Online ISSN : 2249-4618
Print ISSN : 0975-5888
DOI : 10.17406/GJMRA

Global Journal

of Medical Research: F

Diseases

Cancer, Ophthalmology & Pediatric

IgA Nephropathy in a Patient

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Highlights

Breast Cancer Screening Campaign

Laboratory Evaluations with Adolescents

Discovering Thoughts, Inventing Future

VOLUME 22 ISSUE 9 VERSION 1.0

Global Journal of Medical Research: F
Diseases
Cancer, Ophthalmology & Pediatric

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Cancer, Ophthalmology & Pediatric

Volume 22 Issue 9 (Ver. 1.0)

Open Association of Research Society

Incorporation No.: 0423089
License No.: 42125/022010/1186
Registration No.: 430374
Import-Export Code: 1109007027
Employer Identification Number (EIN):
USA Tax ID: 98-0673427

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Sponsors: Open Association of Research Society
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Offset Typesetting

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Packaging & Continental Dispatching

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Global Journal of Medical Research: F
Diseases
Volume 22 Issue 9 Version 1.0 Year 2022
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 2249-4618 & Print ISSN: 0975-5888

Laboratory Evaluations with Adolescents with Down Syndrome Science, Affectivity and Playfulness

By Elvio Marcos Boato, Graciele Massoli Rodrigues, Soraya Valenza Diniz, Márcia Correia Moita & Geiziane Leite Rodrigues Melo

Abstract- People with Down syndrome (DS) present neurophysiological problems that could be alleviated with the systematic practice of Physical Education(PE). However, there are questions regarding laboratory assessments for the prescription of exercises, as there are no adequate equipment or protocols for this group, the difficulty of the individual with DS concerning the proposed tests, and difficulty in controlling emotions when in a laboratory environment because they present intellectual disability. The objective of this study was to report approach procedures for the data collection in a laboratory environment developed in research on muscle strength, body composition, and hemodynamics in adolescents with Down syndrome, from the use of Henri Wallon's theory of emotions and his considerations about emotional manifestations. Considering this theory and what we can call a greater humanization of the process of evaluating people with DS in the laboratory, the participants, who were unable to perform the proposed tests, were encouraged to participate in the study at another time.

Keywords: down syndrome; laboratory evaluations; physical education; affectivity; playfulness; emotions.

GJMR-F Classification: DDC Code: 618.92858842 LCC Code: RJ506.D68

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Elvio Marcos Boato [α], Graciele Massoli Rodrigues [σ], Soraya Valenza Diniz [ρ], Márcia Correia Moita [ω] & Geiziane Leite Rodrigues Melo [¥]

Abstract- People with Down syndrome (DS) present neurophysiological problems that could be alleviated with the systematic practice of Physical Education(PE). However, there are questions regarding laboratory assessments for the prescription of exercises, as there are no adequate equipment or protocols for this group, the difficulty of the individual with DS concerning the proposed tests, and difficulty in controlling emotions when in a laboratory environment because they present intellectual disability. The objective of this study was to report approach procedures for the data collection in a laboratory environment developed in research on muscle strength, body composition, and hemodynamics in adolescents with Down syndrome, from the use of Henri Wallon's theory of emotions and his considerations about emotional manifestations. Considering this theory and what we can call a greater humanization of the process of evaluating people with DS in the laboratory, the participants, who were unable to perform the proposed tests, were encouraged to participate in the study at another time. It was noticed that by understanding what causes emotions and how they interfere with the performance of the tests, an essential and effective tool was acquired in the control of the research environment, preventing fear, discomfort, or lack of knowledge from being impediments to the research. Still far from a path to be proposed suitable for laboratory assessments in PE of people with DS. We can say that the steps followed here, which are not intended to be considered guidelines, can be a principle for proposing techniques for the application of laboratory tests in a respectful manner that considers individuals without losing sight of the need for rigor and seriousness of the scientific method. It may not be much, but we consider it an important step in the search for a path shared and experienced by all, regardless of deficiencies and differences.

Keywords: down syndrome; laboratory evaluations; physical education; affectivity; playfulness; emotions.

I. Initial Considerations

Caminante, no hay camino:
the path if you walk.
Antonio Machado

Down Syndrome (DS) is a chromosomal abnormality on chromosome 21 that affects the entire body system, affecting about 1 in every 1000 newborns worldwide (FBASD, 2019). Despite the high incidence of cases, little is known about the genetic characteristics due to the chromosomal alterations of this population (Mégarbané et al., 2009). However, the literature highlights some changes, such as generalized physiological dysfunction, neuropathogenesis, growth disorders, alteration of mitochondrial function (Roizen & Patterson, 2003), premature aging, ligament laxity, and muscle hypotonia (Foley & Killeen, 2019; Zigman, 2013), heart problems (Tsou et al., 2020; Capone et al., 2020)

Ranweiler (2009) points out that muscle hypotonia is observed in approximately 80% of newborns with DS, in addition to having joint hyper flexibility, short stature, and pelvic dysplasia with a narrow acetabular angle. As a consequence, this results in delayed psychomotor and neurological development (Capone et al., 2001) and reduced muscle strength (Foley & Killeen, 2019; Cioni et al., 1994).

Despite presenting this clinical picture, individuals with DS increased their life expectancy from the 1970s onwards, and today they reach over 60 years of age (Capone et al., 2020; Tsou et al., 2020; Covelli, Raggi, Meucci, Paganelli & Leonardi, 2016). This exponential increase in life expectancy occurred due to the recognition of specifics, better conditions regarding medical care, social assistance, and increased survival (Presson et al., 2013). However, this population has shown accelerated biological aging, increasing Alzheimer's disease. (Bull, 2020; Zigman, 2013), sleep problems, social inadequacy, regressive behavior, depression, anxiety disorders, loss of self-care skills (Covelli, Raggi, Meucci, Paganelli & Leonardi, 2016), loss of muscle strength, low work capacity, chronotropic incompetence, changes in autonomic function, contributing to overall morbidity and mortality (Fernhall, Mendonca & Baynard, 2013).

Such problems could be alleviated by the insertion of regular programs in Physical Education. However, the population with DS has shown a lower level of physical activity compared to their peers without DS, which may accentuate the process of loss of muscle mass and strength in this population (Cowley, Ploutz-Snyder, Baynard & Heffernan, 2010; Ruiz-González, Lucena-Antón, Salazar, Martín-Valero, & Moral-Munoz, 2019).

Studies have reported that adolescents with DS exhibit less muscle strength in the lower limbs, knee extensors, and hip abductors compared to the control group (Mercer & Lewis, 2001; Cioni et al., 1994). Cioni et

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al. (1994) further concluded that adolescents with DS generally do not show improvements in strength beyond 14 years of age. Curiously, Pitetti, Baynard e Agiovlasitis (2013) emphasize that weakness and muscle strength in the lower limbs can be a limiting factor in daily life and aerobic capacity in people with DS. In addition, the loss of muscle strength can directly influence functional performance and autonomy (Volaklis, Halle & Meisinger, 2015).

Thus, to attenuate the loss of muscle strength, it is necessary to carry out assessments to analyze muscle functional capacity to prescribe physical exercises in a safe and individualized way. However, Physical Education teachers may face some difficulties when evaluating the population with DS, requiring prior experience and in-depth knowledge of the characteristics of this group.

It is also considered that DS is the most frequent cause of intellectual disability (Fisher, 2020; Capone, 2020; Vitale et al., 2019), and this deficiency can lead to difficulties in understanding and performing the tests to be presented and to changes in mood towards the professionals involved in the research and the equipment and materials needed for the tests.

These variations in mood can also imply variations in the tonic state and prevent the proper performance of the tests, in addition to the fact that issues related to the affective relationship with the evaluator can create an excessively playful or agitated environment. Another factor is the intimacy with the environment where the evaluation is carried out (or lack thereof), the clothing of the people present in the laboratory, among other aspects that will be analyzed in this work, which can make it challenging to carry out the tests correctly and compromise the reliability of the results of the tests.

It is also worth considering that many physicians, Physical Education teachers, and other professionals involved with laboratory work are not familiar with the behavior of the population with DS, which differs from those of the general population. Thus, it is believed that psychosocial and affective-emotional issues should be considered during laboratory evaluations to avoid erroneous data and diagnoses (Tsou et al., 2020).

In this sense, the objective of this study was to report approach procedures for carrying out data collection in a laboratory environment developed in research on muscle strength, body composition, and hemodynamics in adolescents with Down syndrome.

II. Methodological Paths

The present work is an experience report of a descriptive nature carried out during data collection for research on muscle strength, body composition, and hemodynamics in adolescents with DS. Such collection was carried out in a Physical Fitness and Health laboratory of a private university in the Federal District (Brazil) and approved by the Ethics Committee in Research with Human Beings under protocol nº 2.419.917/2017 related to research with laboratory collection.

Therefore, we present below the materials and methods used to carry out the data collection of the study, and then, we will discuss the procedures developed so that such collection becomes possible and could present reliable results. It is essential to clarify that the development of the methods was due to the non-compliance of the participants with the guidelines preceding the data collection. It was necessary to develop guiding strategies and procedures for data collection to be successful.

a) Materials and Methods for Data Collection

Participated in this data collection 11 adolescents with DS aged between 11 and 17 years and ten adolescents without DS, in the same age group, totaling 21 participants. The 11 participants with DS had Moderate Intellectual Disability, confirmed by a descriptive medical report. In addition, they were part of an extension and research project in specialized educational services in Physical Education and Art at a private University in Brasília, carried out in partnership with the State Department of Education of the Federal District (Brazil).

Although ten adolescents without DS participated in the research within a control group, such participation will not be the focus of this study, which aims to present and analyze only the approach procedures submitted to the adolescents with DS.

The data collection was carried out in the Physical Fitness and Health Laboratory under the supervision of the researcher, a Physical Education teacher and a cardiologist, and a team of technicians who worked in the laboratory.

To carry out the research, the data collection had three phases: assessment of body composition and exercise tests; familiarization with the maximal isometric voluntary contraction test (MVC); and completion of the MVC test.

For anthropometric variables, total body mass was collected and measured on a Filizola® electronic scale (São Paulo, Brazil) with a precision of 0.1 kg; height was measured using a portable stadiometer (SECA® 214, IL, USA) with an accuracy of 0.1 cm; circumferences were measured using a Sanny® tape (Santo André, Brazil). The Lange brand adipometer was also used. Ò (Skinfold Caliper, CA, USA) to collect triceps and subscapular skinfolds, and then the percentage of fat (%F) was determined, as proposed by Nascimento et al. (2016). To assess fat and lean mass, DXA (DTX IQ LUNAR®, IL, USA) was used according to the manufacturer's instructions.

The exercise test was performed on a treadmill (Super ATL, Imbramed, Brazil) coupled to the electrocardiogram during the test on an automatic electrocardiograph (Cortex Biophysik, Metalyzer 3B, Germany), following the ramp-type protocol as established by Myers et al. (1991).

As for the hemodynamic variables, they were performed according to the British Association of Cardiology (Topouchian, El Assaad, Orobinskaia, El Feghali & Asmar, 2005) in the electronic device of the brand Microlife® (BP 3AC1-1, Switzerland). Blood pressure was monitored, at rest, during the test interval and post-test, at 1, 5, and 10 minutes of MVC.

Finally, the CVIM test was performed using a Jamar® handgrip dynamometer (Sammons Preston, Illinois, USA) to determine the isometric strength of the upper limbs. However, to assess the MVIC of the lower limbs, a CEFISE brand Power Din Pro® dynamometer (Campinas, Brazil) was used, so the load cell was attached to a Leg Press 45° (LP45o) device.(Righetto®, Campinas, Brazil), following the manufacturer's recommendations. The protocol for evaluating the IVC for both upper and lower limbs was 5 seconds of maximum isometric strength, with 3-minute intervals for recovery of energy substrates and normalization of cardiovascular parameters.

III. Experience Report

The instruments and tests used to carry out the research are listed above. However, all instructions provided by instrument manufacturers and the methodologies proposed by scientific research in Physical Education are aimed at people who do not have physical or intellectual disabilities.

During the evaluations, it was found that the participants with DS did not present results compatible with those expected for the tests. The main reasons were linked to their physical conditions because of problems such as generalized ligament laxity, hypotonia, and lack of balance, issues directly related to the DS that needed differentiated attention concerning the intensity of the proposed activities as with the rest intervals.

However, the most worrying issues in the case of research participants with DS were related to Intellectual Disability since difficulty was observed in understanding the guidelines for carrying out the assessments. In addition, there was a lack of control of emotions caused by the estrangement regarding the laboratory space, which resembles a hospital environment, and that can refer to bad memories regarding the medical treatments received by the individual (some of them had already undergone heart surgery). This estrangement was aggravated by the clothing of the professionals involved with the research since the use of a white coat was mandatory in the laboratory, which, to a greater or lesser extent, can refer to behaviors similar to those related to the white coat syndrome.

The White Coat Syndrome has its causes related to the association of the doctor or health professional with the hospital environment, needles, illness, and death. Such association can create an aversion to health professionals and the clinical setting.

There was a manifestation of fear and estrangement with the equipment used to carry out the tests and evaluations and adverse reactions, even considering that no instrument or method that was invasive or that caused pain was used.

Another problem was the approximation of study participants with the researcher and other professionals involved. Both in cases where there was and in those where there was no intimacy, emotional reactions from the individuals were perceived to hinder the tests' performance. When intimate, the adolescents played excessively, and when they did not know the researcher or someone on the team, they closed themselves off. In both cases, understanding and carrying out the tests were compromised.

Based on these considerations, and given the failure presented to the performance of the tests and their results, and because of the possibility of not obtaining reliable data for the study's conclusion. We sought to develop approach procedures that considered the most varied nuances of the research participants' emotional behavior and their neurophysiological and psychosocial conditions.

IV. Theoretical Contributions

Considering that the difficulties presented during the tests were linked to the participants' emotions, the theory of sentiments of Henri Wallon (1971, 1975, 2005), for whom they (feelings) essentially consist of systems of attitudes that, for each one, correspond to a certain kind of situation (WALLON, 2005, p. 134). Thus, attitudes and situations will mutually imply each other so that there is adequacy in the individual's responses to the effects of the environment.

For Wallon (1975, p. 119), emotions consist of what unites the individual to social life, so there may be the most fundamental element in their biological existence, being initially, especially in the first year of the child's life, a means of communication with others. Although the organic reactions of emotion tend to fade as the image of situations or things becomes intellectualized, this connection will not suffer ruptures.

To explain the role of emotions in human activity, Wallon (1971, p. 150) discusses muscle tone, giving it a primordial function in the individual's relationship with the environment and its development. Thus, in addition to the process of motility and support and support of body postures, there is the tonic

function, which is the emotional substrate of the posture tonus.

Inside your theory, Wallon (1971, p. 150) describes three categories of action of the tonic function on the motility function: eutonia, hypotonia, and hypertonia. It is essential to point out that the hypotonia presented here is a circumstantial condition that interferes with the motility function according to the individual's emotional state. Therefore, it differs from the hypotonia shown in Down syndrome, which is constant and pathological.

These three conditions are how the tonic function interferes with the motility function, and they happen to represent the emotions experienced by the individual. Thus, a tonic alteration is a form of flow and presentation of emotions and feelings.

For Wallon (1971, p. 150), there are hypertonic emotions, which are those that raise the tone to the muscle's ability to drain them (fear, anger, etc.); hypotonic emotions, which reduce the tone below the muscle's need to act in certain situations (shyness, fright, depression, etc.); and eutonia, which is the state of tonic balance that allows fluidity of movements.

Within the theory of Wallon (1971, p. 111), it is emphasized that it is not possible to remain indifferent in the face of the presence of others or of environments (especially those unknown or not yet experienced). Thus, momentary impressions or desires will interfere with the psychic dispositions of individuals, especially those who do not yet have an intellectual development that gives them an adequate understanding of the situations, whether due to age or a particular disability, as is the case of the individuals who participated in this study (the entire sample had a moderate intellectual disability).

In conclusion, it appears in the theory of Wallon (Martinet, 1981, p. 57) that emotion, regardless of what it is, causes a variation in the tone and the organic life, leading the body to focus on its sensitivity, failing to act accordingly on the surrounding space, because the cognitive means, while the emotion lasts, lose their ability to act.

The experience of emotion can lead to its understanding and overcoming and the individual's intellectual development. However, in the case of intellectual disability, such knowledge and overcoming may take time, leading to more or less unbalanced reactions that compromise specific experiences. Thus, Strategies were sought to reduce the interference of emotion during data collection and to keep individuals close to a state of eutonia for better understanding and to carry out the tests.

a) Paths Traveled

Second Wallon (1971, p. 79), the most acceptable way to reduce the organic manifestations of emotion is to oppose it to perceptual or intellectual activity. Therefore, the first step to meet the needs of individuals with DS was to bring the researcher closer to their families.

An initial conversation with family members, seeking information about routine, tastes, desires, activities performed, fears, color preferences, flavors, music, movies, and leisure activities, is an anamnesis of the individual's daily life.

This closeness to the family facilitated direct communication with the individual with DS since the researcher, from then on, began to consider relevant aspects of her daily life to establish a good affective relationship so as not to compromise the performance of the tests, mainly respecting the rhythm of each research participant and his ability to understand, presenting aspects he has already experienced and that please him.

This procedure sought the possibility of a state of eutony and trust so that the researcher could present the research equipment, materials, and spaces. In this perspective, seeking greater familiarity with such space, she no longer wore the white coat to avoid the research participants' strangeness, asking the other laboratory collaborators to do the same.

The second step was familiarizing individuals with DS with the laboratory space. Visits and conversations were carried out in the laboratory, where the research participants were received in a playful and affectioned way for recognition and not to feel inside an inhospitable environment. The entire process, from the beginning, was accompanied by a family member of each teenager, asking them for help whenever necessary.

From these steps, the tests for data collection began. However, there was another concern. Considering Henri's theory Wallon, an affective and playful environment would be necessary so that there would be no interference of emotions in the process. The environment and the professionals were already known. However, it was necessary to pay attention to the fact that the excess of playfulness could lead to changes in the tone that would disfavor the performance of the tests. Both because the participant could think that it was just games and not performing the activities correctly, as well as considering himself within such an affective environment, that he could guide his actions according to his desires and also fail to carry out the proposed activities.

It was then necessary for the researcher to constantly observe each research participant's tonic and postural alterations and their behavior concerning the proposals. The tonic and postural states were observed to verify if the individual was in the eutonic condition, seeking to avoid excess euphoria or affection.

Upon realizing that the test had been performed inappropriately due to this tonic and postural state

inappropriate, the researcher waited a while and tried again until a correct execution could be observed.

Coercive reprimands were also avoided to seek the correct performance of the tests, as interventions of this type could alter the participant's tone and create discomfort to the point that he no longer wanted to participate in the study.

Moving on to the performance of each test, we begin by describing the procedures carried out in the anthropometric evaluation, when the researcher made the measurements first on herself, stepping on the scale and demonstrating how the participant should position themselves, as well as with the height measurement. To make situations playful, participants were asked to play a game where they should imitate a statue on the scale or the stadiometer so that the participant could not move their bodies when they were doing the height and weight assessments. The researcher also joked by comparing her measurements with the weight and height of the participants.

Then, the evaluation of the percentage of fat through the skinfolds. The first step adopted was the presentation of the equipment to the participants. As the adipometer is similar to a pair of pliers and its use is made by grasping skinfolds, which could frighten participants with DS, the researcher initially played with each one, holding folds on themselves and the fingers of the participants teenagers so that they would realize that the procedure was painless and non-invasive.

From there, playfully, skinfolds were measured on different body parts, always talking to the participants about their sensations. If it was hurting, tickling, if it felt good if they wanted to stop or continue.

The next step was assessing the isometric strength and between parentheses - (how a handgrip) of the upper and lower limbs. To perform the measurements on the lower limbs, a stadiometer was used, a device similar to a pair of pliers that must be pressed by hand for 5 seconds with the individual's maximum strength. For the lower limbs, the Leg Press was used, where the participant lies down and pushes a weight with the legs up, also remaining in this position for 5 seconds.

In these two tests, the researcher found the most difficulty in verifying these teenagers' correct execution. The person with DS has hypotonia and ligament laxity associated with tonic variations due to emotion, which can completely invalidate the test. Another problem can be the lack of understanding of the correct execution or the fact that the participant does not do what was asked, joking or finding it difficult. The question then arose: how to make the participant understand the test and perform it properly without getting dispersed or refusing to complete it?

First, the researcher asked the participants to squeeze her hand "very hard," playing with them and saying that they had much strength; at the end of this movement, she told them to perform the exact grip on the device with the same force as they squeezed her hand. Also, to stimulate them, she squeezed the device using little force and showed the participants that she was not very strong, asking them to do the movement afterward. When noticing that they had done it with more force than the researcher, they felt more confident and encouraged to carry out the text.

Faced with a student who was reluctant to take the handgrip test and did not understand it correctly, the researcher used the image of the child hero "Hulk," who, according to his mother, was his favorite character. Thus, making use of the symbolic game, the researcher said that the test had already been done by "Hulk" and that he was very strong and, based on this information, told the teenager that the trial would evaluate his strength, which was similar to the from "Huck." In this way, he understood the function of the test and was predisposed to do it.

As for the Leg Press test, used to verify the strength of the lower limbs, when performing it, there was always a technician holding the platform that was raised with the participant's legs so that he would not get hurt if he removed his foot from it due to of getting tired or not liking the test.

Games always preceded the performance of this test on the device, where the researcher and a laboratory technician performed the lightweight assessments themselves and encouraged the participants to do the same. They compared the results, always showing that the participants were stronger than they were and encouraging them to do it with maximum strength.

Extra care and procedures were also needed to perform the DXA test, where the participant lay down and was inserted into a tube to do a body scan. First, there must be an understanding of the need to stand still during the 30-minute assessment. There is also annoyance with the sound caused by the device.

Initially, the researcher provided the participants with the experience of lying down on the equipment and seeing the sensation it caused to enter the tube and remain still. Some adolescents commented, played, touched the walls, and asked to leave, among other behaviors that could not happen during the evaluation. In addition, participants were informed that DXA's job would be to take a picture of the inside of their body and that they should stand still and pose so that the picture would look good.

To make the activity playful, the researcher used the resource and asked them to play at turning into a statue during the test, in addition to talking to each participant during the entire time he was on the device in such a way that he felt like he was playing and not performing an assessment.

The experience of showing the test result to each participant was very relevant, informing them that it was a photo of their skeleton and making and encouraging comments about what was done and the outcome.

Regarding the measurement of blood pressure, the researcher, before placing the cuff on the adolescent's arm, reported that it was a belt that would tighten his arm a little, simulating holding the participant's arm with his hand. After that, she would place the cuff on her arm. The teenager inflated it so that he felt the pressure and could see that it didn't hurt or bother him. Only after these procedures was the measurement performed.

It should be emphasized that to measure blood pressure, the participant must be calm, without agitation or haste. Therefore, after the explanation, the researcher talked to each participant until she realized that there were favorable conditions for carrying out the test, and, during the trial, she placed her hand on the participant's hand, as it could close it, raising your blood pressure.

Regarding the test performed on the treadmill, it was essential to carry out recreational activities preliminarily, allowing each participant to get acquainted with the device through games where the treadmill's speed was changed, challenging it to overcome the various conditions presented. During the test, the researcher was always next to the participant, guiding and stimulating him by touching his back to warn him when to increase or decrease the speed of the steps.

