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Mission

ATINER is a *World Non-Profit Association* of Academics and Researchers based in Athens. ATINER is an independent **Association** with a **Mission** to become a forum where Academics and Researchers from all over the world can meet in Athens, exchange ideas on their research and discuss future developments in their disciplines, **as well as engage with professionals from other fields**. Athens was chosen because of its long history of academic gatherings, which go back thousands of years to *Plato's Academy* and *Aristotle's Lyceum*. Both these historic places are within walking distance from ATINER's downtown offices. Since antiquity, Athens was an open city. In the words of Pericles, *Athens "... is open to the world, we never expel a foreigner from learning or seeing"*. ("Pericles' Funeral Oration", in Thucydides, *The History of the Peloponnesian War*). It is ATINER's **mission** to revive the glory of Ancient Athens by inviting the World Academic Community to the city, to learn from each other in an environment of freedom and respect for other people's opinions and beliefs. After all, the free expression of one's opinion formed the basis for the development of democracy, and Athens was its cradle. As it turned out, the Golden Age of Athens was in fact, the Golden Age of the Western Civilization. *Education* and *(Re)searching* for the 'truth' are the pillars of any free (democratic) society. This is the reason why *Education* and *Research* are the two core words in ATINER's name.

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Before you submit, please make sure your paper meets some [basic academic standards](#), which include proper English. Some articles will be selected from the numerous papers that have been presented at the various annual international academic conferences organized by the different [divisions and units](#) of the Athens Institute for Education and Research.

The plethora of papers presented every year will enable the editorial board of each journal to select the best ones, and in so doing, to produce a quality academic journal. In addition to papers presented, ATINER encourages the independent submission of papers to be evaluated for publication.

The current issue of the Athens Journal of Health (AJH) is the fourth issue of the fifth volume (2018). The reader will notice some changes compared with the previous issues, which I hope is an improvement.

Gregory T. Papanikos, President
Athens Institute for Education and Research



Athens Institute for Education and Research

A World Association of Academics and Researchers

18th Annual International Conference on Health Economics, Management & Policy, 24-27 June 2019, Athens, Greece

The [Health Economics & Management Unit](#) of ATINER will hold its 18th Annual International Conference on Health Economics, Management & Policy, 24-27 June 2019, Athens, Greece sponsored by the [Athens Journal of Health](#). The aim of the conference is to bring together academics, researchers and professionals in health economics, management and policy. You may participate as stream leader, presenter of one paper, chair of a session or observer. Please submit a proposal using the form available (<https://www.atiner.gr/2019/FORM-HEA.doc>).

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- **Dr. Paul Contoyannis**, Head, [Health Economics & Management Unit](#), ATINER & Associate Professor, McMaster University, Canada.
- **Dr. Vickie Hughes**, Director, [Health & Medical Sciences Division](#), ATINER & Assistant Professor, School of Nursing, Johns Hopkins University, USA.

Important Dates

- Abstract Submission: **25 February 2019**
- Acceptance of Abstract: 4 Weeks after Submission
- Submission of Paper: **27 May 2019**

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- Greek Night Entertainment (This is the official dinner of the conference)
- Athens Sightseeing: Old and New-An Educational Urban Walk
- Social Dinner
- Mycenae Visit
- Exploration of the Aegean Islands
- Delphi Visit
- Ancient Corinth and Cape Sounion
 - More information can be found here: <https://www.atiner.gr/social-program>

Conference Fees

Conference fees vary from 400€ to 2000€
Details can be found at: <https://www.atiner.gr/2019fees>



Athens Institute for Education and Research *A World Association of Academics and Researchers*

7th Annual International Conference on Health & Medical Sciences 6-9 May 2019, Athens, Greece

The [Medicine Unit](#) of ATINER is organizing its **7th Annual International Conference on Health & Medical Sciences, 6-9 May 2019, Athens, Greece** sponsored by the [Athens Journal of Health](#). The aim of the conference is to bring together academics and researchers from all areas of health sciences, medical sciences and related disciplines. You may participate as stream leader, presenter of one paper, chair a session or observer. Please submit a proposal using the form available (<https://www.atiner.gr/2019/FORM-HSC.doc>).

Important Dates

- Abstract Submission: **7 January 2019**
- Acceptance of Abstract: 4 Weeks after Submission
- Submission of Paper: **8 April 2019**

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- **Dr. Vickie Hughes**, Director, Health & Medical Sciences Research Division, ATINER & Assistant Professor, School of Nursing, Johns Hopkins University, USA.
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Understanding and Addressing Aggressive and Related Challenging Behaviors in Individuals with Dementia

By Dimitra Loukissa *

Dementia in the older adult population is a multifactorial, complex condition currently affecting an estimated 35.6 million individuals worldwide. The literature has been consistent highlighting the financial, emotional, and social burden of the illness on the affected individual, the family, and health care resources. Although in more recent decades there have been significant advances in the area of genetics, neuroscience, testing, and psychopharmacology, the management of this complex condition continues to present major challenges. Common illness related challenging behaviors may range from wandering, restlessness, irritability, personality changes, hoarding, sexual inhibition to escalating anxiety, verbal and physical agitation and aggression. Current pharmacological and non-pharmacological interventions aim at addressing behavioral and psychological symptoms to alleviate patient anxiety, promote cognitive stimulation, address safety issues, decrease caregiver burden, and empower healthcare personnel to better care for these patients in the hospital and nursing home settings. This article reviews published literature covering a 10-year period up to spring 2017 utilizing the PubMed, CINAHL, MEDLINE, Cochrane and ProQuest databases. From the initial 242 identified articles, twenty one studies examining non-pharmacological interventions were deemed appropriate to be reviewed. Key words included dementia, disruptive behaviors, and nursing interventions. Criteria for studies reviewed included: peer-reviewed articles published in the last 10 years, written in English, with the focus on intervention implementation. Findings from those studies offer insights into a variety of approaches that can address challenging behaviors in dementia. Advancements in the areas of behavioral, psychological, milieu interventions and also most commonly utilized pharmacological agents are discussed, as well as the importance of nursing staff involvement in identifying escalating behaviors and successfully intervening to promote safety, and decrease anxiety and agitation. Finally, implications for practice are explored.

Keywords: *Dementia, Disruptive behaviors, Nursing interventions, Older adults.*

Introduction

Dementia, with Alzheimer's disease being the most prevalent form of the illness, is the 6th leading cause of death in the USA and affects an estimated 5.2 million Americans, the vast majority of them over the age of 65. It is estimated that by 2050 this number will escalate to 13.8 million cases (Fargo and Bleiler 2014). Global estimates report that currently there are 46.8 million individuals worldwide with a diagnosis of dementia. It is expected that cases will double by 2030 to approx. 74.7 million and by 2050 the affected individuals will account for 131.5 million worldwide. In the USA alone the cost of care such as medical services, caregiving services, hospitalizations, adult day services, long-term care, and hospice care services, is estimated at \$214 billion. Current worldwide estimates raise the cost to \$818 billion (Fargo and Bleiler 2014).

This illness which results in progressive decline in function and cognition, extends over a period of several years, and causes significant distress to the affected individual, their family, hospital personnel and the society at large. Over

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the course of the illness on average 90%-97% of the affected patients experience at least one aggressive symptom whether they live in the community or in a nursing home (Cankurtaran 2014, Ballard and Corbett 2010). Although there is no definitive treatment for dementia, great progress has been made over the past couple of decades in understanding the complexity of the brain and illness symptomatology as well as implementing non-pharmacological and pharmacological interventions to control the aggressive behaviors.

This work reviews current literature on individual and milieu behavioral interventions to manage disruptive behaviors including basic pharmacological approaches that can be considered as adjunct interventions to relieve persistent aggressive behaviors. Clinical implications and recommendations for nursing practice are also discussed.

Disruptive Behavior Identification in Dementia

Throughout the course of the illness behaviors represent changes of the disease process at the molecular, cellular, and neurochemical levels. According to the literature, behavioral disturbances have been classified as primary and secondary exhibiting various degrees of intensity, at times involving psychiatric symptomatology (Desai and Grossberg 2001, Kales et al. 2014a). These behaviors can occur at home, the community, nursing home settings, but also during hospitalization (Table 1).

Table 1. *Common Disruptive Behaviors in Dementia*

Primary Behaviors	Secondary Behaviors Result of	Psychiatric Symptomatology
<u>Cognitive Challenges</u> Forgetfulness, concentration problems, sundowning, impulsivity, inability to care for self, poor judgment <u>Affective Challenges</u> Apathy, low motivation, lack of interest, irritability, agitation (yelling, wandering, hoarding, screaming, cursing, disinhibition), aggression (grabbing, biting, pushing)	Medication side effects	Paranoia
	Pain	Delusions
	Delirium related to infection or other medical issue	Hallucinations
	Misinterpretation of the environment	Psychosis
	Misidentification	Anxiety
	Insomnia	Depression

Primary Disruptive Behaviors include behaviors that range from escalating anxiety, sundowning, pacing, wandering, to refusal to redirection, verbal threatening, yelling, screaming, and hoarding. Other disruptive behaviors may include sexual inhibition, physical threats or harm to others by kicking, grabbing, biting, pushing through or physically attacking someone (Duane et al. 2015).

Secondary Disruptive Behaviors usually are the result of medical conditions, medication side effects, pain, misidentification and misinterpretation of the

environment and at times delirium related to infection or other acute medical conditions.

Psychiatric Type Symptomatology may include paranoia, delusions, hallucinations, depression, anxiety, and psychosis.

Researchers have stressed the importance of the use of measurement tools to objectively determine the severity of the behavior which may result from depressive symptomatology, wandering, psychotic presentation, or aggression as such behaviors are the most challenging to address (Derlinde et al. 2014). A total of 83 measurements designed to measure challenging behaviors in dementia were examined by Van DerLinde et al. (2014). The researchers commented that only few of those instruments assessed reliability and validity. Although reliability and validity were satisfactory when reported, it is strongly suggested that when considering the use of an assessment tool, variables such as study sample, target population, living situation, time frame, and setting are included as they can affect the outcomes.

Impact of Dementia Disruptive Behaviors

Common challenging behaviors in dementia create safety issues for the affected individual and those around them. Symptomatology can vary in presentation and intensity over the course of the illness. Zwijsen et al. (2014) argue that over 80% of demented nursing home residents express at least one form of disruptive behaviors. Those behaviors may range from repetition, wandering, mood related outbursts, swearing, hoarding, refusing to attend to hygiene, eating problems, disrobing, inappropriate sexual behaviors, to paranoia, hallucinations, delusional thinking, irritability, anger, verbal and physical aggression. Backhouse et al. (2014) found aggression to be the most challenging behavior in nursing home residents, as reported by 37% of care home managers.

Apart from safety and quality of life issues for the affected individual and increase in caregiver stress, as well as threats to caregiver income and health, unaddressed disruptive behaviors usually accelerate the progression of the illness (Van Den Wijngaart et al. 2007, Rabins and Lyketsos 2011).

Case Study

Mr. Jones, a 75-year-old Caucasian retired male, with a recent diagnosis of dementia, was a successful administrator of a large company and avid reader. During his career, Mr. Jones had travelled all over the world, maintained a healthy life style and participated in volunteer work in his community. Several months ago his spouse became concerned as Mr. Jones was becoming increasingly resistant to redirection, and on a couple of occasions he became aggressive with her, pushing her away from the door so he could exit the house and “go to work”. As Mr. Jones was becoming increasingly difficult to control the decision was made to have him hospitalized to have his impulsivity and aggressive behaviors addressed. During his hospitalization on a general psychiatric unit, Mr. Jones required a couple of

times restraints as he was physically aggressive with staff for not allowing him to exit the unit. New medication prescriptions addressed the issue of aggression for the most part, however, Mrs. Jones was concerned that her husband “wasn’t the person she knew anymore” as he appeared sedated and disinterested most of the time. Mr. Jones was transferred to an inpatient dementia unit for rehabilitation and further treatment and stabilization, where he was able to benefit from a patient-centered approach, a milieu that was designed to address the needs of individuals with similar presentation and a daily structure and routine.

Interventions

A typical regimen to address disruptive behaviors includes a combination of antipsychotic agents to control dangerous and aggressive behaviors in combination with non-pharmacological interventions and environmental modifications in the inpatient setting. Although there is a general agreement amongst health care providers that disruptive behaviors must be addressed successfully, behavioral interventions tend to be much more preferred over the use of antipsychotic agents which have been widely criticized.

In more recent years, regulatory requirements have achieved a 3% reduction of antipsychotic medication in nursing homes over a three year old period, as more focus is placed on the use of non-pharmacological interventions and person-centered care (Benbow 2014, Blackburn and Bradshaw 2014). The American Geriatric Society places emphasis on the worldwide initiative for emphasis on the use of non-pharmacological approaches as the first line of interventions to address challenging behaviors (Anand et al. 2014). According to the Health and Social Care Information Center in Great Britain there has been a 17% reduction in the use of antipsychotics in British nursing homes over the course of the past decade (Prince et al. 2013). Yet, due to the conservative response to non-pharmacological approaches, antipsychotic medications often may dictate the course of action in maintaining safety. Although preference is given to behavioral interventions, it is not uncommon that Child et al. (2012) found that 26% of nursing home residents were receiving antipsychotic medications.

