

Characterization of users at risk of developing diabetes: a cross-sectional study

Caracterização de usuários em risco de desenvolver diabetes: um estudo transversal

Caracterización de usuarios en riesgo de desarrollar diabetes: un estudio transversal

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ABSTRACT

Objective: To characterize the profile of users at risk of developing diabetes *mellitus* type 2 according to sociodemographic and clinical variables. **Method:** Cross-sectional study, descriptive, quantitative approach conducted with 266 users of Basic Care. Inferential statistics analysis, calculating the crude prevalence ratio with confidence interval of 95% and *Kruskal-Wallis* test, and application of the multivariate technique simple Correspondence Analysis. **Results:** It was noted that 83.1% were women and 36.4% frequented the Family Health Unit from 1 to 5 years. Regarding the factors associated with diabetes *mellitus* type 2, 66.5% of the users were overweight and 77.9% were rated with central obesity. The great majority, 77.4%, did not practice physical activities and 21.1% had altered glycemia. **Conclusion:** The results showed that many risk factors for developing diabetes *mellitus* type 2 were among the population of the study.

Descriptors: Diabetes Mellitus Type 2; Risk Factors; Primary Prevention; Nursing; Primary Health Care.

RESUMO

Objetivo: Caracterizar o perfil de usuários em risco de desenvolver diabetes *mellitus* tipo 2 de acordo com as variáveis sociodemográficas e clínicas. **Método:** Estudo transversal, descritivo, de abordagem quantitativa realizado com 266 usuários da Atenção Básica. Análise estatística inferencial, com o cálculo das razões de prevalências brutas com intervalo de confiança de 95% e o teste de *Kruskal-Wallis* e a aplicação da técnica multivariada Análise de Correspondência simples. **Resultados:** Constatou-se que 83,1% eram mulheres e 36,4% frequentavam a Unidade de Saúde da Família de 1 a 5 anos. Quanto aos fatores associados ao diabetes *mellitus* tipo 2, 66,5% dos usuários estavam com excesso de peso 77,9% foram classificados com obesidade central; a grande maioria, 77,4% não praticava exercício físico, 21,1% possuíam glicemia alterada. **Conclusão:** Os resultados mostraram que vários fatores de risco para o desenvolvimento do diabetes *mellitus* tipo 2 estiveram presentes na população do estudo.

Descritores: Diabetes Mellitus Tipo 2; Fatores de Risco; Prevenção Primária; Enfermagem; Atenção Primária à Saúde.

RESUMEN

Objetivo: Caracterizar el perfil de usuarios en riesgo de desarrollar diabetes *mellitus* tipo 2 de acuerdo con las variables sociodemográficas y clínicas. **Método:** Estudio transversal, descriptivo, de abordaje cuantitativo realizado con 266 usuarios de la Atención Básica. Análisis estadístico inferencial, con el cálculo de las razones de prevalencias brutas con intervalo de confianza del 95% y la prueba de *Kruskal-Wallis*, y la aplicación de la técnica multivariada Análisis de Correspondencia simple. **Resultados:** Se constató que el 83,1% eran mujeres y el 36,4% frecuentaban la Unidad de Salud de la Familia de 1 a 5 años. Sobre los factores asociados a la diabetes *mellitus* tipo 2, el 66,5% de los usuarios estaba con sobrepeso; el 77,9% fue clasificado con obesidad central; la gran mayoría, el 77,4% no practicaba actividad física y el 21,1% tenía la glucemia alterada.

Conclusión: Los resultados mostraron que diversos factores de riesgo para el desarrollo de la diabetes *mellitus* tipo 2 estuvieron presentes en la población del estudio.

Descriptores: Diabetes Mellitus Tipo 2; Factores de Riesgo; Prevención Primaria; Enfermería; Atención Primaria a la Salud.

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INTRODUCTION

Diabetes *mellitus* (DM) is a worldwide disease that does not choose the age or social condition of the individual, causing lifestyle and body changes in the person affected⁽¹⁾. It is considered a major problem for the Public Health in the 21st century, resulting in prevalence and incidence worldwide concern⁽²⁾.

International Diabetes Federation data indicate that in 2015, in Brazil, there was a predominance of 14.3 million people with DM and it is estimated that for the year 2040 the population will be of 23.2 million⁽³⁾.

Diabetes *mellitus* type 2 (DM2) is 90% to 95% of the global population cases and its factors are related to overweight and heredity⁽⁴⁾. It is considered a chronic disease, with trend in young adults that have sedentary lifestyle and dietary change, consuming processed and fatty foods⁽⁵⁾.

For the International Diabetes Federation, the risk factor for DM2 are: excessive height, family history of diabetes, unhealthy diet, increasing age, high blood pressure, ethnicity, physical inactivity, glucose intolerance, gestational DM history and malnutrition during pregnancy⁽⁶⁾.