When not aggressive, this simple touch on the back can mean a stimulus for the participant and, at the same time, an affectionate gesture, showing him the researcher's affection towards his participation in the proposed activities.

In the treadmill test, it is also necessary to be very attentive to verify that the participant is not exhausted and continues the movements due to the excitement caused by the stimuli of the researcher, family members, and technicians. It is also necessary to verify that the same is not neglecting the test by making little effort to receive the attention of observers. But once, it becomes essential to observe the tonic and postural alterations proposed by Wallon.

Finally, to carry out the cardiological evaluation through the electrocardiogram, problems were also found that could compromise the result and even the performance of the exams. The fact that the participant is lying down and shirtless can already be a distracting factor or leads to games on the part of the teenager or even a possibility of shyness, which can increase their heart rate and compromise their performance on the exam.

Another point that can distract the participant is the simple placement of the electrodes on their chest since this could be funny (some people pulled the electrodes to play with the researcher), uncomfortable, or even painful in some cases. Therefore, there was work to familiarize each participant with each part of the equipment with which he would have contact. The researcher patiently presented the electrodes, pears, wires, and cables and showed how they were connected before starting the exams. She also placed the electrodes and pear in her hand, on the participants' hands and chest, even taking them in front of a mirror so that they could observe the equipment, verifying that they were safe. It was started after realizing there was already the possibility of performing the exam properly.

Also, before cleaning the participant's chest with alcohol, the researcher passed the gel on her hand and the participant's hand, encouraging her to smell her hand, feel the temperature of the alcohol, and always play with these situations. Only after this, during the procedures, verifying that the participant was safe and familiar with the equipment, was the examination carried out, always considering the possible changes in the adolescent's mood, aiming to guarantee a good relationship with the procedures.

V. Perceptions about the Path Taken

All tests and evaluations applied in this study bring the guidelines and guidelines for use by their manufacturers, in addition to having a large number of researches that prove the reliability of the results obtained with their use within the established parameters. However, all of them are designed for a population of people who do not have a disability, and when someone is outside the standards set by them, they end up being removed from the research samples because they are outside the expected curve.

This fact significantly hampers the work of researchers who work with people who have deficiencies in Physical Education - or in other areas of health that need laboratory evaluations - and who end up not finding protocols capable of measuring essential aspects for the prescription of physical activities, treatments or therapies, especially when these people have Down Syndrome.

Unfortunately, this scenario can be entirely visualized in research laboratories; therefore, the search for alternatives that favor the performance of evaluations in populations, such as those with DS, becomes fundamental. Based on Henri Wallon's theory, the perspective presented in this experience report brings alternatives that facilitate the control of emotions during the tests and their understanding.

Realize it was found that by understanding how emotions directly interfere with the performance of tests and what causes such feelings to arise, the researcher acquires a vital and effective tool in controlling the research environment, preventing fear, discomfort, or ignorance from being impediments to carrying out studies.

The sometimes cold and insensitive environment of research laboratories, considering some specificities of certain groups, needs to be exchanged for a more humane, playful, and sensitive space when research is carried out with people who do not suit this environment and the methodologies proposed for the general public. This means treating those who present different behaviors and perceptions from most other people, in an appropriately respectful way, without losing the perspective of the seriousness and rigor with which a collection of scientific data must be carried out.

Such procedures cannot be confused with the infantilization of the researcher or their relationships with the research participant but rather with the adequacy of the treatment directed to the participant according to their conditions of understanding and carrying out the tasks and tests.

For Wallon (2005, p. 11), the child (and considering the specificity of this study, the person with an intellectual disability) only knows how to live his childhood (or his life). It is up to the adult to interpret it, know it, analyze it, and understand it to act on its development. Likewise, establishing an affective relationship between the two depends on the adult. And when there is a conflict between desires, as is the case with the application of unknown and often tedious and tiring tests in an unfamiliar and non-stimulating environment, it is up to the adult to seek alternatives to arouse the individual's desire.

For Aucouturier and Lapierre (1986, p. 77), it is up to the adult to create the conjunction of desires between the child and the adult, or the professional and the person with an intellectual disability, and not continue to the child or the intellectually disabled person, as is often required. Martinet (1981, p. 127) corroborates this issue by showing that affectivity has a preponderant place, and the communion and sensitivity that it establishes between individuals not only precedes but also prepares for intellectual exchange.

We, therefore, consider the search for an affective relationship favorable to the research participants, for assessing their behaviors, reactions, and attitudes towards the proposed tests as valid, as well as for seeking to know their daily life and using elements of this during the tests, can favor the tonic and postural balance necessary for data collection.

In this work, based on the sensitive observation of the adolescents' responses and their posture, a result of their feelings and emotions at that particular moment, the aim was to encourage participation in carrying out the tests without, however, failing to interrupt a test when necessary (due to fatigue, pain, discomfort or any discomfort), correct inappropriate behavior in the laboratory or create a permissive environment where the adolescent could behave as they saw fit.

At no time were issues such as ligament flaccidity, lack of balance, hypotonia, and other DS-related problems that could lead to and, in some cases, to the difficulty of carrying out the tests, always giving adequate time for the participant to recover, even if between one test and another it could take one or more days to restart the evaluation or to redo an interrupted test.

Thus, it is emphasized the need to stimulate from the simple measurement of weight and height to the permanence of 30 minutes immobile inside a device for body scanning, giving each of the attitudes of all the participants' importance and significance that can provide the desire to participate in the tests, in addition to showing pleasure in participating.

In this sense, Henri's theory of emotions Wallon proved to be adequate and relevant, as it provided a more in-depth view of the relationship between emotions and human movement, allowing the contextualization of the reasons why the research participants could not perform the tests and the possibility of body reading that enabled the researcher to know how to act in the face of the most different reactions and attitudes, always considering the triad of tonic manifestations: hypertonia, hypotonia and eutonia and the role of affectivity and playfulness to control these manifestations.

The need for an affective relationship between the adolescent with Down syndrome and the researcher was also considered fundamental, based on an experience before the application of the tests, as well as the knowledge of the daily life, tastes, pleasures, and activities of each participant of the search.

From the use of Henri's theory Wallon and what we can call a greater humanization of the process of evaluating people with Down syndrome in the laboratory, considering the characteristics arising from this syndrome as fundamental, from those that interfere with motility to those that interfere with the understanding and adequate performance of the tests the research participants were encouraged to participate in the study.

VI. By Way of Conclusion - Desire for the Future

> What will become of science if not a means
> to decrease, even if just a little, human misery?
> And what will become of the scientist
> if not the one who dreams with the possibility that,
> through their studies, Increase man's possibilities
> to dream... and fly...?

We consider laboratory evaluations by Physical Education essential for the prescription of physical activity for people with Down syndrome, given their importance for the conditions and quality of life, especially concerning the attenuation of problems arising from ligament laxity, generalized hypotonia, respiratory, cardiac, and balance and intellectual disabilities, among others. Such evaluations are

essential for defining an adequate job that does not accentuate existing problems.

However, it is necessary to search for adequate procedures and methods that consider the characteristics of DS to achieve success in laboratory evaluations.

Before delineating the paths followed in the experience reported here, the muscle strength, body composition, and hemodynamic tests applied to the same sample that participated in this study were unsuccessful. Many difficulties were encountered, but the main one was the difficulty of controlling emotions on the part of adolescents about professionals, materials, equipment, and the research site. From the search for adaptations that considered Henri Wallon's theory of emotions, especially about the interrelationships between emotion and reason and the forms of the flow of emotions through the tone of the posture, the tests were replicated, and there was a success in carrying out the research.

Still far from a path to be proposed as suitable for evaluation laboratory tests in the Physical Education of people with DS, we can say that the steps followed here, which are not intended to be considered as guidelines, can be a principle for proposing techniques for the application of laboratory tests in a respectful way that feels the individualities without losing sight of the need for rigor and seriousness of the scientific method. It may not be much, but we consider it an essential step in the search for a path shared and experienced by all, regardless of deficiencies and differences.

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Global Journal of Medical Research: F
Diseases
Volume 22 Issue 9 Version 1.0 Year 2022
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 2249-4618 & Print ISSN: 0975-5888

IgA Nephropathy in a Patient with No Previous History of Kidney Injury: Case Report

By Alana de Moura Martins, Amanda Faria de Araújo & Luiza Proença Brati

Abstract- *Introduction:* IgA nephropathy, an indirect immune-mediated kidney disease, is considered the main etiology of glomerulopathies and is also responsible for a large partofall cases of end-stage chronic kidney disease.

Objective: To report the case of a patient admitted to a hospital with clinical presentation of mixed syndrome and presence of vasculitis in the lowerlimbs, with a diagnostic hypothesis of IgA nephropathy.

Methodology: The information was obtained by reviewing the chart, photographing the diagnostic methods to which the patient was submitted and reviewing the literature.

Discussion: Studies point to the pathogenic mechanism from the deposition of circulating immune complexes in the renal glomerulus, leading to inflammation and activation of the immune system. The clinical presentationis variable, with the mixed syndrome being the most frequent.

Keywords: *glomerulonephritis, IgA. kidney biopsy. diagnosis. treatment.*

GJMR-F Classification: *DDC Code: 616.075 LCC Code: RG107*

Strictly as per the compliance and regulations of:

IgA Nephropathy in a Patient with No Previous History of Kidney Injury: Case Report[1]

Nefropatia Por IgA Em Paciente Sem História Prévia De Injúria Renal: Relato De Caso

Alana de Moura Martins [α], Amanda Faria de Araújo [σ] & Luiza Proença Brati [ρ]

Resumo- Introdução: A Nefropatia por IgA, doença renal imunomediada indireta, é considerada a principaletiologia dasglomerulopatias e, também, éresponsável por grande parte de todos os casos de doença renal crônica em estágio terminal.

Objetivo: Relatar o caso de uma paciente internada em ambiente hospitalar com apresentação clínica de síndrome mista e presença de vasculite em membros inferiores, com hipótese diagnóstica de Nefropatia por IgA.

Metodologia: As informações foram obtidas através da revisão do prontuário, registro fotográfico dos métodos diagnósticos aos quais a paciente foi submetida e revisão da literatura.

Discussão: Estudos apontam o mecanismo patogênico a partir da deposição de imunocomplexos circulantes no glomérulo renal, levando à inflamação e à ativação do sistema imunológico. A apresentação clínica é variável, sendo a síndrome mista a mais frequente. O diagnóstico é realizado através da biópsia renal, sendo a histologia avaliada conforme a Classificação de Oxford da Nefropatia de IgA. Como tratamento orienta-se o controle dos fatores de risco, administração de anti-hipertensivos nefro-protetores, estatina e, em casos específicos,corticoterapia.

Conclusão: A conclusão diagnóstica é realizada somente através da biópsia renal, por meio da imunofluorescência; entretanto, a história e os achados clínicos costumam ser bastante sugestivos e suficientes para iniciar o tratamento empírico.

Palavras-Chave: glomerulonefrite por IgA. biópsia renal. diagnóstico. tratamento.

Abstract- Introduction: IgA nephropathy, an indirect immune-mediated kidney disease, is considered the main etiology of glomerulopathies and is also responsible for a large partofall cases of end-stage chronic kidney disease.

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Methodology: The information was obtained by reviewing the chart, photographing the diagnostic methods to which the patient was submitted and reviewing the literature.

Discussion: Studies point to the pathogenic mechanism from the deposition of circulating immune complexes in the renal glomerulus, leading to inflammation and activation of the immune system. The clinical presentationis variable, with the mixed syndrome being the most frequent. The diagnosis is made through renal biopsy, and the histology is evaluated according to the Oxford Classification of IgA Nephropathy. The treatment is guided by the control of risk factors, administration of nephro protective antihypertensives, statinsand, in specific cases, corticosteroid therapy.

Conclusion: The diagnostic conclusion is made only through renal biopsy, through immunofluorescence; however, the history and clinical findings are usually quite suggestive and sufficient to initiate empirical treatment.

Keywords: glomerulonephritis, IgA. kidney biopsy. diagnosis. treatment.

I. Introdução

A Nefropatia por IgA (NIgA), também designada como doença de Berger, foi descrita por Berger e Hinglais em 1968 e é conhecida como uma das principais causas de glomerulonefrite primária em todo o mundo, com uma incidência global de 2,5 por 100.000 habitantes; e, apesar de possuir uma lenta progressão clínica, é, também, a principal doença primária que leva à doença renal crônica, o que contribui excessivamente para a população de pacientes em diálise. Por outro lado, a NIgA também pode ser descrita como uma glomerulonefrite secundária, quando surge concomitantemente à outra doença, à exemplo das infecções respiratórias, gastrointestinais, vasculite sistêmica e cirrose. Em resumo, sabe-se que cerca de 50% dos casos de glomerulopatias e 40% de todos os pacientes com doença renal em estágio terminal são devidos à NIgA (NEVES *et al*., 2012; PATTRAPORNPISUT *et al*., 2021).

Desse modo, por meio derelato de caso e revisão de literatura, o presente estudo tem como objetivo conhecer a fisiopatologia e a apresentação clínica da Nefropatia por IgA; e, assim, elucidar o método diagnóstico e o tratamento ideal, a fim de identificá-la com maior facilidade e, consequentemente, iniciar o tratamento de forma mais precoce; visando, dessa forma, reduzir a incidência de efeitos adversos

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[1] Trabalho apresentado como requisito para aprovação da Unidade Educacional Eletivo do 4º ano

da patologia e obter melhores resultados durante e após o tratamento.

II. Metodologia

As informações contidas neste trabalho foram obtidas por meio de revisão de prontuário, registro fotográfico dos métodos diagnósticos aos quais a paciente foi submetida e revisão de literatura acerca da Nefropatia por IgA. As buscas pelas referências bibliográficas foram realizadas utilizando os seguintes descritores: Glomerulonefrite por IgA. Biópsia Renal. Diagnóstico. Tratamento. O trabalho teve como fonte de pesquisa a seleção de artigos científicos nas plataformas LILACS, MEDLINE e SCIELO, nas línguas Espanhol, Inglês e Português. Priorizou-se a busca por materiais referentes aos últimos cinco anos, de 2017 à 2022, necessitando utilizar uma única referência do ano de 2012. Assim, totalizou-se 14 fontes. Dessas, 5 foram excluídasporque não contemplavam os objetivos do tema; resultando, então, em 9 fontes que se encaixaram nos critérios de inclusão.

III. Relato do Caso

a) Anamnese

Paciente feminina, 50 anos, tabagista, hipertensa, sem história pessoal pregressa de nefropatias, porém, com histórico familiar positivo para a mesma;foi encaminhada para internação hospitalar, através da Unidade de Pronto Atendimento (UPA), devido ao quadro de edema periorbital e em membros inferiores (MMII), hematúria, urina espumosa e lesões purpúricas ascendentes em MMII, o qual se manifestou três semanas após uma infecção de vias aéreas superiores, tratada ambulatorialmente com antibiótico.

Em resumo, na semana anterior a paciente já havia procurado a Unidade Básica de Saúde (UBS) de seu bairrocom as queixassupracitadas e, na consulta ambulatorial, foi solicitado à mesma a realização do exame de Creatinina e Parcial de Urina (EQU); entretanto, devido à rápida piora do quadro da paciente, apenas após a admissão hospitalar obteve-se o resultado do exame externo, o qual acusou 3,6mg/dL de Creatinina e EQU com 3^+ de hematúria.

b) Exame Físico

Ao exame, em ambiente hospitalar, a paciente se encontrava em bom estado geral, com pressão arterial de 160x90mmHg e apresentação clínica inicial de síndrome mista, ou seja, síndrome nefrótica associada à possível componente nefrítico; apresentando urina espumosa – sugestiva de proteinúria – edema periorbital e edema de $3^+/4^+$ em membros inferiores bilateralmente,e hematúria macroscópica, sendo as panturrilhas livres e os pulsos periféricos presentes e simétricos.

Além disso, havia a presença de lesões purpúricas não palpáveis em MMII, concentradas principalmente em tornozelos e ascendentes até região da coxa, apresentando diâmetro individual de cerca de 2cm, sendo essas não confluentes.

c) Hipótese Diagnóstica

Feita a hipótese diagnóstica inicial mais provável de Nefropatia por IgA com presença de vasculite cutâneacomo manifestação associada.

d) Conduta

Em ambiente hospitalar, a paciente foi tratada empiricamente para vasculite e para síndrome mista, enquanto aguardava os resultados dos exames complementares de investigação. Assim, foi iniciado o tratamento comPrednisona 1mg/kg/dia, Sinvastatina 40mg/dia,Enalapril 10mg de 12/12 horas eFurosemida EV 2amp de 12/12 horas, associados à restrição hídrica.

Com a administração de corticoterapia via oral a paciente apresentou melhora clínica progressiva das lesões cutâneas e do quadro nefrótico e, também, melhora laboratorial; desse modo, optou-se por realizar a manutenção do tratamento, sem necessidade de iniciar pulsoterapia.

e) Exames Complementares

Durante a investigação hospitalar, foram solicitados exames laboratoriais para acompanhamento da função renal e investigação de glomerulopatia; tendo como resultado Creatinina 3,09 mg/dL,Ureia 81,80 mg/dL, EQU com leucocitúria e hematúria, Proteína Urinária de 24 horas 913,00mg/24h,Relação Pr/Cr 1,26, Albumina 3,00 g/dL, PCR 200,33 mg/L, IgA 677,00 mg/dL, complemento C3 161,00 mg/dL e C4 31,00 mg/dL; e, também, ANCA, FAN, FR e anti-DNAnão reagentes. Além disso, foi solicitado uma Tomografia de Tórax, com o objetivo de excluir vasculite pulmonar, à qual não apresentou sinais de lesão pulmonar.

Ainda, foi solicitada a realização da biópsia renal, com o objetivo de concretizar o diagnóstico e avaliar o grau de acometimento renal. Entretanto, devido à indisponibilidade de materiais necessários para a realização da imunofluorescência, no hospital local; a paciente recebeu alta hospitalar antes mesmo da realização do exame.

Dessa forma, conforme orientação, a paciente realizou a biópsia em um hospital de referência, na capital; porém, de forma tardia, sendo 02 meses após a alta hospitalar e, consequentemente, após o uso de corticosteroide nesse período, o que, possivelmente, ocasionou um resultado falso-negativo na imunofluorescência.

Material: Biópsia Renal

EXAME ANATOMOPATOLÓGICO

MACROSCOPIA

Recebidos em fixador Bouin, quatro fragmentos filiformes de tecido medindo entre 0,4cm e 0,8cm de comprimento. (4TI)

MICROSCOPIA

Os cortes histológicos, corados em hematoxilina-eosina, tricromio de Masson, PAS e impregnação pela prata de Jones, revelam delgados fragmentos de parênquima renal parcialmente envoltos por material sanguinolento. Observam-se vinte e cinco glomérulos, cinco dos quais estão globalmente esclerosados. Parte dos demais apresenta tenue expansão mesangial, com algumas células epiteliais evidentes e leve espessamento da cápsula de Bowman. No compartimento tubular notam-se múltiplas áreas de atrofia acompanhadas por fibrose, edema e mononucleares intersticiais. Presença de material amorfo na luz de alguns túbulos. Os vasos apresentam moderado espessamento intimal.

CONCLUSÃO

RIM (biópsia por agulha)

- AMOSTRA EXIBINDO ESCLEROSE GLOMERULAR GLOBAL E FOCAL (5/25) E LEVEEXPANSÃO MESANGIAL. *VIDE NOTA
- NEFRITE TÚBULO INTERSTICIAL CRÔNICA COM ATROFIA TUBULAR E FIBROSE INTERSTICIAL MODERADAS, NESTA AMOSTRA.
- MODERADO ESPESSAMENTO ARTERIAL FIBROINTIMAL.

Imunofluorescência Direta: Material submetido a cortes em criostato e incubado com anti-soros conjugados fluoresceinados anti-imunoglobulinas humanas A, G e M, frações C1q e C3c do complemento, fibrinogênio e cadeias leves Kappa e Lambda. Os cortes revelaram ausência de depósitos de imunoglobulinas, frações do complemento ou fibrinogênio.

Diagnóstico: RIM (BIÓPSIA):
AUSÊNCIA DE DEPÓSITOS DE IMUNOGLOBULINAS E COMPLEMENTO

Observação: os achados de imunofluorescência não permitiram caracterizar lesão mediada por imunecomplexos ou anticorpos antimembrana basal, em atividade.

NOTA: não há elementos histológicos nesta amostra, nem achados no estudo por imunofluorescência (HRim 4301500/ 222067), que permitam concluir por uma doença vascular e/ou glomerular específica. A interpretação destes achados precisa ser feita dentro do contexto clínico-laboratorial, lembrando-se que, em situação de proteinúria nefrótica, a possibilidade de podocitopatia não pode ser descartada.

f) Evolução

No momento da alta hospitalar, após a corticoterapiacom Prednisona 1mg/kg/dia e manejo para síndrome mista, a paciente apresentou melhora da função renal, com creatinina de 1,58mg/dL, desaparecimento completo das lesões purpúricas e redução do edema ao peso basal da paciente. Ademais, durante todo o período de internação não houve intercorrências.

g) Acompanhamento e Prognóstico

A paciente retornou em consulta ambulatorial após 3 meses, com resposta positiva ao tratamento empírico com corticosteroide, apresentando remissão dos sinais e sintomas de síndrome mista, resolução da vasculite cutânea e melhora da função renal, representada pelos valores de Creatinina 1,05mg/dL, Ureia 44,0mg/dL e EQU com ausência de proteinúria, leucocitúriae hematúria.

Desse modo, acredita-se que a realização tardia da biópsia renal, após 60 dias de uso de corticosteroide, pode justificar a ausência de depósito glomerular, de complemento e de imunoglobulinasna imunofluorescência. Entretanto, pode ser levantada a hipótese de apresentação inicial de Nefropatia por IgA com GNRP, sendo a esclerose demonstrada na biópsia uma evolução de possíveis crescentes celulares no início da apresentação, levando em consideração a perda rápida de função renal que a paciente apresentou, a qual foi controlada com corticoterapia.

Assim, como a paciente apresentou boa resposta ao tratamento empírico para Nefropatia por IgA, ou seja, remissão dos sintomas e melhora dos exames laboratoriais; optou-se por manter o tratamento para essa determinada glomerulopatia, com redução gradual da Prednisonaaté a próxima consulta. Tendo o próximo retorno marcado em 30 dias para reavaliar a função renal e, se boa evolução, planejar a suspensão da terapia medicamentosa.

IV. Discussão

1. Susceptibilidade Genética

Durante a última década, foram realizados estudos de associação genômica ampla (GWAS), com o objetivo de entender a base genética de diversas patologias, inclusive das principais glomerulopatias primárias. Dessa forma, a abordagem GWAS forneceu inúmeras informações à respeito da arquitetura genética da Nefropatia por IgA (NIgA). Em resumo, a NIgA possui uma arquitetura poligênica, com quase 20 lócus significativos em todo o genoma, sendo que o papel dos fatores herdados é baseado em inúmeros relatos de NIgA familiar (SANCHEZ-RODRIGUEZ *et al.*, 2020).

