ABSTRACT
Objective: to track the cognitive impairment of elderly women with type 2 diabetes mellitus. Method: transversal and quantitative descriptive study with 81 Elderly diabetics. Questionnaires were used on the socioeconomic and demographic characteristics and the Mini Mental State Examination (MMSE) for cognitive screening. The psychological test evaluation was used as the cut-off point to indicate to the Ministry of Health. The data are classified by Epi Info software (version 7), presented in a table and a figure processed in Excel. Results: the interviewees were aged between 60 and 84 years, family income of a minimum wage (70.4%), 18.5% were illiterate, 44.4% with 4 to 7 years of study and 25.9% seven more years of study, with a mean of 5.7 years of study of all women. 62.9% of respondents had cognitive impairment, with an average of 25.9. Conclusion: change in cognition of elderly women with type 2 diabetes was observed, especially in those that had low education. Descriptors: Aging; Diabetes Mellitus; Cognition.

RESUMO
Objetivo: rastrear o déficit cognitivo de mulheres idosas com diabetes mellitus tipo 2. Método: estudo descritivo transversal e quantitativo, realizado com 81 idosas diabéticas. Foram utilizados questionários sobre as características socioeconômicas, demográficas e o Mini Exame do Estado Mental (MEEM) para rastreamento cognitivo. Para avaliação do teste psicológico foi utilizado como ponto de corte à indicação do Ministério da Saúde. Os dados foram catalogados pelo programa Epi Info (versão 7), apresentados em uma tabela e uma figura processados no Excel. Resultados: as entrevistadas possuíam idade entre 60 e 84 anos, renda familiar de um salário mínimo (70,4%), 18,5% eram analfabetas, 44,4% com 4 a 7 anos de estudo e 25,9% com mais de sete anos de estudo, tendo como média de 5,7 anos de estudo do total de mulheres. 62,9% das entrevistadas apresentaram déficit cognitivo, com uma média de 25,9. Conclusão: foi observada alteração na cognição de mulheres idosas portadoras de Diabetes Mellitus tipo 2, principalmente, nas que possuíam baixa escolaridade. Descritores: Envelhecimento; Diabetes Mellitus; Cognição.

ORIGINAL ARTICLE
COGNITIVE DEFICIT IN OLDER WOMEN WITH TYPE 2 DIABETES MELLITUS
DÉFICIT COGNITIVO EM MULHERES IDOSAS COM DIABETES MELLITUS TIPO 2
DÉFICIT COGNITIVO EN LAS MUJERES MAYORES CON DIABETES MELLITUS TIPO 2
Larissa Di Leo Nogueira Costa¹, Pabline Medeiros Verzaro¹, Vanessa Virginia Lopes Ericeira³, Ana Hélia de Lima Sardinha²

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Objetivo: rastrear o déficit cognitivo de mulheres idosas com diabetes mellitus tipo 2. Método: estudo descritivo transversal e quantitativo, realizado com 81 idosas diabéticas. Foram utilizados questionários sobre as características socioeconômicas, demográficas e o Mini Exame do Estado Mental (MEEM) para rastreamento cognitivo. Para avaliação do teste psicológico foi utilizado como ponto de corte à indicação do Ministério da Saúde. Os dados foram catalogados pelo programa Epi Info (versão 7), apresentados em uma tabela e uma figura processados no Excel. Resultados: as entrevistadas possuíam idade entre 60 e 84 anos, renda familiar de um salário mínimo (70,4%), 18,5% eram analfabetas, 44,4% com 4 a 7 anos de estudo e 25,9% com mais de sete anos de estudo, tendo como média de 5,7 anos de estudo do total de mulheres. 62,9% das entrevistadas apresentaram déficit cognitivo, com uma média de 25,9. Conclusão: foi observada alteração na cognição de mulheres idosas portadoras de Diabetes Mellitus tipo 2, principalmente, nas que possuíam baixa escolaridade. Descritores: Envelhecimento; Diabetes Mellitus; Cognição.

RESUMEN
Objetivo: seguir el deterioro cognitivo en las mujeres de edad avanzada con diabetes mellitus tipo 2. Método: estudio descritivo y cuantitativo de corte transversal, realizado con 81 diabéticas de edad avanzada. Se utilizaron cuestionarios sobre las características socioeconómicas, demográficas y el Mini Examen del Estado Mental para rastrear deterioro cognitivo. Para evaluar el examen psicológico se utilizó como punto de corte para indicar al Ministerio de Salud. Los datos se clasifican por el programa Epi Info (versión 7), presentados en una tabla y una figura procesadas en Excel. Resultados: los entrevistados habían entre 60 y 84 años, los ingresos familiares de un salario mínimo (70,4%), el 18,5% eran analfabetas, el 44,4% con 4 a 7 años de estudio y 25,9% con más de sete años de estudio, tendiendo como media de 5,7 años de estudio del total de mujeres. 62,9% de las entrevistadas presentaron déficit cognitivo, con una media de 25,9. Conclusión: se observó un cambio en la cognición de las mujeres de edad avanzada con diabetes tipo 2, especialmente en los que tenían bajos niveles de educación. Descriptores: Envejecimiento; Diabetes Mellitus; Cognición.

