



## Proposal of an Instrument to Assess the Level of Knowledge of Adults About the Relationship Between Obesity and Metabolic Syndrome

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### Abstract

Metabolic Syndrome (MS) is a disorder associated with multiple states of health problems with high prevalence in the adult population worldwide. In view of this, lifestyle modification and weight loss should be considered as the first step in preventing or treating MS. However, people prone to developing MS, notably those with excess weight, are resistant to adhering to one or more of the self-care recommendations, such as medication use, physical activity, and healthy eating. Studies have shown that these people's lack of knowledge about the risk and protective factors of MS contribute to non-adherence to a healthy lifestyle and evoke the need to develop more effective health education strategies. Thus, the aim of the present study was to develop an instrument to assess people's knowledge of the relationship between obesity and the development of MS. To develop the instrument's questions, a search was carried out in journals indexed in the PubMed databases, using the descriptors "metabolic syndrome" and "obesity". After reviewing all literature data, 40 questions were created. The answers to the affirmatives of the questions were made using the Likert-type measurement scale. The 40 questions of the instrument were divided into three dimensions: a) Knowledge about obesity and related diseases; b) Knowledge about risk factors and c) Knowledge about protective factors. The instrument was valid in a population of adults (n = 53) whose sociodemographic data were used to analyze the factors that may influence the responses to the questionnaire. A superior performance in the answers obtained in the applied questionnaire was positively correlated with the sociodemographic characteristics of the participants, such as education level and racial ethnic profile. The instrument has a suitable structure to assess aspects of knowledge about the relationship between obesity, lifestyle, and MS.

**Keywords:** Health Education; Chronic Non-Communicable Diseases; Health Promotion

### Introduction

In a recent estimate, the Metabolic Syndrome (MS), a disorder associated with multiple states of health problems [1], which involve a set of metabolic and cardiovascular factors, increase the risk of patients developing type 2 Diabetes Mellitus. (DM2) and cardio/cerebrovascular disease (CVD) [2], showed a prevalence in the world adult population between 20 to 25% [3]. Due to this

increase in prevalence in the last decade, it has become a major global health problem.

With a complex etiology, MS seems to occur mainly in response to a combination of genetic/epigenetic factors [4] and lifestyle, such as an unbalanced diet [5] and sedentary behaviors [6]. Thus, approaches aimed at modifying lifestyles have emerged as important strategies to be targeted both for prevention [7,8] and

for treatment of the SM [9]. Although evidence has suggested the incorporation of physical activity, associated or not with a restrictive diet and pharmacological treatment, within the scope of MS control strategies, there is still no consensus on the most effective approach.

Above all, the essential purpose in the diagnosis of MS is the adaptation of the treatment and the balance of risk factors that can intensify the condition in the proportion that the diseases involved in this syndrome are chronic and their consequences are immutable [10]. Following unhealthy dietary patterns and sedentary lifestyles may be responsible for this remarkable increase in the prevalence of overweight and obesity worldwide [11]. In view of this, lifestyle modification and weight loss are the first step in preventing or treating MS [12]. However, studies have documented that patient show significant resistance to adhering to one or more of the self-care recommendations, such as medication use, physical activity, and healthy eating [13].

Therefore, there is a need for health education actions that consider the complexity of MS treatment, which should be multi professional and interdisciplinary, with a focus not exclusively on weight reduction, but on lifestyle changes, which must be maintained forever. For the success of this health education process, an increasing number of questionnaires or measurement instruments that assess psychosocial characteristics and various health outcomes are available for use in research, clinical practice, and population health assessment [14]. However, to date, at least to our knowledge, there is no instrument to assess people's degree of knowledge about the relationship between lifestyles, obesity, and the development of MS. Thus, we present in this article a proposal for an instrument for this purpose.

## Methodology

For the development of the instrument entitled "Basic Knowledge Scale on Obesity and Metabolic Syndrome", the theoretical and methodological bases of construction and validation of a scale were followed, aiming to expand the use of quantitative instruments in research in education in health promotion.

To develop the statements of the Scale, a search was carried out in journals indexed in the PubMed databases, using the descriptors "metabolic syndrome" and "obesity". After reviewing all data

in the literature, the 40 questions of the scale were elaborated. The answers to the statements of the Scale were made using the Likert-type measurement scale.

To validate the instrument, it was developed a descriptive and cross-sectional study, which was developed between June and July 2021 in the city of Maringá/PR. The study was approved by the Ethics Committee in Research with Human Beings - CEP of Universidade Cesumar - UniCesumar, according to the rules established in Resolution No. 466/12 and Complementary of the National Health Council, under opinion number 4,080,654. All individuals who participated in the study signed the Free and Informed Consent Form (FICT).

Men and women, adults (n = 53), employees of a Higher Education Institution located in the Municipality of Maringa, State of Paraná, Brazil were recruited to respond the instrument "Basic Knowledge Scale on Obesity and Metabolic Syndrome". Recruitment took place through posters distributed throughout the university campus, in places with the highest flow of employees. Participants were invited to a face-to-face meeting where they answered the instrument.