Due to the lack of a single treatment modality that successfully addresses disruptive behaviors, the availability of non-pharmacological and pharmacological interventions, although with various degrees of effectiveness, has allowed caregivers to manage some of those behaviors in the community, thus, delaying institutionalization, and allowing the affected individual to stay in their familiar environment, which in return limits costs, maintains quality of life and prevents caregiver burden. Backhouse et al. (2014) found that concurrent use of non-pharmacological interventions along with the use of antipsychotic medications was effective in addressing disruptive behaviors in care homes. The case study presented above is a clinical testimonial that the use of both pharmacological and non-pharmacological interventions is far more superior in outcome effectiveness than just one approach. Other treatment modalities with various degrees of effectiveness may include Electroconvulsive Therapy or even the use of restraints

in emergency situations as presented in Table 2, in cases where safety is significantly compromised.

Non-Pharmacological Interventions

Current practice guidelines place a great emphasis on the use of non-pharmacological approaches as an initial intervention before resorting to chemical agents as they offer viable and in a number of cases successful alternatives. Although intervention effectiveness in many cases might be modest, there has been ongoing discussion in the literature on interventions that support social interactions for patients affected by dementia, person-centered care approaches as well as the benefit of alternative interventions such as aromatherapy, physical activity, and pet therapy to name a few (Kramer et al. 2009, Nordgren and Engstrom 2014, Tournier et al. 2017, Forrester et al. 2014, Soares-Weiser 2014). Table 3 summarizes related studies.

The benefit of short, structured but systematically applied tactile activities tailored to specific needs of the individual using a “tool box” was discussed by Cohen-Mansfield et al. (2011a). Along the same lines preliminary evidence from small studies assessing aromatherapy shows that the use of lavender oil and *Melissa officinalis* oil (lemon oil) in particular were successful in decreasing agitation while offering the added benefit of a safe alternative (Ballard and Corbett 2010).

To address mild to moderate depressive symptomatology Ballard and Corbett (2010) discuss the benefit of simple activities such as individual or group exercise (Figures 1 and 2), singing, and reminiscing. The benefit of doll therapy as a means of providing comfort, identity, attachment, and sensory stimulation has been widely criticized. Yet, small studies have reported benefits in the areas of comfort, wellbeing, engagement, decrease in agitation, and in some instances increase in dietary intake, as well as creating a sense of active participation in the environment, rather than passively receiving care (Benbow 2014, Mitchell 2014).

Figure 1. *Exercise Therapy*



Figure 2. *Group Exercise Therapy*



Blackburn and Bradshaw (2014) examined 6 randomized controlled trials that assessed the benefit of music therapy on patients with dementia as determined by the Mini-Mental State Exam (Figure 3). These individuals lived in residential care settings in Great Britain. Although it is suggested that music therapy may improve cognitive function and decrease anxiety, depression and agitation in older adults with dementia, the true effectiveness of music therapy remains unclear due to methodological issues of existing studies and lack of reports on which specific aspects of the intervention contribute to its effectiveness. However, music therapy is still recommended as a safe, no cost supplemental intervention to address anxiety and agitation in dementia.

Figure 3. *Music Therapy*



Similarly, Nair et al. (2011) studied the effectiveness of Baroque music on aggressive behaviors of residents in two nursing home units in Australia who scored on the Mini-Mental State Examination 15/30 or below. The researchers chose Baroque music based on music characteristics that mimic the human heart beat and prior reports that Baroque music enhances alpha brain waves in the brain, thus hypothesizing that this kind of music will have calming effects on agitated behaviors. Results showed that Baroque music increased agitation while the music was playing but the effect did not carry over afterwards. They concluded that although volume, individual resident music preferences and speed of music might have been factors that contributed to the results, their findings support existing documentation that music influences behavior significantly.

Table 2. *Interventions to Address Challenging Behaviors in Dementia*

Nopharmacological	Milieu Management	Pharmacological	Other Modalities
<u>Communication Approaches:</u> Reminiscing, sing-along, music, reality orientation, short sentences, simple directions, maintain routine and consistency, reality orientation <u>Affective Approaches:</u> Positive attitude Calm demeanor Smile <u>Tactile Approaches:</u> Use of toolbox Pet Therapy Doll Therapy Tactile stimulation Multi-sensory stimulation <u>Sensory Approaches:</u> Aromatherapy Massage Touch Music Therapy <u>Physical Needs Approaches:</u> Bathroom schedule Nourishment Hydration Sleep Hygiene Pain Assessment and Intervention Room Temperature Regulation Suitable Clothing	Environmental Safety Environmental Modification Opportunities for Physical Activity Possibilities for Wandering Stimulation and Noise Reduction Opportunities for Socialization Neighborhoods Memory Aids Memory Corners Work Stations	Acetylcholinesterase Inhibitors (Antidementia Drugs) Antidepressants Antipsychotics Mood Stabilizers	Bright Light Therapy Electroconvulsive Therapy (ECT) Use of Physical Restraints Transcranial Magnetic Stimulation (TMS)

There is limited research examining the effectiveness of Animal-Assisted Therapy in patients suffering from dementia (Figure 4). The effectiveness of a dog-assisted intervention to address challenging behaviors in eight Swedish nursing homes involving 33 residents was studied by Nordgren and Engstrom (2014). Participants received a total of 10 sessions of dog exposure lasting up to an hour once to twice a week as opposed to a control group. It was found that there was no statistically significant improvement post intervention, however, the researchers commented on promising immediate trends showing decrease in non-aggressive behaviors. It was concluded that dog-assisted interventions may be beneficial as a complementary approach to medication to decrease behavioral symptomatology and promote social interaction. Kramer et al. (2009) introduced AIBO, a robotic dog to 18 nursing home residents with dementia and compared resident initiated interaction, smiles, laughs, and hand gesticulations to another group spending time with a person and a third group spending time with a live dog. It was concluded that although residents in all three groups were more socially interactive than before receiving the intervention, there were no statistically significant differences between the three groups in the areas of verbal and non-verbal behaviors including touch, smiles, hand gestures, and conversations, thus supporting the benefit of social interaction resulting from individualized ongoing stimulation.

Figure 4. *Animal Assisted Therapy*



Table 3. *Non-Pharmacological Intervention Studies to Address Dementia Challenging Behaviors*

Author(s)	Country/ Setting	Method	Sample (N)	Measures	Intervention	Findings
Kramer et al. (2009)	USA, Nursing Home	Behavioral observational approach	18 female residents	Number of behaviors per intervention (eye contact, laughs, smiles, hand gestures, conversations, touch)	Visit by robotic “Pet” AIBO, visit by a person, visit by a person and a live dog	All three types of visits stimulated social interaction with AIBO eliciting more and longer interactions
Nordgren and Engstrom (2014)	Sweden, Nursing Homes	Quasi-experimental, pre/post-test design	33 residents	CMAI and MDDAS standardized caregiver rating questionnaires	Ten sessions of dog assisted intervention 45-60, once or twice a week	Aggressive behaviors decreased immediately post intervention in the treatment group but not overtime
Backhouse et al. (2014)	England, Nursing Homes	Postal Survey to Care Managers	299 Care Managers	Survey developed by authors	Observed challenging behaviors and approaches to address them	Reminiscence and music therapy were the most utilized non-pharmacological approaches
Nair et al. (2011)	Australia Nursing Home	Observational Pilot	75 residents	Behavioral chart	Assessed effect of Baroque music on challenging behaviors	Baroque music seemed to have escalated challenging behaviors
Bauer et al. (2015)	Australia Nursing Home	Descriptive observational method	16 residents	Wilcoxon signed-rank test	Observed resident responses from intervention (Snoezelen) and control group (best practice)	No significant differences between Snoezelen and “best practice” interventions
Bremault-Phillips et al. (2015)	Canada, Practitioner experiences	Qualitative study	53 participants	Focus groups, surveys	Explored issues related to disruptive behaviors, develop plan to address those	There is a need and readiness to develop strategies to address disruptive behaviors
Cohen-Mansfield et al. (2011a)	USA, MDS, PhDs, NPs	Web-based survey	180 MDs, 36 PhDs, 89 NPs	Close-ended questionnaire	Assessed health care provider knowledge and attitude on how to address challenging behaviors non-Pharmacologically	PhDs and NPs had greater knowledge on how to address behaviors nonpharmacologically than MDs. PhDs, NPs, and MDs, attitudes supported the use of non-pharmacological approaches, with NPs scoring the highest

Cohen-Mansfield et al. (2011b)	USA, MDs, PhDs, NPs	Web-based survey	180 MDs, 38 PhDs, 100 NPs	Close ended questionnaire	Gathered information on assessment and treatment of behavioral problems in nursing home residents	PhDs used more frequently assessment instruments, MDs and PhDs utilized similar behavioral and pharmacological interventions
Cooke et al. (2010)	Australia, nursing home residents	Randomized cross-over design with control groups	47 nursing home residents with mild to moderate dementia	Short Form Cohen-Mansfield Inventory, Rating Anxiety in Dementia Scale	Live, familiar song-singing with musicians versus reading activity	Music did not improve anxiety and agitation
Deudon et al. (2009)	France, nursing home residents	Randomized intervention with a control group	306 residents	Cohen-Mansfield Agitation Inventory, Observational Scale	Assessed aggressive behaviors post staff training on handling challenging behaviors	Intervention group experienced decrease in aggressive behaviors post intervention with a carry-over effect 3 months later
Drapeau et al. (2009)	Canada, Outpatients with dementia	Case control study	7 patients with dementia and 16 healthy older adults	Standardized neuro psychological testing	Emotional reactions were recorded given 56 novel film clips	Dementia individuals expressed impaired recognition from the face but auditory emotions were present
Fossey et al. (2006)	Great Britain, nursing home residents	Cluster randomized trial	138 residents	Cohen-Mansfield Agitation Inventory	Trained staff over 10 months to utilize non Pharmacological interventions to address agitation	Staff training reduced the use of medications to address agitation. Results were sustained for 12 months
Sung et al. (2010)	Taiwan, Nursing home residents	Quasi –experimental pre-posttest design	52 residents	Rating Anxiety in Dementia	Staff provided care with preferred music to the control group versus care without music	The intervention group experienced significantly lower anxiety levels
Khan and Curtice (2011)	Great Britain, nursing home residents	Qualitative study	63 nursing home residents	Questionnaire to elicit themes	Trained care home staff to restrict pharmacological interventions for agitation	A total of 14 patients were stable and discharged post intervention
Nicholls et al. (2013)	Australia, family members of nursing home demented individuals	Three-phase mixed method design	31 family caregivers	Semi-structured focus group interviews	Pre, post evaluation of “high touch” intervention based on the End-of-Life Namaste Care program	Residents and families felt more relaxed and comfortable in their interactions with each other

Oppikofer and Geschwindner (2014)	Switzerland, nursing home residents	Pre- post design	67 residents	Cohen-Mansfield Agitation Inventory, Pittsburgh Agitation Scale	Implementation of nursing interventions to decrease agitation	Five nursing interventions (noise reduction, ADLs, fluids, communication, walking) greatly decreased agitated behaviors
Palm et al. (2014)	Germany, nursing home residents	Multi method pre, post-test	145 residents	DemCare-Q questionnaire	Instrument development to assess non-pharmacological interventions	Content validity established, proposed additional testing to test further instrument reliability
Spagnolo et al. (2015)	Italy, outpatient individuals with dementia	Retrospective Observational study	36 patients	Cumulative Illness Rating Scale, Mini Mental Status Examination,	3R Mental Stimulation intervention	There was a decrease in challenging behaviors, along with caregiver distress
Toba et al. (2014)	Japan, newly admitted nursing home residents	Non randomized study design	158 residents in the intervention group and 54 in the control group	Mini Mental Status Examination, Observational Assessments, Dementia Disturbance Scale	Intensive rehabilitation individual activity interventions	Improvement in cognitive function and behaviors
Van Mierlo et al. (2015)	Netherlands, newly admitted nursing home residents	Qualitative explorative design with semi-structured interviews	22 interviews	Mini Mental Status Examination, Neuro psychiatric Inventory	Family and staff education education on how to deal with difficult behaviors of individuals transitioning from the community to the nursing home family support	Intervention increased awareness for both staff and families of challenging behaviors
Tournier et al. (2017)	France, nursing home residents	Pre-, post-intervention	15 residents	Mini Mental Status Examination, systematic assessment of observed behaviors	Trainer-dog pair sessions	Modest effect on resident behavioral scores, but significant improvement in caregiver stress scores

Pharmacological Interventions

Pharmacological agents are considered the last choice of treatment to address unsafe, challenging behaviors in dementia, that include pacing, restlessness, irritability, extreme anxiety, agitation and aggression. Although approximately 40-60% of individuals who experience the above behaviors are nursing home residents, it has been reported that an additional 20% experience those behaviors in the community (Zeller et al. 2016). The safety and efficacy of available medications is considered controversial and clinicians are urged to exercise caution given the severity of possible adverse reactions of most medications. Moreover, dose variations, diversity in assessment scales and limited data reporting from failed trials in addition to population heterogeneity when it comes to drug responses create further issues and limit our knowledge when it comes to medication management of behaviors and symptomatology (Anand et al. 2014).