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English/Portuguese
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The Brazilian population is undergoing a rapid process of aging with the narrowing of the base of the population pyramid. According to 2014 IBGE, between 1960 and 2013, the fertility rate fell from 6.28 children to 1.77 children per woman, meaning a 70% reduction. It was also possible to observe the increase in life expectancy, reaching an estimated 78.5 years for women and 71.2 years for men in 2013. In 2000, life expectancy at birth of a Brazilian was only 69.8 years. It is estimated that the percentage of elderly people will reach about 30% of the national population.

The World Health Organization defines aging as the accumulation of a variety of molecular and cellular damage that can lead to a gradual loss in physiologic reserves, increasing the risk of disease and decline of the intrinsic capacity of the individual. It being understood as a natural process, where the progressive reduction in functional reserve of individuals is. Under normal conditions it does not bring great harm to the individual, but in overload conditions, such as the illness or emotional stress, can cause a pathological condition.

Besides the increase in life expectancy another phenomenon changing population profile can be observed, the feminization of aging. Currently, women constitute the majority of the elderly population worldwide. In 2002 there were 678 men for every thousand elderly women, for 2013, the estimate of female life is still that women live about five to seven years longer than men.

The aging brain level will also present its pace, the more activities and intellectual stimulation it has, the longer it will take to lose its connections. The development of cognitive activities and formal education can influence for better performance on cognitive tests, making the adapted brain counteract the impacts of diseases or other common changes caused by aging. Schooling influences the processing speed, attention, executive functions, memory and intelligence.

Forgetfulness of recent events, assessment difficulties and changes in attention are cognitive deficits commonly seen as natural in this phase. Sometimes, the loss can only be observed if the elderly need more of their memory than usual. There is still difficulty in differentiating pathological cognitive decline and non-pathological, making evaluation a strategic resource for cognitive understanding and tracing the cognitive profile, mainly the elderly.

With aging, functional changes in the body are being generated that, although natural, can result in the impairment of physical ailments related to this period of life such as diabetes, high blood pressure, problems in visual acuity, among others. Population aging, along with growing urbanization and the adoption of unhealthy lifestyles, may be largely responsible for the increased incidence and prevalence of diabetes mellitus (DM) throughout the world.

In Brazil, the growing number of people with DM may cause an even greater impact because it is a developing country, where the disease treatment costs and its complications cause a major economic impact on health services.

Diabetes Mellitus type 2 (DM2) is characterized by a higher prevalence in the elderly, presenting different degrees of disability and resistance to insulin action. More than 50% of people with DM are aged over 60 years. It is a disease associated with the increase of macro and microvascular lesions.

DM2 affecting the elderly has been one of the major health concerns by also causing damage to cognition. Even without a clear picture of dementia, certain cognitive domains may be affected in elderly diabetics, such as attention, memory, executive functions and frontal lobe. DM can induce various cognitive declines and cause serious brain damage by different mechanisms.

Patients with T2DM showed significantly deeper lesions and cortical atrophy. May be associated with DM2 cognitive deficits, including executive functioning, psychomotor efficiency, intelligence, memory and learning, there is also the DM2 severity of the association and the degree of involvement in brain.
METHODOLOGY

- Track cognitive impairment in older women with type 2 diabetes.

Descriptive, cross-sectional study with a quantitative approach, conducted in the endocrinology clinic of University Hospital Unit President Dutra, which develops care for diabetic patients and is a reference in the state of Maranhao, seeing patients from various municipalities.

The study population consisted of 81 elderly people who met the following inclusion criteria: diagnosis of type 2 diabetes for at least 6 months, being age 60 or over, being female, having physical and mental condition to communicate themselves with the researcher and consent to participate.

Exclusion criteria comprised not having any associated neurological comorbidities that impaired response autonomy. The sample was determined based on the estimate of the population proportion. They considered confidence level 95% (α = 0.05), and sampling error fixed at five percentage points. Added up, the size of the sample, 5% by the possibilities of losses and refusals.

