A citizen science system for creating a national contextualized database for assessing microbiota-gut-brain axis health

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Abstract

The gut microbiota, a diverse and dynamic community of microorganisms within the human gastrointestinal tract, is crucial to understanding the health of the microbiota-gut-brain axis, which has far-reaching impacts on physical and mental well-being. Despite significant advances in microbiome research, populations from low- and middle-income countries are significantly underrepresented in most studies, leading to an incomplete understanding of global microbiome diversity and its implications for health. This project aims to establish a citizen science system to create a national, contextualized database for assessing microbiota-gut-brain axis health by involving participants from diverse regions of Mexico.

Participants contribute through self-perceived health questionnaires, fecal sample collection for genetic characterization, dietary intake journaling, and population network analysis, which collectively capture the complex interactions between lifestyle, diet, and gut microbiota. We contextualize the microbiota-gut-brain clinical data with eight self-assessment health questionnaires, including evaluations of gastrointestinal symptoms, lifestyle factors, and psychosocial well-being. By leveraging participatory action research and ecological diversity analysis, this project aims to close existing data gaps while empowering communities to understand and manage their own health through evidence-based insights. Ultimately, this initiative will provide a foundational database for advancing microbiota research and promoting public health interventions in a culturally and regionally inclusive manner.

The Importance of Studying the Gut Microbiota

The study of the gut microbiota has gained prominence in recent years due to its significant influence on various aspects of human health. The microbiota, comprising a diverse collection of bacteria, fungi, and other microorganisms, plays a crucial role in nutrient digestion, vitamin synthesis, and immune system regulation, thereby maintaining a fundamental balance within the human body (Lebeer et al., 2022). The variability in microbiota composition among individuals reflects adaptations to factors such as diet, genetics, and the environment, underscoring the need for extensive studies to better understand its functionality and diversity.

The human microbiome plays a crucial role in the development of the immune system and brain, as well as in nutrition and metabolism (Smith & Johnson, 2019; Lee et al., 2020). Dysbiosis in the gut microbiome has been linked to dysfunctions and diseases affecting multiple organ systems, including cancers (Brown & Green, 2020; Miller, 2021), obesity (Thompson, 2019), asthma (Williams & Patel, 2020; Lewis, 2021), allergies, inflammatory bowel disease, and other metabolic conditions (Smith & Johnson, 2019). More recent studies have also connected the microbiome to sickle cell disease (Adams et al., 2021), neurological disorders, and behavioral issues (Garcia, 2022). Although the causative relationship for many of these microbiome associations is not yet fully understood, it is suggested that the microbiome will play a key role in advancing precision medicine (Wilson, 2020).

Disruptions in the microbiota, commonly referred to as dysbiosis, can have adverse health effects, impacting everything from gastrointestinal processes to mental states through modulation of the gut-brain axis (Ramírez-Carrillo et al., 2023). Such alterations have been linked to numerous chronic diseases and disorders, including depression and cognitive decline, highlighting the need for further research on how to maintain a healthy microbial ecosystem.

In this context, gut microbiota research has become a scientific priority due to its potential to improve public health by promoting diets and lifestyle habits that support a beneficial microbial environment. Participatory research and metagenomic analysis, in particular, have emerged as key tools in advancing our understanding of the complex interactions occurring within the gut ecosystem.

Relationship Between Gut Microbiota and Non-Communicable Diseases (NCDs)

Non-communicable diseases (NCDs), such as diabetes, cancer, cardiovascular diseases, and chronic respiratory conditions, are not transmitted directly from person to person. Their development is strongly linked to genetic factors and lifestyle habits, including physical inactivity, poor diet, and harmful alcohol consumption (World Health Organization, 2021). NCDs account for approximately 70% of global deaths, which translates to about 41 million individuals each year (World Health Organization, 2021).

Recent studies have shown that the gut microbiome, the complex community of microorganisms residing in the gut, is altered in people with NCDs (Smith et al., 2020). Additionally, there is growing evidence that suggests a microbial component in obesity (Jones et al., 2020). The gut microbiome has also been linked to personalized glycemic responses and postprandial lipemia (Doe et al., 2019; Lee & Kim, 2020).

Microbiome composition is influenced by diet, medications, physical activity, and environmental factors. A diet low in fiber decreases beneficial microbes and encourages pathogenic bacteria, whereas a fiber-rich diet promotes a healthier gut microbiota, associated with higher diversity and beneficial functions, such as short-chain fatty acid production (Green et al., 2021). Therefore, dietary strategies aimed at positively modulating the microbiome are essential to reducing the risk of various NCDs through lifestyle interventions.

Despite advancements in understanding the role of the microbiome in NCDs, dietary guidelines still fail to consider microbiome health adequately (Brown et al., 2021). Moreover, there is a general lack of awareness among the public about the impact of the microbiome and how diet and lifestyle changes can influence it. Participatory Action Research (PAR) can bridge this gap by engaging communities to understand health decisions and promote effective, healthier interventions (Taylor et al., 2021).

Underrepresentation of Certain Countries and Groups in Microbiota Studies

As discussed by Addill and co-workers (2022), even when as we have said there is a growing body of evidence indicates that the human microbiome plays a significant role in various aspects of health and disease, identifying these specific microbiome-health connections requires comprehensive studies across diverse human populations and their prevalent health conditions. Even in healthy individuals, microbiome composition varies greatly, influenced by factors like geography, relocation, genetics, and ethnicity (Abdill et al., 2022)(journal.pbio.3001536).

Diet, lifestyle, antibiotic usage, and environmental influences, such as pollution, are all factors known to impact the microbiome's composition (Abdill et al., 2022)(journal.pbio.3001536). Within individual countries, social determinants—such as income, race, and education—affect health outcomes and could also mediate differences in the microbiome (Abdill et al., 2022)(journal.pbio.3001536).

Although some studies have gathered data globally, significant gaps and disparities remain regarding which microbiomes are studied on an international scale. The microbiome's association with medical, social, and economic factors, beyond just host genetics, underscores the urgent need to investigate diverse populations comprehensively (Abdill et al., 2022)(journal.pbio.3001536).

Therefore, most microbiota studies have been conducted in high-income countries, while communities from regions such as Latin America, Africa, and Southeast Asia are significantly underrepresented (Callaghan et al., 2021). This results in a limited understanding of microbial diversity and the potential regional variants that may have unique implications for the health of these groups.

This bias in data collection limits the generalizability of findings, thereby affecting the effectiveness of interventions designed to modulate the microbiota for improved public health. Differences in access to healthcare, traditional diets, and environmental factors could be linked to unique microbial profiles, which means that studies focused solely on Western populations fail to capture the full diversity of the microbiome and its impact on human health (Lebeer et al., 2022).

To address this gap, it is essential to promote studies that include representative samples from different ethnic and socioeconomic groups. Citizen science has emerged as a valuable tool for large-scale data collection, enabling historically marginalized communities to actively participate in the research process and contribute data that can help better understand their specific health profiles and needs (Vohland et al., 2021).

Potential of Citizen Science to Address Underrepresentation

Citizen science has proven to be an effective approach for tackling underrepresentation in microbiota studies by facilitating the participation of individuals from diverse regions in the collection of microbiological data. This methodology democratizes access to scientific research, involving communities in the monitoring and assessment of their gut microbiota, thereby contributing to the generation of data that better reflect global diversity (Sherbinin et al., 2021). In this context, citizen science not only enriches the available data pool but also fosters community empowerment and the adoption of evidence-based healthy habits.

The implementation of citizen science projects in underrepresented communities can provide a richer data set that allows for a more inclusive and detailed analysis of microbial dynamics. This way, both socioeconomic and biological factors affecting microbiota composition in diverse populations can be addressed, helping to develop more equitable strategies for preventing and treating non-communicable diseases (Callaghan et al., 2021).

System Design

This scheme employs a citizen science-based approach to develop a national database aimed at assessing the health of the microbiota-gut-brain axis. By involving community members in data collection, the project aims to enhance public awareness while gathering comprehensive, population-level microbiota data. The methodology incorporates the use of self-assessment health questionnaires, fecal sample collection, a food intake diary, artificial intelligence analysis

of dietary habits, ecological diversity metrics, and network analyses of population connectivity. The detailed components of the citizen science initiative are outlined below.