Participants also answered a questionnaire regarding the level of education and ethnic-racial profile to determine which factors influenced the responses about knowledge of the metabolic syndrome. Data were plotted in excel spreadsheets and analyzed using descriptive statistics. The analysis of the influence of sociodemographic factors on the degree of knowledge about MS was determined using regression analysis. Given the overdispersion of the data, the model chosen for the regression was the negative binomial model. The interpretations of the results were performed according to the prevalence ratio, assuming a significance level of 5% for all analyzes performed.

## Results and Discussion

The analysis of the scientific literature made it possible to identify the key elements for the construction of the theoretical model of the scale, favoring the 1<sup>st</sup> version of the instrument. Theoretical references were important to choose the representative domains of the scale in relation to MS. The 40 questions on the scale were divided into three dimensions (domains): a) Knowledge about obesity and related diseases; b) Knowledge about risk factors and c) Knowledge about protective factors (Table 1).

Obesity can be considered a disease.	1	2	3	4	5
Among the causes of obesity, genetic origin is the most frequent.	1	2	3	4	5
The cause of obesity can be hormonal in origin due to excess food intake.	1	2	3	4	5
Excessive food intake can be one of the most common causes of obesity.	1	2	3	4	5
Obesity can have a psychological cause.	1	2	3	4	5
Obesity is characterized by excessive accumulation of body fat.	1	2	3	4	5
Obesity increases the risk of death.	1	2	3	4	5
In the morbidity associated with obesity we can find: Diabetes, hypertension, cardiovascular diseases, heart attack and gout.	1	2	3	4	5
A sedentary lifestyle (lack of physical activity) or a low level of physical activity causes a person to have a reduced caloric expenditure.	1	2	3	4	5
A sedentary lifestyle (lack of physical activity) can be as dangerous to health as obesity.	1	2	3	4	5
A sedentary lifestyle (lack of physical activity) can cause several diseases, such as diabetes mellitus, obesity, high cholesterol, myocardial infarction.	1	2	3	4	5
A sedentary lifestyle can accelerate aging.	1	2	3	4	5
To get out of a sedentary lifestyle, people should adopt a change in life habits, as far as possible, and dedicate themselves to physical or sports activities that increase energy expenditure, such as walking, running, cycling, swimming, dancing, practicing gymnastics, exercises with weights. and play ball. Or even wash the sidewalk, clean the house.	1	2	3	4	5
The World Health Organization (WHO) recommends that the daily consumption of carbohydrates correspond to a maximum of 5% of the total calories ingested in the day to avoid diseases.	1	2	3	4	5
Sugar intake must be controlled to avoid an increase in obesity, diabetes, and metabolic syndrome.	1	2	3	4	5
Sugar is present in many processed foods, such as soft drinks, juices, yogurt, and ketchup.	1	2	3	4	5
Being overweight, especially if fat is concentrated around the waist, is a risk factor for developing diabetes and associated pathologies.	1	2	3	4	5
Having sleep apnea can be a risk factor for developing diabetes.	1	2	3	4	5
People with diabetes have too much sugar (glucose) in their blood.	1	2	3	4	5
Eating too much sugar in the form of sweets, sugary drinks and cakes can cause Diabetes.	1	2	3	4	5
In type 1 diabetes, the pancreas does not produce insulin.	1	2	3	4	5
People who have diabetes should generally exercise for 30 to 60 minutes a day, most days of the week.	1	2	3	4	5
Medication helps control blood glucose levels, but maintaining an ideal weight, a balanced diet and regular exercise are essential factors in helping to control diabetes.	1	2	3	4	5
The term Metabolic Syndrome describes a set of metabolic risk factors that manifest in an individual and increase the chances of developing heart disease, stroke, and diabetes.	1	2	3	4	5
Metabolic Syndrome is a set of diseases associated with obesity.	1	2	3	4	5
The accumulation of visceral fat, that is, the fat inside the abdomen, is the most harmful to people and has a greater relationship with diseases related to Metabolic Syndrome.	1	2	3	4	5
Among the conditions that define the Metabolic Syndrome, we can highlight resistance to the action of insulin, which forces the pancreas to produce more of this hormone.	1	2	3	4	5
A risk factor for developing Metabolic Syndrome is having a large amount of abdominal fat - In men, a waist greater than 102 cm and in women greater than 88 cm.	1	2	3	4	5
For most people the development of Metabolic Syndrome increases with aging.	1	2	3	4	5