Acetylcholinesterase Inhibitors and Antidepressants

Although the benefit of acetylcholinesterase inhibitors has been consistently discussed in the literature of the past two decades, the efficacy of medications such as memantine and donepezil to address aggression agitation, and irritability has not been consistent. Furthermore, methodological limitations, small sample sizes, lack of assessment tools, and variance in the use of control groups complicate the picture even further (Cankurtaran 2014). Conservative benefits of antidepressants, with SSRIs being the most preferable option, have been associated with improvement in agitation, and are better tolerated than typical and atypical antipsychotics. Research studies still need to explore safety issues associated with long-term use (Cankurtaran 2014, Ballard and Corbett 2010).

Antipsychotics

The use of typical and atypical antipsychotic medications has been discussed primarily over the past two decades in managing aggressive behaviors. Small placebo-controlled trials have focused on the effectiveness of controlling agitation and aggression, yet the use of antipsychotics and concerns over the possibility of cerebrovascular complications, prolonged QT intervals, dystonias, Parkinsonian presentation and concerns about increase in mortality rates have limited intervention periods and make the use of antipsychotics controversial amongst prescribers (Ballard and Corbett 2010). In a prospective clinical trial Mintzer et al. (2006) found risperidone to be significantly effective in addressing psychotic presentation, whereas the efficacy of olanzapine was not supported by all reviewed studies (Schneider et al. 2006, Mintzer et al. 2006, Sultzer et al. 2008). Additionally, quetiapine did not address agitation adequately (Ballard et al. 2005), yet, aripiprazole provided significant amelioration in aggression in another clinical trial (Streim et al. 2008).

Mood Stabilizers and Antiepileptics

Preliminary results from small studies offer conservative benefits for the use of antiepileptic agents to decrease behavioral disturbances, with some agents showing little to no effect in addressing those behaviors (Hungerford et al. 2014). A small number of studies have modestly supported carbamazepine, gabapentin, topiramate and lamotrigine in managing agitation and aggression in some patients, whereas valproate and lithium provided very limited or no effectiveness in managing behaviors (Yeh and Ouyang 2012, Amann et al. 2009, Ng et al. 2009, Desai and Grossberg 2001). Small sample sizes, inconsistencies in the use of measurement scales, use of subjective measurements, low reliability of outcomes, medication adverse reactions and drug to drug interactions in the elderly populations necessitate for close attention and conservative approaches when it comes to the use of these medications to manage aggressive behaviors.

Other Treatment Modalities

Electroconvulsive Therapy (ECT)

Although ECT has been widely utilized with great effectiveness in the treatment of mood depressive disorders in the general population, little has been reported on the effectiveness of this treatment modality to control agitation and aggression in dementia. Yet, ECT is considered to be an attractive option, especially when antipsychotics produce limited results in the area of symptom management, or are associated with serious side effects. Despite its safety and reported effectiveness ECT is considered an off-label, last resort approach in absence of treatment effectiveness of other interventions (Ujkaj 2015). Research findings have been consistently promising over the past decades. For instance, Bang et al. (2008), Wu et al. (2010), Kerner and Prudic (2014), Holmberg et al. (1996) reported improvement in depression, and agitation in patients suffering from dementia.

Consistent with those findings in a more recent study, encouraging results from the use of ECT were reported by Acharya et al. (2015) who followed a group of 23 individuals receiving ECT as the primary intervention to address agitation and aggression. It was found that a total of 87% of the participants tolerated the procedure well and experienced statistically significant reduction in aggression and agitation from baseline. The remaining participants had to discontinue the study primarily because of issues unrelated to ECT such as development of infection (9%), new cardiac diagnosis (4%), death (4%). Only two participants (9%) did not benefit from treatment. Similarly to other ECT studies, this study was also limited due to the small sample size, the heterogeneity of dementia diagnoses and the lack of a control group.

Transcranial Magnetic Stimulation (TMS)

The effectiveness of TMS has been studied in depression with promising effectiveness. Existing studies in dementia have found that TMS may improve cognitive function and verbal communication (Wu et al. 2015, George et al. 2010, Hoogendam et al. 2010, Cotelli et al. 2008, Cotelli et al. 2011). In a randomized trial by Wu et al. (2015) the effectiveness of high frequency transcranial magnetic stimulation (rTMS) in conjunction with standard antipsychotic medications was assessed in a group of 27 participants with a Mini-Mental State Examination (MMSE) of less than 24 and compared to a control group receiving only antipsychotic medication over a period of 4 weeks. It was found that the intervention group experienced statistically significant improvement in the areas of anxiety, phobias, sleep, cognitive function, mood instability, restlessness, aggression and agitation. Although the results on the effectiveness of rTMS and antipsychotic medication were promising, the researchers acknowledged limitations related to the small sample size, and lack of data discussing long-term effectiveness, as well as lack of direction for the use of booster sessions.

Bright Light Therapy (BLT)

The use of BLT has been studied with a number of conditions. The effectiveness of this intervention is rather inconclusive when addressing agitation in older adults with dementia (Hanford and Figueiro, 2013). The effects of daily administration of BLT for one hour over a period of 11 weeks were studied in a randomized trial by Dowling et al. (2005). One group received the intervention in the morning, another one in the afternoon and the control group received regular indoor light. The researchers reported statistically significant differences between the three groups in the areas of aggression and agitation, thus supporting the effectiveness of BLT. In another randomized controlled trial participants in the intervention group were exposed to 10,000 lux intensity light, whereas controls were exposed to standard 100 lux fluorescent light, for a period of two weeks, for two hours a day. It was found that participants in the intervention group experienced improved sleep and decreased agitation, however, the findings were not statistically significant (Dowling et al. 2005).

Nursing Implications

The literature overwhelmingly supports a combination of treatment approaches that individuals suffering from the illness can benefit from. Nurses have an ongoing involvement in the care of these individuals not only in long term care facilities and the community, but also in the hospital setting. Providing person-center care interventions greatly increases the chances to successfully address challenging behaviors that have the potential to escalate to aggressive presentation (Stein-Parbury et al. 2012). The enhancement of cognitive function through activities such as socialization, reminiscence, support of activities of daily living,

are just a few basic examples that promote environmental structure, reorientation and a sense of security, which in return may contribute to the decrease of challenging behaviors (Cohen-Mansfield et al. 2011b).

Although major advances in the area of neuropsychiatry have enabled health care providers to understand the biological basis of challenging behaviors and aggression associated with Alzheimer's disease and related dementias, there is still much to be discovered. Yet, nurses are in a unique position to know their patients' personality characteristics and abilities, thus being able to implement communication strategies, activities, and other related approaches to promote a culture of safety and self-worth, where everyone feels protected. By modifying the milieu, eliminating loud, frightening noises, clutter, or overstimulation, but also making clinical judgement calls when the assistance of medication may be helpful, the intensity of a challenging behavior can be significantly decreased (Keltner et al. 2011). This in return can promote quality of life for the affected individual overtime, but also decrease health care provider and family caregiver burnout with the ultimium goal of delaying and in some cases even preventing nursing home placement.

Conclusions and Future Recommendations

Our understanding of the biological basis of disturbing behaviors in dementia with the most difficult ones of agitation and aggression is limited and the pathophysiology of the illness is continually changing. The exact process of the disease process is still unclear. New findings often times replace previous knowledge about the process. For instance, neuron damage now is believed to be a rather continuous and ongoing process caused from tangles (Anand et al. 2014). A complex casqued of mechanisms affecting mitochondrial dysfunction, and contributing to chronic oxidative stress, inflammation, hormonal imbalances, neurofibrillary tangle accumulation, in addition to genetic abnormalities, seem to have a significant contribution in the disease process (Hungerford et al. 2014). Currently, the focus of pharmacological and non-pharmacological treatments is on addressing specific symptomatology.

The evidence of successful pharmacological management of disruptive behaviors in dementia is inconclusive and study outcomes are limited by a variety of uncontrolled variables and sampling issues. Cholinesterase inhibitors, antidepressants, typical and atypical antipsychotics, benzodiazepines, mood stabilizers and other pharmacological interventions have shown various degrees of effectiveness. Upcoming research presents some innovative approaches, which although at the infancy stage, appear to be promising. Amongst those, immunotherapy, anti-inflammatory therapy, antioxidant supplementation, DNA vaccination are attractive options to consider. In addition, great emphasis is placed on understanding the disease process correctly, as well as the drug's bioavailability and pharmacokinetics (Anand et al. 2014).

Yet, health care providers have been more successful when including psychosocial and behavioral interventions than medication alone. In hospital and

nursing home settings, nursing staff can utilize a variety of behavioral interventions to redirect inappropriate or challenging behaviors, provide structure and purpose and promote self-esteem. Individual and group activities that provide mental stimulation draw from familiar past roles and support self-worth can diminish disruptive behaviors even for a brief period of time. Activities such as music therapy, sing along, reminiscing, aromatherapy, movie night, grooming group, pet therapy, exercise, are just a few options that are popular treatment interventions and are considered safe and well tolerated. Future research can explore the effectiveness of specific behavioral interventions and medications that are successful in addressing specific disruptive behaviors taking into consideration individuals' cultural background. In addition, involving family members in such activities, may allow for continuation of successful interventions at home for community dwelling patients with the ultimate benefits of improved quality of life and perhaps delay in nursing home placement. Moreover, new problem solving health care provided approaches such as the "DICE" approach (Describe, Investigate, Create, Evaluate) can assist in implementing a plan of care that focuses on individual patient needs, thus allowing for more successful management of behaviors (Kales et al. 2014b). Finally, research studies on caregiver direct involvement in activities for the affected person can provide new insights into the areas of caregiver physiological and psychological health.

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Imaging and Stroke Outcome – Evidence from Upper Austria

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Acute Stroke is known as a neurologic emergency, which should be treated as soon as possible. The differences in treatment are dependent on the subtypes of stroke (intracranial hemorrhage/cerebral infarction). To discriminate between bleeding and infarction it is necessary that the patients undergo CT or MRI before treatment. Many recent studies suggest rapid neuroimaging (CT/MRI) for better outcome. However an association between delay of medical imaging, type of imaging and outcome (mortality rate) has not been systematically investigated. The aim of the present paper therefore is to explore the impact of time and type of imaging on outcome. Data was collected over a period of 9 years (2007 – 2015) by using clinical data (N=48,355). Binomial logistic regression was used to estimate odds ratios (OR) and 95% confidence intervals (CI) for the association between age (5 groups) as well as pre-notification by the emergency rescue or doctor, neuroimaging using Stata ©. In several models controlling for patient age and severity of stroke using the National Institutes of Health Stroke Scale (NIHSS), MRI as a diagnostic tool is associated with lower mortality in brain infarction, while for CT imaging no association is found. Time to picture, however, has no significant influence.

Keywords: Stroke, Pre-notification, MRI, CT, Austria

Introduction

Cardiovascular diseases are worldwide leading causes of death. About one third of these deaths is caused by stroke (Bonita, Beaglehole, & Asplund, 1994) which is the most frequent neurological emergency (Hasenbein, 2006). Due to its high prevalence (Feigin, Lawes, Bennett, Barker-Collo, & Parag, 2009; Lemesle et al., 1999; Wieberdink, Ikram, Hofman, Koudstaal, & Breteler, 2012) stroke is one of the most economically important diseases all over the world (Buttinger & Stummer, 2012).

The diagnosis "stroke" presents with an acute onset of a central nervous deficit on the basis of a vascular pathology, starts suddenly and lasts longer than 24 hours. Fugacious, often self-limiting neurological disorders with a significantly shorter duration are called TIA (Transient Ischemic Attack). In recent years, the concept of "acute ischemic cerebrovascular syndrome" (AICS) is found in the literature (Kidwell & Warach, 2003). In this concept the duration of the clinical symptoms is not included in the definition.

The two main subtypes of acute stroke (about 15% cerebral bleeding; about 85% brain infarction) (Warlow, Sudlow, Dennis, Wardlaw, & Sandercock, 2003) need different strategies of therapy.

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Dependent from size (mass effect?), location (compression?), age and comorbidity of the patient either conventional therapeutic strategies (slowly resorption of blood) or surgical procedures (evacuation of intracranial blood) are indicated in case of acute stroke due to intracranial hemorrhage (Bösel, Zweckberger, & Hacke, 2015; Datar & Rabinstein, 2014; Kirkman, Citerio, & Smith, 2014).