Assim, o mais recente e substancial GWAS envolveu o mapeamento de lócus genéticos para endofenótipos quantitativos relacionados à doença, à exemplo do Gd-IgA1 sérico, biomarcador associado com o desenvolvimento e a progressão da NIgA, estando presente em 40 à 80% dos estudos de base familiar (SANCHEZ-RODRIGUEZ *et al.*, 2020).

Dessa maneira, frente à grande prevalência de relatos familiares para NIgA, acredita-se que a paciente relatada possa apresentar um fator genético envolvido bastante significativo, apesar da mesma não saber expor exatamente quais nefropatias seus familiares de primeiro grau apresentaram.

2. Fisiopatologia

Os rins e o sistema imunológico estão profundamente interligados. Nesse contexto, os rins desempenham um papel na manutenção da homeostase imunológica através da expressão de hormônios e células imunes; e, além disso, também auxiliam na manutenção periférica da tolerância imunológica, por meio da depuração de citocinas inflamatórias e lipopolissacarídeos bacterianos. Assim, na existência dessa interação, o sistema imunológico pode levar ao desenvolvimento de uma diversidade de patologias renais, sejam elas agudas ou crônicas, através de mecanismos diretos e/ou indiretos (KANT *et al*., 2022).

No caso da doença renal imunomediada indireta, a lesão renal é consequência de distúrbios imunológicos, nos quais o dano glomerular pode ser explicado através de três principais mecanismos: 1) deposição de autoanticorpos sistêmicos 2) deposição de imunocomplexos circulantes e 3) desregulação do caminho alternativo do complemento. Desse modo, esses processos, na maioria das vezes, ocorrem de forma isolada, porém, também pode haver uma combinação destes (KANT *et al*., 2022).

Dessa forma, na Nefropatia por IgA (NIgA), uma doença renal imunomediada indireta,a patogênese tem como base a deposição de imunocomplexos circulantes, o quais têm propensão pela deposição nos glomérulos devido ao processo de filtração renal ser dependente do tamanho e da carga. Em resumo, a deposição de imunocomplexos leva à inflamação e ativação do sistema imunológico, tanto de seus mecanismos celular quanto humoral. No último citado, a inflamação é agravada pela ativação das vias do sistema complemento, a qual é a principal hipótese fisiopatológica da NIgA(KANT *et al*., 2022).

Nesse contexto, uma “hipótese multi-hit” foi sugerida para explicar o sequencial mecanismo fisiopatológico da Nefropatia por IgA, sendo:

1. Inicialmente, pacientes susceptíveis, ou melhor, com condição hereditária favorável, apresentam elevados níveis séricos de IgA1 deficiente em galactose (Gd-IgA1), ou seja, IgA1 com O-glicanos deficientes em galactose na região de dobradiça.
2. As Gd-IgA1 expõem resíduos terminais de N-acetilgalactosamina (GalNAc), na região de dobradiça, o que atua como um neo-epítopo, favorecendo a formação de imunoglobulina antiglicana autoanticorpos G (IgG). Desse modo, os autoanticorpos antiglicanos circulantes passam à ter como alvo as Gd-IgA1.
3. Os autoanticorpos antiglicanos juntamente às Gd-IgA1 e ao componente C3 do complemento, formam complexos imunes circulantes.
4. Os imunocomplexos patogênicos formados se depositam nos glomérulos, mais especificamente no mesângio, e ativam processos inflamatórios e cascatas de sinalização proliferativa celular, o que contribui com a proliferação de células mesangiais, expansão da matriz extracelular e liberação de citocinas, como TLR-9. Em consequência, o TLR-9 ativado induz a superexpressão de molécula B-cellactivatingfactor (BAFF) em células dendríticas, a proliferação de linfócitos B, o aumento da síntese de IgA e a produção de moléculas, como o indutor de proliferação (APRIL), a interleucina 6 (IL-6) e o fator de crescimento transformador β (TGF-β), os quais estimulam a formação de complexos Gd-IgA1. Assim, o resultado da inflamação não controlada resulta em lesão renal, a qual pode evoluir para fibrose intersticial e glomerular (KANT *et al*., 2022;PATTRAPORNPISUT *et al*., 2021; SANCHEZ-RODRIGUEZ *et al.*, 2020).

5. Apresentação Clínica

A apresentação clínica da NIgA é variável, podendo se comportar com características tanto de síndrome nefrítica quanto de síndrome nefrótica, sendo, na maioria das vezes, uma síndrome mista. Dessa forma, de acordo com as literaturas, a apresentação clínica mais comum de NIgA em adultos compreende a presença de hipertensão arterial sistêmica em até 25,2% dos casos, hematúria assintomática em até 87,5%; e, proteinúria, na maioria das vezes subnefrótica, podendo ser maciça em até 11,8%. Além disso, considera-se a presença de hipertensão e proteinúria maciça como fatores de mau prognóstico. (NEVES *et al*., 2012;PATTRAPORNPISUT *et al*., 2021).

Quanto à hematúria macroscópica, em até 15% dos pacientes, pode-se desenvolver de forma concomitante à uma infecção do trato respiratório – hematúria sinfaríngica – ou menos comumente, do trato gastrointestinal. Ainda, na maioria dos casos, a melhora da função renal ocorre dentro de 1 à 2 semanas após o desaparecimento da mesma. Além disso, vale ressaltar que a hematúria na NIgA difere da observada na glomerulonefrite pós-infecciosa, visto que essa se apresenta apenas 2 à 3 semanas após o início da infecção, e não juntamente à essa (PATTRAPORNPISUT *et al*., 2021).

Ademais, ainda em casos de NIgA secundária, quando no contexto da vasculite sistêmica por IgA (Púrpura de Henoch-Schönlein), é comum a presença de manifestações extrarrenais como púrpura palpável, artralgia, artrite e vasculite gastrintestinal (PATTRAPORNPISUT *et al*., 2021).

Por fim, pacientes com NIgA podem vir à desenvolver insuficiência renal crônica progressiva ou insuficiência renal aguda (LRA). Na LRA, a lesão pode ser diferenciada em rapidamente progressiva (GNRP), presente em 42,5% dos pacientes, a qual é caracterizada por um declínio ≥ 50% na taxa de filtração glomerular estimada (TFGe) durante ≤ 3 meses; ou, em lesão tubular, devido à obstrução do por glóbulos vermelhos (NEVES *et al*., 2012; PATTRAPORNPISUT *et al*., 2021).

Dessa forma, a paciente estudadase encaixou em um quadro típico de NIgA, compreendendo apresentação clínica de síndrome mista, manifestada por hipertensão arterial, proteinúria e hematúria, sendo essa possivelmente sinfaríngica, visto que apresentou um quadro prévio de infecção das vias aéreas superiores; e, ainda, evoluiu com vasculite em MMII, como manifestação extrarrenal. Ademais, a biópsia confirmou GNRP, uma das principaisformas de lesão renal aguda relata nas literaturas.

4. Diagnóstico

O diagnóstico definitivo de Nefropatia de IgA apenas pode ser estabelecido através da realização de biópsia renal, ou seja, não existem biomarcadores de soro ou urina que apresentem diagnóstico validado para NIgA. Assim, é preciso caracterizar e descrever os achados anatomopatológicos para alcançar a descrição correta dessa patologia (KDIGO, 2021).

Dessa forma, na microscopia ótica, as características da Nefropatia de IgA podem variar significativamente entre doentes e dentro de cada amostra. Porém, os achados mais comuns são um aumento da matriz e hipercelularidade mesangial, podendo estar presentes outras lesões como necrose focal, cicatrizes segmentares e, ainda, crescentes no espaço de Bowman. Com o intuito de padronizar a classificação da Nefropatia de IgA com base nos achados histológicos da microscopia ótica, foi desenvolvida em 2009 a Classificação de Oxford da Nefropatia de IgA, pelo WorkingGroupoftheInternational IgA Nephropathy Network e pela Renal Pathology Society. De acordo com esta classificação, elencaram-se 4 variáveis histológicas com elevado grau de reprodutibilidade entre análises que se correlacionam individualmente com o prognóstico renal, independentemente das manifestações clínicas: hipercelularidade mesangial (M), hipercelularidadeendocapilar (E), glomeruloesclerose segmentar (S), atrofia tubular/fibrose intersticial (T) e crescentes (C), constituindo o Score MEST-C, o qual gera scores numéricos com base na presença ou não das 5 variáveis:

- Hipercelularidade mesangial (M) – define-se como a presença de mais de quatro células mesangiais em qualquer área do glomérulo, sendo atribuído um score de M0 se menos de 50% dos glomérulos apresentarem hipercelularidade mesangial e M1 para valores superiores ou iguais a 50%.
- Hipercelularidadeendocapilar (E) – atribui-se um score de E1, se estiver presente hipercelularidade dentro do lúmen dos capilares glomerulares, condicionando estreitamento; ou, E0, se não houver hipercelularidadeendoluminal.
- Glomeruloesclerose segmentar (S) – atribui-se S1, se qualquer parte do novelo glomerular apresentar esclerose; ou, S0 se não houver esclerose.
- Atrofia Tubular/Fibrose Intersticial (T) – atribui-se um score de T0, T1 ou T2, consoante à percentagem de área cortical envolvida por atrofia tubular ou fibrose intersticial seja 50%, respectivamente.
- Crescentes (C) – atribui-se score C0, se não estiverem presentes crescentes celulares ou fibrocelulares; C1, se estiverem presentes em pelo menos um glomérulo; ou, C2, se estiverem presentes em, pelo menos, 25% dos glomérulos (MENINO, 2020).

Todavia, a característica histológica patognomônica e que define a NIgA é dada pelo achado de depósitos granulares mesangiais de IgA pela imunofluorescência. Pode estar isolada ou

associada com depósitos de IgG, IgM e C3. A IgA é sempre a imunoglobulina predominante, C1q e C4 raramente são encontrados (RIELLA, 2018).

Nesse contexto, a biópsia da paciente não foi classificada de acordo com o MEST-C devido à ausência de depósitos de complemento e imunoglobulinas em atividade na imunofluorescência. Contudo, como o quadro inicial dela conteve indícios de uma provávelNIgA e houve demora para a realização da biópsia, há possibilidade de ter sido uma apresentação clínica de NIgA com GNRP, sendo a esclerose global e focal demonstrada no estudo anatomopatológico, uma evolução de crescentes celulares desenvolvidos no início do caso analisado, além de o exame ter sido feito 60 dias após o início da corticoterapia, o que, também, pode ter contribuído para o desfecho da análise do material. Em síntese, caso fosse classificada a biópsia renal de acordo com o MEST-C, o resultado seria M0 E0 S1 T2 C0.

5. Tratamento

Segundo as orientações da KDIGO (2021), deve-se inicialmente implementar a terapia de suporte, que abrange o uso de Inibidores da Enzima Conversora de Angiotensina (IECAs) ou de Bloqueadores de Receptores da Angistoensina II (BRAs), em dose máxima tolerada (alvo de proteinúria menor que 0,5g/dia), sem associá-las; além de manter o alvo de pressão arterial menor que 125x75mmHg para pacientes com proteinúria maior que 1g/dia e menor que 130x80 mmHg para aqueles com proteinúria menor que 1g/dia; uso de estatinas, controle de peso (IMC menor que 25kg/m^2), cessação do tabagismo, restrição de sódio e dieta hipoproteica (0,8mg/kg/dia) (KDIGO 2021).

Ademais, em casos de manutenção de proteinúria acima de 1g com TFG > 50 mL/min/1,73m^2, considera-se o início da corticoterapia por 6 meses. Todavia, a decisão de iniciar imunossupressão deve ser orientada por dados baseados em evidências, mas as recomendações devem ser individualizadas de acordo com o risco de doença de cada paciente, progressão e suscetibilidade à toxicidade relacionada ao tratamento. As variáveis que devem ser consideradas para a recomendação de imunossupressor incluem: idosos, TFG < 50ml/min/1.73m^2, síndrome metabólica, obesidade grau 3 e/ou infecção latente (tuberculose/HIV) (LV *et al*., 2022; PATTRAPORNPISUT *et al*., 2021).

Os esquemas de doses de corticoterapia mais recentes são:

- Metilprednisolona 0,6-0,8 mg/kg/dia (máximo de 48mg/dia) por dois meses; e, após, reduzir 8mg/mês até concluir 6-8 meses de tratamento no total.
- Prednisona 1mg/kg/dia (máximo de 75mg/dia) por dois meses; e, após, reduzir 0,2mg/kg/mês até concluir 6 meses de tratamento no total.
- Prednisona 0,8-1 mg/kg/dia por 8 semanas; e, após, reduzir 5-10 mg/dia à cada duas semanas até concluir 8 meses de tratamento no total (KDIGO, 2021; LV *et al*. 2022).

Além disso, a respeito de outros agentes imunossupressores como Ciclofosfamida, Azatioprina, MicofenolatoMofetil (MMF) e Ciclosporina, não há evidências suficientes que justifiquem a sua utilização, uma vez que não apresentam vantagem quando comparados com o uso isolado de corticosteroides. Em relação à combinação de corticosteróides com Ciclofosfamida, também é sugerido que não seja utilizada, exceto em doentes com Nefropatia de IgA com crescentes e com função renal em declínio rápido. Sobre o uso de óleo de peixe no tratamento da NIgA, a KDIGO sugere apenas quando há proteinúria persistentemente superior ou igual a 1g/dia, apesar de terapêutica otimizada com IECAs/BRAs e controle pressórico adequado (MENINO, 2021).

Por fim, outra medicação que também é utilizada em alguns casos e está sendo cada vez mais estudada, é o Rituximabe (RTX), o qual é uma opção para doenças glomerulares resistentes, sendo acrescentado na terapia com corticosteroides e outros imunossupressores. O RTX é uma imunoglobulina quimérica humana/murina glicada que possui afinidade específica para CD20, uma proteína transmembrana de linfócitos B expressada em linfócitos B normais (exceto por células-tronco, células pró-B e linfócitos B plasmáticos). A administração de Rituximabe provoca a lise de células CD20$^+$ circulantes e residentes nos tecidos, mas não a destruição de células-tronco ou células plasmáticas. A depleção de células B da memória altera a resposta imune, com diminuição da produção de anticorpos e citocinas e alteração do processo de apresentação de antígenos. No geral, esse fármaco é bem tolerado e seus efeitos de depleção das células B podem durar até 12 meses. Todavia, são necessários mais estudos que avaliem e comprovem a real eficácia e segurança do uso de RTX em pacientes com NIgA, uma vez que além de não existirem muitas pesquisas sobre o seu uso nessa patologia, essa medicação tem um custo bastante elevado, sendo que uma dose de RTX de 500mg (frasco de 50mL) custa aproximadamente US$ 1.200 (ALSAHOW *et al*., 2022).

Dessa forma, no caso da paciente, foi implementado inicialmente a terapia de suporte com Enalapril 10mg de 12/12 horas, Sinvastatina 40mg/dia e Furosemida VE 2 ampolas de 12/12 horas para auxiliar na redução do edema e atingir o alvo pressórico adequado, associados à restrição hídrica e dieta hipoproteica e hipossódica. Ademais, também iniciou-se a corticoterapia com Prednisona 1mg/kg/dia por 6

meses, resultando em melhora significativa do quadro clínico e laboratorial da paciente.

V. Conclusão

Em resumo, acredita-se que a realização tardia da biópsia renal, após 60 dias de uso de corticosteroide, pode justificar a ausência de depósito glomerular, de complemento e de imunoglobulinas na imunofluorescência. Entretanto, pode ser levantada a hipótese de apresentação inicial de Nefropatia por IgA com GNRP, sendo o resultado de 25% deglomeruloesclerose demonstrado na biópsia, uma evolução de possíveis crescentes celulares no início da apresentação, levando em consideração a perda rápida de função renal que a paciente apresentou, a qual foi controlada com corticoterapia. Outra hipótese que poderia ser levantada para a glomeruloesclerose seria o diagnóstico prévio de hipertensão arterial da paciente; porém, seus valores pressóricos eram bem controlados.

Dessa forma, houve dificuldade para enquadrar o caso em um diagnóstico único e definitivo, tanto de síndrome nefrótica ou nefrítica, quanto de Glomerulonefrite por IgA ou Vasculite. Pressupõe-se que o diagnóstico possar ter sido prejudicado devido ao prolongado tempo para a realização da biópsia renal, visto que, no hospital local, não havia imunofluorescência, o que pode ter levado ao resultado negativo da mesma; e, ainda, devido ao fato de a biópsia cutânea das lesões purpúricas não ter sido realizada, uma vez que não há médico dermatologista no hospital.

Por fim, chegou-se à impressão final de Nefropatia por IgA, com possível GNRP e vasculite cutânea associada, tendo em vista que a paciente apresentou boa resposta ao tratamento empírico, ou seja,recuperação completa da função renal e dos níveis de proteinúria, desaparecimento das lesões purpúricas e redução do edema ao seu peso basal.

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Global Journal of Medical Research: F
Diseases
Volume 22 Issue 9 Version 1.0 Year 2022
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 2249-4618 & Print ISSN: 0975-5888

Clinical Profile and Findings in a Breast Cancer Screening Campaign in a Brazilian State

By Erik Paul Winnikow, Adriana Magalhaes De Oliveira Freitas, Cristiano Steil Da Silva, Carlos Gustavo Crippa, Braulio Leal Fernandes, Fernando Vequi Martins, Estela Regina Eidt, Daniela Avila Nesello, Bianca Silveira Sa, Kauí Patrício Lebarbenchon, Alexandre Nascimento Mateus & Vivienne Castilho

Abstract- *Objectives:* To describe the sociodemographic characteristics and the findings in the BC screening tests of women who signed up for a Breast Cancer Awareness Month campaign in the Brazilian state of Santa Catarina.

Methods: In this descriptive, retrospective, observational study, 638 women volunteered to participate. Sociodemographic and clinical data collection occurred between February 2020 and June 2021. Participants had mammograms and were referred to additional ultrasound exams when necessary. All participants with BI-RADS® of 4 or 5 were referred to core biopsy.

Results: In our sample, 31.2% had had a mammography longer than 5 years or had never had it. The most frequent findings in the performed mammograms were: dense breasts (37.1%), microcalcifications (12.0%) and breast lumps (10.4%).

Keywords: *breast neoplasms, early detection of cancer, mammography, mammographic breast density, ultrasonography, biopsy, retrospective studies, observational study.*

GJMR-F Classification: *DDC Code: 616.9944905 LCC Code: RC280.B8*

Strictly as per the compliance and regulations of:

Clinical Profile and Findings in a Breast Cancer Screening Campaign in a Brazilian State

Findings in a Breast Cancer Screening Program

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Methods: In this descriptive, retrospective, observational study, 638 women volunteered to participate. Sociodemographic and clinical data collection occurred between February 2020 and June 2021. Participants had mammograms and were referred to additional ultrasound exams when necessary. All participants with BI-RADS® of 4 or 5 were referred to core biopsy.

Results: In our sample, 31.2% had had a mammography longer than 5 years or had never had it. The most frequent findings in the performed mammograms were: dense breasts (37.1%), microcalcifications (12.0%) and breast lumps (10.4%). There were 17 exams classified as BI-RADS® 4 or 5 (in mammogram or ultrasound) and the core biopsy exam detected invasive ductal carcinoma in 6 patients (35.5%), invasive lobular carcinoma in 2 patients (11.8%), cystic or benign lesion without atypia in 6 patients (35.3%), proliferative lesion with atypia in 2 patients (11.8%) and phyllodes tumor in 1 patient (5.9%). The 8 (1.3%) participants diagnosed with carcinoma had the following clinical staging: 2 as T1 and 6 as T2; 7 as N0 and 1 as N1; 4 as M0, 1 as M1 and 3 as Mx.

Conclusion: The observed BC detection rate can be considered high compared to other Brazilian and USA data, reinforcing the importance of measures that favor prevention and early detection of BC, including screening tests. The information contained in this article can be useful for the elaboration of BC programs and policies in Santa Catarina and possibly in other Brazilian regions.

Keywords: breast neoplasms, early detection of cancer, mammography, mammographic breast density, ultrasonography, biopsy, retrospective studies, observational study.

I. Introduction

Breast cancer (BC) was the most commonly diagnosed type of cancer in 2020[1] and it is the leading cause of cancer death in women worldwide[2]. In Brazil, the scenario is similar: according to the National Cancer Institute (INCA), BC is the most common cancer in women, corresponding to almost 30% of new cases. In this gender, it is also responsible for more than 16% of cancer deaths, being the most lethal cancer type[3]. Moreover, a significant increase in BC morbidity and mortality rates has been observed in the past decades[4].

Less than 1% of BC occur in men, making this a mostly female disease[5]. Other risk factors besides gender, such as age, ethnicity, genetic and reproductive factors, breast density, body mass index (BMI), diet, alcohol and tobacco consumption and regularity of physical activity are worth noting. In fact, less than 10% of BC can be attributed to genetic factors, being this disease onset predominantly associated with environmental, reproductive, and lifestyle factors[6]. Regarding breast density, the risk of BC is increased in women with dense breasts. Moreover, dense breast tissue makes cancer detection more difficult since it decreases the sensitivity of traditional mammography. This characteristic is influenced by internal and external hormones and seems to be inversely correlated to age. Still, it is estimated that 40% of women aged 40 to 70 years have heterogeneously or extremely dense breasts[6].

BC prevention can be classified into primary and secondary. The primary prevention includes behavioral measures such as an active lifestyle, obesity control and decrease of high-fat food and alcohol ingestion. Primary prevention also comprises the self-palpation exam, while the clinical breast exam, performed by trained nurses and physicians, and mammography constitute secondary prevention[7]. The access to secondary prevention is decreased by several factors, such as lower socioeconomic status and income, poorer education and region of residence[8]. Furthermore, social distancing measures implemented

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in 2020 because of COVID-19 pandemic, although effective to diminish the disease transmission[9], possibly increased the burden of other diseases, such as cancer. According to the World Health Organization, to date, the only effective form of BC diagnostic in organized population-based programs is mammography screening. Women invited to attend these programs have a relative risk reduction of BC mortality by up to 20% across all age groups[10]. The Breast Cancer Awareness Month (BCAM) campaign is an initiative created in the 1990's that aims to share information regarding early diagnosis and BC prevention screening to reduce the disease's mortality. In Brazil, the first act related to the BCAM happened in 2002[11], but it was only in 2018 that the endurance of the initiative was guaranteed by the federal law number 13.733/2018[12].

Considering early detection and treatment improve BC survival rate[10], the reduction in the number of mammograms performed and the changes in the management of BC are a reason for concern. Hence, the Brazilian Society of Mastology, along with the pharmaceutical Libbs, promoted the Outubro Rosa Program (Pink October Program, in English), a Breast Cancer Awareness campaign in the Brazilian state of Santa Catarina. The initiative aimed at mitigating the COVID-19 pandemic's effects on the treatment of patients with breast cancer, as well as encouraging women's screening and diagnosis of this disease. The program took place in healthcare units in October 2020 and lasted for six months. It promoted several activities related to early diagnosis, diagnostic confirmation, treatment and follow-up of patients with BC. The objective of the present study is to describe the sociodemographic characteristics and the findings in the BC screening tests of women who signed up for the BC screening in the Pink October Program. This is a descriptive, retrospective and observational study, performed with an anonymized database.