The Ministry of Health recommends the tracking of people at risk of developing DM2, in the Basic Health Care, carried out by the nurse in the nursing appointment⁽⁷⁾.

The Basic Health Care, also called Primary Health Care, is an articulated set of health actions that operates in the determinants and conditioning of health, individually and collectively, adding health promotion, protection and rehabilitation actions. It is guided by the principles of the Unified Health System (SUS): universality, equity and integrality; and is the first entrance to the health services, using the Basic Health Units as working strategy⁽⁸⁾.

The Basic Health Units/ Family Health Units (UBS/USF) are centers installed close to the residences and workplaces. They play an important role in ensuring people access to a quality health care, against health population needs⁽⁸⁾.

Researches focused on identifying risk factors for DM2 were conducted with college student^(5,9), children⁽¹⁰⁾, teenagers⁽¹¹⁾ and adults⁽¹²⁾, which shows the concern of scholars about this subject.

The interest in making a study about the profile that characterizes the population at risk of developing diabetes *mellitus* 2 in Basic Health care is based on the need to identify characteristics and behavior of risk, providing subsidies for planning and implementation of directed intervention policies that make it possible to prevent the disease development. It is stated that the sociodemographic and clinical characteristics are factors that increase the risk of developing diabetes *mellitus* type 2 in users of the Basic Care.

OBJECTIVE

To characterize the profile of users at risk of developing DM2 according to sociodemographic and clinical variables.

METHOD

Ethical aspects

The study considered all ethical precepts of the Resolution 466/2012 and Resolution 311/2007 of the COFEN, being approved by the Research Ethics Committee (CEP) of the Health Sciences Department, of Universidade Federal da Paraíba (UFPB), Brazil. All participants signed and informed consent formed in two copies.

Design, study location and period

This is a cross-sectional study, descriptive, with quantitative approach, conducted in 21 Family Health Units in the city of João Pessoa, Paraíba, Brazil, from April to June 2016.

Samples, inclusion and exclusion criteria

To select the participants, it was used the non-probability sampling technique by convenience. To identify the sample size was used the significance level of 5%. The sampling error was set at 6%. According to the IBGE (Brazilian Institute of Geography and Statistics) data, individuals between 20 and 59 years old, in 2014, represented 56%, excluding the prevalence of people with diabetes that, according to the 2014 VIGITEL data, was of 6.9%. Therefore, in the category of the study interest was considered the prevalence of 52.3%⁽¹³⁾.

The target population of the study comprised 134,091 people, being the sample size n calculated by:

$$n = \frac{N \cdot p \cdot q \cdot \left(\frac{Z_{\alpha}}{2}\right)^2}{p \cdot q \cdot \left(\frac{Z_{\alpha}}{2}\right)^2 + (N - 1)E^2} = \frac{134.091 \cdot 0,523 \cdot (1 - 0,523) \cdot (1,96)^2}{0,523 \cdot (1 - 0,523) \cdot (1,96)^2 + (134.091 - 1) \cdot 0,06^2} = 265,7$$

Where N is the population size, p is the prevalence of people aged between 20 and 59 years and other than people with DM, refers to the accumulated value according to normal distribution table that considers the significance level adopted, which was of 5% in this study. E , is the sampling error that, in this study, was of 6%. Through the calculation, the sample size was 266 people.

To obtain the sample, was considered the following inclusion criteria: to be between 20 and 59 years old, registered in the USB and be there at the time of collection. Excluded from the sample: pregnant women, individuals living in the countryside and with confirmed diagnosis of diabetes *mellitus*.

Study protocol

For data collection, it was used a form containing sociodemographic (gender, color/race, age, marital status, education, profession, income, income value and time that they frequent the

unit), anthropometric and clinical (weight, height, physical inactivity, Body Mass Index (BMI), central obesity and altered glycemia) aspects. Trained staff conducted the interviews in a private place previously agreed between the research team and the participants.

It was also used a digital scale with capacity of 150 kg and accuracy of 0.1 kg to measure the weight and a non-elastic tape measure with maximum range of 2m, fixed to the wall, to measure the height. The users were told to remove their shoes, keep upright, still and with flattened hands over their thighs and head adjusted to the Frankfurt plan. It was measured the abdominal circumference with a non-elastic tape measure placed over the skin at the midpoint between the last rib and the upper edge of the iliac crest at the end of expiration, as recommended by the Ministry of Health⁽¹⁴⁾. To analyze the results, was considered: physical inactivity (understood as physical practice under 30 minutes per day and less than 5 times per week)⁽¹⁵⁾, overweight (overweight category with BMI between 25.0 and 29.9 kg/m² and obese category with BMI over 30 kg/m²), central obesity (waist circumference over 102 cm in men and over 88 cm in women)⁽⁶⁾ and altered glycemia over 110 mg/dl. According to the World Health Organization recommendation released by the Ministry of Health, the BMI is defined as the body mass divided by the square of the body height⁽¹⁶⁾. The glycemia value was reported by the participants, being proved by laboratory tests for the last six months added to the medical reports. According to the Ministry of Health, the plasma glycemia is shown as altered in values from 110 to 126 mg/dl⁽⁷⁾.