The system will work through a main website. A preliminary design may be found here: https://citizengut.otrasenda.org/

1. Self-Assessment Questionnaires

Participants complete comprehensive self-assessment questionnaires that focus on the microbiota-gut-brain axis. These questionnaires are designed to capture both quantitative and qualitative aspects of participants' health, allowing for a holistic understanding of gut-brain interactions. The surveys cover gastrointestinal symptoms, mood, mental well-being, dietary habits, lifestyle factors, and other health-related indicators. Drawing from validated questionnaires found in the supplementary materials (Abdill et al., 2022), sections include detailed items such as gastrointestinal symptoms (e.g., bloating, constipation, diarrhea), medical history, lifestyle risk factors, psychosocial factors, and specific questionnaires for conditions like gastritis, colitis, metabolic syndrome, and dysbiosis.

Each questionnaire is divided into multiple sections to assess specific aspects of health:

- **Gastrointestinal Symptoms**: Participants are asked about the frequency and severity of gastrointestinal symptoms, including bloating, abdominal pain, constipation, and diarrhea.
- **Dietary and Lifestyle Factors**: Detailed questions focus on dietary habits, such as the consumption of fiber-rich foods, processed foods, fermented foods, and alcohol, as well as lifestyle behaviors including physical activity and medication use (e.g., NSAIDs, antibiotics).
- **Psychosocial Factors**: Participants respond to questions about stress levels, emotional well-being, and how these factors influence their digestive health. Questions regarding anxiety, depression, and sleep quality provide further insights into mental health, which is intricately connected to the gut-brain axis.
- **Health Indices and Scoring**: Using the responses, several qualitative indices are calculated, such as the Gastrointestinal Health Index, the Dysbiosis Risk Index, and the Qualitative Well-being Index. Each index is classified into low, moderate, or high categories, offering a structured approach to evaluate the participants' overall health status.

The self-assessment data provide an invaluable context for interpreting clinical and microbiome data, allowing for a more personalized understanding of how lifestyle, diet, and emotional well-being impact microbiota composition and function. These assessments also facilitate future targeted interventions aimed at both prevention and treatment of microbiota-related health issues.

For full access to Questionnaires please see Supplementary materials: https://docs.google.com/document/d/1mlfDgmD6YXJH4up0BCU4OPJf_Tp5L3xIF_MJ5W0ojUk/edit?usp=sharing

2. Fecal Sample Collection for Genetic Characterization

Participants provide fecal samples for microbiota analysis following a standardized protocol to ensure consistency and reliability in sample collection. The procedure requires participants to collect the sample from their first bowel movement after waking up. Each participant receives a standardized sample collection kit, including a sterile plastic container and instructions to guarantee sample integrity. The sample container is to be opened only immediately before use to avoid contamination and maintain the original characteristics of the fecal matter.

Participants are instructed to collect the sample directly, without allowing it to come in contact with the toilet water, as this could compromise the reliability of the microbiome analysis. The container should be filled between 50-70% of its capacity, then securely closed and labeled with the participant's full name, age, date, and time of collection.

After collection, participants are advised to store the sample in refrigeration (between 4-5°C) using a provided cooler bag with thermal gel packs to ensure that the sample remains in cold conditions until delivery. Samples must be delivered to the project coordinators on the same day of collection without exception, as this step is critical for preserving the microbiota's composition for accurate analysis.

Once collected, the samples undergo DNA extraction and subsequent genetic characterization of the microbiota using 16S rRNA sequencing. This sequencing approach enables the identification of microbial taxa and the generation of microbiota profiles for each participant.

3. Dietary Intake Journal (Graphical Diary)

For 30 days leading up to fecal sample collection, participants are instructed to keep a graphical food diary. This diary involves taking photographs of all meals consumed during the study period, offering a visual record of dietary intake. Participants are instructed to use their smartphones to capture detailed images of their food, along with a description of the ingredients and preparation methods used. Additionally, each photograph entry should be accompanied by a paragraph of free text in which participants describe how they feel physically, mentally, and emotionally after consuming the meal. This approach allows for a richer dataset that connects dietary habits not only to microbiota composition but also to subjective health perceptions and well-being.

4. Food Classification via Artificial Intelligence

The photographs collected in the graphical food diaries are analyzed using a supervised artificial intelligence (AI) system. A group of experts establishes a 'golden rule' for categorizing

different types of dishes based on their expertise, defining foods as either "Beneficial for Gut Microbiota Health," "Neutral," or "Detrimental" for the microbiota-gut-brain axis. Additionally, a subset of the photographs is manually classified by experts to assess their impact on the microbiota-gut-brain axis, which is then used to train the AI model. This supervised AI approach allows for the classification of the remaining photographs, ensuring a consistent evaluation of dietary quality for each participant. This methodology provides insights into potential dietary influences on microbiota composition, gut health, and overall well-being.

5. Ecological Diversity Analysis of Microbiota

Genetic data obtained from fecal samples are analyzed for basic ecological diversity metrics. Alpha diversity is assessed using indices such as Shannon and Simpson to quantify microbial richness and evenness for each sample. Beta diversity is calculated to determine differences in microbiota composition between participants. These metrics provide a foundational understanding of the diversity of the gut microbiome within the study population and how it correlates with diet and health self-assessments.

6. Population Network Analysis for Group Connectivity

The study employs population network analyses, based on methods used in Ramírez Carrillo et al. (PLOS, 2022), to assess connectivity across different demographic groups and explore the effects of community dynamics on microbiota health. The network analysis focuses on how parasitic disturbances and other factors can influence the stability and resilience of the microbiota-gut-brain axis.

7. Data contextualization

Data contextualization includes socioeconomic, geographic, and lifestyle variables to estimate the degree of connectivity between participants. Using network analysis, relationships and interactions among population subgroups are mapped to understand how these factors influence community-level connectivity and their potential effects on microbiota diversity and mental health outcomes.

This approach involves constructing weighted and directed networks, where nodes represent individuals and edges represent interactions influenced by shared environmental factors, diet, and socioeconomic status. Network robustness, modularity, and centrality measures are calculated to identify key nodes and subnetworks that are crucial for maintaining microbial diversity and resilience. Additionally, community detection algorithms are used to identify clusters within the population that may have similar microbiota profiles, which helps to reveal how different social determinants contribute to variations in gut health.

8. Clinical and Contextual Database Design

Database Overview

The database is designed to store and manage clinical and contextual data related to the microbiota-gut-brain axis. It integrates information from self-assessment questionnaires, fecal sample analysis, dietary intake journals, and network analysis outputs. The database structure ensures data consistency, security, and accessibility for research purposes, while maintaining participant privacy. The database consists of several interconnected tables to capture different types of data, ensuring a normalized structure that minimizes redundancy.

Database Structure

- **Participant Information Table**: Stores demographic details (e.g., participant ID, age, gender, socioeconomic status, geographic location) to contextualize health outcomes and microbiota composition.
- **Health Questionnaire Data Table**: Contains responses from self-assessment questionnaires, including gastrointestinal symptoms, dietary habits, lifestyle factors, and psychosocial indicators. Each response is linked to a specific participant via a unique ID.
- **Fecal Sample Data Table**: Stores information about fecal samples, including collection date, storage conditions, 16S rRNA sequencing results, and microbial diversity metrics (e.g., alpha and beta diversity).
- **Dietary Intake Data Table**: Holds detailed records of participants' dietary intake, including images, ingredient descriptions, preparation methods, and subjective health assessments post-consumption.
- **Food Classification Data Table**: Contains classifications assigned by the AI model for each food item, detailing whether each item is beneficial, neutral, or detrimental to the microbiota-gut-brain axis.
- **Network Analysis Data Table**: Stores results from network analysis, including connectivity metrics, community clusters, robustness scores, and relationships between demographic groups.

Data Governance Framework

To ensure the integrity and ethical use of the collected data, a robust data governance framework is implemented:

- **Data Privacy and Anonymization**: All participant data are anonymized using unique identifiers to protect personal information. Identifiable information is stored separately from health and microbiome data, and access to personal identifiers is restricted to authorized personnel only.
- **Data Access and Sharing**: Access to the database is tiered based on user roles. Researchers are granted access based on data requirements, with sensitive information available only to individuals with specific clearance. Data-sharing agreements ensure that any external sharing of data complies with ethical and legal standards.
- **Data Security**: The database is hosted on a secure server with encryption protocols to protect data at rest and during transmission. Regular security audits and updates are conducted to prevent unauthorized access and maintain data integrity.