II. Methods

This study was approved by the Ethics Committee (CEP: 4.974.425) and complies with Brazilian legislation. All participants agreed with the data safety policy and signed the informed consent form.

a) *Pink October Program*

The program took place in private health care clinics in several cities in Santa Catarina state and lasted for six months. Participants had mammograms and were referred to additional ultrasound exams when necessary. All participants with BI-RADS® of 4 or 5 were referred to core biopsy. Further information regarding its characteristics, as well as how each phase was conducted, can be found on Figure 1. Phases 1 to 4 were evaluated in this article. The treatment and follow-up phases were not the object of this study.

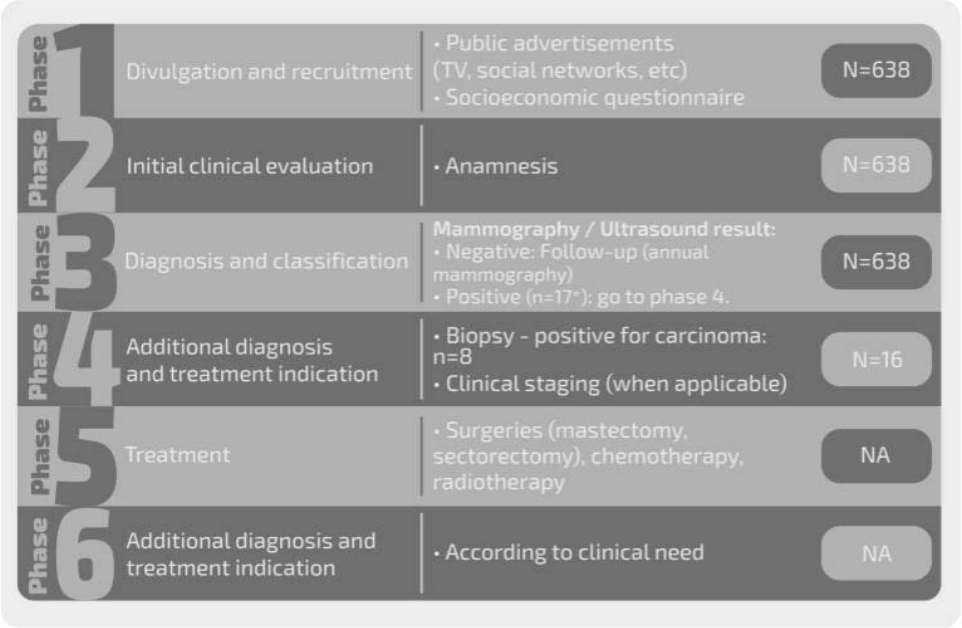

Figure 1: Flowchart of the Pink October Program 2020.

NA: not applicable in the current analysis.
**Seventeen positive breast cancer biopsies were performed from 16 patients (one patient had a bilateral suspicion of breast cancer).*

b) Subjects

The campaign targeted women 40 years of age or older, who had never had a mammography or whose last exam had been over 1 year. Women in Santa Catarina state could sign up regardless of social class or city of residence. Information from all women who participated in phase 3 of the program for mammography screening and authorized the storage and use of their data were included anonymously in the database. The sample size calculation, with 95% confidence and maximum error of 4% (precision), established a number of 600 participants.

c) Measures

Sociodemographic measures, such as age, city, ethnicity and education level were collected on phase 1 through a questionnaire. Data regarding personal and family history, gynecology and obstetrics history, physical characteristics, results of exams for BC detection and results of additional exams were also included in phase 2.

d) Statistical analysis

Data analysis was performed using the software SAS® (version 9.4). The descriptive analyses are presented for continuous variables, as mean and standard deviation, median, and minimum and maximum values. For categorical variables, the descriptive analyses are presented as frequency and percentages. Chi-squared tests were performed to assess differences in the frequencies of BC and BI-RADS® classification in women with different breast densities.

III. Results

The assessment was completed between February 2020 and June 2021, and 638 women agreed to participate in the study. Most participants were from the cities of Florianópolis (22.2%), Mafra (15.0%), Lages (13.2%) and Chapecó (10.7%). Age of participants ranged from 34 to 90 years, with mean of 57.9 ± 9.3 years and median of 56. In regard to ethnicity self-declaration, 80.3% of women were white and 73.2% had complete primary education or higher. Women had BMIs between 15.9 and 44.2 kg/m² (median = 27.5 kg/m²). Further sociodemographic information of participants can be found in Table 1.

Half of participants reported no relevant health history (50.3%), and 31.6% reported family history of breast cancer. Menarche age ranged from 7 to 20 years, with an average of 13.0 ± 1.8 years. The median number of pregnancies was 2, corresponding to 2.1 ± 1.1 children. Age at first delivery ranged from 14 to 44 years; 72.8% of them breastfed, with a median of 13 months of breastfeeding. Furthermore, 45.8% of respondents were on menopause.

Table 1: Sociodemographic characteristics of participants

	Mean ± Standard Deviation (max - min)
Age (n=618)	57.9 ± 9.3 (34 - 90)
Ethnicity (n=638)	**Number of participants (%)**
White	512 (80.3%)
Pardo*	81 (12.7%)
Black	34 (5.3%)
Yellow	2 (0.3%)
Indigenous	1 (0.2%)
Unknown	8 (1.3%)
Education (n=638)	
Illiterate	4 (0.6%)
1st degree of primary education - incomplete	69 (10.8%)
1st degree of primary education	49 (7.7%)
2nd degree of primary education - incomplete	40 (6.3%)

2nd degree of primary education	237 (37.1%)
Secondary education - incomplete	46 (7.2%)
Secondary education	136 (21.3%)
Tertiary education - incomplete	1 (0.2%)
Tertiary education	47 (7.4%)
Unknown	9 (1.4%)
City (n=635)	
Florianópolis	141 (22.2%)
Mafra	95 (15.0%)
Lages	84 (13.2%)
Chapecó	68 (10.7%)
Blumenau	52 (8.2%)
Criciúma	49 (7.7%)
Itajaí	45 (7.1%)
São José	34 (5.4%)
Palhoça	15 (2.4%)
Other**	52 (8.1%)

** Brazilian mixed ethnicities, comprising white, black and/or indigenous peoples.*
*** Navegantes, Camboriú, Balneário Camboriú, Campo Belo do Sul, São José do Cerrito, Penha, Lauro Müller, Içara, Cordilheira Alta, Barra Velha, Xanxerê, Urubici, Sombrio, Santo Amaro da Imperatriz, Saltinho, Morro da Fumaça, Laguna, Itapema, Imaruí, Correia Pinto, Cocal do Sul, Brusque, Biguaçu, and Balneário Arroio do Silva.*

Most participants (75.0%) had already had a mammography, 39.9% less than 2 years before and 26.3% between 2 and 5 years before. The most frequent reasons to get the exam were: screening tests (85.1%), breast tenderness (6.3%) and breast lumps (5.0%). The greatest part of mammograms performed by the program were carried out in private clinics (92.3%), 4.5% were carried out in units of the public healthcare system and 3.0% in hybrid clinics; most exams used digital equipment (53.4% used Computerized Radiography and 46.5%, Digital Radiology) and just one (0,1%) used analogical equipment. Regarding the mammography results, the most frequent findings were dense breasts (37.1%), microcalcifications (12.0%) and breast lumps (10.4%). Details on mammography and ultrasound results, BI-RADS® and breast density can be found in Table 2.

Table 2: Mammography history and results

This was the first mammography (n=612)*	Number of participants (%)
Yes	136 (22.2%)
No	476 (77.8%)
Time since the last exam (n=476)*	
< 2 years	254 (41.5%)
2 to 5 years	167 (27.3%)
> 5 years	55 (9.0%)
Reason (n=637)	
Screening exam	542 (85.1%)
Breast tenderness	40 (6.3%)
Breast lump	32 (5.0%)
Papillary effusion	4 (0.6%)
Other	19 (3.0%)
Mammography BI-RADS (n=637)	
0	86 (13.5%)
1	82 (12.9%)
2	446 (70.0%)
3	14 (2.2%)
4	7 (1.1%)
5	2 (0.3%)
Ultrasound BI-RADS (n=124)	
0	2 (1.6%)
1	15 (12.1%)
2	59 (47.6%)
3	31 (25.0%)
4	15 (12.1%)
5	2 (1.6%)

**Patients with known status on previously performed mammograms (24 patients had no known status on whether or not they had previously had a mammogram).*

Additional core biopsy exam was indicated for 16/638 (2.5%) patients (one of them had a bilateral biopsy), who presented BI-RADS® 4 or 5 (either in mammography or ultrasound). The investigation detected invasive ductal carcinoma in six patients (35.5%), invasive lobular carcinoma in 2 patients (11.8%), benign lesion without atypia in 5 patients (29.4%), proliferative lesion with atypia in 2 patients (11.8%), cystic lesion in 1 patient (5.9%) and phyllodes tumor in 1 patient (5.9%). Clinical staging according American Joint Committee of cancer was recommended to 8 participants (1.3% of the whole sample), of which 2 were classified as T1 and 6 as T2; 7 patients were classified as N0 and 1 as N1; besides, 4 patients were classified as M0, 1 as M1 and 3 as Mx.

Most participants had BI-RADS® 2 and heterogeneously and extremely dense breasts. Frequency of patients with different breast densities and their BI-RADS® can be found in Table 3. Participants who were diagnosed with BC had heterogeneously dense breasts or scattered fibroglandular densities; none of them had extremely dense or predominantly fatty breasts. Frequency of participants with different breast densities, with and without cancer diagnosis can be found in Table 4. The low frequency of BI-RADS® 4 and 5 and breast cancer diagnosis hindered statistical comparisons of these data with breast density. Nonetheless, there was a lower proportion of volunteers with BI-RADS® ≥1 and higher proportion with BI-RADS® 0 (inconclusive) among volunteers with heterogeneously dense breasts in comparison with the other categories of breast density (p = 0,039). Other statistically significant differences in regards to BC frequency or BI-RADS® classification were not detected.

Table 3: Frequency of patients with different breast density characteristics versus BI-RADS classification

	BI-RADS						
	0 (n=86)	1 (n=82)	2 (n=446)	3 (n=14)	4 (n=7)	5 (n=2)	Total (n=637)
Breast density							
Extremely dense	1 (4.5%)	2 (9.1%)	18 (81.8%)	1 (4.5%)	0 (0.0%)	0 (0.0%)	22 (100.0%)
Heterogeneously dense	57 (17.0%)	37 (11.0%)	227 (67.6%)	9 (2.7%)	4 (1.2%)	2 (0.6%)	336 (100.0%)
Predominantly fatty	7 (7.9%)	21 (23.6%)	60 (67.4%)	1 (1.1%)	0 (0.0%)	0 (0.0%)	89 (100.0%)
Scattered fibroglandular densities	21 (11.1%)	22 (11.6%)	141 (74.2%)	3 (1.6%)	3 (1.6%)	0 (0.0%)	190 (100.0%)
Total	86 (13.5%)	82 (12.9%)	446 (70.0%)	14 (2.2%)	7 (1.1%)	2 (0.3%)	637 (100.0%)

Table 4: Frequency of patients with different breast density characteristics, with and without breast cancer

Breast density	Number of patients (%)		
	Breast cancer (n=8)	No Breast cancer (n=629)	Total (n=637)
Extremely dense	0 (0.0%)	22 (100%)	22 (100%)
Heterogeneously dense	5 (1.5%)	331 (98.5%)	336 (100%)
Predominantly fatty	0 (0.0%)	89 (100%)	89 (100%)
Scattered fibroglandular densities	3 (1.6%)	187 (98.4%)	190 (100%)
Total	8 (1.3%)	629 (98.7%)	637 (100%)

IV. Discussion

This study aimed to characterize a sample of women who participated in a BC screening program in Santa Catarina, Brazil. Participants were, in general, in their late 50's, white, with complete primary education or higher and the majority had no relevant personal health history, although approximately a third of them had a family history of BC. Most women had children, breastfed, and almost half of them were on menopause. Their BMIs, menarche and delivery ages varied widely.

The Brazilian Ministry of Health recommends a mammography every two years for women aged between 50 and 69 years[13]. In our sample, that ranged from 35 to 90 years of age, three fourths had already had a mammography at least once, most of them in a five-year range for screening purposes. Considering only participants with known previous mammography status, although 254/612 (41.5%) women had this exam in the previous 2 years and 167/612 (27.3%) had it in a 2–5-year range, 191/612 (31.2%) women had a mammography longer than 5 years or had never had this exam. This percentage is comparable to what was observed in another Brazilian survey that took place in 2012, in which 30.3% of participants never had a mammography in their lifetime[14]. Despite this similarity with data from the entire country, Barcelos and colleagues (2018) showed there was a higher prevalence of women who have never had a mammography in the north, midwest, and northeast regions of Brazil compared to the south and southeast[14]. The number of machines available and their geographical location are estimated to be enough to guarantee access to mammograms[13], but together, these findings indicate the need of programs to increase adherence and access to BC prevention.

Breast Cancer Awareness Month campaigns increase adherence to BC primary and secondary prevention, as shown by a systematic review with information from the United Kingdom[15]. Data from Google Trends show that searches for "Breast Cancer" and "mammography" are higher during the month of October. This holds true for different countries such as the USA[16], Malaysia[17] and also for Brazil[18]. Nonetheless, the COVID-19 pandemic seem to have impacted the search volume for different types of cancer, with a 74.3% decrease in searches for "mammography" during the first peak in global weekly deaths related to COVID-19 compared to the pre-pandemic period[19].

In Brazil, data from DATASUS, an open access database of the Brazilian public healthcare system, show a progressive increase in the number of screening mammograms from 2010 to 2018[20]. However, a retrospective cohort study performed in a private hospital in São Paulo, Brazil, showed a decrease of 78.9% in the number of breast exams in the first 90 days of COVID-19 social isolation measures in comparison to the same period in the previous year[21]. Moreover, almost 70% of responders of an electronic survey with members of the Brazilian Society of Mastology declared they have changed their management approach of BC during the pandemic[22]. In 2020, the first year of the COVID-19 pandemic, there was an overall decrease of 42% in the number of mammograms performed in comparison to 2019. Specifically in the state of Santa Catarina, there was a reduction of 44% in these figures[23]. Notwithstanding, this seems to be a global tendency, since the USA faced a dramatic decrease in the number of screening and diagnostic mammograms in April of 2020. Although this decrease has been followed by a strong rebound in July, a cumulative deficit in missed mammograms can be observed, outnumbering the exams performed during the rebound and raising awareness for possible delayed diagnoses[24].

In our sample, 16 patients had mammography and/or breast ultrasound with BI-RADS® 4 or 5 and were referred to core biopsy exam (one of them had it bilaterally). The results showed that 8 (1.3%) women had

breast cancer (being 6 of them invasive ductal carcinomas and 2 invasive lobular carcinomas), and among them at least one already had metastases by the time of diagnosis. This percentage of BC detection can be considered high compared to another Brazilian study performed in the state of São Paulo, in which percentages of BC diagnoses in consecutive years were: 0,67% in 2010, 0,61% in 2011, and 0,69% in 2012[25]. The 2019 USA data show an even lower breast cancer incidence: among white women, who had the higher incidence rates, the percentage was only 0,13%[26].These findings highlight the importance of BC screening programs and of making efforts to compensate for the number of missed mammograms due to the COVID-19 pandemic. Still, when discussing BC screening, another aspect that should be accounted for is weighing the benefits of early detection versus the harms of supplemental screening, such as false-positive results that can lead to increased patient recalls, patient anxiety and false-positive biopsy findings[27].

It is estimated that, in general, 10% of women have predominantly fatty breasts, 40% of women have scattered fibroglandular densities, another 40% have heterogeneously dense breasts, and 10% have extremely dense breasts, meaning that approximately half women have dense breasts[28]. None of the participants diagnosed with BC had predominantly fatty or extremely dense breasts. Considering that these are the least frequent breast density characteristics and the low number of diagnosed women, this result can be considered as expected.

In addition to the increased BC risk that women with high breast density face[6], breast density information is relevant for BC screening because the mammography sensitivity is inversely related to breast density: in women with predominantly fatty breasts it corresponds to 88%, while in women with extremely dense breasts the sensitivity is reduced to only 62%[28]. In line with these results, our data show an increased percentage of inconclusive mammograms among women with heterogeneously dense breasts. The frequency of women in the extremely dense breasts category was too small in our sample to detect any significant difference, as it would be expected. Thus, it may be beneficial to inform patients of their breast densities after a mammography. Besides, when screening women with dense breasts, health care professionals can suggest supplemental screening modalities known to improve breast cancer detection, such as digital breast tomosynthesis (also known as 3-dimensional mammography), breast ultrasonography, molecular breast imaging (a functional nuclear imaging test that uses a tumor-avid radioactive tracer) and magnetic resonance imaging, in addition to counseling breast self-awareness, careful assessment of patient's risk factors for BC and recommendation of digital mammography rather than film mammography, since the digital exam is more accurate[27,28].

One limitation of our study lies in the use of a convenience sample composed only by women who participated in the BCAM campaign. Although our sample shares several characteristics with what was observed in other studies within the Brazilian population, these data should be interpreted carefully. Moreover, our sample size was small and, although the proportion of women diagnosed with BC can be considered high, the absolute number is noticeably limited, which prevented the accomplishment of statistical comparisons. In line with this, we highlight the need for further studies, with higher sample sizes, to better understand the relationship between breast density, BI-RADS classification and BC.

V. Conclusions

In this retrospective observational study, which aimed to describe the sociodemographic and clinical characterization of women who signed up for the BC screening mammography in the Pink October Program, around a third (191/612) had had a mammography longer than 5 years or had never had this exam. Besides, 8/638 (1,3%) cases of BC were detected, being at least one of them metastatic. The observed BC detection rate can be considered high compared to other Brazilian and USA data. Therefore, along with the significant increase in BC morbidity and mortality rates in the past decades, our findings reinforce the importance of measures that favor prevention and early detection of BC, including screening tests. The information contained in this article can be useful in the elaboration of BC programs and policies in Santa Catarina and possibly in other Brazilian regions.

Acknowledgement

The authors acknowledge Maura Gonzaga for the support in statistical analysis and Kachi Comunicação Científica for medical writing and editorial assistance.

Funding

Funded by Libbs Farmacêutica.

Conflicts of interest

The study was sponsored by Libbs Farmacêutica, which provided financial support for Sociedade Catarinense de Mastologia to plan and perform the study.

Cristiano Stein Da Silva declares having received payment or honoraria for lectures, presentations, speakers bureaus, manuscript writing or educational events from MSD and Pfizer.

The other authors have no additional conflicts of interest to report.

Previous presentations: Not applicable.

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Global Journal of Medical Research: F
Diseases
Volume 22 Issue 9 Version 1.0 Year 2022
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 2249-4618 & Print ISSN: 0975-5888

Impact of Adjuvant and Neoadjuvant Chemotherapy on BMI of Patients with Non-Metastatic Breast Cancer in Center of High Complexity Oncology in Southern Brazil

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Abstract- *Background:* Weight changes during chemotherapy in women with cancer breast cancer are commonly suggested by the medical literature. The association between gain weight and chemotherapy has shown a general trend of decreasing magnitude in last years. The consequence on disease-free survival and self-esteem in patients with breast cancer after chemotherapy highlights the importance of research on the topic. This study aims to evaluate weight changes in patients with non-metastatic breast cancer undergoing adjuvant and/or neoadjuvant chemotherapy in a oncology in southern Brazil.

Methods: Data from 122 medical records center of high complexity oncology in Southern Brazil for patients diagnosed with non- metastatic malignant breast cancer and undergoing chemotherapy for one year. Statistical analysis was performed by SPSS v.20.0.

Keywords: *adjuvant therapy; neoadjuvant therapy; body weight; body mass index; breast cancer.*

GJMR-F Classification: *DDC Code: 616.9940019 LCC Code: RC262*

Strictly as per the compliance and regulations of:

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Samantha Lia Ziotti Bohn Gonçalves Soares [α], Luana Trentin Hofmann [σ], Gisela Quissini Leoncio [ρ] & Janaina Brollo [ω]

Abstract- Background: Weight changes during chemotherapy in women with cancer breast cancer are commonly suggested by the medical literature. The association between gain weight and chemotherapy has shown a general trend of decreasing magnitude in last years. The consequence on disease-free survival and self-esteem in patients with breast cancer after chemotherapy highlights the importance of research on the topic. This study aims to evaluate weight changes in patients with non-metastatic breast cancer undergoing adjuvant and/or neoadjuvant chemotherapy in a oncology in southern Brazil.

Methods: Data from 122 medical records center of high complexity oncology in Southern Brazil for patients diagnosed with non- metastatic malignant breast cancer and undergoing chemotherapy for one year. Statistical analysis was performed by SPSS v.20.0. For to associate the nutritional status categories, the Mc Nemar test was used. the level of significance was considered at 5% for comparisons.

Results: The mean age of the sample was 53.48 ± 12.23 years. 44.3% of patients were post- menopausal. 90.2% of patients have invasive ductal carcinoma and most patients were stage IIB. 51.6% underwent chemotherapy neoadjuvant, 36.1% adjuvant chemotherapy and 12.3 underwent both types. the BMI in the first consultation before chemotherapy, the mean was 29.25±5.94; BMI at the last consultation, the mean was 29.32 ± 6.01. By Student's T Test, the weights and BMI before and after chemotherapy were P=0.711 and P=0.774 respectively.

Conclusion: This study did not reveal significant weight changes after one year of chemotherapy adjuvant and/or neoadjuvant. Further studies are suggested on the trend of change in weight and association with long term chemotherapy. Furthermore, most patients with breast cancer followed up in the period did not change the classification of the Body Mass (BMI) according to the World Health Organization (WHO).

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Keywords: adjuvant therapy; neoadjuvant therapy; body weight; body mass index; breast cancer.

I. Background

Breast cancer is the second most frequently diagnosed malignancy, it is also the leading cause of cancer death in women. cancer patients early-stage breast cancer undergo primary breast and lymph node surgery regions, with or without radiotherapy. Afterwards, adjuvant systemic therapy may be indicated. However, some patients with early-stage invasive breast cancer may be treated with neoadjuvant therapy first. Chemotherapy is associated with effects side effects, including nausea, vomiting, diarrhea, hair loss, fatigue, mucositis, cytopenia, ovarian failure, cardiac toxicity, and emotional and psychiatric. Among the known side effects of chemotherapy, the weight change and its association with a poor prognosis of the disease (1- 3)

Weight change in breast cancer patients can influence the quality of life, self-esteem and development of new comorbidities. Studies report greater risk of disease recurrence and worse prognosis when performing the treatment (1-6). One meta-analysis showed that a weight gain of 10% or more after the diagnosis of Breast cancer is associated with a higher mortality rate (4). On the other hand, there are recent studies showing no significant changes in the weight of patients with breast cancer undergoing chemotherapy (3,5,6). Based on these data, studies have also demonstrated the importance of nutritional monitoring and exercise during the chemotherapy treatment (7-9).

