were collected. The third part was a cognitive screening. Approximate screening time was between 10 and 15 minutes.

Criteria for MetS and cognitive assessment

For the purposes of the study, we used the classification of MetS according to the International Diabetes Federation Worldwide Definition of MetS (2005) for European populations (Alberti, Zimmet, Shaw, 2006). The combination of MetS components is displayed using a Venn diagram, which was created in a free available online application (Oliveros, 2007). Cognitive performance was evaluated using the brief but commonly used cognitive screening tool, the translated Slovak version of the original Montreal Cognitive Assessment (Nasreddine et al., 2005), which is characterised by high sensitivity for mild cognitive impairment. The maximum scale range of the MoCA test is 30 points, and the cutoff for cognitive impairment is ≤ 24 points (Bartos & Fayette, 2018).

Statistical evaluation

The data were statistically analysed using the SAS Education Analytical Suite for Microsoft Windows, version 9.3 (copyright © 2012 SAS Institute Inc., Cary, NC, USA). Clinical variables (the MoCA score) of respondents were represented by the arithmetic mean value and the standard deviation. Categorical descriptive variables (eg gender and individual components of MetS, such as central obesity, lipid profile abnormalities, high blood pressure, type 2 diabetes, and MoCA status) were described by absolute frequencies and percentages. In the case of comparing two groups with continuous data, results were analysed with a two-sample *t*-test. A value of $p < 0.05$ was used as a threshold for statistical significance for all tests and 0.8 was taken as the minimally acceptable power of the tests.

RESULTS

MetS, according to the classification of IDF 2006, was present in 19% of all elderly patients, without significant gender differences. The baseline characteristics of the study cohort including an occurrence of individual MetS components is summarised in Table 1. Hypertension was the most common MetS component in both genders (65.4% in males and 69.5% in females). Approximately one-third of all elderly individuals (30.9%) had a concurrent presence of high blood pressure with abdominal obesity. The most common cluster of three components of MetS consisted of hypertension, abdominal obesity, and dyslipidaemia (9.5%; $N = 21$). Combinations of individual MetS components and their occurrence rate in the study cohort are shown in Figure 1. Only 15% of all subjects did not suffer of any component of MetS.

Cognitive decline was identified in 41% of the elderly participants. Increasing age was in negative correlation to the MoCA score achieved ($p < 0.05$). Cognitive performance expressed as the MoCA score was not significantly worse in elderly participants with MetS compared with groups without MetS (NS). Patients with high blood pressure achieved a significantly lower MoCA mean score than groups without hypertension ($p < 0.05$). In the cohort studied, the mean MoCA scores achieved by patients with abdominal obesity (AO+), hypertension (HT+), dyslipidaemia (DL+), and type