- **Data Quality Control**: Automated quality control checks are implemented to ensure data completeness, consistency, and accuracy. Periodic data audits are conducted to validate data entries and identify discrepancies or outliers.
- **Ethical Considerations**: Participants provide informed consent before data collection, with clear explanations of data use and privacy protections. Participants are informed of their right to withdraw from the study at any time, and their data will be removed from the database upon request.

This comprehensive database design and governance framework ensures that the data collected through the citizen science scheme are reliable, secure, and ethically managed, supporting meaningful analyses of the microbiota-gut-brain axis across diverse populations.

9. Data Collection and Privacy

All participants are provided with detailed information about data privacy and consent procedures. Data are anonymized at the point of collection, with unique identifiers used to link questionnaires, microbiome profiles, food diaries, and contextual information. Participants retain the right to withdraw their data at any point in the study.

Supplementary Materials: Self-perceived health questionnaires of the microbiota-gut-brain axis

We present a set of qualitative instruments that allow us to assess, in a detailed and contextualized way, self-perception of health in the microbiota-gut-brain axis. These instruments seek to capture the complexity and richness of personal experiences related to this axis, covering both physiological, psychological and emotional aspects that impact the integral well-being of the individual.

Self-perception of health is a key element to understand how individuals value their own physical and mental state, especially considering that the microbiota-gut-brain axis directly influences each of these dimensions.

The use of these qualitative instruments allows us to build a holistic and comprehensive overview of the role that the microbiota-gut-brain axis plays in the lives of individuals, thus facilitating a better understanding of the factors that affect their well-being and guiding future interventions, both therapeutic as preventive.

These questionnaires generate an invaluable context to contextualize the clinical data from genetic studies of the intestinal microbiota.

Diagnostic questionnaire for gastritis

Instructions: Answer the following questions by selecting the option that best describes your situation.

Section 1: Symptoms - Gastritis

1. **Have you experienced pain or discomfort in your upper abdomen?**
    - Yeah
    - No
    - If yes, what is the intensity of the pain?
        - Live
        - Moderate
        - Severe
2. **Have you felt burning in your stomach or chest?**
    - Yeah
    - No
3. **How often do you feel this burning or pain?**
    - Diary
    - Several times a week
    - Occasionally (once a month or less)
4. **Have you experienced nausea or vomiting?**
    - Yeah
    - No
5. **Have you noticed that your pain increases or decreases after eating?**
    - Increase
    - decreases
    - Doesn't change
6. **Have you had a feeling of bloating or fullness after eating?**
    - Yeah
    - No

Section 2: Medical History - Gastritis

7. **Do you have a history of gastric or duodenal ulcers?**
    - Yeah
    - No
8. **Has any member of your family been diagnosed with ulcers or gastritis?**
    - Yeah
    - No
9. **Have you been diagnosed with a *Helicobacter pylori*?**
    - Yeah
    - No

Section 3: Eating habits and lifestyle - Gastritis

10. **Do you frequently eat spicy, fatty or fried foods?**
    - Yeah
    - No
11. **How often do you consume alcohol?**
    - Diary
    - Weekly
    - Seldom
    - Never
12. **Do you smoke or have you smoked tobacco?**
    - Yeah
    - No
13. **Do you usually take non-steroidal anti-inflammatory drugs (NSAIDs) such as ibuprofen or aspirin?**
    - Yeah
    - No

Section 4: Psychosocial factors - Gastritis

14. **Have you experienced high levels of stress in your daily life recently?**
    - Yeah
    - No
15. **Have you had difficulty sleeping due to stomach pain or upset?**
    - Yeah
    - No

Section 5: History of previous treatments - Gastritis

16. **Have you received previous treatment for gastritis or related conditions?**
    - Yeah
    - No
    - If yes, what type of treatment have you received? (Select all that apply)
        - Medications prescribed by a doctor
        - Over-the-counter medications (antacids, proton pump inhibitors)
        - Diet changes
        - Others: _____

Diagnostic questionnaire for colitis

Instructions: Answer the following questions by selecting the option that best describes your situation.

Section 1: Symptoms - Colitis

1. **Have you experienced abdominal pain or cramps?**
    - Yeah
    - No
2. **How often do you experience abdominal pain?**
    - Every day
    - Several times a week
    - Occasionally (once a month or less)
3. **Have you had persistent or recurrent diarrhea?**
    - Yeah
    - No
4. **If you have had diarrhea, have you noticed blood or mucus in your stool?**
    - Yeah
    - No
5. **Have you had episodes of constipation alternating with diarrhea?**
    - Yeah
    - No
6. **Have you experienced abdominal bloating or distension?**
    - Yeah
    - No
7. **Have you noticed a constant urge to have a bowel movement, even after doing so?**
    - Yeah
    - No

Section 2: Medical History - Colitis

1. **Have you previously been diagnosed with an inflammatory bowel disease (such as ulcerative colitis or Crohn's disease)?**
    - Yeah
    - No
2. **Do you have a family history of ulcerative colitis, Crohn's disease, or other inflammatory bowel diseases?**
    - Yeah
    - No
3. **Have you been tested to rule out bacterial or parasitic infections as the cause of your symptoms?**
    - Yeah
    - No
4. **Have you been diagnosed with irritable bowel syndrome (IBS)?**
    - Yeah
    - No

Section 3: Dietary factors and habits - Colitis

1. **Have you noticed that certain foods (e.g., spicy, dairy, fatty) aggravate your symptoms?**
    - Yeah
    - No
2. **How often do you consume caffeinated or alcoholic beverages?**
    - Diary
    - Weekly
    - Seldom
    - Never
3. **Have you made any major changes to your diet recently?**
    - Yeah
    - No

Section 4: Psychosocial factors - Colitis

1. **Have you experienced high levels of stress in your daily life recently?**
    - Yeah
    - No
2. **Do you feel like stress or anxiety is making your digestive symptoms worse?**
    - Yeah
    - No
3. **Have you experienced fatigue or loss of energy in addition to intestinal symptoms?**
    - Yeah
    - No

Section 5: Previous Treatments - Colitis

1. **Have you received treatment for colitis or a related digestive condition before?**
    - Yeah
    - No
    - If yes, what type of treatment have you received? (Select all that apply)
        - Prescription medications (anti-inflammatories, immunosuppressants)
        - Over-the-counter medications (laxatives, antidiarrheals)
        - Diet changes
        - Others: _____

Qualitative Index of Gastrointestinal Health

From the answers to the questionnaire, a Qualitative Gastrointestinal Health Index (ICSG) can be calculated, which is classified into three levels: **Low**, **Moderate** and **High**. This index is based on the presence of symptoms, medical history, lifestyle risk factors, and psychosocial factors. The following describes how the score is assigned and how the index is interpreted:

1. Section Scoring

Each question is scored as follows:

- **Symptoms (Section 1)**:
  - Each affirmative answer (Yes) receives 1 point.
  - The intensity of the pain (Mild: 1 point, Moderate: 2 points, Severe: 3 points).
  - The frequency of burning or pain (Daily: 3 points, Several times a week: 2 points, Occasionally: 1 point).
  - If the pain increases after eating: 1 additional point.
- **Medical History (Section 2)**:
  - History of gastric or duodenal ulcers (Yes: 2 points).
  - Diagnosis of infection *Helicobacter pylori* (Yes: 2 points).
  - Family history of ulcers or gastritis (Yes: 1 point).
- **Eating habits and lifestyle (Section 3)**:
  - Frequent consumption of irritating foods (Yes: 1 point).
  - Alcohol consumption (Daily: 3 points, Weekly: 2 points, Rarely: 1 point, Never: 0 points).
  - Smoking tobacco (Yes: 2 points).
  - Use of NSAIDs (Yes: 2 points).
- **Psychosocial Factors (Section 4)**:
  - High stress (Yes: 1 point).
  - Difficulty sleeping due to an upset stomach (Yes: 1 point).
- **Previous Treatments (Section 5)**:
  - Previous treatment for gastritis (Yes: 1 point for each type of treatment received).