A meta-analysis showed that weight gain during chemotherapy was greater in articles published up to the 2000s and that there is a trend of weight gain be decreasing over the years (1). In line with this idea, a meta-analysis Canadian added that weight gain is more associated with chemotherapy adjuvant, with long-term treatments and increased in pre menopause (10). In this context, the literature suggests that the duration of chemotherapy can also be a factor for weight gain (11,12) and also shows that pre-menopausal patients

show greater weight gain than post-menopausal patients (6,13). The association between weight gain and chemotherapy treatment has shown general trend of decreasing magnitude in recent years. It is known that changes in weight change may be unfavorable in body composition. the consequence disease- free survival and self-esteem, associated with the emergence of psychiatric disorders in patients with breast cancer after chemotherapy evidences the importance of research on the subject. Therefore, this study aims to evaluate changes in weight and BMI (Body Mass Index) in breast cancer patients non-metastatic patients undergoing adjuvant and/or neoadjuvant chemotherapy in a of oncology in southern Brazil.

II. Objectives

a) *Primary Purpose*

To evaluate weight and BMI changes in non-invasive breast cancer patients undergoing adjuvant and/or neoadjuvant chemotherapy in the Center of High Complexity Oncology in Southern Brazil in the period from March 2020 to December 2021.

b) *Secondary Objectives*

a. Outline the epidemiological profile and the presence of other comorbidities in non- metastatic breast cancer patients undergoing adjuvant chemotherapy and or neoadjuvant treatment in the Center of High Complexity Oncology in Southern Brazil.
b. To analyze whether there was a change in the WHO classification of the BMI of patients with non-metastatic breast cancer undergoing adjuvant chemotherapy and/or neoadjuvant in the Center of High Complexity Oncology in Southern Brazil.

III. Study Design

Observational, Descriptive and Retrospective Study

IV. Study Population and Methodology

Population Studied: Data from 122 medical records at the Center of High Complexity Oncology in Southern Brazil of patients diagnosed with malignant neoplasm of the non-metastatic breast and submitted to neoadjuvant and/or adjuvant chemotherapy during March 2020 until December 2021.

Methodology: The data were entered in the Excel program and later exported to the SPSS program v. 20.0 for statistical analysis. Categorical variables were described by frequencies and percentages. The normality of quantitative variables was verified by the Kolmogorov Smirnov test. Quantitative variables were described by the mean and the standard deviation. Mean weight and BMI were compared before and during the chemotherapy by Student's t test for paired samples. To associate the categories of nutritional status before and after the Mc Nemar test was used. It was considered a significance level of 5% for the established comparisons.

Inclusion and Exclusion Criteria: All patients who received chemotherapy participated in the study. neoadjuvant and/or adjuvant for breast cancer in March of 2020 until December 2021 with the diagnosis through anatomopathological analysis of neoplasia non-metastatic breast cancer, regardless of histological type with stages clinics from I to IIIC. In the inclusion criteria were considered: Being of the sex feminine; Be over 18 years of age; No neoplasm metastatic; Maintaining follow-up at medical consultation and nutrition during the study period. For this study, data were collected from 190 patients, the following were excluded: male patients, deaths, metastatic tumors; patients with loss of oncological follow-up and patients with incomplete data.

Research Ethics Committee: The present study comprises the analysis of data from medical records and exams already performed, not requiring direct intervention with human beings, was written only a term of secrecy and confidentiality. The study was approved by the Ethics Committee and Research at the General Hospital of Caxias do Sul-RS.

V. Outcome

122 female patients with non-metastatic breast cancer and mean age 53.48 ± 12.23 years were followed up for one year. 44.3% of patients were post-menopausal. Regarding the comorbidities presented, the following stand out: Systemic Arterial Hypertension (34.4%), Hypothyroidism (10.7%), Dyslipidemia (6.6%), Diabetes (3.8%), Deep Vein Thrombosis (2.5%), Rheumatologic Disorders (3.3%), Cardiac (2.5%). 1.6% of the patients maintained their alcohol consumption and 12.3% maintained the smoking during treatment. In the studied sample, 3.3% had generalized anxiety, 12.3% depression, and other psychiatric disorders in follow-up were found in 4.1% of patients. During this period, 7.4% of the patients developed COVID 19. Table 1 shows the characteristics of patients.

Regarding the type of breast cancer, 90.2% of the patients have breast cancer invasive ductal carcinoma, while 3.3 had invasive lobular carcinoma and 3.3% the others types. 70.5% of the patients had the positive hormone receptor subtype and 35.2% Her-2 positive. The stages of breast cancer were also analyzed, with the majority being of stage IIB patients (35.2%). Table 2 shows the characteristics of cancers of breast.

As shown in table 3, in the analyzed sample, 51.6% performed neoadjuvant chemotherapy, 36.1% adjuvant chemotherapy and 12.3 underwent both types of chemotherapy. The chemotherapy time was less than or equal to 1 year for 77% of patients. In the annual follow-up, 9% had adverse reactions to chemotherapy, the majority being a mild reaction. It is known that the

treatment of breast cancer it is multifactorial. In relation to other treatments associated with chemotherapy, 45.9% of patients underwent hormone therapy and 50% of patients underwent radiotherapy.

Patients were classified according to the BMI classification of the World Health Organization (WHO) before and after chemotherapy. You results are described in table 4. Most of the sample was pre chemotherapy with weight at the first visit before chemotherapy with a mean of 75.4 ±16.95kg; Weight at the last post-chemotherapy visit with a mean of 75.61 ±17.29 kg; Height had a mean of 160.39 ± 7.20. The BMI at the first consultation before the chemotherapy presented an average of 29.25±5.94; BMI at the last consultation showed an average of 29.32 ± 6.01. When statistically comparing by Student's T Test the weights and BMI before and after chemotherapy showed P=0.711 and P=0.774 respectively. A non-significant relationship was observed between the patients' baseline weight and postpartum weight. chemotherapy.

Regarding the BMI classification according to WHO, there was no significant change in the status between pre and post chemotherapy P=0.607. 67.3% remained in the eutrophic category. 54.5% remained in the obesity category I. 83.3% remained in the obesity category II. 57.1% remained in the obesity category III. 59.6% remained overweight. Variations in ranking during follow-up are represented in table 5.

VI. Discussion

We evaluated pre- and post-chemotherapy weight changes among women with non- metastatic breast cancer. Most of the studied sample presented time of chemotherapy less than or equal to one year. The medical literature suggests that the duration of chemotherapy can be a factor for weight change, and long-term treatments duration have greater weight gain. (10). Furthermore, unlike the presented in our study, young and pre-menopausal women would have greater weight gain according to some previous research (10,11,14,15)

Consistent with our results, a narrative review suggested that women with normal BMI at baseline were more likely to gain weight compared with overweight women (10). We demonstrated that eutrophic women had more chance of gaining weight than overweight patients after chemotherapy. 32.1% of patients in the eutrophic classification were overweight after chemotherapy and 22.7% of patients with Grade I Obesity had Grade II Obesity after chemotherapy, while 5.6% of patients with grade II obesity had Grade III obesity.

In the same context, other articles also demonstrated no significant weight change among patients with non-metastatic breast cancer before and after chemotherapy (3,6). Article in Saudi Arabia followed 228 women between 18-80 years of age with non-metastatic breast cancer and early-stage chemotherapy and did not obtain significant changes in weight (3). Likewise, a Korean survey evaluated 260 women with non-metastatic breast cancer and showed no change in significant weight (5). Furthermore, although weight gain still prevails as an effect post-chemotherapy collateral, studies have shown a tendency for a decrease in weight change in women with breast cancer after chemotherapy over the years (1).

Some factors may have contributed to the non-weight gain of patients in our study: regular follow-up with a nutrition team, the time of chemotherapy and the type of chemotherapy performed. Studies show that the increase of taxanes in treatments has suggested less weight gain in more recent years (1). The group of patients in follow-up was also considered to have less previous comorbidities in relation to the reference studies, being another possible fator not to change weight. 51.6% of patients underwent neoadjuvant chemotherapy, it is known that studies on the association of neoadjuvant chemotherapy and changes in weight are still limited in the medical literature.

VII. Conclusion

This study did not reveal significant weight changes after one year of adjuvant and/or neoadjuvant chemotherapy. Furthermore, most patients with breast cancer followed-up during the period did not change their BMI classification according to WHO. Since studies show a trend towards a reduction in Weight changes over the next few years in breast cancer patients are needed new studies, considering the different regional features.

Conflicts of interest
None

Financial relationships
None

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Table 1: Characteristics and previous comorbidities of the patients studied

Characteristics and Previous comorbidities	Outcomes
Age	53,4 ± 12,2
Pre- Menopausal Women	55,7% (68)
Pos- Menopausal Women	44,3% (54)
Arterial Hypertension Systemic	34,4% (42)
Diabetes	9,8% (12)8
Deep Vein Thrombosis	2,5% (3)
Hypothyroidism	10,7% (13)
Dyslipidemia	6,6% (8)
COVID19	7,4% (9)
Anxiety	3,3% (4)
Depression	12,3% (15)
Other Disorders Neuropsychiatric	4,1% (5)
Alcoholism	1,6% (2)
Smoking	12,3% (15)
Rheumatological Comorbidities	3,3% (4)
Cardiological Comorbidities	2,5% (3)

Table 2: Characteristics of Studied Breast Cancer

Characteristics	Outcomes
Invasive Ductal Carcinoma	90,9% (110)
Invasive Lobular Carcinoma	3,3% (4)
Other Types of Carcinoma	3,3% (4)
Positive Hormone Receptor	70,5% (86)
Negative Hormone Receptor	29,5% (36)
HER 2 Positive	35,2% (43)
HER 2 Negative	64,8% (79)

Table 3: Characteristics of Chemotherapy

Characteristics	Outcomes
Chemotherapy Type	
Neoadjuvant	51,6% (63)
Adjuvant	36,1% (44)
Neoadjuvant + Adjuvant	12,3% (15)
Chemotherapy time:	
Less than or equal to one year	77,0% (94)
Major to one year	23,0% (28)
Presence of reaction to chemotherapy	9,0% (11)

Table 4: BMI Classification according to WHO

Classification	Outcomes
Pre-Chemotherapy	
Eutrophic	23,0% (28)
Grade I Obesity	18,0% (22)
Grade II Obesity	14,8% (18)
Grade III Obesity	5,7% (7)
Overweight	38,5% (47)
Pos- Chemotherapy	
Eutrophic	25,4% (31)
Grade I Obesity	16,4% (20)
Grade II Obesity	18,9% (23)
Grade III Obesity	4,1% (5)
Overweight	35,2% (43)

Table 5: BMI Classification according to WHO pre-chemotherapy X BMI Classification according to WHO pos-chemotherapy

Classification Pre-Chemotherapy	Classification Pos-Chemotherapy				
	Eutrophic	I Obesity	II Obesity	III Obesity	Overweight
Eutrophic	67,9%	0%	0%	0%	32,1%
I Obesity	0%	54,5%	22,7%	0%	22,7%
II Obesity	0%	5,6%	83,3%	5,6%	5,6%
III Obesity	0%	14,3%	28,6%	57,1%	0%
Overweight	25,5%	12,8%	2,1%	0%	59,6%

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Global Journal of Medical Research: F
Diseases
Volume 22 Issue 9 Version 1.0 Year 2022
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 2249-4618 & Print ISSN: 0975-5888

Type 2 Diabetes Mellitus in Mexico, Elements to Consider to Strengthen the Health Promotion Component in the National Strategy for Prevention and Control

By Dra. Maria David Keyla Nogueda Velez

Abstract- Type 2 diabetes mellitus (DM2) is a disease of primary importance for public health, not only in Mexico but throughout the world, because it is the most common non-communicable disease, caused by a combination of genetic, environmental and behavioral factors, which is why it is necessary to identify patients at high risk of DM2.le disease. However, is important to bear in mind that intervention by the health system through the Specific Action Program for the Prevention and Control of Diabetes Mellitus 2013-2018, could benefit the population at risk and impact the quality of life of sick patients through health promotion. Finally, proposals were included to strengthen the National Strategy, with emphasis on health promotion.

Palabras Clave: *diabetes mellitus tipo 2, factores de riesgo, sistema de salud, educación para la salud, promoción de la salud, programa de acción específico para la prevención y control de diabetes mellitus tipo 2, intervention mapping.*

GJMR-F Classification: *DDC Code: 362.1989700973 LCC Code: RA564.8*

Strictly as per the compliance and regulations of:

Type 2 Diabetes Mellitus in Mexico, Elements to Consider to Strengthen the Health Promotion Component in the National Strategy for Prevention and Control

Diabetes Mellitus Tipo 2 En México, Elementos A Considerar Para Fortalecer El Componente De Promoción De La Salud En La Estrategia Nacional Para Su Prevención Y Control

Dra. Maria David Keyla Nogueda Velez

Resumen- La diabetes mellitus tipo 2 (DM2) es una enfermedad de primordial importancia para la salud pública, no solo en México sino en todo el mundo, por ser la enfermedad no transmisible más común, causada por una combinación de factores genéticos, ambientales y de comportamiento. Por tal motivo, es necesario identificar a los pacientes con alto riesgo de enfermedad DM2. Sin embargo, es importante tener en cuenta que la intervención del sistema de salud a través del Programa de Acción Específico para la Prevención y Control de la Diabetes Mellitus 2013-2018, podría beneficiar a la población en riesgo e impactar en la calidad de vida de los pacientes enfermos a través de la promoción de la salud. Finalmente, se incluyeron propuestas para fortalecer la Estrategia Nacional, con énfasis en la promoción de la salud.

Palabras Clave: diabetes mellitus tipo 2, factores de riesgo, sistema de salud, educación para la salud, promoción de la salud, programa de acción específico para la prevención y control de diabetes mellitus tipo 2, intervention mapping.

Abstract- Type 2 diabetes mellitus (DM2) is a disease of primary importance for public health, not only in Mexico but throughout the world, because it is the most common non-communicable disease, caused by a combination of genetic, environmental and behavioral factors, which is why it is necessary to identify patients at high risk of DM2.Ie disease. However, is important to bear in mind that intervention by the health system through the Specific Action Program for the Prevention and Control of Diabetes Mellitus 2013-2018, could benefit the population at risk and impact the quality of life of sick patients through health promotion. Finally, proposals were included to strengthen the National Strategy, with emphasis on health promotion.

I. Introducción

La diabetes mellitus Tipo 2 (DM2), es una enfermedad de primera importancia para la salud pública, no solo en México sino en todo el mundo, debido a que es la enfermedad no transmisible más frecuente. Se relaciona con diversas complicaciones que van deteriorando el organismo, la más frecuente es la aterosclerosis de los grandes vasos sanguíneos, y su localización puede ser miocárdica, cerebral y vascular. Las complicaciones crónicas de los pequeños vasos son principalmente la nefropatía, retinopatía y neuropatía (Moreno- Altamirano, L., García-García, J., Soto-Estrada, G., Capraro, S. y Limón-Cruz, D., 2014).

La DM2 es una enfermedad causada por una combinación de factores genéticos, ambientales y conductuales, por lo que es necesario identificar a los pacientes con alto riesgo de DM2. Algunos factores de riesgo para la diabetes son modificables y otros son no modificables. Dentro de los factores no modificables se incluye la edad, raza/etnia, antecedentes heredofamiliares de DM2, antecedentes de diabetes gestacional y síndrome de ovario poliquístico. En el grupo de los factores de riesgo modificables se incluyen el sobrepeso, obesidad, sedentarismo, tabaquismo y hábitos de alimentación.

En el perfil de la salud de la población mexicana sobresale la emergencia de la diabetes mellitus (DM) como la enfermedad no transmisible que, sin lugar a duda, rápidamente la está convirtiendo en la epidemia del siglo XXI y en un reto del Sistema de Salud (Barba, J., 2018).

El aumento de la obesidad, el sobrepeso y el comportamiento demográfico de México, en donde hay cambios en la pirámide poblacional, generan un mayor riesgo para la población adulta. Dichas tendencias incrementarán la demanda de servicios de atención para DM2 a corto, mediano y largo plazo, además de que se incrementarán los costos para su atención, principalmente los generados por sus complicaciones. En el año 2011 México ocupaba el noveno lugar mundial en la prevalencia de diabetes, las proyecciones refieren que para el año 2025, el país ocupará el sexto o

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séptimo lugar (Moreno- Altamirano, L., García- García, J., Soto-Estrada, G., Capraro, S. y Limón-Cruz, D., 2014).

Por otro lado, según la Encuesta Nacional de Salud y Nutrición 2018-2019 (ENSANUT), en México, se gasta alrededor de 3,872 millones de dólares en atención a la diabetes anualmente, representando el 34% del gasto en salud, generando el costo por persona de 707 dólares al año (INEGI., INSP., SSA., ENSANUT, 2018). Por lo tanto, las finanzas públicas y el sector salud están limitados para tratar a todos los pacientes afectados. Esto se refleja en cobertura insuficiente, desabasto de medicamentos y largos tiempos de espera, por lo que el gasto de bolsillo de cada familia mexicana aumentará, habrá mayor pobreza, perjudicando el costo en el tratamiento de la DM2.

Ante este panorama, en México es una prioridad que las instituciones del Sistema Nacional de Salud y la sociedad en general, realicemos acciones de protección, promoción y prevención, dirigidas a reducir la carga de la enfermedad de la DM2. En este sentido es apremiante la búsqueda y/o fortalecimiento de estilos de vida saludables, necesarios para mejorar la calidad de vida de los pacientes con diagnóstico de DM2, pero sobre todo para prevenir o retardar tanto la aparición de complicaciones agudas o graves, como los nuevos casos de diabetes, haciendo énfasis en estilos de vida que impulsen hábitos de alimentación y de actividad física que disminuyan el sobrepeso y obesidad. Sin embargo, dentro de estas acciones de promoción de la salud impulsadas desde el sistema de salud en México, es crucial el considerar acciones que impulsen tanto la construcción de ambientes saludables y seguras (áreas verdes, espacios recreativos) como acciones que reduzcan la exposición a tóxicos ambientales relacionados con la diabetes como son la contaminación del aire, el consumo de agua con arsénico (Dendup, T., Feng, X., Clingan, S., y Astell-Burt, T., 2018) y la exposición a disruptores endócrinos como el Bisfenol (Dendup, T., Feng, X., Clingan, S., y Astell-Burt, T., 2018).

II. Justificación

En el presente artículo, se hace hincapié en la trascendencia que tiene la DM2 en México, así como la importancia de la promoción para la salud, estrategias impulsadas desde la secretaría de Salud, ya que es un eje prioritario para el mejoramiento de la salud en pacientes ya diagnosticados y para evitar nuevos casos, debido a que la mayoría de los pacientes con diagnóstico de DM2, son inicialmente tratados en el primer nivel de atención por el médico general o el médico familiar.

Debido a que la DM2, es una enfermedad de carácter heterogéneo, con grados variables de predisposición hereditaria, es importante hacer mención de los factores ambientales que contribuyen a la prevalencia de ésta, ya que, a través de intervenciones por parte del sistema de salud, podría verse beneficiada la población en riesgo, así como la calidad de vida de los pacientes enfermos.

En este sentido, en el presente trabajo se incluye la promoción de estilos de vida saludables para los pacientes con DM2. Las recomendaciones acerca de mantener hábitos higiénico dietéticos saludables tales como seguir una alimentación adecuada, evitar el sedentarismo con la finalidad de evitar el sobrepeso y obesidad, fomentar la actividad física, así como abstenerse de ingerir bebidas alcohólicas, es importante para el seguimiento de los pacientes para evitar complicaciones tanto agudas como crónicas.

III. Desarrollo

La DM2, es una enfermedad manifestada por la presencia de concentraciones anormalmente altas de glucosa en la sangre. La Norma Oficial Mexicana, NOM-015-SSA2-1994, para la prevención, tratamiento y control de la diabetes mellitus en la atención primaria, define a la DM2, como a un grupo heterogéneo de enfermedades sistémicas, crónicas, de causa desconocida, con grados variables de predisposición hereditaria y la participación de diversos factores ambientales que afectan al metabolismo intermedio de los hidratos de carbono, proteínas y grasas que se asocian fisiopatológicamente con una deficiencia en la cantidad, cronología de secreción y/o en la acción de la insulina (Secretaría de Salud, 2002). Estos defectos traen como consecuencia una elevación anormal de la glucemia después de cargas estándar de glucosa e incluso en ayunas conforme existe mayor descompensación de la secreción de insulina. La American Diabetes Association, define a la DM2 como un grupo de enfermedades metabólicas caracterizadas por hiperglucemia, resultante de la alteración de la secreción de insulina, la acción de la insulina, o ambas (American Diabetes Association, 2020).

a) Antecedentes Históricos: La diabetes en México

En América Latina, una de las primeras referencias acerca de la diabetes mellitus en América alude a Gonzalo Jiménez de Quezada, el conquistador español, quien presentó complicaciones de su diabetes, a su vez, el conquistador alemán Nicolás de Federman “a través de su descendiente dejó la enfermedad en Nuevo Santander y al noreste de Boyacá”. Dichas referencias también mencionan a los franceses que colonizaron la costa atlántica colombiana a finales del siglo XVII y que se mezclaron con los nativos africanos que habitaban esa región (García, J., Salcedo, A., Milke, E., Alonso, C., García de Alba, J., 2017).

Ya en el siglo XVIII, los médicos graduados en la Real y Pontificia Universidad de México, conocían lo que era la diabetes, definiéndola como una enfermedad que cursaba con mucha sed, aumento en la frecuencia urinaria y que, cuando se dejaba secar al sol, la orina dejaba unos "cristales pegajosos" (García, J., Salcedo, A., Milke, E., Alonso, C., García de Alba, J., 2017).

En el caso de México esta situación cambió drásticamente a partir del Tratado de libre Comercio de Norteamérica. En el periodo comprendido entre los inicios del siglo XIX y del XX, México experimentó grandes cambios sociales, marcados por la Independencia, la Reforma y la Revolución de 1910, durante este lapso la medicina del mundo occidental modernizó sus paradigmas, circunstancia a la que nuestro país no fue ajeno, pues también se fincaron las bases de la medicina mexicana. La medicina novohispana se basaba en la enseñanza otorgada de acuerdo con la tradición antigua y algunas concepciones de la modernidad temprana en las reales universidades coloniales de México y Guadalajara (García, J., Salcedo, A., Milke, E., Alonso, C., García de Alba, J., 2017).

El doctor Juan Manuel González Ureña, egresado de la Real y Pontificia Universidad de México y establecido en Morelia, Michoacán, publicó en 1829 el opúsculo "Diabetes Michoacana", en el que señala que encontró y clasificó una entidad clínica que consideraba distinta, según él, a la diabetes que se conocía en Europa. Esta entidad la clasificó como "un flujo desmedido al orinar" y la relacionó como una afección del riñón, fundamentó su especificidad geográfica en Hipócrates, ya que los lugares donde se da la principal incidencia de la enfermedad influyen en los temperamentos de las personas linfáticas es decir, con características tales como caquexia, laxos y obesos, a quienes les invadía una fuerte pesadumbre, ira y temor que les resultaba letal; a su vez, González Ureña planteó como causa el abuso de emulsiones, limonadas, naranjadas, tamarindo, aguas nitradas, frutas subácidas y demás antiflogísticos y atemperantes. Finalizó su exposición apoyándose en la teoría de Broussais, acerca de la irritación local que provoca inflamación sobre el sistema nervioso simpático y actúa sobre el resto del organismo, por lo que clasifica a la diabetes como una "abirritación aguda" causada por algunas substancias ingeridas (García, J., Salcedo, A., Milke, E., Alonso, C., García de Alba, J., 2017).

b) Epidemiología

Dada la transición epidemiológica, la prevalencia de DM2, se ha incrementado de forma importante en los últimos años, México vive un proceso de envejecimiento poblacional que provoca cambios en su estructura demográfica, el aumento en la esperanza de vida es sin duda uno de los factores con mayor influencia en este fenómeno poblacional. La transición demográfica en México dio pasos agigantados desde la época de los años cincuenta en la que la política demográfica del país era la de poblarlo (Secretaria de Salud., Subsecretaria de Prevención y Promoción de la Salud., Dirección General de Epidemiología., 2018).