A questionnaire was used as a data collection instrument which primarily includes socioeconomic and demographic aspects, closed and leading questions. The Mini Mental State Examination (MMSE), validated in Brazil in 1994 was used for the cognitive screening test.\(^\text{10}\)

The psychological test evaluation was used as the cut-off point indicated to the Ministry of Health that considers the educational levels for this analysis, taking into account the years of formal study.

The Ministry of Health considers possible changes in cognition, illiterate individuals scored equal to or below 19, those who had one to three years of study, scored 23 or below, from 4 to 7 years of study equal to or below 24, and those with more than 7 years of study equal to or below 28.\(^\text{11}\)

The data are classified by the Epi Info software (version 7), presented in a table and a figure processed in Excel.

This study is a subproject of the project entitled "Quality of life in elderly patients with metabolic syndrome in São Luís- MA", approved by the Ethics Committee for Research with human beings University Hospital Unit Presidente Dutra-HUUPD with opinion No. 012/11 approved on February 11, 2011.

RESULTS

81 women aged between 60 and 84 years were interviewed (reaching an average of 69 years), among these, 59.3% were self-reported as being of mixed race, 48.1% married, and mostly with family income only a minimum wage (70.4%), the majority also having, four or more children (66.7%).

As for education, 18.5% of women said they were illiterate, 11.2% with 1 to 3 years of formal study, 44.4% with 4 to 7 years of study and 25.9% composed of elderly with more than seven years of study, with a mean of 5.7 years of schooling among all women.
Table 1. Socioeconomic and demographic data of elderly women with Diabetes Mellitus, São Luís-MA, 2014.

<table>
<thead>
<tr>
<th>Variables</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schooling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Illiterates</td>
<td>15</td>
<td>18.5</td>
</tr>
<tr>
<td>From 1 to 3 years of study</td>
<td>9</td>
<td>11.2</td>
</tr>
<tr>
<td>From 4 to 7 years of study</td>
<td>36</td>
<td>44.4</td>
</tr>
<tr>
<td>&gt; 7 years</td>
<td>21</td>
<td>25.9</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>15</td>
<td>18.5</td>
</tr>
<tr>
<td>Mulatto</td>
<td>48</td>
<td>59.3</td>
</tr>
<tr>
<td>Black</td>
<td>18</td>
<td>22.2</td>
</tr>
<tr>
<td>Marital status</td>
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<td></td>
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<tr>
<td>Married</td>
<td>39</td>
<td>48.1</td>
</tr>
<tr>
<td>Single</td>
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<td>11.2</td>
</tr>
<tr>
<td>Widowed</td>
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<td>40.7</td>
</tr>
<tr>
<td>Family income</td>
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<td></td>
</tr>
<tr>
<td>&lt;1 minimum salary</td>
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<td>7.4</td>
</tr>
<tr>
<td>1 minimum salary</td>
<td>57</td>
<td>70.4</td>
</tr>
<tr>
<td>2 to 3 times minimum salary</td>
<td>15</td>
<td>18.5</td>
</tr>
<tr>
<td>4 to 5 times minimum salary</td>
<td>3</td>
<td>3.7</td>
</tr>
<tr>
<td>Number of children</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>6</td>
<td>7.4</td>
</tr>
<tr>
<td>1</td>
<td>6</td>
<td>7.4</td>
</tr>
<tr>
<td>1 to 2</td>
<td>15</td>
<td>18.5</td>
</tr>
<tr>
<td>&gt;= 4</td>
<td>54</td>
<td>66.7</td>
</tr>
</tbody>
</table>

The average MMSE was 25.9 among all respondents, where 42 women, meaning 51.8%, showed results in MMSE less than 24. 62.9% of the interviewed women had cognitive impairment.

Obtaining as mean MMSE for education, 16.2 in illiterate women, 20.3 average for those that completed 1-3 years of study, 24.2 average for those with 4 to 7 years of study, and an average of 24.5 in the elderly who have completed more than seven years of formal study.

It is observed in the present study that a score on the MMSE test increased with increasing years of study.

![Figure 1. Mean Mini-Mental State Examination of education by years of study, São Luís, 2014.](image)

DISCUSSION

In a study that aimed to analyze the intervention strategies used in cognitive stimulation workshops for seniors and associate them to the performance of functional capacity it was obtained that most were female (82.4%); long-lived; with a mean age of 69.9 ± 6.0, median 70
and minimum 60 and maximum 77 variation, as corroborated this study.\textsuperscript{7}

In a study on cognitive stimulation through physical activities in older people, held in the Federal District, the age of the elderly does not interfere with cognitive performance, factors such as physical health conditions, self-care, contact with family, involvement with friends and church and physical activities have influence than age itself.