The risk of developing Metabolic Syndrome increases if a person leads a sedentary lifestyle.	1	2	3	4	5
For most people, the development of metabolic syndrome involves weight gain, especially in the abdominal region (waist circumference); family history of diabetes; high levels of fat in the blood; high pressure.	1	2	3	4	5
Smoking can increase heart risk and potentiate the consequences of metabolic syndrome on the heart.	1	2	3	4	5
Increasing physical activity and losing weight are the best forms of treatment for metabolic syndrome, but medication may be needed to treat risk factors.	1	2	3	4	5
Prioritizing foods rich in unsaturated fats and reducing carbohydrate intake has been shown to be effective in losing weight and avoiding the risk of developing metabolic syndrome.	1	2	3	4	5
Increasing physical activity and losing weight are the best forms of treatment for Metabolic Syndrome.	1	2	3	4	5
For the prevention and treatment of Metabolic Syndrome, it is recommended to reduce the consumption of simple carbohydrates, such as pasta.	1	2	3	4	5
For the prevention and treatment of Metabolic Syndrome, the intake of vegetables, legumes, whole grains, and fruits should be prioritized.	1	2	3	4	5
Among the recommendations to prevent and treat Metabolic Syndrome are smoking cessation and control of alcohol intake to prevent and treat Metabolic Syndrome.	1	2	3	4	5
The practice of physical activity has been recommended as a form of prevention and treatment of metabolic syndrome.	1	2	3	4	5
Medication is the only effective treatment for Metabolic Syndrome.	1	2	3	4	5

**Table 1:** Basic Knowledge Scale on Obesity and Metabolic Syndrome.

A good questionnaire to assess the evolution of learning must generate valid answers, accepted by the interviewees, and motivate participation and the provision of the desired information [15]. It is noteworthy that the elaboration of the items must follow the guidelines of the International Test Commission, which recommends the construction of clear and objective items, which express a single idea; that are intelligible to the target population, consistent with the factor to be tested. The present scale proposal was built from these precepts, strictly following all the suggested criteria.

We also recognize that in relation to the production of the scale, in addition to be elaborated through scientific evidence, such as the one that was conducted, there is still a need for its validation by specialists and its pilot test in the target population, as previously determined [16]. Content validity is defined as the degree to which the content of an instrument adequately reflects the construct being measured, or in other words, it is the degree to which an instrument includes all the items necessary to represent the concept being measured. For this, it is essential that the instrument be evaluated by judges, knowledgeable on the subject due to their academic

training or work experience. Therefore, the present proposal of the scale will be submitted to expert analysis in the future before being validated for use in the target population.

Table 2 presents the data regarding the analysis of the coefficients obtained considering the number of correct answers in the instrument on knowledge of the metabolic syndrome and the sociodemographic variables. The expected reference value 15.52 represented the number of expected hits when all continuous variables assumed the value zero and the categorical variables assumed the reference class (education = elementary school; ethnic-racial profile = white; sex = female). This is the base value from which, when assigning the values of the other variables, the value of correct answers is increased or decreased according to the coefficient of the variable. The percentage of increase or decrease in the number of hits was calculated using the formula:  $(e/\text{coefficient}/-1) \times 100$  and the increase or decrease was characterized by the sign of the coefficient. It was noted that education and ethnic-racial profile were factors that influenced the degree of knowledge about the metabolic syndrome.

Variables	p Value	Coefficients	Interpretation of the coefficient
Intercept	0.0426 *	2.7423339	15.52 (expected reference value)
Education = high school	0.0959 †	0.6922710	There was an increase of 99.82% (comparing high school with elementary)
Education = higher education	0.0302 *	0.7655568	There was an increase of 115.02% (comparing higher education with elementary)
Skin color = brown	0.0647	-0.2856695	There was a reduction of 33.07% (comparing brown and white skin color)

**Table 2:** Influence of the level of education and ethnic-racial profile on the level of knowledge about the metabolic syndrome.

Relationships were established between sociodemographic data and risk factors for the development of MS with the participants’ knowledge about this disease. Our results demonstrated the influence of schooling and ethnic-racial profile on the degree of knowledge about MS. There was a positive correlation between higher education and the rate of correct answers in the applied questionnaire. Our data also suggest the presence of socioeconomic discrepancies in the different ethnic-racial profiles, which was also reflected in the knowledge about MS. This last data may have repercussions on general health knowledge and its implications. Our data showed a higher performance of white individuals in the questionnaire on knowledge of risk factors and prevention of MS. In turn, 74% of individuals who declared themselves white had higher education. Objectively, these data suggest high access to higher education by white individuals.

**Conclusion**

The systematic analysis of the scientific literature made it possible to identify the key elements for the construction of the Basic Knowledge on Obesity and Metabolic Syndrome scale. The theoretical frameworks were important to build the representative do-

mains of the scale in relation to MS, summarized in 40 questions. The initial construct allows assessing the degree of knowledge of individuals in three specific dimensions: a) knowledge about obesity and related diseases; b) knowledge about risk factors; and c) knowledge about protective factors. We believe that after completing the instrument validation process, the scale can be applied to assess the efficiency of health education strategies based on the relationship between lifestyles, obesity and the development of MS. The results found in this study showed the determining factors for people’s knowledge about MS, especially the education factor and ethnic-racial profile. This fact may allow a new role for health professionals with a view to preventing risk factors and encourages the expansion of the field of research in this area, given that this topic is still a matter of concern for the health of the population.

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