Different to other sites in the human body the vascular supply of the central nervous system has only few collaterals. In case of a brain infarction at least one (cervical or intracranial) vessel is occluded due to various reasons. This means that in case of a vascular occlusion the affected brain territory gets insufficient blood and oxygen and therefore loses cerebral function and vitality. Because there is only a short time window for survival of brain cells, it is necessary that the blood flow is restored as soon as possible ("time is brain") in order to minimize deaths and improve functional outcomes (Gomez, 2018). Many trials demonstrated that in case of brain infarction intravenous thrombolytic therapy with recombinant tissue plasminogen activator (rtPA) given up to 4.5 hours after symptom onset is an effective treatment which saves lives and improves functional outcome (Adams et al., 2007; Hacke et al., 2008; Hajjar, Kerr, & Lees, 2011; Lees et al., 2010; Nolte & Endres, 2012; Schellinger et al., 2007; Shobha, Buchan, Hill, & Canadian Alteplase for Stroke Effectiveness, 2011). On the other hand outcome data has shown that in less than 30% of patients with a clot in a proximal intracerebral artery (middle cerebri artery or basilar artery) or in the internal carotid artery intravenous thrombolysis (rtPA) leads to an early recanalization (Fransen et al., 2014).

Therefore in the last years another treatment option for ischemic stroke was proven. Since November 2014 five positive randomized controlled trials (MR CLEAN, REVASCAT, ESCAPE, SWIFT PRIME, EXTEND IA) impressively showed that the treatment of a severe stroke due to a proximal vessel occlusion is safe and highly effective when the blood clot is removed early by mechanical intraarterial thrombectomy (Campbell et al., 2014; Evans, White, Cowley, & Werring, 2017; Fransen et al., 2014; Molina et al., 2015; Palaniswami & Yan, 2015; Saver et al., 2015; Weiner & Ducruet, 2015).

Early intraarterial mechanical thrombectomy (within 6 hours after onset of stroke symptoms) significantly improves outcome in case of severe ischemic stroke (Evans et al., 2017) and therefore this therapeutic procedure has found its way into certain guidelines (Ringleb & Veltkamp, 2015; Schlaganfall-Gesellschaft, 2017).

A few subgroups of stroke (e.g. wake-up strokes) are not fully covered from these data. In order to select patient groups which will mostly benefit from a mechanical intraarterial thrombectomy a strong need for a multimodal neuroradiologic imaging was shown (Menon, Campbell, Levi, & Goyal, 2015; Palaniswami & Yan, 2015).

The DEFUSE3 trial used (CT or MR) perfusion imaging in order to select patients with a severe stroke (6 to 16 hours after a patient was last seen well) eligible for endovascular treatment (Albers et al., 2018). Similar, the DAWN trial used CT (Perfusion) or MR (Diffusion) imaging (difference between infarct

volume and clinical deficit) in order to select patients suitable for thrombectomy 6 to 24 hours after stroke (Nogueira et al., 2018). Despite of noticeably later beginning of endovascular treatment both trials demonstrated better outcomes for patients treated with endovascular therapy plus standard therapy than standard medical therapy alone. The findings of the DEFUSE3 trial (Albers et al., 2018; Powers et al., 2018) led to a major revision of the 2018 guidelines for the early management of patients with acute ischemic stroke in the US (Powers et al., 2018).

Clinical neurological examinations are used to assess the severity of an acute stroke. For this purpose some scoring systems (clinicometric scales and functional impairment scales) have been developed. The Barthel Index (BI) and the modified Rankin scale (mRS) are widely used functional impairment and disability scales (Ghandehari, 2013). For daily use in emergency situations at hospital sites the National Institute of Health Stroke Scale (NIHSS) has been proven successful. Moreover this deficit scale is also routinely used in clinical stroke trials (Goldstein & Samsa, 1997).

Many papers describe clinical outcomes from acute stroke and the measurement of clinical outcome parameters after suffering from stroke. Unlike for other diseases, however, there is no conclusive evidence on the right moment and on which kind of measurement (Davalos, Castillo, & Martinez-Vila, 1995; Duncan, Jorgensen, & Wade, 2000; Hacke et al., 2008; Johnston et al., 2000; Kotila, Waltimo, Niemi, Laaksonen, & Lempinen, 1984; Martínez-Vila E, 2004). In addition, different, non-coherent stroke scales (NIHSS, mRS, BI) are used to describe the results of treatment (Ghandehari, 2013; Hacke et al., 2008; Kotila et al., 1984; Ward, Payne, Caro, Heuschmann, & Kolominsky-Rabas, 2005).

Stroke symptoms are equal in all types of stroke (cerebral bleeding or intracranial infarction) and can only be safely distinguished by neuroradiologic imaging. Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) are practical worldwide used imaging modalities for selecting patients to get the right therapeutic strategy (Adams et al., 2007; Menon et al., 2015; Menon et al., 2013; Veltkamp, 2012)

Noncontrast CT (NCCT) discriminates reliably between cerebral ischemia and intracranial hemorrhage and therefore provides the information to make decisions about therapy options in most of cases (Menon et al., 2015; von Kummer et al., 1994).

CT Angiography (CTA) can easily depict (carotid or intracranial) vessel occlusion and therefore helps clinicians in selecting patients eligible for endovascular treatment (Adams et al., 2007; Menon et al., 2015)

CT Perfusion (CTP) visualizes the infarct core and the tissue at risk. Additional dynamic angiography views generated from raw CTP data are helpful in grading collaterals with excellent temporal resolution (Menon et al., 2013).

MR Diffusion Imaging (DWI), MR Perfusion Imaging (MRP) and MR Angiography (MRA) of patients with acute stroke symptoms are also helpful to rule out stroke mimics and in categorizing the type of stroke (Menon et al., 2015). MR imaging is more time consuming than CT imaging and motion artifacts are more common (Menon et al., 2015; Menon et al., 2013). Therefore, in most

national guidelines only standard CT or MRI and not Perfusion or Angiography are included.

There is also limited data about outcome from acute stroke and the role of MRI imaging. Burke et al (Burke, Gelb, Quint, Morgenstern, & Kerber, 2013) looked for circumstances influencing management of patients with acute stroke and outcome parameters in cases where MRI was used (Burke et al., 2013).

If a patient reaches the emergency department with symptoms of an acute stroke quick and robust neuroradiologic imaging (CT or MRI) is necessary for managing further therapeutic steps (Audebert & Fiebach, 2015; Menon et al., 2015). Time consuming imaging procedures (CTP, MRA, MRP) should only be used in special situations (e.g. wake up stroke) or in controlled stroke trials (Audebert & Fiebach, 2015).

Aim of the Present Study

As discussed in the literature review, there is little evidence on the relation between the type of imaging and outcome. The aim of the underlying paper is to analyze more in detail the triangular relation between different imaging types (CT/MRI), treatments used (thrombolysis) and outcomes (mortality) for stroke patients in order to improve clinical practice guidelines. Our proposition for the optimization of the clinical process is the following:

We suggest that (1) a pre-notification (aviso) from the ambulance will reduce the time to image acquisition, (2) the different types of imaging (CT vs. MRI) will lead to differences in treatment and (3) therefore, different outcomes regarding the type of imaging can be observed.

Methodology

For testing our assumptions, we use a rich stroke registry dataset from Upper Austria containing 48,335 documented insults from 16 hospitals between October 2006 until December 2015. Due to missing data, only 5 of the 9.3 years can be used for the present analysis. Furthermore, we only include cases admitted to the hospitals with one of the following two diagnoses: (i) cerebral infarction (ICD-10 code I63) or (ii) intracranial hemorrhage (ICD-10 code I60-I62). Our primary outcomes include the time to image acquisition measured on a 5-point ordered scale from (1=image prior to admission, 2=less than 0.5 hours, 3=0.5–1 hour, 4=1–6 hours to 5=image more than 6 hours after admission to the hospital), the probability of receiving thrombolysis (1=Yes, 0=No) and in-hospital mortality. Secondary outcomes include 7-day mortality, 30-day mortality and 90-day mortality.

In the statistical analysis, a Mann-Whitney *U* Test is used to compare the median time to imaging acquisition between cases where an aviso happened and cases without aviso. Binomial logistic regressions with hospital fixed effects are used to estimate odds ratios (OR) and 95% confidence intervals (CI) for (i) the association between MRI, CT and the probability of receiving thrombolysis and

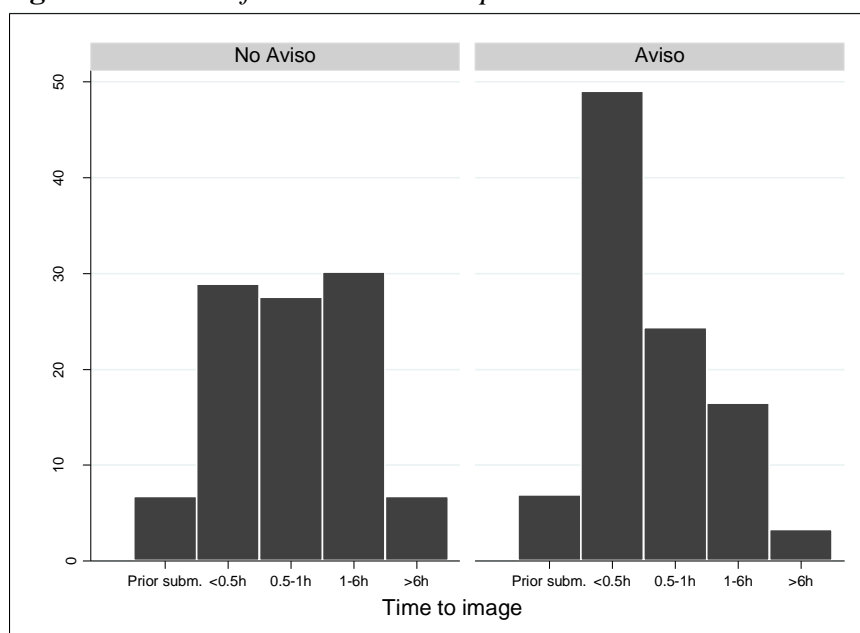
(ii) MRI, CT and mortality rates controlling for age (measured in years), sex, the stroke severity measured with the National Institutes of Health Stroke Scale (NIHSS) and time to image acquisition for the two main stroke subtypes using Stata 14 ©.

Results

From the overall database of 9.5 years, only 5 years could be used as all the relevant variables were coded properly and no systematic misses could be detected what reduces the number of cases to 22,199. As some of the analyses we are referring to only some of the hospitals in the database (e.g. hospitals having both, CT and MRI) for some of the analyses the number of cases are reduced further down to a lowest number of 3,337.

Our first proposition was that a pre-notification (aviso) from the ambulance or from the emergency doctor significantly reduces the time from admission to image acquisition. Figure 1 shows the distribution of the variable "time to image" by aviso state. When an aviso happened (right panel Figure 1) almost 50% of patients receive a CT or MRI within the first 30 minutes, whereas without aviso (left panel Figure 1) this proportion drops to less than 30%. Using a Mann-Whitney U test for testing the difference in the two distributions, a significant difference is found between cases with and without pre-notification ($p < 0.001$). Our first result therefore shows that an aviso significantly reduces the time span between admission and image acquisition.

Figure 1. Pre-Notification at the Hospital and Time to Picture



Our second proposition was that using different types of imaging will lead to differences in treatment measured by whether patients receive thrombolysis

or not. We did this analysis in two steps, testing differently the hospitals that have both, CTs and MRIs and the hospitals only having CTs. In the hospitals having both, 3,583 cases can be analyzed.

Table 1. *Influence of Imaging on Thrombolysis Rate within Hospitals Having both, MRI and CT*

Variables	Thrombolysis Rate	
	OR (SE)	95% CI
MRI (=1)	1.668 (0.172)	1.364-2.040
CT (=1)	0.382 (0.039)	0.313-0.466
Age (in years)	0.997 (0.004)	0.989-1.004
Female (=1)	1.168 (0.115)	0.963-1.416
Time to image	0.744 (0.032)	0.683-0.810
NIHSS score	1.085 (0.007)	1.071-1.100
Constant	0.357 (0.111)	0.194-0.655
Observations	3,583	

Notes: Binomial logistic regression with hospital fixed effects and robust standard errors (SE) clustered on patient level in parentheses.

Table 1 shows the results for running a logistic regression where the probability of thrombolysis is regressed on both MRI and CT controlling for additional covariates for hospitals having both CT and MRI. The results show that when an MRI is used, the odds of thrombolysis is 1.67 times higher than without MRI ($p < 0.001$) whereas when a CT is used the odds of performing a thrombolysis significantly decrease to 0.382 ($p < 0.001$) compared to no CT. In addition, Table 1 also shows that for patients with a higher NIHSS score the odds for thrombolysis increase significantly while for patients where the time span between admission and image acquisition is high the odds for thrombolysis decrease significantly.