La tasa de mortalidad general ha presentado un incremento constante desde el 2003; este incremento es el reflejo del proceso de envejecimiento de la población como aspecto principal. La situación demográfica es acompañada de la transición epidemiológica, en la que la incidencia y prevalencia de las enfermedades infectocontagiosas o del subdesarrollo, se cambian por las crónicas no transmisibles o de los países desarrollados (Secretaria de Salud., Subsecretaria de Prevención y Promoción de la Salud., Dirección General de Epidemiología., 2018).

La DM2 se presenta en todos los grupos de edad, pero ha sido más frecuente entre los individuos de 25 y 59 años y cada vez se observa en individuos más jóvenes. El grupo con la incidencia más alta en 2012 fue el de 60 a 64 años, aunque la tasa se va incrementando a partir de los 25 años y declina de los 65 años en adelante (Moreno- Altamirano, L., García-García, J., Soto-Estrada, G., Capraro, S. y Limón-Cruz, D. , 2014).

Hoy padecen en el mundo DM2, 387 millones de personas (Naranjo, Y., 2016). Según la Organización Mundial de la Salud (OMS) se estima que en el 2014 la prevalencia global de esta enfermedad fue del 9 % entre los adultos mayores de 18 años; en tanto en el año 2012 fallecieron 1,5 millones de personas como consecuencia directa de la diabetes.

Según proyecciones de la OMS, dicha enfermedad será la séptima causa de mortalidad en el 2030. Desde el año 2000, la diabetes mellitus en México es la primera causa de muerte entre las mujeres y la segunda entre los hombres. En 2010, esta enfermedad causó cerca de 83,000 muertes en el país. El Instituto Nacional de Estadística y Geografía (INEGI) y el Instituto Nacional de Salud Pública (INSP) dieron a conocer los resultados de la Encuesta Nacional de Salud y Nutrición 2018-2019 (ENSANUT) de acuerdo a estos resultados, en el año 2018 había en México un total aproximado de 8,668,530 personas diagnosticadas con diabetes mellitus. Para dimensionar esa cifra basta decir que se trata de una suma relativamente similar a la población total que habita en la ciudad de México. De esa cantidad de personas, 770,365 se encuentran en el grupo de edad que va de los 20 a los 39 años. Asimismo, 3,823,013 se ubican en el rango de los 40 a los 59 años de edad, mientras que 4,075,152 tienen 60 años o más (INEGI., INSP., SSA., ENSANUT, 2018).

En México, la mortalidad se ha incrementado durante las últimas décadas de forma alarmante, en 1990, la tasa de mortalidad por 100,000 habitantes se encontraba en 29.6 para la población general mientras

que para 2011 esta tasa se incrementó a 69.9, lo cual representa un incremento del 136% en prácticamente 2 décadas, y en 2012 esta tasa aumentó a 72.66. Por esta causa, en México, en 2011 ocurrieron 80,788 defunciones, con una tasa de 69.8 por 100,000 y en 2012 85,055 (Moreno- Altamirano, L., García-García, J., Soto- Estrada, G., Capraro, S. y Limón-Cruz, D. ,2014). Es así que desde el año 2000 la diabetes ocupa el primer lugar como causa de muerte en México de acuerdo con el Sistema Nacional de Información en Salud (Moreno- Altamirano, L., García-García, J., Soto-Estrada, G., Capraro, S. y Limón-Cruz, D. ,2014).

La diferencia de tasa de incidencia por sexo se ha acortado, para el año 2011, las tasas para mujeres y hombres, fueron de 70.9 y 68.8 por 100,000 habitantes respectivamente, y para 2012 se observó una tasa de 73.2 para mujeres y de 72.1 para hombres.

En cuanto a edad, en 2012, en el grupo de menores de 35 años, la diabetes constituyó un poco más del 1% de las muertes. Entre las personas de 35 a 44 años representó el 3.3% del total. En el grupo de 45 a 64 años ocupó el primer lugar como causa de muerte, y en él se concentró la tercera parte de las defunciones por esta causa. En la población de 65 años en adelante representó un poco más de 15% del total de defunciones, y en esta edad se registraron prácticamente 3 de cada 5 muertes (52,367) por la enfermedad en el conjunto de la población nacional (Moreno- Altamirano, L., García-García, J., Soto-Estrada, G., Capraro, S. y Limón-Cruz, D., 2014).

c) Sistema Nacional de Vigilancia Epidemiológica

En nuestro país, a través del Sistema Nacional de Vigilancia Epidemiológica (SINAVE), se realiza la recolección sistemática, continua, oportuna y confiable de información relevante y necesaria sobre las condiciones de salud de la población y sus determinantes. El análisis e interpretación de esta información permite establecer las bases y facilitar su difusión para la toma de decisiones (Secretaria de Salud., 2013).

Mediante la vigilancia epidemiológica se realiza la recolección sistemática, continúa, oportuna y confiable de información necesaria sobre las condiciones de salud de la población y sus determinantes, su análisis e interpretación para la toma de decisiones y su difusión. La Secretaría de Salud es el órgano rector del SINAVE, y funge como la instancia responsable de recopilar, procesar y difundir toda la información generada por el Sistema Nacional de Salud (Secretaria de Salud., 2013).

En el caso de diagnóstico de DM2, la notificación de casos en el SINAVE, será de la siguiente manera:

- La población en riesgo de padecer DM2, es obligatoria la notificación y vigilancia de las personas con obesidad a través del Sistema de Notificación Semanal de casos (Secretaría de Salud, 2002).
- Los y las pacientes que de acuerdo a los resultados de la detección hayan sido detectados como probables diabéticos deberán ser confirmados en la consulta del médico de primer nivel y notificados por las disposiciones jurídicas aplicables en materia de vigilancia epidemiológica (Secretaría de Salud, 2002).
- La notificación de los casos confirmados diagnosticados, bajo los procedimientos de la Norma Oficial Mexicana Nom-015-Ssa2-1994, Para la Prevención, Tratamiento y Control De La Diabetes, se realizará la notificación semanal (Secretaria de Salud., 2013).

A partir del sistema de vigilancia epidemiológica actual, se establece una red de información a manera de Observatorio que procesará periódicamente información y emitirá informes de variables e indicadores relacionados con las enfermedades no transmisibles. El sistema cuenta con información desagregada desde un nivel nacional hasta el local, trabajando con los consejos estatales y el Consejo Nacional de Enfermedades Crónicas (Secretaria de Salud., 2013).

La vigilancia epidemiológica propuesta en la Estrategia Nacional para la Prevención y el Control del Sobrepeso y Obesidad y la Diabetes (Secretaria de Salud., 2013), representa un área de oportunidad única para hacer investigación integral sobre la etiología de estas enfermedades metabólicas, para buscar interacciones gen-ambiente y para valorar intervenciones personalizadas considerando el componente genético del individuo, obteniendo:

1. Datos antropométricos y bioquímicos, diagnóstico de obesidad, dislipidemia, disglucemia o diabetes.
2. Tratamiento farmacológico y su respuesta.
3. Cuestionario para valorar dieta (por frecuencia de consumo) y actividad física (validados por el Instituto Nacional de Salud Pública).
4. Muestra de sangre para hacer una genoteca, que permita estudiar variación genética común, variación genética rara con secuenciación de nueva generación y cambios epigenéticos (metiloma).
5. Muestras de suero y orina para almacenar en bio-banco, y para medir contaminantes como el arsénico, selenio, bisfenoles, etc.
6. Muestras de materia fecal para analizar microbiota.

Estos datos serán de utilidad para identificar y caracterizar genes de susceptibilidad para la obesidad, dislipidemia, síndrome metabólico y DMT2 en población mexicana, así como variantes genéticas con relevancia a nivel salud pública. Por otra parte, determinar los contaminantes ambientales asociados al desarrollo de obesidad y DMT2 y las interacciones gen-contaminante. Con base a lo anterior, poder diseñar

estrategias personalizadas para prevenir o tratar la obesidad y la DMT2 (Secretaria de Salud., 2013).

d) Factores de riesgo para diabetes

Existen factores de riesgo para el desarrollo de Diabetes Mellitus tipo 2, los cuales pueden ser no modificables o modificables. Dentro del grupo de los factores no modificables, se encuentra la predisposición genética, es decir, antecedentes heredofamiliares. Aquellos individuos con un padre diabético tienen un 40% de posibilidad de desarrollar la enfermedad, si ambos padres son diabéticos el riesgo se eleva a un 70%. Hay una concordancia del 70% en gemelos idénticos (Palacios, A., Duran, M., Obregón, O, 2012). Existen grupos étnicos que tienen mayor riesgo de desarrollar DM2, como los grupos indígenas en Norte América, islas del Pacífico y Australia donde la prevalencia alcanza hasta un 20 a 30%, mientras que en el África sólo llega a ser alrededor de un 3,1% (Palacios, A., Duran, M., Obregón, O, 2012). Por otra parte, tenemos otro factor no modificable, que corresponde a la historia de diabetes gestacional y síndrome de ovarios poliquísticos (SOP), las mujeres con antecedentes de diabetes gestacional tienen un mayor riesgo de DM2, décadas después de su embarazo, por lo tanto, deben ser controladas adecuadamente para prevenir la aparición de la enfermedad. En el SOP existe una condición en donde hay resistencia a la insulina, asociada a obesidad, y por lo tanto, hay mayor riesgo de desarrollar DM2 (Palacios, A., Duran, M., Obregón, O, 2012).

Dentro del grupo de los factores modificables, se encuentra el sobrepeso y la obesidad, la prevalencia de la obesidad va en aumento progresivo a nivel mundial y muy especialmente en Latinoamérica. Se ha determinado que la circunferencia abdominal refleja el contenido de grasa visceral, por lo que puede ser un mejor indicador que el IMC para el riesgo de aparición de DM2, cabe mencionar que es la distribución de la grasa más que el contenido total lo que contribuye al desarrollo de la diabetes (Palacios, A., Duran, M., Obregón, O, 2012). Aunado a este factor, tenemos que el sedentarismo es un factor predictor independiente de DM2, tanto en hombres como en mujeres.

e) Factores dietéticos y obesidad

Los factores dietéticos, contribuyen a la prevalencia de obesidad y sobrepeso en la población, la sobrecarga de carbohidratos y el predominio de la ingesta de grasas saturadas sobre las poliinsaturadas, pueden predisponer a DM2. La obesidad, entre otras cosas, se considera un estado de inflamación, por lo que se elevan varios marcadores séricos entre los cuales se encuentran: la proteína C reactiva ultrasensible (PCRus), inhibidor del activador del plasminógeno tipo 1 (PAI-1), interleucinas, moléculas de adhesión, factor de von Willembrand (vWF), resistina, E-selectina, que pueden predisponer al desarrollo no sólo de enfermedad cardiovascular sino también de DM2 (Palacios, A., Duran, M., Obregón, O. 2012). En el grupo de las dislipidemias más frecuentes, se encuentra la hipertrigliceridemia, que juega un rol aterogénico muy marcado debido a la concurrencia de HDL-C bajo con una mayor proporción de partículas de LDL pequeñas y densas, ya es considerada un factor independiente del riesgo cardiovascular. Se ha determinado que sujetos con bajo peso al nacer, así como aquellos cuyas madres presentaron diabetes gestacional tienen un riesgo aumentado de DM2 (Palacios, A., Duran, M., Obregón, O, 2012).

f) Factores ambientales

Como ya se hizo mención, se establece que la DM2, es el resultado de la interacción de factores biológicos y factores heredofamiliares, pero también de factores ambientales. El estrés ambiental, puede provocar una carga alostática, que conlleva al desgaste de sistemas fisiológicos, así como la tensión acumulada por el estrés, inclusive el insomnio, puede estimular la liberación de sustancias, tales como el cortisol y citosinas pro inflamatorias, que pueden dañar el sistema inmunológico, lo que conlleva al desarrollo y progresión de enfermedades crónico degenerativas, de igual manera, el estrés puede motivar a comer, fumar y beber poco saludables y afectar el sueño, aunado a la mala salud mental, tienen un efecto sinérgico, que puede llegar a impactar los procesos metabólicos y el peso corporal, aumentando el riesgo de padecer DM2 (Dendup, T., Feng, X., Clingan, S., Astell-Burt, T., 2018). Por otra parte, el crimen, los desórdenes sociales y un lugar inseguro para residir, aumentan el estrés de los seres humanos y pueden incitar al aislamiento social, llevando a mermar la actividad física, mientras que la convivencia social, la seguridad, los espacios verdes y agradables puede mejorar la salud mental o contrarrestar los efectos adversos relacionados y fomentar la actividad física.

La evidencia sobre los efectos del medio ambiente sobre el riesgo de padecer DM2 ha aumentado en los últimos años. La disponibilidad a recursos recreativos, espacios verdes y abiertos, destinos transitables y lugares públicos en adecuadas condiciones, puede fomentar la actividad física.

Las características ambientales estudiadas más comunes en relación con la DM2, fueron, la contaminación ambiental, espacios transitables, el entorno alimentario, la disponibilidad de recursos para la actividad física y la proximidad de carreteras. Vivir en barrios con mayores niveles de accesibilidad para peatones y espacios verdes fue asociado con un menor riesgo de DM2, mientras que los niveles más altos de contaminación del aire y ruido se asociaron con mayor riesgo de DM2 (Dendup, T., Feng, X., Clingan, S. y Astell- Burt, T., 2018).

Otros estudios documentan que la exposición a la contaminación del aire, puede alterar la función endotelial en tanto animales como humanos, dichas alteraciones endoteliales a menudo preceden los cambios en resistencia a la insulina y se han implicado en la reducción de la captación periférica de glucosa. La exposición a partículas, también resultó en elevaciones en las adipocinas protrombóticas, así como el inhibidor del activador del plasminógeno-1, además del aumento de moléculas de adhesión circulantes como la E-selectina, que es importante en la adherencia de leucocitos en poscapilar venular endotelio. Esta exposición a partículas, se asoció con el deterioro en fosfatidilinositol 3-quinasa-Akt-endotelial, señalización de óxido nítrico sintetasa en la aorta y disminución fosforilación de tirosina de IRS-1 en el hígado, proporcionando evidencia de señalización anormal de insulina en la vasculatura (Rajagopalan, S., Brook, R., 2012).

Hay evidencia de que la exposición a partículas ambientales, puede asociarse a la elevación de biomarcadores proinflamatorios sistémicos, varios informes tienen una asociación detallada entre la variación diaria en proteínas de fase aguda, como la proteína C reactiva (PCR) interleucina 6 (IL-6), recuento de fibrinógeno o glóbulos blancos y soluble circulante moléculas de adhesión, un aumento de macrófagos del tejido adiposo con un cambio a un fenotipo proinflamatorio, caracterizado por un aumento en del factor de necrosis tumoral alfa (TNF-a) e IL-6 y el hallazgo de una mayor inmunidad innata células en el tejido adiposo visceral (VAT) es un signo fisiopatológico distintivo de DM2 (Rajagopalan, S., Brook, R., 2012).

Por otro lado, la exposición al arsénico, es otra fuente de contaminación que puede causar DM2. La exposición a arsénico puede relacionarse al uso y manufactura de pesticidas y herbicidas, a la minería y metalurgia, fundición y refinación de metales, al uso de combustibles fósiles, uso de medicamentos y remedios, al contacto con maderas prensadas y tratadas con preservantes arsenicales y a la ingesta de agua contaminada y alimentos. Esta última ruta de exposición es la principal forma de exposición al arsénico. El arsénico puede ser absorbido por inhalación, ingestión o por penetración en la piel o en las mucosas. Cerca del 70 al 90 % del arsénico inorgánico ingerido se absorbe fácilmente por el tracto gastrointestinal para posteriormente ser distribuido a varios órganos y se excretado a través de la orina durante los primeros días o en el lapso de una semana máximo; los efectos observados a largo plazo resultan de una exposición continua, así mismo. La toxicidad del arsénico depende de su forma y su estado de oxidación, además de otros factores, tales como dosis, duración y frecuencia de exposición, edad, sexo, sensibilidad individual, genética; y factores nutricionales. En el cuerpo humano, se dan una serie de reducciones sucesivas y reacciones oxidativas, así como reacciones de metilación, que transforman el Asin para producir diferentes metabolitos (Medina- Pizzali, M., Robles, P., Mendoza, M., y Torres, C., 2018).

En México, varios de los acuíferos contaminados con arsénico inorgánico son utilizados como fuentes de abastecimiento. En estas regiones, la mayoría del agua potable parte de un depósito en el cual se mezclan flujos de agua no contaminada con agua proveniente de depósitos filtrantes con diversos gastos y grados de contaminación con arsénico (Medina- Pizzali, M., Robles, P., Mendoza, M., y Torres, C., 2018).

Dentro de los estudios acerca del mecanismo por el cual el arsénico favorece al desarrollo de diabetes tipo 2 se han propuesto algunos mecanismos generales, los cuales incluyen la substitución del arsenato por el fosfato, la reacción del arsenito con los grupos sulfhidrilos, el estrés oxidativo, la alteración en el transporte y metabolismo de la glucosa, así como la alteración en la producción de energía y en la expresión de genes. Algunos trabajos experimentales poseen evidencia de que el arsénico favorece al desarrollo de diabetes tipo 2 actuando a nivel pancreático como también en el tejido adiposo (Díaz, A., 2008).

Finalmente, otros tóxicos clasificados como disruptores endócrinos, se han relacionado con DM2. Los disruptores endócrinos pueden ser compuestos naturales o artificiales que imitan a las hormonas o interferiren en sus funciones, modificando las señales que producen las hormonas y afectar a la actividad normal de tejidos y órganos. Estos disruptores, se encuentran en muchos objetos de uso cotidiano, incluidas botellas y recipientes de plástico, revestimientos de metal, detergentes, alimentos, juguetes, cosméticos y pesticidas (Navalón, E., 2020). El sistema endocrino es una de las vías de comunicación principal del cuerpo, responsable del control y la homeostasis de las funciones vitales, regulando funciones del sistema nervioso, sistema reproductor, sistema renal, digestivo y metabólico, para producir y mantener la energía, el crecimiento y el desarrollo. Dichos disruptores endócrinos, pueden mimetizar los efectos de hormonas endógenas, antagonizar su acción, alterar su producción o modificar los niveles de los receptores hormonales, interfiriendo con el sistema de señalización endocrino al transmitir mensajes erróneos, lo que puede tener efectos negativos sobre la salud humana. En lo que se refiere a la diabetes, producen resistencia a la insulina y alteran el funcionamiento y la masa de la célula beta pancreática, encargada de generar la hormona que mantiene la glucosa en sangre en niveles correctos (Navalón, E., 2020).

Los disruptores endocrinos suponen un mayor riesgo en el periodo prenatal y el postnatal, mientras se desarrollan los órganos y el sistema nervioso, ya que

modifican químicamente el ADN. Estas alteraciones modifican la expresión de genes en el tejido adiposo, el hígado, el músculo esquelético y el páncreas, con lo que suponen un factor de riesgo muy alto para desarrollar diabetes, obesidad e hígado graso en el futuro (Navalón, E., 2020).

Dentro de los disruptores endócrinos el bisfenol A (BPA), es una sustancia química producida en muy alto volumen, se usa ampliamente en la fabricación de resinas, plásticos de policarbonato y envases de alimentos y bebidas. Se cree que la exposición al BPA es principalmente a través de la ingesta dietética, con exposición adicional a través de agua, selladores dentales, inhalación de polvos domésticos, y exposición a través de la piel. Se ha demostrado que el BPA tiene efectos disruptores de las hormonas tiroideas y génicas, la evidencia reciente, especialmente de estudios en animales, sugiere que la exposición al BPA puede tener un papel en el aumento de peso, el desarrollo de obesidad y resistencia a la insulina, y el subsecuente desarrollo frecuente de DM2. Los estudios en animales han demostrado que la exposición al BPA puede tener un papel en el aumento de peso y desarrollo de la obesidad a través de varios mecanismos, incluyendo la acción del BPA sobre los preadipocitos, acción como antagonista de la hormona tiroidea, además de influir en la función endocrina pancreática y causar hiperinsulinemia, resistencia a la insulina e intolerancia a la glucosa (Shankar, A., Teppala, S., 2011).

g) Historia Natural de la DM2

La historia natural de la enfermedad, es la evolución que sigue ésta en ausencia dé intervención. Este proceso consta de diferentes etapas, en primer lugar, el período prepatogénico que se refiere al momento en que las causas de la enfermedad (ambientales y de la persona) actúan hasta iniciar el proceso (Delgado, M., Llorca, J., 2020).

El período patogénico consta de dos fases: una etapa en la que la enfermedad no se detecta clínicamente, es decir, la enfermedad es subclínica o también llamada fase de latencia, y una etapa de evidencia clínica, en la que los síntomas sobrepasan el umbral de detección que se refiere al horizonte clínico, que es cambiante entre las personas y se hace aparente la enfermedad. La enfermedad termina en esta fase, ya sea por curación (la clínica desciende por debajo del horizonte clínico), cronificación o muerte (Delgado, M., Llorca, J., 2020).

En estas tres fases se puede intervenir. La prevención primaria actúa sobre las causas o determinantes de la enfermedad, e intenta evitar que la enfermedad aparezca (Delgado, M., Llorca, J., 2020).

En este sentido, la historia natural de la enfermedad de la DM2, tiene dos periodos, el periodo pre patogénico y el patogénico.

El Periodo Pre patogénico, está conformado por la triada ecológica: agente, hospedero, y ambiente (Sepúlveda, F., 2016).

- El agente, se refiere a un agente biológico endógeno, es decir, la herencia multifactorial o a un gen recesivo. También se consideran factores causantes de la diabetes los tumores pancreáticos, la pancreatitis, el uso de fármacos esteroides y a las enfermedades estresantes, ya que afectan las glándulas endocrinas que participan en el origen de la diabetes.
- El hospedero incluye la inmunidad, grupo étnico, edad, estado nutricional, sexo y herencia.
- El ambiente, se refiere a los hábitos y costumbres del hospedero sobre todo en lo relacionado a estilos de vida.

El segundo periodo de la historia natural de la DM, se le denomina Periodo Patogénico, dicho periodo se integra de las siguientes etapas: Alteraciones tisulares en los islotes de Langerhans lo que conlleva a la aparición de signos y síntomas, que incluyen astenia, adinamia, polidipsia, poliuria, polifagia, pérdida de peso. Posteriormente inicia el desarrollo de complicaciones como la hiperglucemia, la cetoacidosis diabética, la hipoglucemia, la retinopatía, la neuropatía, la nefropatía, problemas en la piel, la periodontitis, las enfermedades microvasculares. La evidencia de daños, que pueden ser totales o parciales e incluye la ceguera por retinopatía, las amputaciones en miembros inferiores, insuficiencia renal, Muerte (Sepúlveda, F., 2016).