Analysis of results and statistics

The obtained data were listed in a spreadsheet of the software Microsoft Excel, through double typing and further validation, in order to control possible mistakes and then exported to the software *Statistical Package for Science Social* (SPSS), version 20.0. To present and analyze the results it was used the descriptive statistics for frequency calculation, in absolute value and percentage. To compare associated characteristics at risk of DM2, it was used the inferential statistics, calculating the crude prevalence ratio (PR) with confidence interval of 95% (CI). In case of relation between time of USF and age, it was used the *Kruskal-Wallis* test and applied the multivariate technique simple correspondence analysis for double entrance tables (two variable cross).

RESULTS

According to the sociodemographic variables listed in table 1, the data show that of

266 interviewed users, 83.1% were women, 59.4% aged less than 45 years, 42.0% have full high school, 51.0% self-reported brown, 54.1% were single/divorced/widowed/separated, 74.5% had income, 57.0% had a monthly income value from 1 to 3 minimum wages, 36.4% frequent the USF for the period from 1 to 5 years, 49% have a profession classified as others.

Regarding the factors associated with DM2, 66.5% of the users were overweight, being 34.5% classified as overweight and 32.0% as obesity. In relation to waist circumference, 77.9% were classified as central obesity. The great majority, 77.4%, did not practice physical activities and 21.1% had high glycemia as presented in table 2. To explain the relation between time of USF and age, it was used the *Kruskal-Wallis* test in the Table 3.

To prove the test above, it was applied the multivariate technique simple correspondence analysis for double entrance tables (two variable cross).

Table 1 – Distribution of users in the Family Health Units, according to sociodemographic characteristics, in the city of João Pessoa, Paraíba State, Brazil, 2016

Variables	n	%	RP*	CI** - 95%
Gender				
Female	221	83.1	1	-
Male	45	16.9	0.84	0.72 - 0.99
Age				
< 45	158	59.4	1	-
45 to 54	76	28.5	1.36	1.12 - 1.65
55 to 59	32	12.2	1.88	1.26 - 2.80
Education				
Illiterate/Literate/Incomplete Elementary Education	66	25.0	1	-
Full Elementary Education/Incomplete High School	51	19.0	0.83	0.66 - 1.06
Full High School	111	42.0	0.89	0.72 - 1.11
Incomplete Higher Education/Full Higher Education	38	14.0	0.81	0.63 - 1.03
Ethnicity				
White	85	32.0	1	-
Black	31	12.0	1.29	0.91 - 1.82
Brown	136	51.0	0.91	0.77 - 1.07
Marital status				
Single/Divorced/Widowed/Separated	144	54.1	1	-
Married/common-law marriage	122	45.9	1.05	0.90 - 1.22
Income				
Without income	68	25.5	1	-
With Income	198	74.5	0.85	0.85 - 1.20
Amount				
Less than 1 minimum wage	47	18.0	1	-
One to Three	151	57.0	1.10	0.91 - 1.33
USF time ***				
< 1 year	38	14.2	1	-
1 to 5	97	36.4	0.88	0.70 - 1.13
6 to 10	59	22.1	0.88	0.68 - 1.13
11 to 15	47	18.0	1.11	0.81 - 1.52
> 15	25	9.3	1.22	0.81 - 1.84
Profession				
Civil Servant	38	14.2	1	-
Self-employed	52	19.5	0.90	0.68 - 1.19
Others	129	49.0	0.88	0.69 - 1.14

Note: *PR - Prevalence Ratio; **CI - Confidence Interval; ***USF - Family Health Unit.

Table 2 – Distribution of users in the Family Health Units, according to clinical characteristics, in the city of João Pessoa, Paraíba State, Brazil, 2016

Clinical variables	n	%	RP*	CI** - 95%
BMI***				
< 25	89	33.5	1	-
25 to 30	92	34.5	1.22	1.11 a 1.41
> 30	85	32.0	2.49	1.90 a 3.26
Waist circumference				
M < 94 / F < 80	59	21.9	1	-
M 94 a 102 / F 80 a 88	62	23.4	1.07	1.01 a 1.16
M > 102 / F > 88	145	54.5	1.90	1.62 a 2.23
Physical activity				
1 = Yes	60	22.6	1	-
2 = No	206	77.4	1.26	1.09 a 1.45
Hyperglycemia				
1 = No	210	78.9	1	-
2 = Yes	56	21.1	2.04	1.46 a 2.84

Note: *PR - Prevalence Ratio; **CI - Confidence Interval; ***BMI - Body Mass Index; M - Male; F - Female.