When testing the frequency of thrombolysis between hospitals with both MRI and CT and hospitals only having CT ($N=310$), we observe a slightly higher rate of thrombolysis in hospitals with both CT and MRI (OR=1.297, CI: 0.935-1.798). This result, however, is not significant, therefore the treatment behavior within the first group differs depending on the imaging type used, but the treatment behavior does not differ between hospitals having both imaging types and hospitals only having CT.

As we assumed in proposition (3), the different treatment behavior analyzed in proposition (2) should lead to different outcomes. This should only be true for cerebral infarction, as bleeding can be seen in both, CT and MRI. To test our proposition, we run logistic regressions for in-hospital mortality, as well as 7-day, 30-day and 90-day mortality.

Table 2. Influence of Imaging on In-Hospital Mortality for Hospitals Having both, MRI and CT for Cerebral Infarction (ICD-10 I63)

Variables	In-hospital mortality	
	OR (SE)	95% CI
CT (=1)	0.913 (0.214)	0.576-1.446
MRI (=1)	0.458 (0.114)	0.281-0.745
Age (in years)	1.068 (0.010)	1.049-1.088
Female (=1)	0.792 (0.139)	0.561-1.118
Time to image	0.972 (0.085)	0.819-1.154
NIHSS score	1.192 (0.013)	1.167-1.217
Constant	0.0001 (0.00008)	0.00002-0.0005
Observations	3,337	

Notes: Binomial logistic regression with hospital fixed effects and robust standard errors (SE) clustered on patient level in parentheses

Table 2 shows the results for regressing in-hospital mortality on the two imaging types for hospitals having both MRI and CT and for patients diagnosed with cerebral infarction. Controlling for additional covariates, the results show that running an MRI is associated with a significantly lower in-hospital mortality (OR=0.458, CI: 0.281-0.745), whereas for CT we do not find any significant relation. Interestingly, time to image – though a critical variable in guidelines – has no influence on mortality (Table 3).

Table 3. Influence of Time to Picture I60-62

Variables	(1)	(2)	(3)	(4)
	In-hospital mortality	7-day mortality	30-day mortality	90-day mortality
Age (in years)	1.044*** (0.0161)	1.031 (0.0196)	1.037** (0.0164)	1.054*** (0.0161)
Female (=1)	1.032 (0.350)	1.182 (0.531)	1.178 (0.418)	1.046 (0.342)
Time to picture	1.064 (0.184)	0.724 (0.234)	1.053 (0.193)	1.151 (0.187)

Notes: Binomial logistic regression with hospital fixed effects and robust standard errors (SE) clustered on patient level in parentheses

When running the same regressions for our secondary outcomes (7-day, 30-day, 90-day mortality), the results remain robust (Tables A1-A3 in the Appendix).

In sum, our results show that (1) a pre-notification has a significant influence on time to image, (2) for hospitals having both, CT and MRI, using MRI leads to a significantly higher thrombolysis rate and (3) therefore using MRI (when having a cerebral infarction), is associated to lower mortality rates. This can be due to higher thrombolysis as maybe the doctors feel more secure, but that cannot be proved with the data (4) However, time to image has no impact on mortality rates.

Discussion

The two main causes of acute stroke (intracranial bleeding vs. cerebral ischemia) need different therapeutic strategies: Small Hemorrhages without brain herniation disappear by phagozytosis, larger bleedings often need to be evacuated (craniectomy). In case of cerebral ischemia rapid reperfusion techniques (i.v. thrombolysis, endovascular therapy) are necessary in order to supply the brain with blood again.

In acute stroke non-contrast Computed Tomography (NCCT) helps to distinguish intracranial bleeding from cerebral ischemia and is often followed by CT-Angiography in order to select patients with a proximal occlusion of a large intracranial vessel for endovascular treatment within the first 6 hours (Audebert & Fiebach, 2015).

If there is no information about the beginning of the symptoms (e.g. wake up stroke) MRI (DWI, Perfusion) is used to distinguish between infarct core and penumbra areas (mismatch imaging) (Berkefeld & Neumann-Haefelin, 2009). On this way patients eligible for endovascular therapy can be selected properly.

Head CT is less time consuming than performing MRI of the neurocranium and enables door-to-needle time of 20 minutes or less to stroke patients (i.v. Thrombolysis). On the other hand MRI is more sensitive in detecting cerebral ischemia and penumbral tissue loss.

What we expected was the positive impact of pre-announcement on the time to the imaging (CT or MRI). This is in line with the literature and the rational expectations. However, there is no significant correlation between time to picture and mortality. Maybe this can be that the time span can really be longer as discussed or mortality is the wrong outcome indicator for this improvement of processes. Using the Barthel-index (Schlote, Krüger, Topp, & Wallesch, 2004), a nursing based index on activities of daily living would probably either support this result or lead to different results. The latter proposition would be suggested by us.

We tested treatment behavior in hospitals having both, MRI and CT and in hospitals only with a CT. While between those two groups, no significant differences exist, there are significant differences within the group of the hospitals having both. In the latter hospitals, treatment behavior of MDs differs as a function of imaging. Probably, if they are used to having images more sensitive in detecting cerebral ischemia, physicians feel more secure having MRI and are more cautious in giving lysis i.v. if they are not really sure. In opposite to a recent study (Hansen et al., 2018) our findings demonstrate lower mortality rates when MR-Imaging was performed. These different results could be subject for further research.

In the long run, due to additional reperfusion techniques (mechanical thrombectomy) (Evans et al., 2017), guidelines will change, however in many countries this will take some time and then (CT- or MR-) Angiography will be the standard and then those differences should no longer be the case.

Conclusion

In hospitals equipped with two imaging modalities (CT and MRI), using MRI leads to a significantly higher thrombolysis rate and is associated with lower mortality rates. Though pre-notification significantly lowers time to image, it does not influence mortality in patients with acute stroke. Retrospective real-world data analysis can – due to high specificity – complement insights from clinical data (Geisel-Marbaise & Stummer, 2010), however it cannot replace it. Our data show a significant difference in treatment behavior based on imaging modalities more sensitive for detecting cerebral ischemia. Prospective studies however should prove the causality.

Limitations

Due to data quality issues only part of the database could be used. In future research, better standardized routine data from stroke registers should be able to compare pairs of patients with additional data on activities of daily living.

Ethical Approval

An approval by a local ethic committee was not necessary due to the local hospital act regarding the use of non-interventional standard data; however the use of the data was registered by the federal data protection commission, the predecessor of the data protection authority domiciled at the federal chancellery under the number DVR 0023981.

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Appendix

Table A1. Influence of Imaging on 7-Day Mortality for Hospitals Having both, MRI and CT for Cerebral Infarction (ICD-10 I63)

Variables	7-day mortality	
	OR (SE)	95% CI
CT (=1)	0.766 (0.200)	0.460-1.277
MRI (=1)	0.406 (0.121)	0.227-0.727
Age (in years)	1.061 (0.012)	1.037-1.085
Female (=1)	0.821 (0.180)	0.535-1.261
Time to image	1.061 (0.102)	0.879-1.281
NIHSS score	1.192 (0.014)	1.164-1.220
Constant	0.00009 (0.00009)	0.00001-0.0006
Observations	3,337	

Notes: Binomial logistic regression with hospital fixed effects and robust standard errors (SE) clustered on patient level in parentheses.

Table A2. Influence of Imaging on 30-Day Mortality for Hospitals Having both, MRI and CT for Cerebral Infarction (ICD-10 I63)

Variables	30-day mortality	
	OR (SE)	95% CI
CT (=1)	0.978 (0.211)	0.641-1.492
MRI (=1)	0.443 (0.099)	0.285-0.687
Age (in years)	1.079 (0.010)	1.059-1.100
Female (=1)	0.810 (0.133)	0.587-1.119
Time to image	1.070 (0.090)	0.907-1.261
NIHSS score	1.185 (0.012)	1.161-1.209
Constant	0.00006 (0.00005)	0.00001-0.0003
Observations	3,337	

Notes: Binomial logistic regression with hospital fixed effects and robust standard errors (SE) clustered on patient level in parentheses.

Table A3. Influence of Imaging on 90-Day Mortality for Hospitals Having both, MRI and CT for Cerebral Infarction (ICD-10 I63)

Variables	90-day mortality	
	OR (SE)	95% CI
CT (=1)	0.944 (0.179)	0.651-1.368
MRI (=1)	0.419 (0.085)	0.282-0.622
Age (in years)	1.095 (0.010)	1.076-1.115
Female (=1)	0.980 (0.136)	0.747-1.286
Time to image	1.101 (0.079)	0.956-1.267
NIHSS score	1.171 (0.011)	1.149-1.192
Constant	0.00004 (0.00003)	0.0000-0.0002
Observations	3,337	

Notes: Binomial logistic regression with hospital fixed effects and robust standard errors (SE) clustered on patient level in parentheses.

Interrelation of the Population Awareness of the Presence of an Increased Risk of Developing Type 2 Diabetes Mellitus

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Diabetes mellitus (DM) is one of the most important public health problems in the world. The aim of the study is to evaluate the initial level of knowledge of the population about risk factors, the first signs and complications of the disease, and to define the weaknesses of hygienic education of the population. Also we have conducted comparative analysis of the psychosomatic status of patients with Type 2 Diabetes Mellitus (T2DM) and without diabetes. During the study, 300 people were interviewed about awareness of diabetes issues and the 10-year risk of developing T2DM (FINDRISC score) was estimated. Interrelation of the population awareness of an increased risk of developing T2DM was studied. Eating behavior was studied using the Dutch Eating Behavior Questionnaire (DEBQ). Hospital Anxiety and Depression Scale (HADS) was used to assess the psychological and emotional status. Stress-resistance was studied using the Social Readjustment Rating Scale (SRRS). Personality features were assessed using the Toronto Alexithymia Scale. 33% of respondents of population were not informed about the risk factors for diabetes, 38% - about the first signs of the disease; 29% - of possible complications. The largest proportion of factors that significantly influenced the 10-year risk of developing T2DM were modifiable behavioral factors, namely, body mass index (BMI), waist circumference (WC), daily availability of 30-minute activity and consumption of vegetables. About half of the respondents do not follow the recommendations on rational diet, physical activity, smoking cessation and alcohol consumption. Low level of awareness of these issues leads to underestimation of existing risk factors, unwillingness to change the habitual lifestyle and, as a consequence, increases the risk of diabetes. Thus, it is necessary to improve the awareness of both the population and specialists in diabetes issues, increase responsibility of medical staff to the patient, increase the interest of the population to a more conscious and responsible attitude to their own health.

Keywords: Awareness, Diabetes mellitus, Prediabetes, Psychosomatic status

Introduction

Chronic non-communicable diseases (CNCDS) are the leading causes of death throughout the World Health Organization (WHO) European Region. More than 75% of all deaths are caused by one of four CNCDS - cancers, cardiovascular diseases, diabetes and chronic respiratory diseases. In the Republic of Belarus, as in other countries, CNCDS remain the main cause of morbidity, disability and premature mortality, accounting for 86% of deaths and 77% of overall morbidity

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(WHO 2017). According to recent studies, 52% of the patients who has several CNCs are persons aged under 65 (WHO 2013). Currently, diabetes has the leading prevalence rate among all non-communicable diseases. The number of people with diabetes has increased from 108 million in 1980 to 422 million in 2014. The global prevalence of diabetes among people over 18 years has increased from 4.7% in 1980 to 8.5% in 2014. The prevalence of diabetes is increasing faster in middle- and low-income countries (WHO 2016). According to the International Diabetes Federation (IDF), in 2011, diabetes accounted for about 4.6 million deaths worldwide (IDF 2011). In more than half of cases T2DM occurs in active working age (40-59 years). It must be noted that according to the experts of the IDF the number of people with diabetes aged 20-79 years was predicted to rise to 642 million (uncertainty interval: 521-829 million) by 2040 (Ogurtsova et al. 2017).

Diabetes mellitus is a major public health problem worldwide. This disease has become one of the major causes of premature death in most countries. This is also true to Belarus. In the Republic of Belarus as of January 1, 2017, there were 303,922 patients with diabetes under follow-up, including T1DM – 17,264 people, T2DM – 284,207 people (prevalence 3.5%), gestational diabetes - 383, other specific types of diabetes – 2,068. The number of first time diagnosed diabetes has increased of 6-8% per year over the last 5 years. In the general structure of the prevalence of diabetes mellitus in Belarus, T2DM is 93%¹. With the increase in the prevalence of T2DM in Belarus, identifying T2DM at early stage with simple and accurate methods becomes a public health priority.