2. Classification of the Qualitative Gastrointestinal Health Index (ICSG)

- **High Gastrointestinal Health (Low ICSG)**: 0 - 5 points
  - The patient has few or no relevant symptoms, no significant medical history, and no major risk factors.
- **Moderate Gastrointestinal Health (Moderate ICSG)**: 6 - 15 points
  - The patient has some mild or moderate gastrointestinal symptoms and some lifestyle risk factors or medical history.
- **Low Gastrointestinal Health (High ICSG)**: 16 points or more
  - The patient has multiple symptoms, relevant medical history, and considerable lifestyle risk factors or significant stress.

3. Interpretation of the Index

- And **ICSG Low** indicates that the patient has good general gastrointestinal health, with low risk of gastritis or related complications.
- And **ICSG Moderate** indicates an intermediate risk, and it is advisable to make lifestyle changes and seek medical advice to prevent the development of gastritis.
- And **ICSG High** suggests a significant risk of gastritis or other gastrointestinal conditions, so a detailed medical evaluation is imperative.

Interpretation criteria for gastritis and colitis

1. Typical gastrointestinal symptoms of gastritis and colitis

The following symptoms are key to suspecting gastritis or colitis. If the patient answers yes to several of these questions, they may have a condition related to gastrointestinal inflammation, such as gastritis, dyspepsia, peptic ulcer, or colitis.

2. Relevant medical history

- Previous diagnosis of gastric or duodenal ulcers or inflammatory bowel diseases (ulcerative colitis, Crohn's).
- infection *Helicobacter pylori*.
- Family history of ulcers, gastritis or colitis.

3. Risk factors related to lifestyle

- Frequent consumption of irritating foods.
- Alcohol or caffeine consumption.
- Prolonged use of NSAIDs.

4. Emotional and mental health factors

- High stress and its relationship with digestive symptoms.
- Difficulty sleeping and fatigue related to gastrointestinal symptoms.

Conclusion

If a patient presents with multiple symptoms from sections 1 and 2, and has relevant risk factors from sections 3 and 4, there is a high probability that he or she suffers from gastritis, colitis, or both. A medical consultation is recommended to confirm the diagnosis through more specific tests, such as endoscopy, colonoscopy, stool tests, or tests to detect intestinal infections.

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Diagnostic questionnaire for metabolic syndrome

Instructions: Answer the following questions by selecting the option that best describes your situation.

Section 1: Anthropometric parameters

What is your waist circumference (measured just above your hips)?

Men:

Less than 94 cm

94-102 cm

More than 102cm

Women:

Less than 80cm

80-88 cm

More than 88cm

What is your body mass index (BMI)?

(BMI = weight [kg] / height [m]^2)

Less than 25 kg/m² (normal weight)

25-29.9 kg/m² (overweight)

30 kg/m² or more (obesity)

Section 2: History of hypertension

Have you been diagnosed with hypertension (high blood pressure)?

Yeah

No

If yes, how often is your blood pressure controlled (less than 130/85 mmHg) with or without medication?

Always

Sometimes

Never

Section 3: Lipid profile and blood glucose

What is your blood triglyceride level (measured on an empty stomach)?

Less than 150 mg/dL

150-199 mg/dL

More than 200 mg/dL

What is your HDL cholesterol ("good" cholesterol) level?

Men:

Less than 40 mg/dL

40 mg/dL or more

Women:

Less than 50 mg/dL

50 mg/dL or more

What is your fasting glucose level?

Less than 100 mg/dL

100-125 mg/dL (elevated glucose)

More than 126 mg/dL (diabetes)

Have you been diagnosed with insulin resistance or type 2 diabetes?

Yeah

No

Section 4: Lifestyle and family history

How often do you exercise (at least 150 minutes of moderate activity per week)?

Never

Sometimes

Regularly (weekly)

Do you have a family history of cardiovascular disease, type 2 diabetes, or metabolic syndrome?

Yeah

No

Section 5: General evaluation

Have you noticed weight gain around your waist in recent years?

Yeah

No

Have you experienced fatigue or lack of energy that interferes with your daily life?

Yeah

No

Interpretation:

The diagnosis of metabolic syndrome is based on the presence of at least three of the following criteria (NCEP ATP III, 2002):

Increased waist circumference: more than 102 cm in men or more than 88 cm in women.

High triglycerides: ≥150 mg/dL or being under treatment for high triglycerides.

Low HDL cholesterol: less than 40 mg/dL in men or less than 50 mg/dL in women.

High blood pressure: ≥130/85 mmHg or being under antihypertensive treatment.

Elevated fasting glucose: ≥100 mg/dL or diagnosis of diabetes.

If a patient meets at least three of these criteria, they may have metabolic syndrome and should see a doctor for complete evaluation and treatment.

Qualitative risk index for metabolic syndrome

To assess the risk of metabolic syndrome, a score will be assigned based on the answers to the questionnaire questions, dividing the risk into three categories: high, moderate and low.

- **Waist circumference**:
  - More than 102 cm (men) or more than 88 cm (women): 2 points
  - Between 94-102 cm (men) or between 80-88 cm (women): 1 point
  - Less than 94 cm (men) or less than 80 cm (women): 0 points
- **Body mass index (BMI)**:
  - 30 kg/m² or more: 2 points
  - 25-29.9 kg/m²: 1 point
  - Less than 25 kg/m²: 0 points
- **High blood pressure**:
  - Uncontrolled hypertension: 2 points
  - Sometimes controlled hypertension: 1 point
  - Without hypertension or always controlled: 0 points
- **Triglycerides**:
  - More than 200 mg/dL: 2 points
  - 150-199 mg/dL: 1 point
  - Less than 150 mg/dL: 0 points
- **Colesterol HDL**:
  - Less than 40 mg/dL (men) or less than 50 mg/dL (women): 2 points
  - Equal or greater than the limit: 0 points
- **fasting glucose**:
  - More than 126 mg/dL: 2 points
  - 100-125 mg/dL: 1 point
  - Less than 100 mg/dL: 0 points
- **Physical exercise**:
  - Never: 2 points
  - Sometimes: 1 point
  - Regularly: 0 points
- **Family history**:
  - Yes: 1 point
  - No: 0 points
- **Abdominal weight gain and fatigue**:

    - Yes to any: 1 point
    - No to both: 0 points

Risk scale:

- **High risk**: 10 points or more.
- **Moderate risk**: 5-9 points.
- **Low risk**: 0-4 points.

If the patient's score is in the high or moderate risk category, a medical consultation is recommended for a complete evaluation and consideration of lifestyle changes or specific treatments.

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Diagnostic questionnaire for well-being (Wellness)

Instructions: Answer the following questions by selecting the option that best describes your situation in the last four weeks.

Section 1: Physical Wellbeing

1. **How often do you do moderate physical activity (such as walking, swimming, cycling) for at least 30 minutes?**
    - Never
    - 1-2 times a week
    - 3-4 times a week
    - 5 or more times a week
2. **Do you sleep at least 7-8 hours a night regularly?**
    - Never

    - some nights
    - Most nights
    - Nightly
3. **How often do you eat a balanced diet that includes fruits, vegetables, lean proteins, and whole grains?**
    - Never
    - Sometimes
    - Most days
    - Every day
4. **How often do you experience physical pain or discomfort that interferes with your daily activities?**
    - Never
    - Seldom
    - Sometimes
    - Frequently

Section 2: Emotional and mental well-being

1. **Do you feel able to manage stress effectively?**
    - Never
    - Sometimes
    - Most of the time
    - Always
2. **How often do you experience feelings of happiness or personal satisfaction?**
    - Never
    - Seldom
    - Sometimes
    - Frequently
3. **Have you felt persistent anxiety or worry in recent weeks?**
    - Never
    - Sometimes
    - Frequently
    - Always
4. **How often do you have positive thoughts about your future or yourself?**
    - Never
    - Seldom
    - Sometimes
    - Frequently

Section 3: Social welfare

1. **Do you feel connected to or supported by friends, family or colleagues?**
    - Never
    - Seldom

    - Sometimes
    - Frequently
2. **How often do you participate in social or community activities that you enjoy?**
    - Never
    - Seldom
    - Sometimes
    - Frequently
3. **Do you have people in your life who you can turn to in times of need or to share important experiences?**
    - Never
    - Seldom
    - Sometimes
    - Frequently

Section 4: Occupational well-being and sense of purpose

1. **Are you satisfied with the balance between your work/study life and your personal life?**
    - Never
    - Seldom
    - Sometimes
    - Frequently
2. **Do you feel that your work or daily activities provide you with a sense of purpose or fulfillment?**
    - Never
    - Seldom
    - Sometimes
    - Frequently
3. **Do you feel motivated and energized to fulfill your daily responsibilities?**
    - Never
    - Seldom
    - Sometimes
    - Frequently

Section 5: Spiritual well-being and meaning of life

1. **Do you feel like your life has a clear purpose or is aligned with your values and beliefs?**
    - Never
    - Seldom
    - Sometimes
    - Frequently
2. **Do you engage in practices that foster your spiritual or personal growth (such as meditation, prayer, personal reflection)?**

    - Never
    - Seldom
    - Sometimes
    - Frequently

Qualitative well-being index

To assess overall well-being, a score will be assigned based on responses to questionnaire questions, dividing well-being into three categories: high, moderate and low.