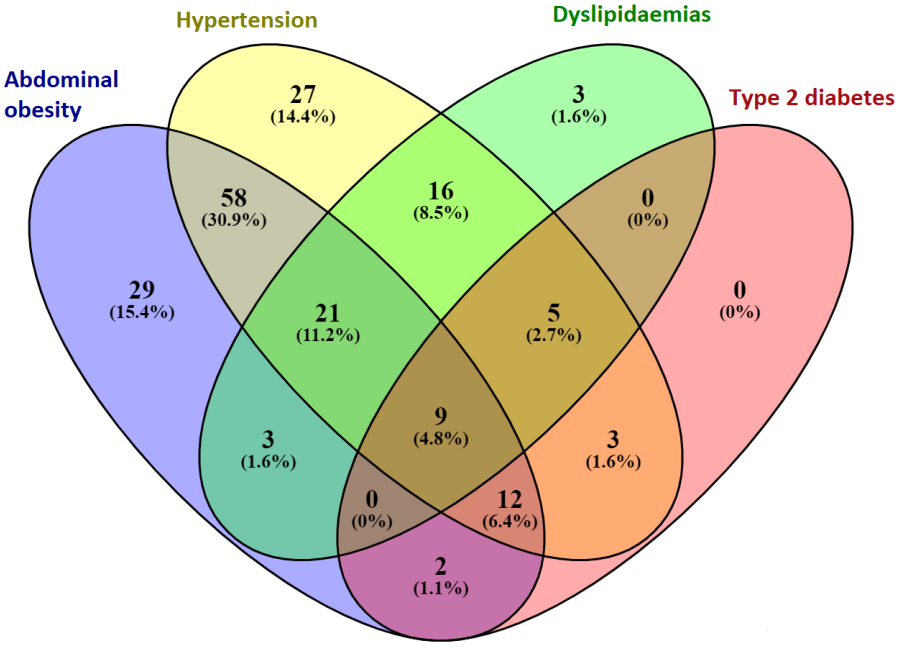


Figure 1. Concurrent occurrences of various MetS components and their incidence rate in study cohort (N, %).

Table 1. Baseline characteristics of study cohort.

Characteristics	
Participants number	222
Age, mean (SD)	69 ± 6.3
Female, *N* (%)	141 (64)
Male, *N* (%)	81 (36)
Abdominal obesity, *N* (%)	134 (60)
Hypertension, *N* (%)	151 (68)
Type 2 diabetes mellitus, *N* (%)	31 (14)
Dyslipidaemias, *N* (%)	57 (26)
sMetS according to IDF 2006, *N* (%)	42 (19)
Smoking, *N* (%)	32 (14)
Sedentary lifestyle, *N* (%)	90 (41)
MoCA score, mean (SD)	24.0 (3.5)
MoCA score ≤ 24, *N* (%)	91 (41)

2 diabetes (DM2+) were 24.0 ± 3.5 points, which confirms a substantial presence of cognitive decline in the elderly population. We did not find any differences between males and females. Mean MoCA scores achieved with or without individual MetS components are summarised in Table 2. Patients without MetS components ($N = 34$; 15%) had a mean MoCA score of 24.8 ± (3.5).

The number of MetS components played a significant role in the MOCA score that participants achieved although the size effect was very weak ($p < 0.05$, $r^2 = 0.03$). On the other hand, the occurrence of lower cognitive performance under the MoCA score cutoff (≤ 24 points) was significantly more frequent in respondents with a higher number of MetS components ($p < 0.05$). Additionally, we did not find significant differences between male and female groups.

DISCUSSION

Our pilot study was focused on an assessment of the cognitive functioning of a subset of the elderly population (patients aged 60 years and over) with and without metabolic syndrome at community pharmacies in Slovakia. The main finding is that the presence of MetS and its components, with the exception of hypertension, did not have a significant effect on the MoCA score achieved by elderly individuals. Many studies have reported decreased scores on cognitive tests according to the number of MetS components (Assunsao et al., 2018; Liu et al., 2015), although other studies have also presented opposite results (Feinkohl et al., 2019). We found that with an increasing number of MetS components, cognitive performance expressed as an MoCA score decreased only slightly.

MetS is considered a global health problem (Yates et al., 2012) and also one of the risk factors for cognitive impairment, particularly in the elderly (Liu et al., 2015). Our findings (19% prevalence of MetS) are practically in line with a current Chinese study, which describes 20.4% of prevalence of MetS according to the IDF 2006 criteria (Wang et al., 2020). This study also describes higher MetS prevalence in males (Wang et al., 2020), which is, however, inconsistent with our results. In our cohort, the most prevalent MetS component in both genders was hypertension, which is in line with the findings of Hildrum

Table 2. MoCA mean score with presence or absence of individual MetS components.

	MoCA score ± SD		*p* value	MoCA score ± SD		*p* value
	All					
MetS components	**Presence**	**Absence**		**Male**	**Female**	
Abdominal obesity	23.6 ± 3.4	24.5 ± 3.6	0.061	24.1 ± 3.2	23.3 ± 3.5	0.243
Hypertension	23.6 ± 3.6	24.9 ± 3.1	<0.05	23.7 ± 3.3	23.5 ± 3.8	0.774
Dyslipidaemias	23.5 ± 3.7	24.2 ± 3.4	0.227	25.7 ± 1.2	23.3 ± 4.0	0.251
Type 2 diabetes mellitus	23.6 ± 3.2	24.0 ± 3.6	0.500	24.5 ± 2.7	22.8 ± 3.5	0.149