The role of stress in the etiology of diabetes is difficult to define and measure, but there is significant evidence of its metabolic consequences. Stress is often observed in conjunction with the diagnosis of diabetes and it alters the glucose metabolism and the immune response (Falco et al. 2015). Premorbid psychological features of the personality and its basic parameters (temperament and character) form the basis of any psychosomatoses or psychological trauma. Researchers at the University of Munich identified three main reasons contributing to the development of diabetes in terms of psychosomatic: post-traumatic depression, chronic psychological problems in the family and increased anxiety (Poberey and Mellina 2012). That is why there is the interest in the study of eating disorders accompanied by specific features of thinking and behavior in obesity and T2DM.

An important measure to reduce burden of diabetes is the participation of the patients in the management of their disease. That is why, the main aims of this research are 1) to study the population awareness of the risk factors, symptoms and complications of diabetes mellitus; 2) to estimate 10-year incident of diabetes and evaluate the impact of the level of public awareness on the 10-year risk of developing type 2 diabetes; 3) to consider the problem of psychosomatic relationships in diabetes.

Knowledge of the distinctive features of the patient's psychological profile, based on the study of cognitive, emotional and behavioral characteristics, may be

¹Retrieved from <https://bit.ly/2NX1mNN>. (In Russian)

enable the doctor and patient to interact productively in the process of managing of diabetes.

Literature Review

The term diabetes mellitus describes a metabolic disorder of multiple aetiology characterized by chronic hyperglycaemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action, or both (ADA 2014, WHO 1999).

A degree of hyperglycemia sufficient to cause pathologic and functional changes in various target tissues, but without clinical symptoms, may be present for a long period of time before diabetes is detected (ADA 2014). Modern laboratory capabilities in diagnostics make it possible to detect the condition of "prediabetes".

"Prediabetes" is the term used for individuals whose glucose levels do not meet the criteria for diabetes but are too high to be considered normal. This term used for individuals with impaired fasting glucose (IFG) and/or impaired glucose tolerance (IGT) and indicates an increased risk for the future development of diabetes (ADA 2015). Currently, a serious problem is in the lack of alertness for both doctors and patients at this stage of the disease.

Prediabetes should not be considered as an independent clinical form of the disease, but rather as an increased risk of developing diabetes and cardiovascular diseases (CVDs). Several research studies have shown success of interventions designed for treatment of prediabetes with sustained reduction in incidence of diabetes. It should be noted that the development of T2DM can be prevented through activities aimed at changing the lifestyle (Bansal 2015, Hopper et al. 2011, Knowler et al. 2002, Li et al. 2008, Lindström et al. 2006, Natangelo et al. 1990).

According to the data of American Diabetes Association (ADA), the United States Diabetes Prevention Program demonstrated that intensive lifestyle interventions (ILS) can reduce the incidence of T2DM by 58% within 3 years. The biggest determinant of risk reduction was noted to be weight loss (ADA 2017, Lindström et al. 2006, Knowler et al. 2002). Also randomized studies demonstrate that lifestyle modification, which consists only in reducing body weight and increasing physical activity, prevents or slows the progression of glucose metabolism disorders in persons with IGT, which emphasizes the importance of explaining the need for lifestyle modification and assisting in its implementation (Rydén et al. 2014).

Nowadays, 40-50% of patients with diabetes at the time of diagnosis already have complications associated with the disease (Dedov and Shestakova 2013). The grave complications, such as amputations of lower extremities, blindness and chronic kidney disease adversely affect the ability to work and the quality of life of the patients. Diagnosis of diabetes in the early stages and timely prescribed therapy provide long-term positive results in the treatment of patients with diabetes by preventing or delaying the development of complications (Stratton et al. 2000). Therefore, one of the important goals is to increase the awareness of the general

population about the risk factors, the opportunities for prevention and early detection of diabetes.

Previous studies have shown that individuals with inadequate health literacy had significantly higher rates of hypertension (49.9% vs 43.3%), diabetes mellitus (18.7% vs 12.8%), heart failure (6.1% vs 3.8%), and arthritis (57.3% vs 50.1%) with those with adequate skills. Inadequate health literacy was a significant independent predictor of having diabetes mellitus and heart failure (Wolf et al. 2005). Patients with inadequate functional health literacy are also less likely to know basic elements of their care plan for diabetes and hypertension (e.g., low-salt diet, symptoms of hypoglycemia, normal range for blood pressure or blood glucose level) (Williams et al. 1998).

The issues of assessing the level of knowledge of the population about diabetes and its possible relation to development of T2DM have not been yet studied in the Republic of Belarus, which predetermined the aim of the study. The aim of this study is to specify and evaluate the awareness of the population of Belarus about the risk factors, symptoms, complications of diabetes mellitus and basic preventive measures of pathology. Further, in this study we regard the possible correlation between knowledge of population about diabetes and 10-year risk of developing T2DM. Moreover, in the course of the research we interviewed sample of population in order to regard the problem of psychosomatic relationship in diabetes. Through this, we hope to assess the initial level of knowledge of the population about risk factors, the first signs and complications of the disease, and also to identify the weaknesses of health literacy of the population for the purpose of improving diabetes prevention and decrease prevalence of the disease.

Materials and Methodology

The research data were collected during spring 2017 from the population who applied for medical assistance to outpatient health organizations (organizations which provide primary healthcare in Belarus) in Gomel, Belarus. These institutions were selected as that is exactly where the patients have the first contact with the doctor; and there is possibility to study initial level of knowledge about diabetes. The responders were interviewed by the researcher or filled out the questionnaire by themselves.

The study was approved by the local executive committee of Gomel. All subjects provided informed written consent prior to participation in the study and agreed to anonymous use of their data. The participation was voluntary.

Study of the Population Awareness of Diabetes and its Prevention

Anonymous questioning was used as an investigation method. The Population Awareness Questionnaire included:

- personal data (sex, age);
- sections about diet, physical activity, adherence to prevention, smoking and drinking alcohol habits, sources of information on diabetes; and
- questions about the risk factors for the diabetes, symptoms and complications specific for this pathology.

The main exclusion criteria were:

- patients with a diagnosis of diabetes;
- medical workers; and
- patients with acute conditions, exacerbations of chronic diseases, with chronic diseases in the terminal stage, as well as with mental disorders.

Evaluation of the 10-year Risk of Developing T2DM

The evaluation of the 10-year risk was carried out using the FINDRISC scale proposed by Lindström and Tuomilehto (2003). FINDRISC is a simple self-administered questionnaire which can be used as an initial diabetes screening in primary care or community settings (Zhang et al. 2014). It takes into account the usual clinical characteristics, such as age (years), body mass index (BMI: kg/m²), waist circumference (WC: cm), daily physical activity (having at least 30 minutes of physical activity during work or at leisure time vs. not), daily consumption of fruits, vegetables, and berries (consume every day vs. not), use of antihypertensive medication, history of high blood glucose, and family history of diabetes. BMI and WC were identified from the anthropometric data measured by researchers. The answers to all the other questions of the FINDRISC were identified via self-reported answers.

Interpretation of results was carried out by the sum of the scores from 8 questions and ranges from 0 to 26 (Saaristo et al. 2005, Zhang et al. 2014).

Ten-year risk of developing type-2 diabetes mellitus according to FINDRISC.

- <7 - Low Estimated: 1 in 100 will develop disease;
- 7-11 - Slightly elevated Estimated: 1 in 25 will develop disease;
- 12-14 - Moderate Estimated: 1 in 6 will develop disease;
- 15-20 - High Estimated: 1 in 3 will develop disease;
- 20 - Very high Estimated: 1 in 2 will develop disease (Lindström and Tuomilehto 2003).

Study of Psychosomatic Relationships in Diabetes

Eating behavior was studied using the Dutch Eating Behavior Questionnaire (DEBQ). The Dutch Eating Behavior Questionnaire (DEBQ) was developed to measure eating styles that may contribute to or attenuate the development of overweight. It comprises three scales that measure emotional, external and restrained eating (Cebolla et al. 2014). Psychosomatic theory focuses on emotional eating (eating in response to negative emotions such as depression and

discouragement) as an atypical response to distress. Externality theory emphasizes eating in response to food-related stimuli, such as the sight, smell and taste of food, regardless of the internal state of hunger and satiety. Restraint theory focuses on the possible psychological side effects of dieting, specifically the disinhibition effect: overeating by dieters when their cognitive resolve to eat less than desired is abandoned (Barrada et al. 2016).

Hospital Anxiety and Depression Scale (HADS) was used to assess the psychological and emotional status. The HADS was developed from a study conducted in the outpatient clinic of a general medical hospital. The findings of this study were published by Zigmond and Snaith (1983). The questionnaire comprises seven questions for anxiety and seven questions for depression, and takes 2-5 min to complete (Stern 2014).

Stress-resistance was studied using the Social Readjustment Rating Scale (SRRS). The SRRS was created by Thomas Holmes and Richard Rahe in the late 1960s to provide a standardized measure of the impact of a wide range of common stressors.

Personality features are assessed using the Toronto Alexithymia Scale (TAS). It was developed in 1986. The TAS is a 26-item self-report measure of alexithymia with good internal consistency and test-retest reliability, and a factor structure congruent with the alexithymia construct (Bagby et al. 1986).

Statistical Analyses

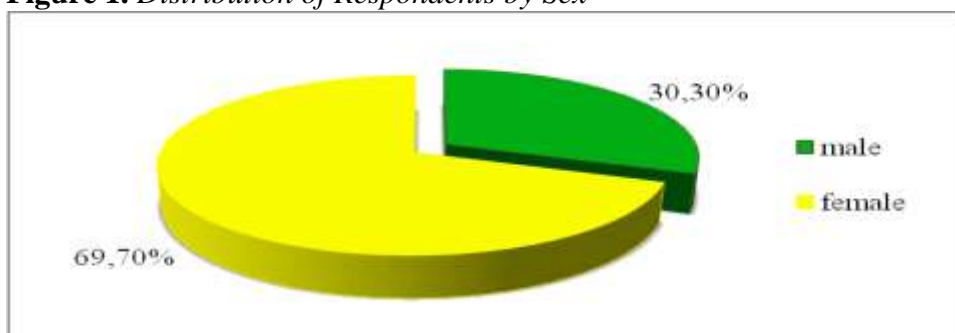
Statistical analyses were carried out using nonparametric statistics, since the distribution within the groups was not normal. The data of descriptive statistics are expressed as mean M_e (q_1 ; q_3). The Mann-Whitney test was used to detect statistically significant differences. The chi-squared test was used to compare frequencies between the groups, Fisher's method was used in groups with less than 30 respondents.

A linear regression analysis was performed to identify the factors that significantly influenced the stratification of the 10-year risk of developing diabetes mellitus. Statistical analyses were performed with SPSS Statistics 17.0.

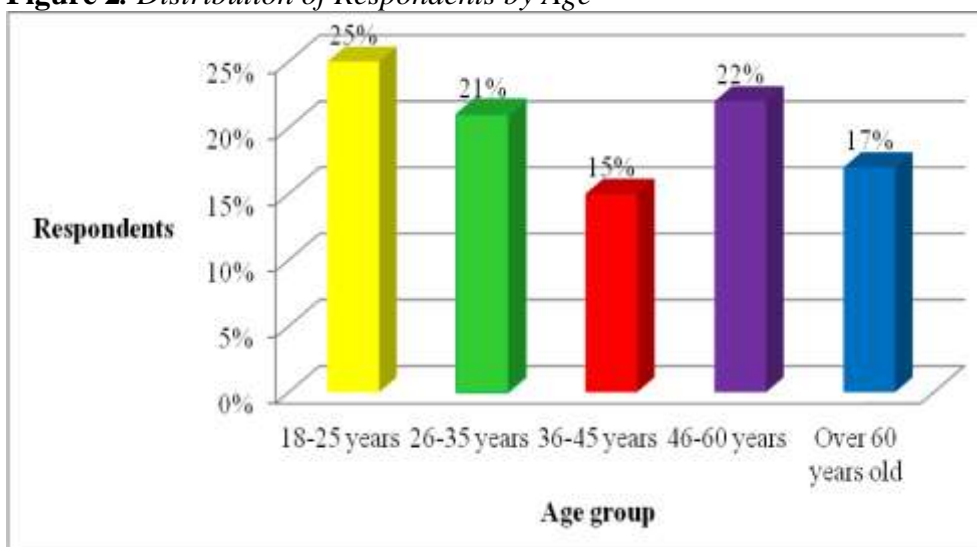
Results

Study of the Population Awareness of Diabetes and its Prevention

The research group consisted of 300 people (Figure 1), of which men - 91 (30.3%), women - 209 (69.7%).