Table 3 – Comparison of users age with time and frequency in the Family Health Units, in the city of João Pessoa, Paraíba State, Brazil, 2016

Time of USF*	People	Age		K-W***
		Average	SD**	
< 1 year	38	36.84	10.17	
1 to 5	97	40.52	11.09	
6 to 10	59	41.19	8.52	0.004
11 to 15	47	42.85	10.94	
> 15	25	46.84	10.63	

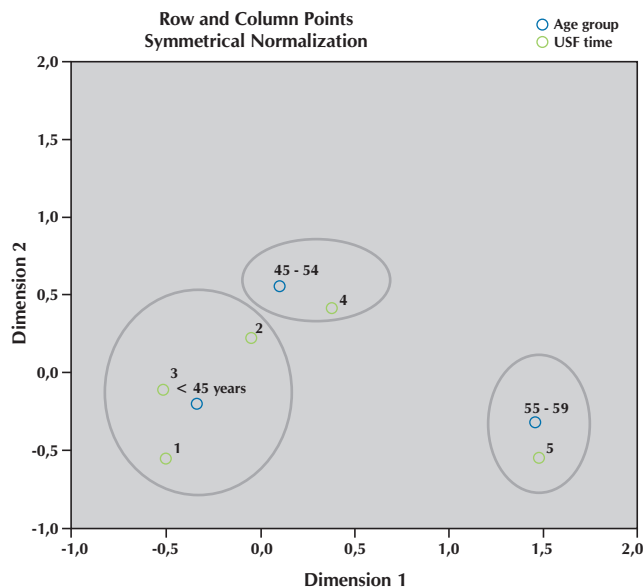
Note: USF* - Family Health Unit; SD** - Standard Deviation; K-W*** - Kruskal-Wallis Test.

Table 4 – Analysis of correspondence for crossing the time in the Family Health Units by Age Group, in the city of João Pessoa, Paraíba State, Brazil, 2016

Size	Singular value	Inertia	Chi-square	% Inertia
1	0.327	0.107		87.5
2	0.123	0.015	< 0.001	12.5
Total	-	0.122		100.0

It may be observed in Table 4 that the simple correspondence analysis shows 100% explanation for the variability in this crossing with only two dimensions (since the number of dimensions is equal to the minimum [age group category less 1, number of USF time category less 1] = minimum [2,4] = 2). Greater importance of the dimension 1 may also be noticed.

According to the Figure 1, the higher age group is related to a higher time of USF, confirming the results of the *Kruskal-Wallis* test presented in the Table 3.



Note: USF* - Family Health Unit.

Figure 1 – Percentage map of the Correspondence Analysis for the crossing of USF time by age group at risk of developing diabetes mellitus type 2, in the city of João Pessoa, Paraíba State, Brazil, 2016

DISCUSSION

The current study aimed to characterize profiles of people at risk of developing diabetes mellitus type 2 in the city of João Pessoa, Paraíba State. The importance of this characterization may be pointed out as basic strategy for actions that may affect the health/disease process of the USF users.

Regarding sociodemographic data, the results refer to the major attendance of women at the USF. This data was attested in another study⁽¹⁷⁻¹⁸⁾, fact that may indicate that women have a greater self-care regarding health and are considered the main users of the Unified Health System (SUS). However, the study shows a concern regarding men that also need health care, but do not have attendance in the units, fact that may leads to an increase of chronic diseases in men and a need for greater care offered by the health service⁽¹⁹⁻²⁰⁾.

In relation to gender, this study points out that there is no considerable statistics probability. This information is in disagreement with another study that observed a higher risk of DM2 in men due to a higher responsibility of women regarding their self-care⁽²¹⁾. However, it was supported by systematic review about prevalence and incidence of risk factors for DM2 in Vietnam, in which the gender factor did not show considerable difference and pointed out the lack of consistency in the association between gender and diabetes requires further investigation⁽²²⁾. Nevertheless, national and international studies respectively, revealed that men have higher risk of developing DM2^(2,23).

Among the participants of the current research, most of them was adults under 45 years. This age group meets the literature with work related to the identification of risk for DM2, in southern Brazil, with basic care users under 45 years (49.7%)⁽¹⁹⁾ and in Azores, Portugal, also with users in the same age group (56%)

⁽²⁴⁾. The Ministry of Health classifies the age group over or equal to 45 years as a risk for developing DM2⁽⁷⁾. This may be seen in other studies that also classifies this age group as a risk for developing the disease⁽²⁵⁾. In this study, it was observed that the higher the age, the more likely to develop DM2.

Regarding education, it was identified the prevalence of full high school among the participants studied, which may indicate a protection for DM2 risk, since literature states that the lower the education, the greater the trend of the disease development^(2,4,23). The National Health Survey of 2013, including education data in its evaluation, confirmed higher percentage of people with lower education level among those who were registered in the USFs. This profile was observed in all regions of Brazil, however, the southeast showed the highest variation between levels⁽²⁵⁾. In the current study, the education variable showed no considerable statistics relation for the risk of DM2.