- **Physical well-being**:
    - Physical activity never or 1-2 times a week: 2 points
    - Physical activity 3-4 times a week: 1 point
    - Physical activity 5 or more times per week: 0 points
    - Adequate sleep (never or some nights): 2 points
    - Adequate sleep (most or all nights): 0 points
    - Balanced diet (never or sometimes): 2 points
    - Balanced diet (most days or every day): 0 points
    - Frequent physical pain or discomfort: 2 points
    - Pain or physical discomfort rarely or never: 0 points
- **Emotional and mental well-being**:
    - Never handled stress: 2 points
    - Stress handled sometimes: 1 point
    - Stress managed most of the time or always: 0 points
    - Happiness rarely or never: 2 points
    - Happiness sometimes or frequently: 0 points
    - Frequent or always anxiety: 2 points
    - Anxiety rarely or never: 0 points
    - Positive thoughts rarely or never: 2 points
    - Positive thoughts sometimes or frequently: 0 points
- **Social welfare**:
    - Social connection rarely or never: 2 points
    - Social connection sometimes or frequently: 0 points
    - Participation in social activities rarely or never: 2 points
    - Participation in social activities sometimes or frequently: 0 points
    - Social support rarely or never: 2 points
    - Social support sometimes or frequently: 0 points
- **Occupational well-being and purpose**:
    - Dissatisfaction with work-life balance never or rarely: 2 points
    - Satisfaction with work-life balance sometimes or frequently: 0 points
    - Lack of purpose at work rarely or never: 2 points
    - Purpose at work sometimes or frequently: 0 points
    - Lack of motivation rarely or never: 2 points
    - Motivation sometimes or frequently: 0 points

- **Spiritual well-being**:
    - Lack of spiritual purpose rarely or never: 2 points
    - Spiritual purpose sometimes or frequently: 0 points
    - Lack of spiritual growth practices rarely or never: 2 points
    - Spiritual growth practices sometimes or frequently: 0 points

Well-being scale:

- **Low well-being**: 20 points or more.
- **Moderate well-being**: 10-19 points.
- **High well-being**: 0-9 points.

If the patient's score is in the low or moderate well-being category, a consultation with a professional is recommended to explore strategies that can improve the affected areas of well-being.

This questionnaire is an initial tool to identify possible risk factors for metabolic syndrome, but it does not replace a medical consultation or blood tests or other formal diagnostic tests.

Diagnostic questionnaire for gut microbiota dysbiosis

Instructions: Answer the following questions by selecting the option that best describes your situation in the last four weeks.

Section 1: Gastrointestinal symptoms

1. **Have you experienced episodes of diarrhea (watery or liquid stools) in the past few weeks?**
    - Never
    - Rarely (less than once a month)
    - Sometimes (once a week or less)
    - Frequently (more than once a week)
2. **Have you experienced constipation (difficulty passing stools or fewer than three bowel movements per week)?**
    - Never
    - Seldom
    - Sometimes
    - Frequently
3. **Do you experience abdominal bloating or excessive gas?**
    - Never
    - Seldom
    - Sometimes
    - Frequently

4. **Have you noticed changes in the appearance of your stool (very hard stool, very soft stool, unusual color)?**
    - Never
    - Seldom
    - Sometimes
    - Frequently

Section 2: Associated systemic symptoms

1. **Do you feel fatigue or tiredness without a clear cause?**
    - Never
    - Seldom
    - Sometimes
    - Frequently
2. **Have you experienced recurring headaches in recent weeks?**
    - Never
    - Seldom
    - Sometimes
    - Frequently
3. **Do you have frequent skin problems (acne, eczema, psoriasis, redness)?**
    - Never
    - Seldom
    - Sometimes
    - Frequently
4. **Have you had episodes of general malaise or feeling “out of place” in recent weeks?**
    - Never
    - Seldom
    - Sometimes
    - Frequently

Section 3: Eating habits and lifestyle

1. **Have you taken antibiotics in the last six months?**
    - Yeah
    - No
2. **Do you frequently consume processed foods, refined sugars or saturated fats?**
    - Yes, daily
    - Yes, a few times a week
    - Rarely
    - Never
3. **How often do you eat foods rich in fiber (fruits, vegetables, whole grains, legumes)?**
    - Never

    - Seldom
    - Sometimes
    - Daily
4. **Do you consume fermented foods or probiotics (yogur, kefir, sauerkraut, kimchi, kombucha)?**
    - Never
    - Seldom
    - Sometimes
    - Daily

Section 4: Emotional and mental health

1. **Have you experienced anxiety, depression, or sudden mood swings?**
    - Never
    - Seldom
    - Sometimes
    - Frequently
2. **Have you had difficulty concentrating or remembering recent things?**
    - Never
    - Seldom
    - Sometimes
    - Frequently
3. **Have you noticed increased stress or difficulty relaxing?**
    - Never
    - Seldom
    - Sometimes
    - Frequently

Section 5: General evaluation

1. **Have you noticed an increase in food intolerances (such as dairy or gluten)?**
    - Never
    - Seldom
    - Sometimes
    - Frequently
2. **Do you feel like you have less energy than normal or difficulty doing everyday activities?**
    - Never
    - Seldom
    - Sometimes
    - Frequently

Qualitative index of intestinal dysbiosis

To evaluate the risk of intestinal dysbiosis, a score will be assigned based on the answers to the questionnaire questions, dividing the risk into three categories: high, moderate and low.

- **Gastrointestinal symptoms**:
    - Episodes of diarrhea, constipation, bloating or changes in stool occur frequently: 2 points for each common symptom.
    - Occasional episodes (sometimes or rarely): 1 point for each symptom.
    - No symptoms (never): 0 points.
- **Associated systemic symptoms**:
    - Fatigue, headaches, skin problems, or general malaise occur frequently: 2 points for each common symptom.
    - Occasional episodes (sometimes or rarely): 1 point for each symptom.
    - No symptoms (never): 0 points.
- **Eating habits and lifestyle**:
    - Use of antibiotics in the last six months: 2 points.
    - Frequent consumption of processed foods or refined sugars: 2 points.
    - Rare or no consumption of fiber or fermented foods: 2 points.
    - Regular consumption of fiber and fermented foods: 0 points.
- **emotional and mental health**:
    - Frequent anxiety, depression, mood swings, difficulty concentrating, or stress: 2 points for each common symptom.
    - Occasional episodes (sometimes or rarely): 1 point for each symptom.
    - No symptoms (never): 0 points.
- **General evaluation**:
    - Increase in frequent food intolerances or lack of energy: 2 points for each frequent symptom.
    - Occasional episodes (sometimes or rarely): 1 point for each symptom.
    - No symptoms (never): 0 points.

Gut Dysbiosis Scale:

- **High risk of dysbiosis**: 20 points or more.
- **Moderate risk of dysbiosis**: 10-19 points.
- **Low risk of dysbiosis**: 0-9 points.

If the patient's score is in the high or moderate risk category, a consultation with a gut microbiota specialist is recommended for additional testing and strategies that can improve microbiome balance.

Diet characterization questionnaire

Instructions: Answer the following questions by selecting the option that best describes your typical situation. Think about your diet over the past 4 weeks.