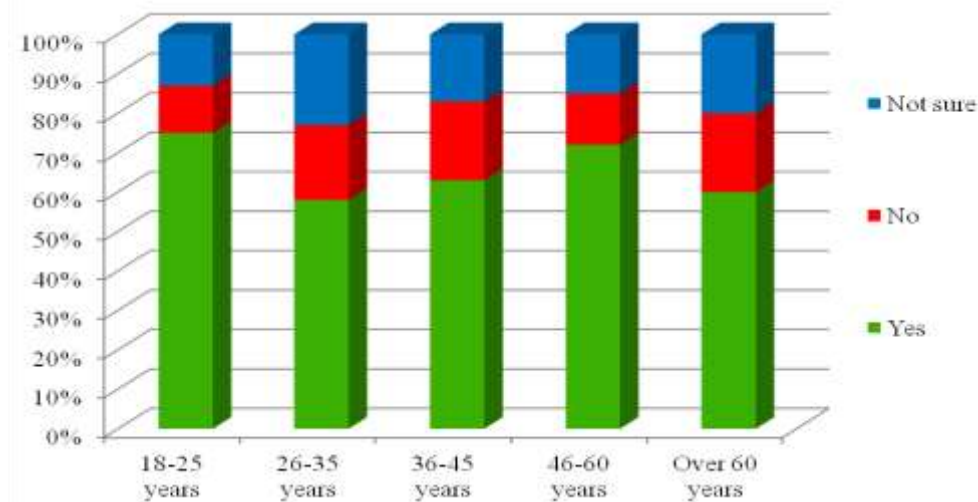
Figure 1. *Distribution of Respondents by Sex*

The number of respondents represented by the age group of 18-25 years was 25%. The share of the 26-35 age group was 21%; 36 - 45 years - 15%. 46 - 60 years - 22%, over 60 years - 17% (Figure 2). An analysis of the age distribution of the respondents showed that the majority of those who took part in the survey were patients of the young and able-bodied age of 18-59 years - 83%.

Figure 2. *Distribution of Respondents by Age*

In the course of the study we have analyzed questions about population awareness of the risk factors, main symptoms and complications of diabetes. We asked respondents whether they were aware of risk factors for diabetes. The results showed that the proportion of respondents informed about the risk factors for diabetes varied from 58% in the 26-35 age group to 75% in the 18-25 age group and did not significantly differ between age groups. It can be said that, in general, the level of respondents' knowledge of the risk factors for diabetes is above average (Figure 3).

Figure 3. *The Level of Awareness of Risk Factors for Development of DM According to the Age Groups*

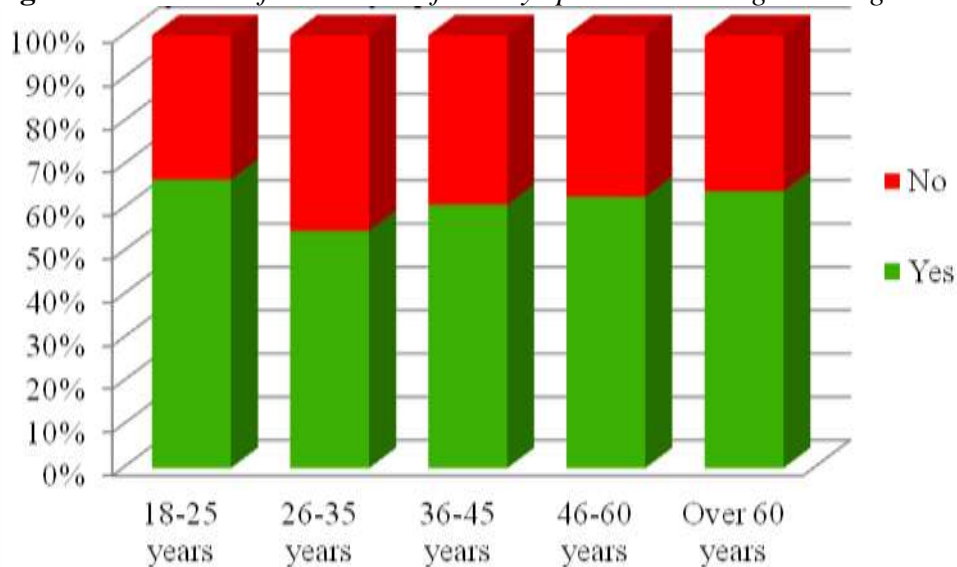


Source: Authors' estimations.

The proportion of people who was unsure or did not know at all about the risk factors for DM has ranged from 25% in the 18-25 age group to 42% in the 26-35 year old group.

Further, we asked if the respondents knew the symptoms of diabetes. Sixty two percent of the respondents indicated that they were aware of the symptoms of DM (Figure 4). The rest of participants (38%) noted that they did not know the symptoms of diabetes.

Figure 4. *The Level of Awareness of DM Symptoms According to the Age Groups*



Source: Authors' estimations.

In the course of the analysis of the population awareness of possible complications of diabetes, statistically significant differences among the age groups were not obtained. Forty seven percent of respondents indicated correctly the conditions that could complicate the course of diabetes. About a quarter of respondents found it difficult to answer about possible complications of diabetes. Twenty nine percent of respondents do not know about any complications of diabetes suggested in the answers.

Further, the issue of preventive measures, which the population takes in its daily life, was analyzed (Table 1). In the age groups of 46-60 years and over 60 years, the proportion of respondents who followed several recommendations for correcting behavioral risk factors (healthy nutrition; physical activity; rejection of "bad habits", such as smoking, alcohol and drugs consumption; annual blood test for glycemia level control) was 46% and 48%, respectively. The lowest share in this indicator was in the age group of 36-45 (37%), in the age groups of 18-25 years and 26-35 years, the share was 43% and 40%, respectively. The analysis has showed that less than half of respondents observe several preventive recommendations in everyday life.

Table 1. Preventive Measures, which the Population Takes in its Daily Life

Preventive measure	Age group				
	18-25 years old, %	26-35 years old, %	36-45 years old, %	46-60 years old, %	Over 60 years old, %
Healthy diet	28	23	26	36	22
Physical active lifestyle	25	13	9	13	18
Cessation of smoking and alcohol consumption	21	11	26	29	26
Annual blood test for glycemia level control	0	0	22	19	28
Nothing	9	16	9	3	8

Source: Authors' estimations.

Attention is drawn to the fact that about 1/5 (16%) of respondents aged from 26 to 35 do not follow the recommendations on healthy lifestyle, and the proportion of similar respondents aged from 46 to 60 years was less than 1/10 (3%), and this difference was statistically significant ($p < 0.02$).

The number of tobacco smokers and people who consumes alcohol in the age group of 25-30 years constituted 56%, and it was significantly higher ($p < 0.03$) compared to other age groups. In the age group over 60 years, a significantly higher number of respondents (74%) answered that they do not have a habit of smoking and alcohol consumption ($p < 0.01$). This data indicates on a more conscious attitude to their health in older age groups.

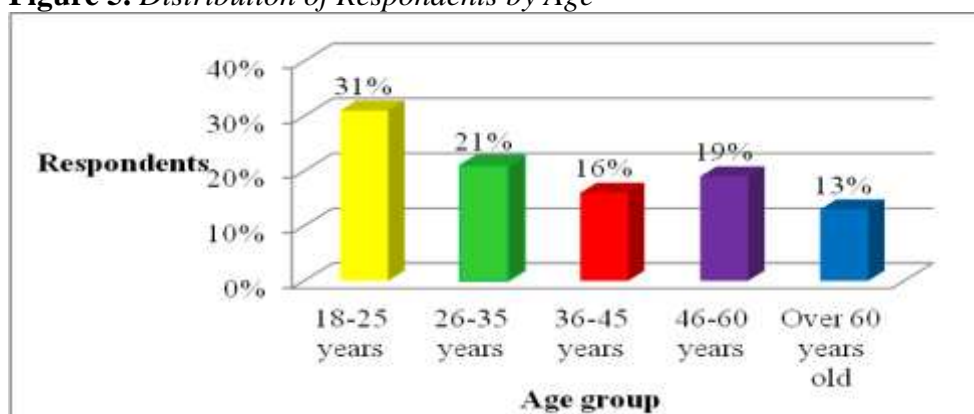
The obtained results suggest a need for extension of public awareness campaigns and diabetes education programmes in order to intensify preventive

measures and the motivation of the population to preserve and strengthen their health.

Evaluation of the 10-year Risk of Developing T2DM

The sample population for assessing the 10-year risk of T2DM development consisted of 244 patients, 75 (30.7%) men and 169 (69.3%) women. The greatest number of respondents is represented by the age group of 18-25 years - 31%. The share of the 26-35 age group was 21%; 36 - 45 years old - 16%. 46 - 60 years - 19%, over 60 years - 13% (Figure 5).

Figure 5. *Distribution of Respondents by Age*



An analysis of the obtained data of assessment the 10-year risk of developing T2DM showed that 44% of respondents had a value of BMI that exceeded the upper limit of the norm of 24.9 kg/m^2 , which confirms the high prevalence of overweight and obesity within the population who took part in the study (according to WHO data, the BMI value of $25\text{-}30 \text{ kg/m}^2$ is characteristic for excess body weight, and $\text{BMI} > 30 \text{ kg/m}^2$ for obesity). With age, there was a tendency of the increase of the proportion of respondents with excessive body weight and obesity. The smallest number of people with overweight and obesity was recorded in the 18-25 age group (10%). This value was significantly lower than in the age groups from 36 to 45 years (50%, $p < 0.00001$), from 46 to 60 years (80%, $p < 0.0001$) and over 60 years (91%, $p < 0.0001$).

According to the recommendations of IDF experts, normal values of waist circumference in Europeans women are less than 80 cm, in men - 94 cm. With a value of more than 88 cm in women and 94 cm in men, there is a high risk of developing type 2 diabetes mellitus and cardiovascular pathology (IDF 2006). Within the surveyed, the largest number of respondents (93%) with normal waist circumference values was recorded in the 18-25 age group, which significantly differed with the age groups of 36-45 years (50%, $p < 0.1$), 46-60 years (24%, $p < 0.0002$) and over 60 years (6%, $p < 0.00001$). Moreover, waist circumference > 102 (88) cm (characteristic for abdominal obesity and metabolic syndrome) was frequent within the subjects older than 46 years than WC 94-102 (80-88) cm.

The most important behavioral factors characterizing the motivation of the population for healthy lifestyle are their physical activity and application of the principles of nutrition. According to the survey results, the largest proportion of people who observe the physical activity regime for at least 30 minutes a day is in the 18-25 age group and is 83%. In other age groups, there was a significant ($p < 0.0001$) decrease in the proportion of people who noted the daily physical activity (Table 2).

Table 2. Prevalence of Risk Factors for Development of T2DM in Respondents of Different Age Groups

Risk factor	Possible answer	Age group				
		18-25 years old, %	26-35 years old, %	36-45 years old, %	46-60 years old, %	Over 60 years old, %
Body mass index, kg/m ²	< 25	89	75	50****	20***	9***
	25-30	9	19	42	39	42
	> 30	2	6	8	41	49
Waist circumference, cm	< 94 (80)	93	67	50*	24**	6****
	94-102 (80-88)	7	29	34	30	27
	> 102 (88)	0	4	16	46	67
Daily availability of 30-minute activity	Yes	83	67***	66***	63***	67***
	No	17	33	34	37	33
How often do you consume vegetables?	Every day	43	62	50	57	55
	Not every day	57	38	50	43	45
Have you had to take antihypertensive drugs?	No	99	98	87	63	15
	Yes	1	2	13	37	85*****
Have you ever had an increased level of glucose?	No	96	90	87	80	58
	Yes	4	10	13	20	42***
Was there any diabetes mellitus in your family?	Yes	28	25	43	26	30

* $p < 0.1$, ** $p < 0.0002$, *** $p < 0.0001$, **** $p < 0.00001$, ***** $p < 0.001$

Source: Authors' estimations.

Based on the evidence-based European guidelines for the prevention of T2DM, it has been shown that lifestyle modification, consisting only in reducing body weight and increasing physical activity, prevents or slows the progression of

glucose metabolism disorders in persons with ITG. Therefore, people at high risk for T2DM and with the present ITG should be educated about the need for lifestyle modification and assistance in its implementation (Paulweber et al. 2010).

The survey data showed that daily consumption of vegetables was noted by the 43% respondents up to 62% respondents in the 18-25 age group and in the 26-35 age group respectively. Attention is drawn to the fact that only half of the respondents (52%), when analyzing the group as a whole, note the daily consumption of vegetables.

There was not significant difference in prevalence of family history of diabetes between the age groups. Thirty percent of all respondents indicated the presence of diabetes mellitus in family history.

As it was expected, the greatest number of people with a history of episodes of increased glycemia and constantly taking antihypertensive drugs was noted in the age group of 60 years and older, which was statistically significantly different from the age group of 18-25 years ($p < 0.0001$ and $p < 0.001$, respectively).

To determine the factors that significantly affected the magnitude of 10-year risk of T2DM, a linear regression was performed with the construction of a linear regression model taking into account the significance ($p < 0.05$) or the influence of selected predictors at the level of stable trends ($p < 0.1$).

The age ($b = 0.21$, $p < 0.0001$) had a significant effect on the growth of the 10-year risk of DM development, moreover the highest risk was determined in the age group of 36-45 years – young able-bodied population.