With respect to ethnicity, brown was majority in the study. According to the Brazilian Society of Diabetes⁽⁴⁾ there is no distinction of risk for diabetes *mellitus* between white/brown/black. In a study conducted among bank clerks in Santa Catarina State, Brazil, was not found considerable statistics results $p=0.456$ related to ethnicity and the development of DM2⁽²⁶⁾. This fact attests the current study. An international study conducted in an adult community in Boston, US, showed $PR=2.98$ for black and $PR=1.48$ for white, in regard to develop DM2⁽²⁷⁾.

Concerning marital status, it may be observed that single/divorced/widowed/separated were those who had the highest prevalence in the study. A study carried out in Rize, Turkey, among 930 adults by cluster sampling, was related to the prevalence of risk factors for DM2 to the married/stable union population. It was justified in the study by the higher incidence of obesity in this group⁽²⁸⁾. This result may be confirmed in the study with the bank clerks of Santa Catarina State, Brazil⁽²⁶⁾. In the current study, there was no considerable statistics relation.

Concerning the family income, it was considered the minimum wage (R\$880.00) in the period the study was carried out. The National Household Sample Survey (NHSS) disclosed that the Brazilian average *per capita* income in 2015 reached R\$1,113, ranging from R\$509.00 in the Maranhão State to R\$2,252 in the Federal District. In Paraíba State this per capita income is R\$776.00 according to the research⁽²⁹⁾. This study observed a higher income than was estimated for the population of the Paraíba State. It has already been found in international literature, in Australia, that lower socioeconomic and education levels were considerably associated with higher chances of developing DM2⁽²⁵⁾. However, in the current study, the income did not show considerable statistics value for the risk of DM2.

In terms of users frequency time to the services offered by the health units studied, it was found that, the period from 1 to 5 years accounted for the highest percentage. These frequency data did not showed considerable statistics relation. On the other hand, it may interfere with the fact that the higher frequency time in the units, the more care would be received by users, considerably reducing the chances of DM2. For a better understanding, it was made an association between the frequency time in the health units and the age of the participants through the *Kruskal-Wallis* test, presented in Table 3. It was confirmed

that the people average age have increased as the USF time increased. According to the nonparametric test *Kruskal-Wallis*, there is a considerable difference in the average age by USF time, being likely the older the people, the higher the time in the service frequency. This conclusion may be observed by using the multivariate technique of simple correspondence analysis for double entrance tables (two variable cross).

Then, it will may be inferred that this association between age and time of frequency in the health units is related to confidence in the basic care service, causing the user to continue looking for it. Thereby, referring to a thought of prevention and protection regarding diabetes if the health providers be aware of the risk factors presented by the users and keep a continuous care. However, these findings should be better studied, what seem to be a challenge for future research.

In terms of profession, it was not observed in the study a considerable statistics relation with DM2 probability, but it was already found in the literature a positive relation between the risk for DM2 and profession. This relation was observed among nurses by a study that pointed out this characteristic as being related to the working process of nursing, which may interfere in the sociodemographic and psychosocial variables⁽³⁰⁾.

Concerning clinical factors analyzed and associated with DM2, the overweight and obesity was a considerable statistics value in relation to the risk likelihood of developing DM2. These results respond to international⁽³¹⁻³²⁾ and national^(20,23) studies that prove this relation. An integrative review that studied the relation among risk factors for DM2 in the Arab world proved that obesity was the main risk factor for rapid increase of DM2 in this region⁽³³⁾.

In terms of waist circumference and the risk for DM2, it was observed that the higher the waist circumference, the higher the probability of developing the disease. In a study conducted in the city of Pinal Del Rio, Cuba, in the Primary Health Care, was observed the waist circumference increase as a risk for DM2 in both gender⁽³⁴⁾. In southern Brazil, in a study among basic care users it was observed that the waist circumference between 94-102 cm in men and 80-88 cm in women was a considerable statistics value in likelihood of risk for DM2⁽²⁰⁾.

Physically inactive people were the sample majority and had considerable statistics PR value of 1.26 for developing DM2. A survey conducted in the city of Concordia, Santa Catarina State, Brazil, among workers of an industry showed that, in the high-risk group for DM2, all of them were sedentary⁽³⁵⁾. This information is in line with another study carried out in the city of Jundiaí, São Paulo State, Brazil⁽²³⁾. The physical activity practice as benefit to the health and the body is widely disclosed in the social networks and the media, however, a study in southeastern Brazil pointed out that the disclosure of this information is not clear, nor is encouraged by the professionals in the Primary Health Care⁽³⁶⁾.