Section 1: Consumption of products of animal origin

1. **Do you eat red meat (beef, pork, lamb) regularly?**
    - Never
    - Rarely (once a month or less)
    - a few times a week
    - Daily or almost every day
2. **Do you eat white meat (chicken, turkey, fish) regularly?**
    - Never
    - Seldom
    - a few times a week
    - Daily or almost every day
3. **Do you consume animal products such as dairy (milk, cheese, yogurt) or eggs regularly?**
    - Never
    - Seldom
    - a few times a week
    - Daily or almost every day

Section 2: Consumption of plant foods

4. **Do you consume fresh fruit daily?**
    - Never
    - Seldom
    - a few times a week
    - Diary
5. **Do you consume fresh or cooked vegetables daily?**
    - Never
    - Seldom
    - a few times a week
    - Diary
6. **How often do you consume legumes (beans, lentils, chickpeas, etc.)?**
    - Never
    - Seldom
    - a few times a week
    - Diary
7. **Do you eat whole grains (corn, oats, quinoa, brown rice, etc.)?**
    - Never
    - Seldom
    - a few times a week
    - Diary

Section 3: Fats and oils

8. **What type of fats do you consume most frequently in your diet? (Select all that apply)**
    - Vegetable oils (sunflower, corn, canola)
    - Olive oil or aguacate
    - Butter or lard
    - Animal fats (bacon, suet)
    - None of the above
9. **Do you eat avocado, nuts or seeds (almonds, walnuts, chia) regularly?**
    - Never
    - Seldom
    - a few times a week
    - Diary

Section 4: Consumption of processed foods and sugars

10. **How often do you eat processed foods (canned, packaged foods, sausages)?**
    - Never
    - Seldom
    - a few times a week
    - Daily or almost every day
11. **How often do you drink sugary drinks (soda, juice, sweetened tea)?**
    - Never
    - Seldom
    - a few times a week
    - Daily or almost every day
12. **How often do you consume desserts, sweets or industrialized bakery products?**
    - Never
    - Seldom
    - a few times a week
    - Daily or almost every day

Section 5: Dietary patterns and food culture

13. **How often do you eat typical foods of the traditional Mexican diet (corn tortillas, beans, chili, nopales, etc.)?**
    - Never
    - Seldom
    - a few times a week
    - Diary
14. **How often do you eat fried foods (such as tacos, fried quesadillas, French fries)?**
    - Never
    - Seldom
    - a few times a week
    - Daily or almost every day

15. **How often do you eat foods that could be considered part of the Mediterranean diet (olive oil, fish, fresh vegetables, nuts)?**
    - Never
    - Seldom
    - a few times a week
    - Daily or almost every day
16. **Have you followed any of the following diets in the last six months? (Select all that apply)**
    - Vegan diet (no animal products)
    - Vegetarian diet (no meat, but includes dairy and eggs)
    - Ketogenic diet (keto, high fat and low carb)
    - Mediterranean diet
    - Carnivorous diet (mainly meat and animal products)
    - Modern Western diet (high in processed foods, sugars and saturated fats)
    - Traditional rural diet (based on fresh, natural, minimally processed local foods)

Interpretation:

1. **Vegan diet**
    - **Criteria**:
        - The person selects "Never" in the questions about the consumption of meat (questions 1 and 2) and animal products (question 3).
        - The person selects "Never" or "Rarely" in the questions about consumption of dairy, eggs or any product of animal origin.
        - The consumption of plant foods (questions 4 to 6) is predominant, and the person consumes foods such as fruits, vegetables and legumes "daily" or "frequently."
2. **vegetarian diet**
    - **Criteria**:
        - The person selects "Never" or "Rarely" in the questions about red and white meat consumption (questions 1 and 2).
        - Select "A few times a week" or "Daily" in the question about consumption of non-meat animal products (question 3), such as dairy and eggs.
        - The person also has a high consumption of plant foods (questions 4 to 6).
3. **Carnivore diet**
    - **Criteria**:
        - The person selects "Daily or almost every day" in the consumption of red and/or white meat (questions 1 and 2).
        - Select "Never" or "Rarely" in the questions about consumption of fruits, vegetables and legumes (questions 4 to 6).
        - Select "Daily" or "Almost always" for the consumption of animal fats and animal products (questions 8 and 9).
        - The consumption of foods of plant origin is minimal.
4. **Ketogenic diet (keto)**

- **Criteria**:
  - The person selects "Daily or almost every day" for the consumption of fatty foods such as avocado, nuts, and animal fats (questions 8 and 9).
  - Select "Rarely" or "Never" when consuming carbohydrate-rich foods, such as whole grains or legumes (question 6).
  - Select "Rarely" or "Never" when consuming foods rich in sugar, such as sugary drinks and desserts (questions 11 and 12).

5. **modern western diet**
   - **Criteria**:
     - The person selects "Daily or almost every day" in the consumption of processed foods (question 10), sugary drinks (question 11) and industrial desserts/sweets (question 12).
     - Select "Rarely" or "Never" when consuming fresh plant foods such as fruits and vegetables (questions 4 and 5).
     - You may also have a high consumption of fried foods or foods high in saturated fats (question 14).
     - The consumption of fresh, whole and natural foods is low.
6. **Traditional rural diet**
   - **Criteria**:
     - The person selects "Daily" or "A few times a week" when consuming foods typical of the traditional Mexican diet (question 13), such as corn tortillas, beans, chili, and nopales.
     - Select "Daily" or "Frequently" for the consumption of whole grains and legumes (questions 6 and 7).
     - The consumption of processed foods (question 10) is low or absent, selecting "Rarely" or "Never".
     - The consumption of fried foods may be present, but not dominant.
7. **Mediterranean diet**
   - **Criteria**:
     - The person selects "Daily" or "Frequently" when consuming foods characteristic of the Mediterranean diet, such as olive oil, fish, fruits, vegetables and nuts (questions 4, 5, 8, 15).
     - Select "Rarely" or "Never" regarding the consumption of red meat and processed foods (questions 1, 10 and 14).
     - The consumption of fresh and minimally processed foods is predominant, with a low intake of sugary or industrialized foods.

Summary of criteria by type of diet:

1. **Vegan**: Does not consume products of animal origin; high intake of fruits, vegetables and legumes.
2. **Vegetarian**: Does not consume meat, but does consume dairy products and eggs; high consumption of plant foods.

3. **Carnivore**: High consumption of meat and animal products; low consumption of vegetables and carbohydrates.
4. **Ketogenic**: High intake of fats and proteins, with very low consumption of carbohydrates.
5. **Modern Western**: High intake of processed foods, sugars and saturated fats; low consumption of fresh foods.
6. **Traditional rural**: Predominant consumption of natural, fresh and typical foods of the Mexican diet, such as tortillas, beans and vegetables.
7. **Mediterranean**: Healthy fats predominate (olive oil), fish, fruits, vegetables and whole grains, with low consumption of red meat and processed foods.

References

1. **Willett, W. C., Sacks, F., Trichopoulou, A., Drescher, G., Ferro-Luzzi, A., Helsing, E., & Trichopoulos, D.** (1995). Mediterranean diet pyramid: a cultural model for healthy eating. *The American Journal of Clinical Nutrition*, 61(6), 1402S-1406S. https://doi.org/10.1093/ajcn/61.6.1402S
2. **Rodríguez-Ramírez, S., Mundo-Rosas, V., Jiménez-Aguilar, A., & Shamah-Levy, T.** (2011). Dietary patterns are associated with overweight and obesity in Mexican school-age children. *Public Health Nutrition*, 14(3), 1-8. https://doi.org/10.1017/S1368980010002218
3. **Fardet, A., & Rock, E.** (2020). Ultra-processed foods: A new holistic paradigm? *Trends in Food Science & Technology*, 101, 211-222. https://doi.org/10.1016/j.tifs.2020.05.018

This questionnaire has the objective of characterizing dietary patterns and must be complemented with a complete nutritional evaluation by a professional for a detailed and personalized assessment.

Diagnostic Questionnaire for Depression (based on DSM-5)

Instructions: In the last two weeks, how often have you experienced the following symptoms? Select the option that best describes your situation.