Es en el tercer escalón del período patogénico donde se presentan los episodios de hospitalización ya sea de ingreso o reingreso, puesto que es cuando se desarrollan complicaciones, y la evidencia de daños parciales o totales que pueden llegar hasta la muerte del paciente (Sepúlveda, F., 2016).

h) Niveles de Prevención de DM2

En cuanto a niveles de prevención, es en la prevención primaria, en donde incide la presente investigación ya que es de interés conocer las estrategias a seguir en em marco de la promoción para la salud.

Las intervenciones dirigidas hacia la prevención del inicio de la enfermedad de la DM2, de acuerdo la Norma Oficial Mexicana Nom-015-Ssa2-1994, Para la Prevención, Tratamiento y Control de la Diabetes, se lleva a cabo a partir de tres niveles:

El primero se aplica entre la población en general buscando modificar los estilos de vida con la finalidad de disminuir el peso, promover una adecuada nutrición, fomentar el ejercicio y disminuir factores de riesgo cardiovascular.

Forman parte de esta prevención primaria: La promoción de la salud en torno a actividades que

promuevan la realización de un examen anual que valore el estado de salud, la diseminación de información entre la comunidad sobre enfermedades transmisibles y no transmisibles, el fomento de una nutrición equilibrada, la promoción de activación física. Así como la protección específica basada en apego a estilos de vida saludables, la creación y ejecución de programas comunitarios dirigidos específicamente a personas que cuenten con un perfil de riesgo, promoción de la detección oportuna, seguimiento a personas con perfil de riesgo, la iniciación de grupos de ayuda mutua en la comunidad (Sepúlveda, F., 2016).

La prevención secundaria: se aplica entre la población que ya cuenta con factores de riesgo, como el sobrepeso y la obesidad, el sedentarismo, antecedentes heredofamiliares, mayores de 45 años de edad con productos macrosómicos mayores a 4 kilos y/o con antecedentes de diabetes gestacional, mujeres con antecedentes de ovarios poliquísticos , personas con hipertensión arterial, dislipidemias, enfermedades cardiovasculares, enfermedades psiquiátricas con uso de antipsicótico, y además son pacientes ya confirmados con DM2, el objetivo es evitar o retrasar el desarrollo de complicaciones agudas y/o crónicas (Sepúlveda, F., 2016).

La prevención terciaria: dirigida a pacientes que ya tienen complicaciones crónicas, cuyo objetivo es evitar la discapacidad y mortalidad. Incluye la rehabilitación a partir de la esfera biopsicosocial, que contiene factores como la edad, tiempo de evolución, aceptación del padecimiento, modificaciones al estilo de vida, participación familiar y recursos económicos disponibles (Sepúlveda, F., 2016).

i) Programa de Acción Específico Prevención y Control de la Diabetes Mellitus 2013-2018

La Secretaría de Salud es la entidad responsable de establecer y conducir la política nacional en materia de asistencia social, servicios médicos y salud pública, a través del Consejo de Salubridad General, que también comprende las Secretarías de Educación y Hacienda. El Consejo Nacional de Salud se encarga de la coordinación con los estados federativos.

En la Ley General de Salud, en su Título segundo que corresponde al Sistema Nacional de Salud, en el Artículo 6° perteneciente al Sistema Nacional de Salud tiene por objetivo proporcionar servicios de salud a toda la población y mejorar la calidad de los mismos, atendiendo a los problemas sanitarios prioritarios y a los factores que condicionen y causen daños a la salud, con especial interés en la promoción, implementación e impulso de acciones de atención integrada de carácter preventivo, acorde con la edad, sexo y factores de riesgo de las personas.

En el año 2013, se lanza en México, la Estrategia Nacional para la Prevención y el Control del Sobrepeso, la Obesidad y la DM2 en donde se establece un modelo único de prevención de las Enfermedades Crónicas No Transmisibles (ECNT) y sus complicaciones, enfocado a grupos poblacionales bien definidos tal es el caso de personas con factores de riesgo para presentar DM2, o bien personas que ya tengan el diagnóstico clínico y por laboratorio de DM2 , con el fin de incrementar su impacto mediante acciones que incrementen la cobertura y la calidad en la atención primaria, incluyendo las campañas de promoción de la salud y prevención de enfermedades no transmisibles. El objetivo primordial de este Plan de Acción es mejorar los niveles de bienestar de la población mexicana y contribuir a la sustentabilidad del desarrollo nacional al desacelerar el incremento en la prevalencia de sobrepeso y obesidad, a fin de revertir la epidemia de las enfermedades crónico no transmisibles. Este Programa de Acción Específico (PAE) Prevención y Control de la DM2, se encuentra alineado a la Constitución Política de los Estados Unidos Mexicanos, además de las Leyes, Reglamentos, Normas Oficiales Mexicanas y la Estrategia Nacional para la Prevención y Control del Sobrepeso, la Obesidad y la Diabetes (Secretaría de Salud, 2014).

En el Programa de Acción Específico señala que uno de los grandes desafíos a los que se enfrenta México, es lograr la participación de diferentes sectores como son el educativo, económico y de salud, con la finalidad de fortalecer la rectoría de la Secretaría de Salud, reforzando la atención de los pacientes con DM2, a través de acciones interinstitucionales de manera análoga. Es importante lograr que en el primer nivel de atención se realice la detección oportuna de pacientes que tengan factores de riesgo para DM2, así como en aquellos pacientes cuyas detecciones sean positivas, ingresaras al tratamiento no farmacológico y farmacológico, que incluya la realización de actividad física, orientación nutricional, consultas psicológicas fomentando el autocuidado, atención odontológica, de tal manera que haya promoción de los cambios de estilos de vida. En este Programa de Acción Específico para la Prevención y Control de la Diabetes Mellitus 2013-2018, se establecen objetivos y a su vez se plantean varias estrategias y líneas de acción para llevarlos a cabo.

Uno de los objetivos de este Programa de Acción Específico es implementar esquemas proactivos de prevención y detección oportuna de casos para tratar, controlar y prevenir la diabetes y sus complicaciones, ya que nos ayudará a mejorar los niveles de bienestar de la población mexicana, siendo la detección temprana y la adherencia terapéutica una vía para mejorar la calidad de vida de los pacientes y evitar complicaciones (Secretaría de Salud, 2014). La estrategia consiste en que se impulse la prevención de diabetes mellitus y riesgos específicos, enfocados a

grupos poblacionales con perspectiva de género para elevar su impacto mediante acciones coordinadas.

Otro de los objetivos es fortalecer las acciones que permitan incrementar la cobertura de pacientes con DM2 en control, a través de acciones de información, educación y comunicación a pacientes con diabetes mellitus y sus familias, otorgando orientación y consejería de DM2, fomentar el autocuidado de la personas con DM2, promover la corresponsabilidad de la familia con respecto al cuidado de los pacientes, realizar un evento que conmemore el día mundial de la DM2 a fin de concientizar sobre la problemática que representa esta enfermedad. Igualmente, consolidar la atención integral a la población con DM2 en las unidades del primer nivel de atención para otorgar una atención integral e impulsar el control metabólico de los pacientes, promoviendo la orientación nutricional y actividad física en la atención primaria.

El último de los objetivos va encaminado a mejorar los estándares de calidad en el primer nivel de atención en cuanto a abasto de insumos y personal de salud capacitado, incorporando la prevención y control de estas enfermedades en la formación de todo el personal sanitario, poniendo énfasis en la atención primaria de salud. Se menciona que para lograr el control metabólico se deberá de realizar la gestión de abasto oportuno y suficiente de medicamentos para el control de la diabetes, para fortalecer la eficiencia, efectividad y oportunidad en la prestación de los servicios de salud en las unidades del primer nivel de atención (Secretaría de Salud, 2014).

Como parte del Programa Nacional de Salud 2001-2006 se establece el Programa de Acción para la Prevención y Control de la Diabetes Melitus. En este documento, se considera como eje central la promoción de la salud y la detección temprana de la diabetes. El objetivo fue proteger la salud o retardar la aparición de esta enfermedad y las complicaciones de mayor prevalencia entre la población adulta y adulta mayor, así como elevar la calidad de vida de este grupo poblacional (Secretaría de Salud, 2014).

Así mismo, se ha logrado incrementar la cobertura de atención de la DM2 en la población de 20 años y más a través del Sistema de Protección Social en Salud (SPSS), en todos los estados del país mediante las Unidades de Especialidades Médicas (UNEMES) con el modelo de prevención clínica que ha contribuido a mejorar la calidad de la atención y la prevención de complicaciones. Otros modelos de atención integral se han desarrollado de manera sectorial en el Instituto Mexicano del Seguro Social (IMSS) mediante los Programas Integrados de Salud (PREVENISMSS) que tienen como propósito general la provisión sistemática y ordenada de acciones relacionadas con la promoción de la salud, la vigilancia de la nutrición la prevención, detección y control de enfermedades, salud sexual y reproductiva y atención médica, ordenándolas por grupos de edad y el Programa Institucional para la Prevención y Atención de la Diabetes (DIABETIMSS) enfocada a la prevención secundaria del paciente diabético y evitar las complicaciones derivadas de este padecimiento, en el Instituto de Seguridad y Servicios Sociales a los Trabajadores del Estado (ISSSTE) mediante el Manejo Integral de Diabetes por etapas (MIDE) y en Petróleos Mexicanos (PEMEX) que llevan a cabo las acciones integrales en el Laboratorio de Salud (Secretaría de Salud, 2014).

j) Educación para la salud

En definitiva, la educación para la salud es una herramienta y un vehículo, que al momento de que se lleva a cabo o se desarrolla con la participación activa de las personas, se transforma en promoción de la salud. La educación para la salud debe hacer hincapié en fomentar la motivación, habilidades personales y su autoestima para que adopten medidas destinadas a mejorar la salud de los pueblos (Quintero, E., Fe de la Mella, S., Gómez, L., 2017).

La educación para la salud, es un término utilizado para designar las oportunidades de aprendizaje creadas de manera consciente para facilitar los cambios de conducta hacia una meta que una está predeterminada. Por ejemplo, Paulo Freire, decía que el educador debe de involucrarse en la problemática de su pueblo, y denominó a la educación, como una acción política capaz de liberar a los oprimidos y educarlos, también afirma que el educador, que no conoce el mundo del campesino no, puede establecer un vínculo pedagógico con él, y mucho menos cambiar su actitud (Quintero, E., Fe de la Mella, S., Gómez, L., 2017).

Para Turabián, citado por Quintero 2017, la manera gráfica de esta relación, entre la educación para la salud, participación comunitaria y promoción de salud, señaló que el vehículo es la educación para la salud, el camino es la participación comunitaria, por lo que la promoción de la salud, engloba todo lo que se desea alcanzar.

k) Promoción de la salud

En el año de 1984, por decisión de la organización de la Salud y el Bienestar de Canadá y la Asociación Canadiense de Salud pública, se crea por primera vez el concepto de promoción para la salud, que consiste en proporcionar a los pueblos, los medios necesarios para mejorar la salud y ejercer un mayor control sobre la misma, y se plantearon los pre requisitos para la salud, que son: paz, educación, vivienda, alimentación, renta, ecosistema estable, justicia social y equidad, además de una política pública sana, con el fin de lograr un compromiso a favor de la promoción de salud (Quintero, E., Fe de la Mella, S., Gómez, L. , 2017).

El objetivo de la promoción en salud, es propender por el óptimo nivel de salud, ya que es irreal pensar que habrá un individuo totalmente sano, debido a que un individuo tendrá un desajuste a nivel emocional, social, biológico.

En 1986, por decisión de la Organización de la Salud y Bienestar de Canadá y la Asociación Canadiense de Salud Pública, se organizó una conferencia mundial sobre la promoción de salud, y en ella los participantes aprobaron la denominada "Carta de Ottawa", que formuló por primera vez el concepto de promoción de la salud: «…la promoción de salud consiste en proporcionar a los pueblos los medios necesarios para mejorar su salud y ejercer un mayor control sobre la misma»; en ella se plantearon como prerrequisitos para la salud: paz, educación, vivienda, alimentación, renta, ecosistema estable, justicia social y equidad; finalizó expresando que las mejoras en la esfera de la salud han de basarse en estos prerrequisitos. Se explicaron las cinco líneas de acción, declaradas desde la Carta de Ottawa, pues estas siguen vigentes después de 30 años, y debieran escudriñarse más y adecuar las acciones de promoción de salud para cada línea de acción, en los diferentes escenarios (Quintero, E., Fe de la Mella, S., Gómez, L., 2017).

La séptima conferencia mundial de promoción de la salud, se celebró en Nairobi, capital de Kenia en el año 2009, tuvo como procedente los importantes debates sobre los determinantes de salud, e incluyó que se debe de utilizar el potencial no explotado de la promoción en salud, fortalecer los sistemas de salud y de liderazgo, implementar nuevas políticas para el acceso universal de salud, alfabetización básica para el desarrollo y promoción de la salud, así como renovar la atención primaria con la participación comunitaria, estableciendo políticas públicas saludables (Quintero, E., Fe de la Mella, S., Gómez, L, 2017).

El reconocimiento de la trascendencia y la gravedad de la DM2 nos llevan a considerar que la educación del paciente, es esencial para el tratamiento y control de los pacientes que padecen DM2. De acuerdo con la Organización Mundial de la Salud (OMS), la educación para la salud comprende las oportunidades de aprendizaje creadas de forma consciente, las cuales suponen un perfil de comunicación destinada a mejorar la alfabetización sanitaria, incluida la mejora del conocimiento de la población en relación con la salud, y desarrollo de habilidades personales y la autoestima, cuestiones que conducirán a la salud individual y de la comunidad. La educación es el medio para disminuir el costo de la ignorancia, no solo en beneficio de los diabéticos, sino de la sociedad en su totalidad (Casanova, M., Bayarre, H., Navarro, D., Sanabria, G., Trasancos, M., 2015).

El aumento de la frecuencia de esta enfermedad a nivel mundial y en particular en países en desarrollo, tal como es el caso de México, se ha traducido en un incremento impresionante de los costos de la asistencia médica, que pueden absorber hasta el 10 % de los presupuestos nacionales destinados a los servicios de salud. Ese dinero se gasta en los tratamientos de las complicaciones de la diabetes que dañan el corazón, los riñones, los ojos y el sistema nervioso. Con la educación adecuada se podrían identificar los grupos de personas de alto riesgo y hacer el diagnóstico antes de que se presentaran las complicaciones, los diabéticos ya diagnosticados podrían evitar hasta el 80 % de las complicaciones de la enfermedad (Casanova, M., Bayarre, H., Navarro, D., Sanabria, G., Trasancos, M., 2015).

Por lo anterior, la DM2, una enfermedad de alto costo para los sistemas de salud. Quienes la padecen acuden con mayor frecuencia a las unidades de atención médica, reciben más medicación, tienen una probabilidad mayor de ingresar a los servicios de urgencias y, debido a las múltiples complicaciones, las cuales requieren hospitalizaciones más prolongadas en comparación con los individuos que no son diabéticos (Rodríguez, R., Reynales, L., Jiménez, J., Juárez, S., Hernández, M., 2010).

En México la DM debe ser considerada como una prioridad de salud pública, por lo que su manejo requiere informar a la sociedad en su conjunto acerca de la magnitud y la complejidad del problema, así como realizar investigación interdisciplinaria para asignar eficientemente los recursos en un modelo de atención preventivo, así como propuestas para fortalecer la educación y promoción para la salud, con la finalidad de dar un tratamiento integral a cada uno de los pacientes que padecen esta enfermedad (Rodríguez, R., Reynales, L., Jiménez, J., Juárez, S., Hernández, M., 2010).

l) Propuestas para fortalecer la Estrategia Nacional, con énfasis en promoción de la salud

Es fundamental garantizar el acceso a los servicios de salud a todos los mexicanos, por lo que el punto medular de mi estrategia, es fortalecer el primer nivel de atención, mejorando la calidad de primer nivel de atención en cuanto a instalaciones adecuadas, insumos suficientes proporcionando recurso para la compra de insumos médicos necesarios para el paciente diabético, y supervisando el abasto oportuno de dichos insumos. Contar con personal de salud capacitado para una atención adecuada. Contar con profesionales de la salud capacitados para el cuidado integral de pacientes con esta patología que incluya una combinación de conocimientos acerca de cuidados clínicos, terapia nutricional, acompañamiento psicológico, consultas dentales.

Otra de las estrategias es implementar acciones de detección oportuna de pacientes con DM2, y con ello tratamiento oportuno, reduce la carga de las

complicaciones agudas o crónicas de la DM2, por lo que el tamizaje para su detección temprana debería considerarse. El tamizaje debe realizarse a cierto sector de la población, con factores de riesgo, como antecedentes heredofamiliares, mujeres con antecedente de diabetes gestacional o SOP, pacientes con sobrepeso u obesidad, sedentarismo, con estrés ambiental, contaminación del aire, o del agua, etc.

Debemos de tomar en cuenta que la educación para la salud, se puede llevar a cabo en diferentes momentos de la historia natural de la enfermedad de DM2, el objetivo será mejorar los conocimientos y habilidades del paciente acerca del autocuidado, la educación individual, se realizará desde el inicio del diagnóstico, durante el control y seguimiento de su tratamiento, siendo un proceso dinámico, donde existe un intercambio de conocimientos, protegiendo la integridad del paciente y brindando confianza para que el paciente exponga sus dudas.

Por otra parte, es importante involucrar a los integrantes de familia de los pacientes ya que este padecimiento afecta la dinámica familiar, la relación que tengan en su núcleo familiar llega a beneficiar o perjudicar la conducta terapéutica del paciente. Esta estrategia promoverá que el paciente adquiera mejores hábitos higiénicos dietéticos con ayuda de sus familiares, y que exista un mejor apego al tratamiento.

El número de pacientes con diabetes mellitus controlados con una glucosa central y hemoglobina glucosilada controlados, se puede lograr. Se recomienda individualizar las metas de control de niveles séricos de glucosa, tomando en cuenta diversos factores. Las metas de glucemia se deben formular en contexto con el estado psicológico, social y económico. Se recomienda que en los adultos con reciente diagnóstico de DM2, sin riesgo cardiovascular, se realice control glucémico a cifras normales o lo más cercano a ellas, para reducir el desarrollo de complicaciones microvasculares. Los niveles por abajo o cercanos a 7% de A1c han mostrado reducción en las complicaciones microvasculares de DM2 y, si es implementado lo más cercano posterior al diagnóstico, se ha asociado a retraso a largo plazo de enfermedad microvascular, por lo que se recomienda metas de A1c (SSa, SEDENA, SEMAR., 2013). Se recomienda mantener niveles séricos de glucosa en ayuno <110 mg/Dl L y concentraciones séricas postprandiales de 140 mg/dL a las 2 horas para llegar a metas de A1c (SSa, SEDENA, SEMAR., 2013).

Promover realizar ejercicio físico, se disminuyen los niveles de estrés, baja niveles de glucosa aumentando la sensibilidad a la insulina, por lo que las células pueden aprovechar más la insulina disponible para usar glucosa mientras hace actividad física, se ha demostrado que baja niveles de colesterol LDL y triglicéridos. Fomentar la actividad física, en todos los grupos de edad, y hacerlo en familia, es la propuesta que hago. Rescatando, rehabilitando fomentando la vigilancia y seguridad de los espacios públicos, como parques, unidades deportivas, ya que ayudará a disminuir el nivel de sedentarismo en la sociedad. Dentro de esa propuesta, también incluyo las actividades deportivas de carácter familiar, tales como organizar maratones, carreras de bicicletas, relevos, etc, para motivar a la gente y mantenerla activas de manera constante.

Para poder realizar actividad física en espacios abiertos y reducir el estrés de nuestra vida diaria, necesitamos disminuir la contaminación del aire, por lo que es indispensable tener una cultura ecológica tanto en nuestros hogares como en espacios públicos. Ciertas acciones como reciclar, reutilizar, usar focos ahorradores, reducir el consumo de consumo de agua, separar desechos sanitarios, dejar de fumar, no tirar basura, tienen un impacto positivo al ambiente.

En este sentido, es imprescindible tener estrategias y políticas públicas para mejorar la calidad del aire y el agua con el fin de controlar la contaminación en las ciudades, las emisiones de desechos químicos en la industria y la promover fuentes de energía limpia y renovable en nuestro país.

De igual forma es necesario medir de manera constante la concentración de arsénico en todas las ciudades y ofrecer soluciones tanto cambiar la fuente de agua de la comunidad o filtrar el agua para remover estos contaminantes de forma eficiente sobre todo por su relación con la DM2 y por las múltiples fuentes de exposición a estos tóxicos como minería, contaminación de agua por pozos profundos (Alarcón, M., Martin, A., Martin, I., 2011).

La contaminación de agua por arsénico en México es una consecuencia de la actividad minera, ya que el agua se extrae, procesa y concentra en las rocas en ciertos lugares principalmente en estados del Norte de nuestro país, por lo que se vuelve una fuente de contaminación para el agua potable. La roca de las montañas o los sedimentos los valles pueden contener arsénico, pero al momento que una empresa minera la extrae y la almacena se agrava la contaminación original ya que la superficie de contacto entre el aire/oxígeno y la roca molida es mayor, y la exposición a la lluvia que disuelve estos contaminantes y los transporta hacia los ríos y mantos subterráneas. Una de las estrategias, es usar filtros de agua domésticos para eliminar arsénico del agua directamente dentro la casa, para cocinar, lavar alimentos y carnes e incluso para beber. También se podría recurrir a que el gobierno federal para que construya una planta para tratar el agua potable y realizar la remoción de arsénico, realizando un monitoreo por lo mínimo de un año de esa agua para asegurarse de que está adecuada para el consumo humano. Difundir la importancia de consumir agua sin arsénico, a través de promoción y educación para la salud, con el objetivo de disminuir los

efectos adversos que tiene sobre la población, brindando pláticas y talleres en las escuelas, invitando a toda la comunidad a participar, para explicar la importancia de tomar agua sin contaminantes, promover el uso del filtro, enseñar como armarlo y mantenerlo en condiciones, etc. Así mismo, dejar spots publicitarios informando en escuelas, transporte público espacios recreativos para difundir dicha información.

m) Intervention Mapping para pacientes con DM2

Uno de los grandes desafíos a los que se enfrenta México, es lograr la participación de diferentes sectores como son el educativo, económico, político y de salud, con la finalidad de fortalecer la rectoría de la Secretaría de Salud, reforzando la atención de los pacientes con DM2, a través de acciones interinstitucionales de manera análoga.

Es importante lograr que en el primer nivel de atención se realice la detección oportuna de pacientes que tengan factores de riesgo para DM2, así como en aquellos pacientes cuyas detecciones sean positivas, ingresaras al tratamiento no farmacológico y farmacológico, cuyo objetivo sea la realización de actividad física, orientación nutricional, consultas psicológicas, atención odontológica, fomentando el autocuidado, de tal manera que haya promoción de los cambios de estilos de vida.

A su vez, se implementará un esquema proactivo de prevención y detección oportuna de casos para prevenir, controlar y tratar la diabetes y sus complicaciones, ya que ayudará a mejorar los niveles de bienestar de la población mexicana, siendo la detección temprana y la adherencia terapéutica una vía para mejorar la calidad de vida.