According to what was reported by the population studied, 21.1% had glycemia rise. This percentage was higher than what was observed in other review⁽²³⁾ about the investigation of DM risk, conducted among student parents of a private school in the city of Jundiaí, Brazil, which represented 18%. However, in a cross-sectional study for DM2 risk evaluation

carried out among Australians, the level of high glycemia corresponded to 32%⁽³⁷⁾. In the current study, there was considerable statistics relation $PR = 2.04$ for DM2. Fact that was attested in other study⁽³⁶⁾. Changes in glycemia are a great alert to health care professionals, mainly to the nurse in the follow-up of patients at risk of developing DM2. For many times, the DM2 appears silently and the uncontrolled glycemia may be the first parameter to indicate a possible diagnosis of diabetes, being a factor that must be better studied.

Study limitations

The limits of the study were the cross-sectional design that did not allowed the relation of cause and effect. In addition, because the male users have a low attendance to the Primary Health Care and many refused to respond to the survey, there was a limitation in the stratified analysis by gender.

Contributions to nursing, health and public policy

This study shows that many risk factors for developing DM2 were present among the population of the study. In the face of these findings, it is highlighted the importance of carrying out health education and interventions by health professionals to encourage changes in habits, as it provides users access

to knowledge about their health-disease process. Thereby, encouraging positive attitudes in its care, slowing or preventing the onset of diabetes. It should be pointed out that the nurse must be able to identify people at risk for DM2, considering their sociodemographic and clinical characteristics, as well as the context in which they are inserted.

CONCLUSION

The data obtained in this study characterized a predominantly female population, aged less than 45 years, with full high school, brown, single/divorced/widowed/separated, with income of 1 to 3 minimum wages, with health units attendance of 1 to 5 years and profession classified as others.

The analysis of the prevalence ratio, applied to all sociodemographic and clinical factors investigated, are statistically considerable as follows: old age, BMI, increased waist circumference, physical inactivity and elevated glucose. In view of their patients knowledge, it is up to the health managers and professionals the greater efficiency in the health services management, emphasizing the healthy lifestyle promotion, such as regular practice of physical activities, weight control and healthy eating.

REFERENCES

1. Batista NNLA, Luz MHBA. [Experiences of people with diabetes and amputation of members]. *Rev Bras Enferm* [Internet]. 2012[cited 2016 Aug 5];65(2):244-50. Available from: <http://www.scielo.br/pdf/reben/v65n2/v65n2a07.pdf> Portuguese
2. Marinho NBP, Vasconcelos HCA, Alencar AMPG, Almeida PC, Damasceno MMC. Risk for type 2 diabetes mellitus and associated factors. *Acta Paul Enferm* [Internet]. 2013 [cited 2016 Aug 5];526(6):569-74. Available from: http://www.scielo.br/pdf/ape/v26n6/en_10.pdf
3. International Diabetes Federation. Atlas do Diabetes 2015: atualização. Sociedade Brasileira de Diabetes adapted. 7th ed. [Internet]. 2015 [cited 2016 Jun 20]. Available from: <http://www.diamundialdodiabetes.org.br/media/uploads/atlasidf-2015.pdf>
4. Sociedade Brasileira de Diabetes. Diretrizes da Sociedade Brasileira de Diabetes: 2015-2016. São Paulo: AC Farmacêutica; 2015.
5. Magalhães AT, Silva BAK, Ribeiro JA, Bisneto JFA, Pereira LPI, Machado NV, et al. Assessment of risk of developing type 2 diabetes mellitus in a university population. *Rev Bras Promoç Saúde* [Internet]. 2015[cited 2016 Aug 5];28(1):5-15. Available from: http://periodicos.unifor.br/RBPS/article/view/3198/pdf_1
6. International Diabetes Federation. Diabetes Risk Factors[Internet]. 2015[cited 2016 Aug 05]. Available from: <http://www.idf.org/about-diabetes/risk-factors>
7. Brasil. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Atenção Básica. Estratégias para o cuidado da pessoa com doença crônica: diabetes mellitus. Brasília (DF): Ministério da Saúde; 2013.
8. Brasil. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Atenção Básica. Política Nacional de Atenção Básica. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Atenção Básica. Brasília: Ministério da Saúde, 2012.
9. Lima ACS, Araújo MFM, Freitas RWJF, Zanetti ML, Almeida PC, Damasceno MMC. Risk factors for Type 2 Diabetes Mellitus in college students: association with sociodemographic variables. *Rev Latino-Am Enferm* [Internet]. 2014[cited 2016 Aug 31];22(3):484-90. Available from: http://www.scielo.br/pdf/rlae/v22n3/pt_0104-1169-rlae-22-03-00484.pdf
10. Montgomery M, Jhonson P, Ewell P. The presence of risk factors for type 2 diabetes mellitus in underserved preschool children. *Nurs Clin North Am*[Internet]. 2015 [cited 2016 Jul 17];50(3):585-94. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/26333612>
11. Vasconcelos HC, Araujo MF, Damasceno MM, Almeida PC, Freitas RW. Risk factors for type 2 diabetes mellitus among adolescents. *Rev Esc Enferm USP*[Internet]. 2010[cited 2016 Aug 5];44(4):881-7. Available from: http://www.scielo.br/pdf/reeusp/v44n4/en_04.pdf
12. Columbié YL, Soca PEM, Vázquez DR, Chi YB. Risk factors associated to occurrence of type 2 diabetes mellitus in adults. *Rev Cubana Endocrinol*[Internet]. 2016[cited 2016 Aug 5];27(2):123-33. Available from: <http://www.scielo.sld.cu/pdf/end/v27n2/end02216>
13. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Departamento de Vigilância de Doenças e Agravos não Transmissíveis e Promoção da Saúde. Vigitel Brasil 2014: vigilância de fatores de risco e proteção para doenças crônicas por inquérito telefônico. Brasília (DF): Ministério da Saúde; 2015.