Also, an increase in the 10-year risk of development of T2DM was influenced by the values of BMI ($b=0.39$; $p < 0.0001$) and waist circumference ($b=0.41$; $p < 0.0001$). Regression analysis shows that a 10-year risk of developing type T2DM increases not only with obesity, but also at the stage of overweight.

The lack of physical activity had a significant impact on the growth of the 10-year risk of developing T2DM ($b=0.19$; $p < 0.01$). Among respondents who indicated regular physical activity, the median risk for developing T2DM was 3.00 and was significantly lower than the median of respondents who did not have physical activity 8.00 ($Z=-3.25$; $p < 0.001$). As it was shown earlier, in the age groups older than 26 years there was a decrease in the proportion of people who indicated the presence of daily physical activity.

The lack of vegetables in the daily diet increased the risk of T2DM at the level of a stable trend ($b=0.11$; $p=0.054$). Respondents who consumed vegetables on a daily basis had a risk median of 3.00 and it was significantly lower than the median risk of respondents who did not consume vegetables daily 4.50 ($Z=-1.87$; $p < 0.04$), with a specific gravity of about half all age groups.

The presence of hypertension requiring medication correction had a significant impact on the growth of the 10-year risk of developing T2DM ($b=0.37$; $p < 0.0001$). In respondents who did not take antihypertensive drugs on a regular basis, the risk median was 3.00 and it was significantly lower against the median of respondents suffering from AH 8.50 ($Z=-5.66$; $p < 0.000001$). The average risk for respondents who had an anamnesis without episodes of hyperglycemia was 3.00 (0.00; 7.00) and it was significantly lower than the median of respondents who had transient hypoglycemia disorders 8.50 ($Z=-$

2.11; $p < 0.0001$). The greatest number of people taking antihypertensive drugs and noting an increase in the level of glycemia was noted in the age group over 60 years.

In addition, an analysis was made of the likelihood of developing T2DM in different age groups of patients (Table 3, Figure 6).

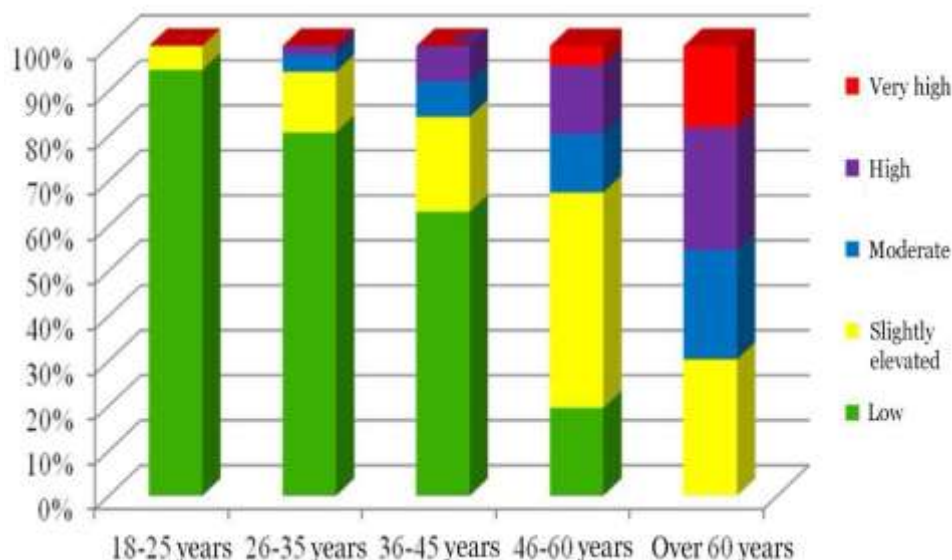
Table 3. Structure of a 10-year Risk of Developing T2DM

Risk of development of type 2 DM		Age group				
		18-25 years, %	26-35 years, %	36-45 years, %	46-60 years, %	Over 60 years, %
Low	<i>Lower than 7 points</i>	95	81	63	20	1
Slightly elevated	<i>7-11 points</i>	5	13	21	48	30
Moderate	<i>12-14 points</i>	0	4	8	13	24
High	<i>15-20 points</i>	0	2	8	15	27
Very high	<i>Higher than 20</i>	0	0	0	4	18

Source: Authors' estimations.

In the age groups of 18-25 years, 26-35 years and 36-45 years, the overwhelming majority of respondents had a low risk of developing T2DM (lower than 7 points), and a very high risk (higher than 20 points) was not registered at all. Among the population 46 years and older there was a shift towards a moderate level of risk increase (from 12 points).

Figure 6. Structure of a 10-year Risk of Developing T2DM



Source: Authors' estimations.

In the age groups of 46-60 years and over 60 years there was an increase in the number of people with a moderate and high risk of developing T2DM. In the

age group over 60 years, there was registered the greatest proportion of people with high and very high risk, which amounted to 27% and 18%, respectively. This trend is due to a combination of risk factors in these age groups. It should be noted that the most significant factors that significantly influenced the risk of developing T2DM were controlled behavioral factors, namely: BMI, WC, adherence to proper nutrition and physical activity.

Further, some data were compared that were obtained during the analysis of the level of awareness of the population on DM issues and an assessment of the 10-year risk of developing T2DM. It is noteworthy that 66% of respondents indicated that they know about the risk factors for the development of the disease, of which only 43% observe several recommendations on healthy lifestyle, including healthy diet, a physically active lifestyle and a refusal to smoke and alcohol consumption. There was shown that these parameters (BMI, WC, daily 30-minute activity and vegetables in the diet) had the most significant impact on the 10-year risk of developing T2DM.

Obtained results may indicate to lack of motivation of population to take care about their health. Efforts to improve knowledge about diabetes, increase promotion of healthy behaviors and availability of changing lifestyle programs are needed to slow the growth in new cases of diabetes (Geiss et al. 2010).

Study of Psychosomatic Relationships in Diabetes

246 respondents aged 18-55 were interviewed, 126 of them had T2DM with a duration of more than 5 years, 120 - persons without diabetes. The median of the BMI was 28.81 (23.51, 32.65) kg/m²: with T2DM - BMI 29.12 (24.48, 33.35) kg/m²; in persons without T2DM - 27.92 (22.85, 31.26) kg/m².

Comparative analysis of the eating behavior of patients with T2DM and individuals without T2DM showed no statistically significant differences in the groups. At the same time, respondents with normal body weight and overweight/obesity have differences in all scales of questionnaire of the eating behavior: restrictive eating behavior $p < 0.05$; emotiogenic eating behavior $p < 0.005$; external eating behavior $p < 0.005$.

Among the respondents with overweight and obesity, there was identified the following distribution styles of eating behavior: the leading eating style (the predominance of emotional, external or restrained eating) was verified in 70.3% of cases; mixed eating style - in 23.5%; there were not detected eating disorders in 6.2%. Among the individuals with the presence of leading style of food, there was noted the predominance of emotiogenic style - 48.6%, the second place took the external eating style of 31.4%, and the third - the restrictive type - 20.0%.

Significant differences in styles of eating behavior have been identified depending on gender: women were significantly more likely to have an emotiogenic style (identified in 117 women, versus 55 men; $\chi^2 = 16.71$; $p < 0.0001$), the incidence among women and men of external style and restrictive style. Therefore, the styles of eating behavior do not differ depending on the presence or absence of DM and mediate the relationship between the personality characteristics of respondents with overweight. Women, in comparison with men,

are dominated by an emotiogenic style of eating behavior, a stimulus to food intake, which becomes not a hunger, but emotional discomfort: anxiety, irritability, bad mood, a sense of loneliness.

In the study of psychoemotional status, there was established that subclinical and clinically expressed manifestations of anxiety in persons without T2DM are significantly less frequent (28 cases per 120 people) than in individuals with T2DM (50 cases per 126 people; $\chi^2=3.96$; $p<0.05$). The incidence of subclinical and clinically significant manifestations of depression was about 5.0% in patients with T2DM and without DM. A significant direct correlation was found in the incidence of clinically significant anxiety with the emotionogenic type of eating behavior in women who are overweight or obese ($rS =0.49$; $p<0.05$). At the same time, the correlation analysis demonstrated the absence of an interrelation of the psychoemotional status of men with the types of eating behavior depending on BMI and the presence of T2DM.

The study of psychoemotional status demonstrated that the majority of overweight people, even in the absence of T2DM, are in a state of disadaptation and psychoemotional stress.

Absolute majority of patients with T2DM (84.62%) and persons without T2DM (83.17%) showed high resistance to stress. At the same time, the proportion of people with a high level of stress among patients T2DM is higher than without T2DM ($\chi^2=4.20$; $p=0.04$). In 15 patients with T2DM, a high level of stress was detected, whereas in 5 patients without T2DM there was detected a high level of stress. This may indicate to the high psychoemotional tension and difficulties in overcoming negative psychological situations in T2DM.

Alexithymia - reduced ability in verbalization of emotional states and feelings - is characteristic of people who, for one reason or another, are limited in processing, and therefore aware of emotional impressions, experiences, feelings, causes of actions. Among the subjects studied, the non-lecthiemic type of personality was recorded in 81.58% of cases among persons without T2DM and in 79.23% with T2DM ($p>0.05$). In 29 patients with $BMI \geq 25 \text{ kg/m}^2$ the Alexitimic personality type was diagnosed (74 points and higher), with $BMI < 25 \text{ kg/m}^2$ - in 11 examined. Alexithymic type of personality was significantly more common in cases of overweight or obesity ($\chi^2=6.28$; $p=0.01$). In addition, when conducting a correlation analysis, the "Alexitimic" personality type showed a direct significant connection with clinically significant anxiety ($rS =0.34$; $p<0.042$).

Discussion and Conclusion

One of the objectives of the present study was to assess the awareness of the population about the diabetes and preventive measures of this pathology. The obtained results demonstrate the gaps of knowledge on some issues: 33% of respondents of population are not informed about the risk factors for diabetes, 38% - about the first signs of the disease; 29% - of possible complications. Similar study for awareness of type 2 diabetes risk factors and prevention strategies among low-income Latinos in Lawrence (Massachusetts) have shown that this Latino

sample had limited knowledge of diabetes risk factors and lifestyle changes that can prevent or delay diabetes onset. Moreover, the limited awareness of diabetes risk factors in this sample was paralleled by the limited knowledge of strategies to prevent or delay diabetes onset (Rosal et al. 2011). Therefore, an insufficient level of awareness of the population on diabetes mellitus issues leads to low alertness in relation to risk factors and clinical manifestations.

Study findings demonstrated that 66% of respondents were aware of the risk factors of T2DM, but only 43% of them follow several recommendations on healthy lifestyle (diet, a physically active lifestyle and cessation of smoking and alcohol consumption). This data may indicate that low adherence to healthy lifestyle among the population is due not only to ignorance, but also to a lack of desire to change behavioral determinants and underestimation of existing risk factors.

The study of psychoemotional status demonstrated that the majority of overweight people, even in the absence of T2DM, are in a state of disadaptation and psychoemotional stress, which can be a risk factor for the development of a deficit of compensatory resources of the body and the emergence of psychosomatic diseases. Recent literature suggests that stress and emotional distress are perceived as triggers for diabetes (Coronado et al. 2004, Jezewski and Poss 2002, George et al. 2005, Mier et al. 2007), as well as depressed individuals are less likely to succeed at lifestyle change efforts and that depression may independently contribute to the development of diabetes (Engum 2007, Rosal et al. 2011). This group of people requires not only monitoring the laboratory indicators of carbohydrate and lipid metabolism, but also in the framework of preventive work of carrying out psycho-corrective measures aimed at normalizing the psychoemotional state with the goal of preventing diseases, which may be based on psychosomatic conditions.

To have a significant public health impact, tailored programs at the individual level must be matched by changes in policy and the physical and social environments in a truly multilevel approach (Castro et al. 2009). Prevention of T2DM should begin with convincing the public of the need to modify the lifestyle and habitual settings, and be implemented both at the level of the population as a whole and at the individual level. An important point is to increase the motivation of the population to a more conscious attitude to their own health. When patient characteristics are assessed and understood, health care providers are presented with an opportunity to influence patient efficacy beliefs (Thomas et al. 2016). At the same time, information of preventive and motivational orientation should be accessible and clearly formulated. Presented materials other than general phrases, such as: reducing overweight, optimizing physical activity, healthy eating, should contain specific recommendations for lifestyle modification.

Previous studies have shown that providing patients specific information about their risk of developing diabetes and the expected risk reduction associated with preventive treatments may encourage lifestyle changing. New guidelines and evidence recommend the personalized approach (patient-centered dialogue) to helping patients make treatment decisions (O'Brien et al. 2016).

Therefore, preventive measures in relation to DM should be based on a strategy of long-term and multistage work with certain segments of the population, based on knowledge of the behavioral and psychological characteristics of this population, knowledge of its motivations and interests.

Limitations of the Study

We obtained interesting results during the study of psychosomatic status of patients with T2DM and without diabetes. But the sample of population was quite small, so it needs to be examined in fuller detail.

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