Another study conducted in the city of Porto Alegre with the elderly in a long-stay institution, showed that the memory does not age in healthy older adults, usually what happens is that it becomes less required, worse for lack of use. For it to be maintained, it must be exercised.\textsuperscript{13}

In the same study on intervention strategies used in cognitive stimulation workshops for seniors, the average MMSE was 27.6 before and after the intervention of workshops for improvement of cognition, this superior outcome to this research is justified by the average education Santana et al., 10.9 ± 3.5, median of 11 and a minimum of eight and maximum of 16.\textsuperscript{7}

In studies of cognitive decline conducted with diabetic patients different results can be observed with a mean MMSE of 24.86 in research conducted in Salvador,\textsuperscript{14} 27.37 in Rio Grande do Sul\textsuperscript{10} and 27.4 in a study conducted in the city of Curitiba\textsuperscript{15}

The lower the level of education of the elderly, the greater the cognitive loss.\textsuperscript{16} Elderly people with higher education (8-15 years) had better cognitive performance in evaluations of language in a survey of 50 elderly in the city of São Paulo. Age and education are factors directly related to cognitive impairment because education influences the processing speed, attention, executive functions, memory and intelligence.\textsuperscript{17}

Schooling is an influencing factor in the evaluation of memory loss in the elderly. Education reduces the association between pathological burden and cognitive decline, i.e., those with more years of education during life had reduced risk of developing dementia in old age. Furthermore, the broadest form of stimulation (physical and mental), during life, is proposed to increase cognitive reserve, allowing cognitive function to remain in old age, so as to protect by delaying the onset of dementia.\textsuperscript{16, 19}

In a study conducted in the city of Rio de Janeiro to analyze the cognitive impairment in the elderly, 303 individuals with an average age of 73 years were interviewed.

In their sample, 60% were living without a partner, 46% had 1 to 4 years of schooling and 26.5% were classified as illiterate, differing from this study that the number of illiterate people obtained was 18.5%, however. Yet, there is this illiteracy in the population in larger or smaller proportions.

In the MMSE test, this study revealed an average score of 19.2, a mark below this study, which brings the average 25.9, which can be explained by the low level of education of its sample.\textsuperscript{20}

In the same study conducted in the city of Rio de Janeiro, 72.5% of the sample were formed by illiterates and under 4 years of study, a significant number of people who received little or no years of study.

In this study, the largest number of people by education (44.4%) were in the range of 4 to 7 years of formal study, which shows that education influences the results obtained through the MMSE, corroborating other studies done in the same period\textsuperscript{5}, indicating that educational levels have influence on performance in the assessment tools.

According to this, education has a direct influence on processing speed, action, executive functions, memory and intelligence, as well as making the brain more flexible and durable against the effects of disease or even common to aging.\textsuperscript{15}

In another survey conducted in Porto Alegre, which conducted a study of comorbidity and cognitive impairment in 176 elderly people, where, through the MMSE, 21 elderly (11.9%) had mild cognitive decline, the average schooling of patients seen in Primary Care Health was 6.2 years of study.

Among the patients seen at the clinic, 59.2% had more than 8 years of formal education, which differs from the present
study, where the education level is lower, with an average of 5.7 years of study.

This demonstrates again that education over the years of life will reflect in a healthier aging or not.21

CONCLUSION

Ageing is a natural process in which physiological structures suffer gradual changes with the passing of time, characteristics of functionality will be lost or changed according to each individual.

Given this reality and these enormous changes experienced by the body in the process, the importance of adopting healthier choices throughout life is increasingly observed and discussed, in order to reach a healthy aging.

Incorporating healthy habits like a balanced diet, physical activity and encouraging reading and study can influence the reduction of the impact caused by diseases such as diabetes mellitus and the decrease in cognitive impairment.

The research showed cognitive impairment in older women with diabetes mellitus, highlighting the importance and necessity of actions that can reach this population more fully, directing care for healthier aging, achieving control of blood glucose levels and diabetes prevention and also establishing intellectual and cognitive stimulation.

This study has also shown the influence of low education levels in the results of cognitive impairment, making the number of patients with cognitive impairment greater still. There is a growing number in the scores of the results of the Mini-Mental State Examination, according to the increasing level of education.

The higher the years of formal schooling, the higher the score obtained by the MMSE, clearly demonstrating the importance of education for better aging.

It also emphasizes the importance of appropriate public policies that guarantee education and health to increasing aging population to prevent diseases such as diabetes mellitus and cognitive impairment, reaching thus enhancing the quality of life of the population.

REFERENCES


Cognitive deficit in older women...