14. Organização Mundial de Saúde. OMS. Atividade física [Internet]. 2016 [cited 2016 Aug 25]. Available from: <http://www.who.int/mediacentre/factsheets/fs385/es/>
15. Brasil. Ministério da Saúde. Secretaria de Atenção à Saúde, Departamento de Atenção Básica. Estratégias para o cuidado da pessoa com doença crônica. Brasília: Ministério da Saúde [Internet]. 2014 [cited 2016 Aug 5];159p. Available from: http://bvms.saude.gov.br/bvs/publicacoes/estrategias_cuidado_pessoa_doenca_cronica_cab35.pdf
16. Brasil. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Atenção Básica. Orientações para a coleta e análise de dados antropométricos em serviços de saúde: Norma Técnica do Sistema de Vigilância Alimentar e Nutricional - SISVAN[Internet]. Brasília: Ministério da Saúde. 2011[cited 2016 Aug 18]. 71p. Available from: http://bvms.saude.gov.br/bvs/publicacoes/orientacoes_coleta_analise_dados_antropometricos.pdf
17. Bruno A, Pereira LR, Almeida HS. Evaluation of the prevalence of risk factors for development of type 2 diabetes mellitus in patients of the Unesc Clinic. Demetra [Internet]. 2014[cited 2016 Aug 18];9(3):661-80. Available from: <http://www.e-publicacoes.uerj.br/index.php/demetra/article/viewFile/10659/12439>
18. Araújo LO, Silva ES, Mariano JO, Moreira RC, Prezotto KH, Fernandes CAM, et al. Risk of developing diabetes mellitus in primary care health users: a cross-sectional study. Rev Gaúcha Enferm[Internet]. 2015[cited 2016 Aug 1];36(4):77-83. Available from: http://www.scielo.br/pdf/rgenf/v36n4/pt_1983-1447-rgenf-36-04-00077.pdf
19. Mendes TAB, Goldbaum M, Segri NJ, Barros MBA, Cesar CLG, Alves MCGP. Diabetes mellitus: factors associated with prevalence in the elderly, control measures and practices, and health services utilization in São Paulo, Brazil. Cad Saúde Pública [Internet]. 2011[cited 2016 Jun 14];27(6):1233-43. Available from: <http://www.scielo.br/pdf/csp/v27n6/20.pdf>
20. Pimenta FB, Pinho L, Silveira MF, Botelho ACC. Factors associated with chronic diseases among the elderly receiving treatment under the Family Health Strategy. Ciênc Saúde Colet[Internet]. 2015[cited 2016 Jun 16];20(8):2489-90. Available from: <https://scielosp.org/pdf/rbepid/2012.v15n2/265-274/en>
21. Mazzini MCR, Blumer MG, Hoehne EL, Guimarães KRLSLQ, Caramelli B, Fornari L, et al. Diabetes mellitus risk screening of parents of private school students in the city of Jundiaí, São Paulo, Brazil. Rev Assoc Med Bras [Internet]. 2013[cited 2016 Jun 16];59:136-42. Available from: http://www.scielo.br/pdf/ramb/v59n2/en_v59n2a12.pdf
22. Nguyen CT, Pham NM, Lee AH, Binns CW. Prevalence of and Risk Factors for Type 2 Diabetes Mellitus in Vietnam A Systematic Review. Asia-Pacific J Public Health [Internet]. 2015[cited 2016 Jun 3];27(6):588-600. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/26187848>.
23. Ding D, Chong S, Jalaludin B, Comino E, Bauman AE. Risk factors of incident type 2-diabetes mellitus over a 3-year follow-up: results from a large Australian sample. Diabetes research and clinical practice [Internet]. 2015[cited 2016 Jun 12];108(2):306-15. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/25737033>
24. Valente T, Azevedo L. Estudo radar: risco aumentado de diabetes em Amarante. Rev Port Med Geral Fam [Internet]. 2012[cited 2016 Jul 21];28(1):18-24. Available from: <http://www.rpmgf.pt/ojs/index.php/rpmgf/article/view/10913>
25. Malta DC, Santos MAS, Stopa SR, Vieira JEB, Melo EA, Reis AAC. Family Health Strategy Coverage in Brazil, according to the National Health Survey, 2013. Ciênc Saúde Colet[Internet]. 2016[cited 2016 Jun 23];21(2):327-38. Available from: http://www.scielo.br/pdf/csc/v21n2/en_1413-8123-csc-21-02-0327.pdf
26. Bittencourt A, Vinholes DB. Assessing the risk for type 2 diabetes mellitus in bank employees from the city of Tubarao, Santa Catarina state, Brazil. Sci Med [Internet]. 2013[cited 2016 Jul 28];23(2):82-9. Available from: <http://revistaseletronicas.pucrs.br/ojs/index.php/scientiamedica/article/view/12756/9660>
27. Piccolo RS, Duncan DT, Pearce N, McKinlay JB. The role of neighborhood characteristics in racial/ethnic disparities in type 2 diabetes: Results from the Boston Area Community Health (BACH) Survey. Soc Sci Med [Internet]. 2015[cited 2016 Jul 28]; p. 79-90. Available from: [https://linkinghub.elsevier.com/retrieve/pii/S0277-9536\(15\)00067-2](https://linkinghub.elsevier.com/retrieve/pii/S0277-9536(15)00067-2)
28. Wang C, Yatsuya H, Tamakoshi K, Toyoshima H, Wada E, Li Y, et al. Association between parental history of diabetes and the incidence of type 2 diabetes mellitus differs according to the sex of the parent and offspring's body weight: a finding from a Japanese worksite-based cohort study. Prev Med [Internet]. 2015[cited 2016 Jul 29];81:49–53. Available from: <http://dx.doi.org/10.1016/j.ypmed.2015.07.021>
29. Brasil. Instituto Brasileiro de Geografia e Estatística. IBGE. Diretoria de Pesquisas, Coordenação de Trabalho e Rendimento. Pesquisa Nacional por Amostra de Domicílios Contínua. PNAD Contínua [Internet]. 2015[cited 2016 Jul 29]. Available from: http://www.ibge.gov.br/home/estatistica/pesquisas/pesquisa_resultados.php?id_pesquisa=149
30. Almeida VC, Zanetti ML, Almeida PC, Damasceno MM. Occupation and risk factors for type 2 diabetes: a study with health workers. Rev Latino-Am Enferm [Internet]. 2011[cited 2016 Jun 24];19(3):476-84. Available from: <http://www.scielo.br/pdf/rlae/v19n3/05.pdf>
31. Viveiros AS, Borges M, Martins R, Anahory B, Cordeiro MS. [LIDIA Study: Diabetes mellitus type 2 Risk in a rural population of the Azores]. RPEDM[Internet]. 2015[cited 2016 Jun 23];10(2):124-27. Available from: http://www.spedm.org/website/download/1856-RPEDM_Rev20_V10N2_FinalsemPUB.pdf Portuguese
32. Narayanamurthy MR, Baghel RK, Siddalingappa H. Prevalence and factors influencing type 2 diabetes mellitus in rural Mysore. Int J Diabetes Dev Ctries [Internet]. 2015[cited 2016 Jun 23];35(Suppl 2):S–S8. Available from: <https://link.springer.com/>