el al (2007) for a similar population. In a Chinese population, the most frequent MetS component was abdominal obesity (Wang et al., 2020). One of the explanations for this discrepancy might lie in the different definitions of this MetS component. Whilst criteria in China define obesity by a waist circumference ≥ 90cm in males, European criteria use the limit ≥ 94 cm. Abdominal obesity was the second most prevalent component of MetS, and it also occurred concomitantly with hypertension in 31% of our elderly population, which is in line with the findings described in the study of Hildrum et al. (2007). It is important to identify and establish the management of all patients with MetS and also of those who are not affected yet but show early signs of features of MetS (Yates et al., 2012; Maiuolo et al., 2021; Feinkohl et al., 2019). Moreover, it is crucial to act as early as possible because these signs are modifiable and can help to manage patients' cognitive impairment and identify individuals with a high risk of cognitive dysfunction (Liu et al., 2015).

Many studies focus on the relationship between MetS, its features, and cognitive impairment but come to different conclusions (Assunsao et al., 2018; Liu et al., 2015; Yaffe et al., 2011). In our overall study cohort, we found 41% of elderly respondents with lower cognitive performance according to the MoCA test, which is higher than reported by other studies (32.4%; Ren et al., 2018). However, our findings are consistent with the results of Yaffe and colleagues (2011), who thought their study focused on a population ≥ 85 years of age. Our main findings support the conclusions of a Brazilian study that has reported that MetS is not associated with lower cognitive performance on a cognitive screening test of elderly participants (Shigaeff et al., 2013). Controversially, other studies have shown a significant effect of MetS on the cognitive test scores in an elderly population (Assunsao et al., 2018; Liu et al., 2015). Moreover, our current findings are also in conflict with our previous results (Macekova et al., 2022), where we reported an influence of MetS on cognitive performance, although the composition of the study cohort was different. The controversy might be explained also by the effect of possible comorbidities besides MetS and its components (heart disease, neurological disease), and comedication with potential adverse effects on cognition (benzodiazepins, proton pump inhibitors, and anticholinergics) or other circumstances (eg distress, anxiety, fatigue).

Studies have reported various outcomes when investigating the impact of individual MetS components on cognition. We found that abdominal obesity, dyslipidaemia, and type 2 diabetes did not have a significant effect on cognitive performance expressed as an MoCA score. We also found that elevated blood pressure negatively affected the MoCA scores in elderly people in comparison with individuals without hypertension. Thus our finding is in accordance with the outcomes of previous studies (Liu et al., 2015; Ren et al., 2018). Hypertension is a serious risk factor for cognitive impairment and predicts reduced grey matter volume and white matter alterations (Moonen et al., 2021), with main clinical outcomes being a worsening of visual working memory, episodic memory, processing speed, and executive functions (Moore & Jefferson, 2021; Muller et al., 2014). Chronic hypertension leads to change of vascular integrity (Varghese et al., 2018), promotes the formation of atherosclerosis, and contributes to restrictions of nutrition delivery through reduced cerebral blood flow, which leads to episodes of hypoxia and ischemia with cerebral damage (Moonen et al., 2021). On the other hand, elevated blood pressure may also contribute to the development of inflammation and neurovascular diseases, which affect changes in cerebral autoregulation, destroy the mechanism of brain clearance, and support the formation of Alzheimer's disease pathogenesis (Muller et al., 2014; Maiuolo et al., 2021).

In conclusion, our outcomes show that the presence of metabolic syndrome only slightly contributes to the impairment of cognitive functioning of patients receiving routine pharmaceutical care at community pharmacies. Cognitive assessment might be an important tool for identifying risk groups of patients who would benefit from a specific approach within the framework of pharmaceutical care.

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ABBREVIATIONS

AO	Abdominal obesity
DL	Dyslipidaemias
DM2	Type 2 diabetes mellitus
HT	Hypertension
IDF 2006	International Diabetes Federation Worldwide Definition of MetS
MetS	Metabolic syndrome
MoCA	Montreal Cognitive Assessment

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