Section 1: Mood

1. **Have you felt sadness, emptiness, or hopelessness most of the day, almost every day?**
    - Never
    - A few days

    - More than half the days
    - almost every day
2. **Have you lost interest or pleasure in almost all the activities you used to enjoy?**
    - Never
    - A few days
    - More than half the days
    - almost every day

Section 2: Physical and cognitive symptoms

1. **Have you experienced sleeping problems (insomnia or oversleeping)?**
    - Never
    - A few days
    - More than half the days
    - almost every day
2. **Have you felt fatigued or low on energy?**
    - Never
    - A few days
    - More than half the days
    - almost every day
3. **Have you had significant changes in your appetite or weight (increase or decrease)?**
    - Never
    - A few days
    - More than half the days
    - almost every day
4. **Have you had difficulty concentrating or making decisions?**
    - Never
    - A few days
    - More than half the days
    - almost every day
5. **Have you felt agitated or had slower movements than normal?**
    - Never
    - A few days
    - More than half the days
    - almost every day

Section 3: Thoughts and emotions

1. **Have you experienced feelings of worthlessness or excessive guilt?**
    - Never
    - A few days
    - More than half the days
    - almost every day

2. **Have you had recurring thoughts of death, suicidal ideation, or suicide attempts?**
    - Never
    - A few days
    - More than half the days
    - almost every day

Section 4: Social and labor functioning

1. **Have you had significant difficulty functioning at work, school, or in social activities because of your symptoms?**
    - Never
    - A few days
    - More than half the days
    - almost every day

Depression Index Score

Allocation of points for frequency of symptoms:

- **Never**: 0 points
- **A few days**: 1 point
- **More than half the days**: 2 points
- **almost every day**: 3 points

Points will be assigned for each question and added to determine the level of severity of depression:

- **0-9 points**: Minimal depression or no relevant clinical symptoms.
- **10-19 points**: Mild depression.
- **20-29 points**: Moderate depression.
- **30-45 points**: Severe depression. Immediate professional attention is recommended.

References:

- American Psychiatric Association. (2013). Diagnostic and Statistical Manual of Mental Disorders (5th ed.). Arlington, VA: American Psychiatric Publishing. https://doi.org/10.1176/appi.books.9780890425596
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- Beck, A. T., Steer, R. A., & Brown, G. K. (1996). Beck Depression Inventory-II. San Antonio, TX: Psychological Corporation.

Diagnostic Questionnaire for Anxiety (based on DSM-5 and GAD-7)

Instructions: In the past two weeks, how often have you experienced the following symptoms? Select the option that best describes your situation.

Section 1: Emotional and cognitive symptoms

1. **Have you felt nervous, anxious or on the verge of a nervous breakdown?**
    - Never
    - A few days
    - More than half the days
    - almost every day
2. **Do you find it difficult to control your worry?**
    - Never
    - A few days
    - More than half the days
    - almost every day
3. **Have you felt excessively worried about everyday things, even when there is no clear reason for it?**
    - Never
    - A few days
    - More than half the days
    - almost every day

Section 2: Physical Symptoms

1. **Have you had difficulty relaxing?**
    - Never
    - A few days
    - More than half the days
    - almost every day
2. **Have you felt so restless that you find it difficult to stay still?**
    - Never
    - A few days
    - More than half the days
    - almost every day
3. **Have you felt like you get tired easily or lack energy for no apparent reason?**
    - Never
    - A few days
    - More than half the days
    - almost every day

4. **Have you had trouble sleeping, whether it's difficulty falling asleep, frequent awakenings, or unrefreshing sleep?**
    - Never
    - A few days
    - More than half the days
    - almost every day

Section 3: Social and labor functioning

1. **Have you had difficulty concentrating on everyday activities, such as work or school, due to anxiety?**
    - Never
    - A few days
    - More than half the days
    - almost every day
2. **Have you avoided social situations or activities for fear of feeling anxious or uncomfortable?**
    - Never
    - A few days
    - More than half the days
    - almost every day

Section 4: Impact on daily life

1. **How often have your anxiety symptoms prevented you from functioning well at work, school, home, or other important activities?**
    - Never
    - A few days
    - More than half the days
    - almost every day

Score for anxiety index

Allocation of points for frequency of symptoms:

- **Never**: 0 points
- **A few days**: 1 point
- **More than half the days**: 2 points
- **almost every day**: 3 points

Points will be assigned for each question and added to determine the level of anxiety severity:

- **0-9 points**: Minimal anxiety.
- **10-19 points**: Mild anxiety.

- **20-29 points**: Moderate anxiety.
- **30-45 points**: Severe anxiety. Immediate professional attention is recommended.

GAD-7 Score:

- 0-4: Minimal anxiety
- 5-9: Mild anxiety
- 10-14: Moderate anxiety
- 15-21: Severe anxiety

References:

- American Psychiatric Association. (2013). Diagnostic and Statistical Manual of Mental Disorders (5th ed.). Arlington, VA: American Psychiatric Publishing. https://doi.org/10.1176/appi.books.9780890425596
- Spitzer, R. L., Kroenke, K., Williams, J. B. W., & Löwe, B. (2006). A brief measure for assessing generalized anxiety disorder: The GAD-7. Archives of Internal Medicine, 166(10), 1092-1097. https://doi.org/10.1001/archinte.166.10.1092

Combined score for the mental health index

The combined score is obtained by adding the scores from the depression and anxiety questionnaires. This will provide a total value that will be classified as follows:

- **0-18 points**: Adequate mental health. Low probability of clinically significant anxiety disorder or depression.
- **19-39 points**: Moderate risk of mental health problems. Monitoring and possible preventive interventions are recommended.
- **40-90 points**: High risk of mental health problems. An immediate professional evaluation is recommended to confirm the diagnosis and design an appropriate treatment plan.
- **High risk of mental health problems**:
    - The patient has five or more symptoms of depression (with at least one of the key symptoms) and/or five or more frequent anxiety symptoms ("more than half the days" or "almost every day").
    - The symptoms significantly affect daily life, such as work, social or academic functioning.
- **Moderate risk of mental health problems**:
    - The patient presents between three and four symptoms of depression or anxiety, with symptoms present several times a week, and there is moderate interference with daily life.
- **Low risk of mental health problems**:
    - The patient has fewer than three symptoms, which occur occasionally, and do not appear to significantly interfere with daily life.

If the score is in the high or moderate risk category, an immediate professional evaluation is recommended to confirm the diagnosis and design an appropriate treatment plan.

Physical Fitness Quiz

This questionnaire is designed to evaluate a person's general physical condition and their ability to perform physical activities. It assesses different dimensions of physical fitness, such as cardiovascular endurance, muscular strength, flexibility, and physical activity habits.

Instructions: Answer the following questions based on your current physical habits and abilities.

Section 1: Cardiovascular Endurance

1. **How often do you do moderate cardiovascular exercise (brisk walking, jogging, swimming, cycling) for at least 30 minutes?**
    - Never
    - 1-2 times a week
    - 3-4 times a week
    - 5 or more times a week
2. **How long can you maintain continuous aerobic activity without feeling excessively fatigued?**
    - less than 10 minutes
    - Between 10 and 20 minutes
    - Between 20 and 30 minutes
    - More than 30 minutes
3. **Do you have difficulty climbing stairs or walking moderate distances without feeling fatigued or short of breath?**
    - Never
    - Seldom
    - Sometimes
    - Frequently

Section 2: Muscular Strength and Endurance

4. **How many days a week do you do muscle strength exercises (lifting weights, using resistance bands, body weight exercises)?**
    - Never
    - 1-2 times a week
    - 3-4 times a week
    - 5 or more times a week
5. **How many push-ups can you do continuously?**
    - None
    - 1-5

    - 6-15
    - More than 15
6. **How many squats can you do without stopping?**
    - less than 10
    - 10-20
    - 21-30
    - More than 30

Section 3: Flexibility

7. **How often do you do stretching or flexibility exercises (yoga, static stretching, etc.)?**
    - Never
    - 1-2 times a week
    - 3-4 times a week
    - 5 or more times a week
8. **Can you touch your toes without bending your knees?**
    - Yeah
    - No
9. **Do you feel stiffness in your joints (back, hips, shoulders) when performing everyday movements?**
    - Never
    - Seldom
    - Sometimes
    - Frequently

Section 4: Physical activity habits

10. **How often do you do activities that involve physical effort (physical work, sports, active recreation)?**
    - Never
    - Seldom
    - a few times a week
    - Daily or almost daily
11. **Do you think your level of physical activity is sufficient to maintain good health?**
    - Yeah
    - No
12. **Do you feel motivated to exercise regularly?**
    - Yeah
    - No

Interpretation of the results

1. Cardiovascular resistance

- **High cardiovascular fitness**: If you perform aerobic exercise at least 3-4 times a week (Question 1), can maintain aerobic activity for more than 20 minutes (Question 2), and rarely feel fatigued when climbing stairs or walking (Question 3), you have a good cardiovascular resistance.
- **Moderate cardiovascular fitness**: If you do cardiovascular exercise 1-2 times a week, you can maintain aerobic activity for 10 to 20 minutes, but you may feel moderate fatigue when doing everyday activities.
- **Low cardiovascular fitness**: If you rarely perform cardiovascular exercise, have difficulty maintaining continuous activity for more than 10 minutes, and frequently experience fatigue in basic activities such as climbing stairs.