article/10.1007/s13410-014-0202-2

33. Abuyassin B, Laher I. Diabetes epidemic sweeping the Arab world. *World J Diabetes* [Internet]. 2016[cited 2016 Jul 15];7(8):165-74. Available from: <http://www.wjgnet.com/1948-9358/full/v7/i8/165.htm>
 34. Naranjo AA, Rodríguez AY, Llera RE, Aroche R. Diabetes risk in a Cuban Primary Care Setting in persons with no known glucose abnormalities. *Medicc Review* [Internet]. 2013[cited 2016 Jul 15];15(2). Available from: <http://www.medicc.org/mediccreview/index.php?get=2013/2/16>
 35. Zardo M, Bassan MB, Farias KCM, Diefenthaler HS, Graziotin NA. Tracking risk factors for type 2 diabetes in workers of an industry from the city of Concordia-SC. *Rev Perspect*[Internet]. 2015[cited 2016 Aug 6];145(39):85-95. Available from: http://www.uricer.edu.br/site/pdfs/perspectiva/145_484.pdf
 36. Santos RP, Horta PM, Silva CS, Santos CA, Oliveira HBS, Almeida LMR, et al. Nutrition and physical activity counseling: practice and adherence of primary care users. *Rev Gaúcha Enferm* [Internet]. 2012[cited 2016 Aug 6];33(4):14-21. Available from: <http://www.scielo.br/pdf/rgenf/v33n4/02.pdf>
 37. Aguiar EJ, Morgan PJ, Collins CE, Plotnikoff RC, Callister R. Characteristics of men classified at high-risk for type 2 diabetes
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