Fortalecer la cobertura de la atención de los pacientes con DM2 en control, a través de acciones de información, educación y comunicación a los pacientes y a sus familiares otorgando orientación y consejería de su padecimiento a través de Grupos de Apoyo "juntos por ti", fomentando el autocuidado de la personas, y promoviendo la corresponsabilidad y sensibilizar a la familia con respecto al cuidado de los pacientes, realizar un evento que conmemore el día mundial de la DM2 a fin de concientizar sobre la problemática que representa esta enfermedad.

Mejorar los estándares de calidad en el primer nivel de atención en cuanto a abasto de insumos y personal de salud capacitado, ya que para lograr el control metabólico se deberá de realizar la gestión de abasto oportuno y suficiente de medicamentos para el control de la diabetes, fortalecer la eficiencia, efectividad y oportunidad en la prestación de los servicios de salud en las unidades del primer nivel de atención.

n) Diseño del programa

Es fundamental garantizar el acceso a los servicios de salud a todos los mexicanos diabéticos, por lo que el punto medular de nuestra estrategia, sería la implementación de una nueva estrategia "la vida sana de un diabético".

Este programa consiste en capacitar al núcleo básico de primer nivel de atención (médicos, enfermeras, nutriólogos, trabajadoras sociales, dentistas, promotores de salud), con la finalidad de otorgar acompañamiento a los pacientes y familiares a lo largo de su enfermedad, para realizar educación para la salud a pacientes y familiares.

Se realizarán actividades grupales entre los Grupos de Apoyo, "juntos por ti", se tendrán una atención integral (atención psicológica, odontológica, nutrimental) adecuada hacia la población beneficiaria.

Los temas a tratar, en el contexto de la educación para la salud, dentro de los Grupos de Apoyo "juntos por ti", serán:

- Conocimiento acerca de la DM2.
- Factores de riesgo para padecer DM2.
- ¿Qué y Cómo debo de comer?
- Beneficios de la actividad física.
- Complicaciones agudas y crónicas de la DM2.
- ¿Cómo tomo mi medicamento?
- Viviendo con tu diabetes (hábitos higiénico dietéticos).
- El diabético y su familia.

Cualquier intervención, exigirá un esfuerzo de las autoridades sanitarias para trabajar en conjunto en todos los niveles de gobierno, por lo que es importante consolidar vínculo entre las autoridades locales y los Servicios de Salud Estatal y Nacional, para incrementar inversiones en el desarrollo de salud, expandir la colaboración para la promoción de la salud y con ello fortalecer y coordinar el Programa, supervisar y crear acciones de mejora.

o) Producción del programa

Fortalecer el primer nivel de atención, mejorando su calidad con respecto a infraestructura, con la oportuna adquisición de recursos humanos y de insumos suficientes para el paciente diabético supervisando el abasto oportuno de dichos recursos.
Es necesario promover la salud, no solo en los centros de salud sino también es los espacios públicos de la localidad, de manera clara a través de material didáctico, claro y preciso para la comprensión de la información a transmitir.

p) Plan de implementación del programa

Implementar acciones de detección oportuna de pacientes con DM2, reduce la carga de las complicaciones agudas o crónicas de la DM2, por lo que el tamizaje para su detección temprana debería considerarse. El tamizaje debe realizarse a cierto sector de la población, con factores de riesgo, como antecedentes heredofamiliares, mujeres con antecedente de diabetes gestacional o Síndrome de

ovario poliquístico, pacientes con sobrepeso u obesidad, sedentarismo, con estrés ambiental.

Ya que este padecimiento afecta la dinámica familiar, es importante involucrar al núcleo familiar con la finalidad de promover en el paciente mejores hábitos higiénico dietéticos y mejor apego al tratamiento médico.

El número de pacientes con DM2, controlados con una glucosa central y hemoglobina glucosilada (A1c) adecuados, se puede lograr, individualizando las metas de control de niveles séricos de glucosa. Se recomienda que en los adultos con reciente diagnóstico de DM2, los niveles por abajo o cercanos a 7% de A1c han mostrado reducción en las complicaciones microvasculares de DM2. Se recomienda mantener niveles séricos de glucosa en ayuno <110 mg/dL y concentraciones séricas postprandiales de 140 mg/dL a las 2 horas para llegar a metas de A1c (SSa, SEDENA, SEMAR., 2013).

Al Promover realizar ejercicio físico, se disminuyen los niveles de estrés, bajan niveles de glucosa y aumenta la sensibilidad a la insulina, por lo que fomentar la actividad física, en todos los grupos de edad y en familia ha demostrado que baja niveles de colesterol LDL y triglicéridos.

Rescatar, rehabilitar, fomentar la vigilancia y seguridad de los espacios públicos, como parques, unidades deportivas, ayudará a disminuir el nivel de sedentarismo en la sociedad. Dentro de esa propuesta, se incluyen actividades deportivas de carácter familiar, tales como maratones, carreras de bicicletas, relevos, en espacios abiertos, para reducir el estrés de la vida diaria y con la finalidad de motivar a la población y mantenerla activa de manera constante.

Ciertas acciones como reciclar, reutilizar, usar focos ahorradores, reducir el consumo de agua, separar desechos sanitarios, dejar de fumar, no tirar basura, tienen un impacto positivo al ambiente. En este sentido es imprescindible tener estrategias y políticas públicas para mejorar la calidad del aire y el agua con el fin de controlar la contaminación en la comunidad, las emisiones de desechos químicos en las industrias y la promover fuentes de energía limpia y renovable en nuestro país.

Etapas de implementación del programa:

1. Diagnóstico de salud en la comunidad: proximidad y adaptación con la comunidad, ejecución del diagnóstico de salud de la comunidad, para conocer las necesidades prevalencia e incidencia de DM2.

   Estar al tanto de los recursos con los que se cuentan, identificar líderes e informantes.

   Unificación intersectorial y organización vinculada para trabajo en conjunto de los servicios de salud, el municipio y servicios Estatales.
2. Investigación acción-participación: ya que se identificó el problema de salud y se efectuó el plan de acción multisectorial, se podrá lograr la participación de la comunidad y poder explicarles los resultados que se desean obtener.
3. Monitoreo y evaluación

q) Evaluación

El objetivo principal de la evaluación, es ayudar en el proceso de toma de decisiones y se considera de suma importancia evaluar los programas de salud, como instrumento para realizar cambios o ajustes en las políticas públicas. Los objetivos de la evaluación, es determinar si las metas se alcanzaron y medir tanto el nivel del logro, así como la forma como se ejecutó, proporcionar controles de calidad, proporcionar conocimiento científico y proponer hipótesis para estudios futuros y desarrollar nuevos abordajes y estrategias para futuros programas (Casanova, M., Bayarre, H., Navarro, D., Sanabria, G., Trasancos, M., 2015).

El programa consideró 6 meses de intervención, en el cual, el plan de atención del núcleo básico incluyó:

- Atenciones médicas: al inicio, al cuarto y sexto mes, en donde se realizaba historia clínica completa y examen físico, somatometría, diagnóstico nutricional.
- Atenciones de nutricionista: plan de alimentación individualizada con respecto a sus requerimientos.
- Sesiones de actividad física, durante el primer mes 3 veces a la semana, al segundo mes 4 veces a la semana, ejercicios aeróbicos supervisados por un fisioterapeuta.
- Sesiones con los Grupos de ayuda, con una duración aproximadamente de 1 hr una hora aproximadamente, con un número máximo de 10 personas por grupo.
- Exámenes de laboratorio. Al inicio y a los 6 meses de seguimiento, que incluya biometría hemática, química sanguínea de 6 elementos, hemoglobina glucosilada.
- Si es necesario, referencia a segundo nivel de atención para interconsulta.

Es importante mantener la vigilancia estrecha en pacientes diabéticos para evitar complicaciones tempranas y tardías de dicho padecimiento, disminuyendo la incidencia de ingresos hospitalarios o inclusive de fallecimiento a causa de la patología en mención.

Para medir los resultados de las estrategias implementadas en el programa, es necesario observar y analizar los avances obtenidos por los pacientes de manera mensual, llevando el control de la somatometría (peso, índice de masa corporal, perímetro abdominal) y glucosa periférica al momento de la consulta médica, para verificar si está dentro del rango de meta de su

glucosa, además de enviar a realizar a los pacientes a los 6 meses, laboratorios de control para ver sus niveles de glucosa central y Hemoglobina glucosilada.

Verificar la adherencia al tratamiento de cada uno de los pacientes, así como el surtimiento adecuado del tratamiento indicado por el médico tratante.

Para dar seguimiento a las variables anteriores, se considerarían varios procesos de evaluación tales como:

- Encuestas de satisfacción del diabético en las que se determine el tiempo de espera, tipo de atención recibida, insumo completo, infraestructura adecuada.
- Buzón de quejas y sugerencias para mejorar la calidad del servicio y fortalecer la atención integral de los pacientes atendidos.

Cada paciente recibió una cartilla, en donde se encuentran sus datos personales, las fechas de citas mensuales con respecto a la atención odontológica, nutrimental y psicológica, así como las actividades que han realizado al mes, medidas antropométricas, resultados de laboratorios al inicio y al finalizar el, todo esto para vigilar la asistencia al Programa "la vida sana de un diabético" y el avance que ha tenido cada uno de nuestros pacientes.

IV. Conclusiones

En el presente artículo quise hacer énfasis en el impacto que tiene la DM2 en la población mexicana, así como en nuestro Sistema de Salud debido a que nos enfrentamos a un problema de salud pública a causa del sedentarismo, el sobrepeso y la obesidad, que repercute en la calidad de vida de los pacientes., incrementando el riesgo de padecer complicaciones ya sean agudas o crónicas. Los estudios epidemiológicos sobre DM2 tienen un gran impacto en la investigación conocer la historia natural de la enfermedad, conocer la magnitud, la frecuencia, y los componentes socioeconómicos y culturales, definición de los criterios diagnósticos, identificación de los factores de riesgos y las complicaciones de la DM2 para proponer estrategias de prevención, atención y de la enfermedad, por tales motivos se incluye datos epidemiológicos de DM2 en México.

La probabilidad de que un individuo desarrolle DM2, depende de una combinación de factores de riesgo biológicos, al estilo de vida, y al medio ambiente al que nos exponemos día con día, es un hecho que se pueden cambiar factores de riesgo como los antecedentes familiares, la edad o el origen étnico, pero sí se pueden modificar los factores que tienen que ver con los hábitos higiénico dietéticos, como lo es la alimentación, la actividad física, mejorar hábitos del sueño, reducción del estrés así como la reducción de la contaminación del medio ambiente. Estos pequeños cambios que a la vez tienen un gran impacto en la vida de cada individuo pueden hacer la diferencia entre desarrollar o no DM2. Por tal motivo, incluí la perspectiva de los factores de riesgo asociados al desarrollo de la enfermedad, y a la vez estrategias para mejorar nuestro entorno y con ello mejorar la calidad de vida de nuestros pacientes.

Un sistema de vigilancia epidemiológica proporciona información oportuna que facilite la toma de decisiones y a su vez, hacer recomendaciones a corto, mediano o largo plazo, con el propósito de prevenir o controlar un problema de salud, como es el caso de la DM2, que es reconocida por su alta prevalencia. Contar con un sistema de vigilancia epidemiológica para pacientes que padecen DM2, permitirá que las autoridades sanitarias cuenten con información útil para mejorar las condiciones de vida de los pacientes que lo requieran.

La Secretaría de Salud es la responsable de establecer la política nacional en cuanto se refiere a la asistencia social, servicios médicos y salubridad general; también coordina los programas de servicios a la salud. También está a cargo de coordinar la participación responsable del Sistema Nacional de Salud en su ámbito público, social y privado; atendiendo a la población con programas sociales y para mejorar las condiciones de salud atendiendo a la población vulnerable de nuestro país.

El reto para los servicios de salud pública es enorme debido a los costos económicos directos e indirectos que se necesitan para la atención integral de nuestros pacientes, así como la pérdida en la calidad de vida de persona que la padece y de los familiares.

Por estas razones, se integró el Programa de Acción Específica De Prevención y Control de la Diabetes Mellitus 2013-2018, el cual pone énfasis en las acciones de prevención y promoción de la salud con el propósito de disminuir la prevalencia de DM2 en los distintos grupos etarios, para lograrlo, se requiere de la participación de todas las instituciones que integran el Sistema Nacional de Salud, a través de los Programas de Acción Específico de Prevención y Promoción de la Salud, en el marco del Plan Nacional de Desarrollo 2013-2018 y del Programa Sectorial de Salud, que son la herramienta de evaluación y seguimiento de las estrategias e indicadores que permiten medir el desempeño del Sistema de Salud.

Para mejorar la situación de DM2 en México, se necesita una respuesta multisectorial en conjunto con la sociedad, así como intervenciones dirigidas al desarrollo de políticas, la reducción de factores de riesgo, la respuesta del Sistema Nacional de Salud en México, así como de la vigilancia e investigación, con la finalidad de reducir la incidencia, prevalencia y mortalidad de esta enfermedad. Al realizar estas intervenciones en primer nivel de atención, se tendrá un impacto al reducir los costos de los servicios de salud, aumentar la productividad y el crecimiento económico

en el país. Las acciones se deben centrar en trabajar para promover los entornos saludables, fomentar una alimentación sana, aumentar la práctica de actividad física y mejorar los hábitos higiénico- dietéticos de nuestros pacientes, así como la educación para la salud.

Es necesario impulsar las líneas de Acción Específica De Prevención y Control de la Diabetes Mellitus 2013-2018, por tal motivo, en el presente artículo realicé varias estrategias para reforzar dicho Plan de Acción, tales como garantizar el acceso a los servicios de salud, de buena calidad, con insumos necesarios y personal capacitado para la atención integral de pacientes con DM2. Implementar acciones de detección oportuna de pacientes con DM2, y con ello tratamiento oportuno, tendrá como consecuencia la reducción de las complicaciones agudas o crónicas de la DM2. La educación para la salud, es un vehículo que al momento que se desarrolla con la participación activa de las personas, se convierte en promoción para la salud, y se puede llevar a cabo, en diferentes momentos de la historia natural de la enfermedad de la DM2, con el objetivo de mejorar los conocimientos y habilidades del paciente acerca del autocuidado, la educación individual y colectiva con ayuda de su núcleo familiar.

En la actualidad, el sistema de Salud mexicano, se encuentran inmersos en la dinámica de la economía de salud, falta de los recursos, el alto costo de la atención y el presupuesto asignado a la salud, por lo que los establecimientos de salud de primer nivel de atención deben de ejercer sus recursos en forma eficiente a través de habilidades clínicas y gerenciales para la adecuada toma de decisiones a favor de la población.

La estrategia que planteo en dicha Intervención, se enfoca en fortalecer la educación y promoción para la salud, creando profesionales de la salud capacitados, con la finalidad de otorgar acompañamiento a los pacientes y familiares a lo largo de su enfermedad, así como Grupos de Apoyo, para una atención integral. También se recomienda individualizar las metas de control de niveles séricos de glucosa, en cada uno de los pacientes, tomando en cuenta el estado psicológico, social y económico de cada uno de los pacientes.

La promoción de la actividad física ya sea de manera individual o acompañados de sus familiares, es indispensable para disminuir el estrés, mejorar la calidad del sueño y, por ende, la diminución de los niveles de glucosa séricos, por lo que es imprescindible, mejorar las condiciones de los espacios públicos y fomentar la seguridad para todos los ciudadanos, así como crear políticas públicas para mejorar la calidad del aire y el agua con el fin de controlar la contaminación en las ciudades.

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Fellows/Associates of Medical Research Council

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14. Arrangement of information: Each section of the main body should start with an opening sentence, and there should be a changeover at the end of the section. Give only valid and powerful arguments for your topic. You may also maintain your arguments with records.

15. Never start at the last minute: Always allow enough time for research work. Leaving everything to the last minute will degrade your paper and spoil your work.

16. Multitasking in research is not good: Doing several things at the same time is a bad habit in the case of research activity. Research is an area where everything has a particular time slot. Divide your research work into parts, and do a particular part in a particular time slot.

17. Never copy others' work: Never copy others' work and give it your name because if the evaluator has seen it anywhere, you will be in trouble. Take proper rest and food: No matter how many hours you spend on your research activity, if you are not taking care of your health, then all your efforts will have been in vain. For quality research, take proper rest and food.

18. Go to seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.

19. Refresh your mind after intervals: Try to give your mind a rest by listening to soft music or sleeping in intervals. This will also improve your memory. Acquire colleagues: Always try to acquire colleagues. No matter how sharp you are, if you acquire colleagues, they can give you ideas which will be helpful to your research.

20. Think technically: Always think technically. If anything happens, search for its reasons, benefits, and demerits. Think and then print: When you go to print your paper, check that tables are not split, headings are not detached from their descriptions, and page sequence is maintained.

21. Adding unnecessary information: Do not add unnecessary information like "I have used MS Excel to draw graphs." Irrelevant and inappropriate material is superfluous. Foreign terminology and phrases are not apropos. One should never take a broad view. Analogy is like feathers on a snake. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Never oversimplify: When adding material to your research paper, never go for oversimplification; this will definitely irritate the evaluator. Be specific. Never use rhythmic redundancies. Contractions shouldn't be used in a research paper. Comparisons are as terrible as clichés. Give up ampersands, abbreviations, and so on. Remove commas that are not necessary. Parenthetical words should be between brackets or commas. Understatement is always the best way to put forward earth-shaking thoughts. Give a detailed literary review.

22. Report concluded results: Use concluded results. From raw data, filter the results, and then conclude your studies based on measurements and observations taken. An appropriate number of decimal places should be used. Parenthetical remarks are prohibited here. Proofread carefully at the final stage. At the end, give an outline to your arguments. Spot perspectives of further study of the subject. Justify your conclusion at the bottom sufficiently, which will probably include examples.

23. Upon conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print for the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects of your research.

Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form which is presented in the guidelines using the template.
- Please note the criteria peer reviewers will use for grading the final paper.

Final points:

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

The introduction: This will be compiled from reference matter and reflect the design processes or outline of basis that directed you to make a study. As you carry out the process of study, the method and process section will be constructed like that. The results segment will show related statistics in nearly sequential order and direct reviewers to similar intellectual paths throughout the data that you gathered to carry out your study.

The discussion section:

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to prior workings.

Writing a research paper is not an easy job, no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record-keeping are the only means to make straightforward progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear: Adhere to recommended page limits.

Mistakes to avoid:

- Insertion of a title at the foot of a page with subsequent text on the next page.
- Separating a table, chart, or figure—confine each to a single page.
- Submitting a manuscript with pages out of sequence.
- In every section of your document, use standard writing style, including articles ("a" and "the").
- Keep paying attention to the topic of the paper.
- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don't address the reviewer directly. Don't use slang or superlatives.
- Avoid use of extra pictures—include only those figures essential to presenting results.

Title page:

Choose a revealing title. It should be short and include the name(s) and address(es) of all authors. It should not have acronyms or abbreviations or exceed two printed lines.

Abstract: This summary should be two hundred words or less. It should clearly and briefly explain the key findings reported in the manuscript and must have precise statistics. It should not have acronyms or abbreviations. It should be logical in itself. Do not cite references at this point.

An abstract is a brief, distinct paragraph summary of finished work or work in development. In a minute or less, a reviewer can be taught the foundation behind the study, common approaches to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Use comprehensive sentences, and do not sacrifice readability for brevity; you can maintain it succinctly by phrasing sentences so that they provide more than a lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study with the subsequent elements in any summary. Try to limit the initial two items to no more than one line each.

Reason for writing the article—theory, overall issue, purpose.

- Fundamental goal.
- To-the-point depiction of the research.
- Consequences, including definite statistics—if the consequences are quantitative in nature, account for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

Approach:

- Single section and succinct.
- An outline of the job done is always written in past tense.
- Concentrate on shortening results—limit background information to a verdict or two.
- Exact spelling, clarity of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else.

Introduction:

The introduction should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.

The following approach can create a valuable beginning:

- Explain the value (significance) of the study.
- Defend the model—why did you employ this particular system or method? What is its compensation? Remark upon its appropriateness from an abstract point of view as well as pointing out sensible reasons for using it.
- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
- Briefly explain the study's tentative purpose and how it meets the declared objectives.

Approach:

Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done. Sort out your thoughts; manufacture one key point for every section. If you make the four points listed above, you will need at least four paragraphs. Present surrounding information only when it is necessary to support a situation. The reviewer does not desire to read everything you know about a topic. Shape the theory specifically—do not take a broad view.

As always, give awareness to spelling, simplicity, and correctness of sentences and phrases.

Procedures (methods and materials):

This part is supposed to be the easiest to carve if you have good skills. A soundly written procedures segment allows a capable scientist to replicate your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order, but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt to give the least amount of information that would permit another capable scientist to replicate your outcome, but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section.

When a technique is used that has been well-described in another section, mention the specific item describing the way, but draw the basic principle while stating the situation. The purpose is to show all particular resources and broad procedures so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step-by-step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

Materials may be reported in part of a section or else they may be recognized along with your measures.

Methods:

- Report the method and not the particulars of each process that engaged the same methodology.
- Describe the method entirely.
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures.
- Simplify—detail how procedures were completed, not how they were performed on a particular day.
- If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

Approach:

It is embarrassing to use vigorous voice when documenting methods without using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result, when writing up the methods, most authors use third person passive voice.

Use standard style in this and every other part of the paper—avoid familiar lists, and use full sentences.

What to keep away from:

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings—save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part as entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Use statistics and tables, if suitable, to present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if requested by the instructor.

Content:

- Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation of an exacting study.
- Explain results of control experiments and give remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or manuscript.

What to stay away from:

- Do not discuss or infer your outcome, report surrounding information, or try to explain anything.
- Do not include raw data or intermediate calculations in a research manuscript.
- Do not present similar data more than once.
- A manuscript should complement any figures or tables, not duplicate information.
- Never confuse figures with tables—there is a difference.

Approach:

As always, use past tense when you submit your results, and put the whole thing in a reasonable order.

Put figures and tables, appropriately numbered, in order at the end of the report.

If you desire, you may place your figures and tables properly within the text of your results section.

Figures and tables:

If you put figures and tables at the end of some details, make certain that they are visibly distinguished from any attached appendix materials, such as raw facts. Whatever the position, each table must be titled, numbered one after the other, and include a heading. All figures and tables must be divided from the text.

Discussion:

The discussion is expected to be the trickiest segment to write. A lot of papers submitted to the journal are discarded based on problems with the discussion. There is no rule for how long an argument should be.

Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implications of the study. The purpose here is to offer an understanding of your results and support all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of results should be fully described.

Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact, you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved the prospect, and let it drop at that. Make a decision as to whether each premise is supported or discarded or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."

Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work.

- You may propose future guidelines, such as how an experiment might be personalized to accomplish a new idea.
- Give details of all of your remarks as much as possible, focusing on mechanisms.
- Make a decision as to whether the tentative design sufficiently addressed the theory and whether or not it was correctly restricted. Try to present substitute explanations if they are sensible alternatives.
- One piece of research will not counter an overall question, so maintain the large picture in mind. Where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

When you refer to information, differentiate data generated by your own studies from other available information. Present work done by specific persons (including you) in past tense.

Describe generally acknowledged facts and main beliefs in present tense.

The Administration Rules

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Topics	Grades		
	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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ISSN 9755896