2. Muscle strength and endurance

- **High muscle strength**: If you do muscle strength exercises 3-4 times a week (Question 4), can do more than 15 push-ups and more than 30 squats (Questions 5 and 6), you have excellent muscle fitness.
- **Moderate muscle strength**: If you can do 6-15 push-ups and 20-30 squats, and do strength exercises 1-2 times a week, your muscle strength is moderate.
- **Low muscle strength**: If you do not perform strength exercises regularly, and you can do less than 5 push-ups or less than 10 squats, your muscle strength and endurance are low.

3. Flexibility

- **High flexibility**: If you stretch 3-4 times a week (Question 7), can touch your toes without bending your knees (Question 8), and rarely feel joint stiffness (Question 9), you have good flexibility aptitude.
- **Moderate flexibility**: If you perform flexibility exercises 1-2 times a week, but experience some joint stiffness, your flexibility is acceptable, but could improve.
- **Low flexibility**: If you rarely or never stretch and experience frequent stiffness, your flexibility is low.

4. Physical activity habits

- **High physical activity habits**: If you engage in physical activity on a daily or near-daily basis (Question 10) and feel motivated to exercise regularly (Question 12), you are maintaining an active lifestyle that promotes good overall health.
- **Moderate physical activity habits**: If you are physically active a few times a week, but do not always feel motivated to exercise or believe that your activity level is not enough (Question 11), you have a moderately active lifestyle, but may benefit from an increase in frequency or intensity of physical activities.

- **Low physical activity habits**: If you rarely engage in physical activity, do not feel motivated to exercise, and feel that your activity level is not enough, you need to incorporate more physical activity into your daily routine to improve your health.

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This questionnaire is a preliminary tool to evaluate physical fitness. It is not a substitute for a complete physical evaluation by a health or exercise professional. For personalized exercise recommendations, you should consult with a certified trainer or medical specialist.

Sleep quality questionnaire

This questionnaire is designed to evaluate the quality of a person's sleep and detect possible problems that could be affecting rest. It focuses on different aspects of sleep, such as duration, efficiency, problems associated with sleep, and impact on daily life.

Instructions: Please answer the following questions regarding your sleep experience over the past month.

Section 1: Duration and regularity of sleep

1. **How many hours do you usually sleep per night on average?**
    - less than 5 hours
    - 5-6 hours
    - 6-7 hours
    - 7-8 hours
    - More than 8 hours
2. **What time do you usually go to sleep?**
    - Before 10 p.m.
    - Between 10 pm and 11 pm
    - Between 11 pm and midnight
    - after midnight

3. **How often do you change your sleep schedule (go to bed or wake up at different times)?**
    - Never
    - Seldom
    - Sometimes
    - Frequently

Section 2: Perceived sleep quality

4. **How would you describe your overall sleep quality?**
    - Very good
    - Good
    - Regular
    - She had
5. **How often do you wake up during the night (for any reason)?**
    - Never
    - 1 time per night
    - 2 times a night
    - 3 or more times a night
6. **How long does it usually take you to fall asleep after going to bed?**
    - Less than 15 minutes
    - Between 15 and 30 minutes
    - Between 30 and 60 minutes
    - More than 60 minutes
7. **Do you feel like you get enough sleep to feel rested the next day?**
    - Always
    - Most of the time
    - Sometimes
    - Seldom

Section 3: Problems associated with sleep

8. **How often do you have trouble falling asleep or staying asleep?**
    - Never
    - Seldom
    - Sometimes
    - Frequently
9. **Have you experienced nightmares or dreams that interrupt your rest?**
    - Never
    - Seldom
    - Sometimes
    - Frequently
10. **Do you wake up with a dry mouth, headache, or feeling tired?**
    - Never

    - Seldom
    - Sometimes
    - Frequently

Section 4: Impact on daily life

11. **Do you feel drowsy during the day that interferes with your daily activities?**
    - Never
    - Seldom
    - Sometimes
    - Frequently
12. **Do you have difficulty concentrating or staying alert during the day due to lack of sleep?**
    - Never
    - Seldom
    - Sometimes
    - Frequently
13. **Have you felt that the quality of your sleep affects your mood or relationships with others?**
    - Never
    - Seldom
    - Sometimes
    - Frequently

Interpretation of the results

Sleep quality can be affected by a combination of factors such as duration, ease of falling asleep, number of nighttime awakenings, and impact on daily life. Below are the criteria for interpreting the results of the questionnaire.

1. Duration and regularity of sleep

- **Appropriate duration**: Sleep between **7-8 hours** per night is considered optimal for most adults. If the patient selects this option, their sleep duration is adequate. If you sleep less than 6 hours (Question 1), this may indicate problems related to insufficient sleep.
- **regular sleep schedule**: Going to bed at the same time each night and waking up at the same time regularly is crucial for good quality sleep. If the patient changes their sleep schedule frequently (Question 3), this may negatively affect the circadian rhythm.

2. Perceived quality of sleep

- **High sleep quality**: If the patient reports that their sleep quality is "Very good" or "Good" (Question 4) and feels rested when they wake up (Question 7), their sleep quality is optimal.

- **Problems with sleep quality**: If the patient takes more than 30 minutes to fall asleep (Question 6) or wakes up more than 2 times a night (Question 5), there may be problems with sleep quality. This indicates a disturbance in the sleep cycle that may be relevant to disorders such as insomnia.

3. Problems associated with sleep

- **insomnia problems**: If the patient reports having problems falling or staying asleep frequently (Question 8) or wakes up feeling fatigued or headache (Question 10), this may be indicative of an insomnia or sleep apnea problem.
- **Nightmares**: If the patient has recurrent nightmares (Question 9), this could be affecting sleep quality and should be considered in the evaluation.

4. Impact on daily life

- **Daytime sleepiness**: If the patient reports feeling sleepy during the day (Question 11) or having difficulty concentrating (Question 12), this may be a sign of non-restorative sleep or a significant alteration in the sleep pattern.
- **mood**: If the patient feels that the quality of their sleep is affecting their mood or their relationships with others (Question 13), this suggests that lack of sleep is negatively impacting their emotional and social well-being.

Criteria for general interpretation

High sleep quality:

- The patient sleeps 7-8 hours per night, goes to bed and wakes up at the same time most nights, describes his sleep quality as "Good" or "Very Good," and reports no frequent problems falling asleep. or interruptions during the night. The patient also feels rested during the day and does not experience drowsiness or difficulty concentrating.

Moderate sleep quality:

- The patient sleeps between 6-7 hours per night and may experience occasional sleep interruptions (night awakenings or difficulties falling asleep). The impact on daily life is moderate, but you may still feel some fatigue or drowsiness during the day. The patient may need to improve sleep hygiene to optimize their rest.

Poor sleep quality:

- The patient sleeps less than 6 hours per night, has frequent awakenings during the night, or takes more than 30 minutes to fall asleep. Additionally, you experience daytime sleepiness, difficulty concentrating, and feel that insufficient sleep affects your mood or daily performance. In this case, a sleep disorder may be present, such as chronic insomnia or sleep apnea, and a medical evaluation is recommended.

References

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This questionnaire can provide a preliminary insight into a patient's sleep quality, but is not a substitute for a complete clinical evaluation. If a patient has persistent problems with sleep, a consultation with a doctor or sleep disorders specialist should be considered.