

Exploring the Psychological Distress and Struggles Faced by Women with Iron Deficiency

Trisha Vaz

Oberoi international school JVLR
Mumbai, India
trisha.vaz22@gmail.com

Reetu Jain

On My Own Technology
Mumbai, India
reetu.jain@onmyowntechnology.com

Abstract— Iron deficiency, a pervasive nutritional concern on a global scale, has traditionally received attention for its physical health implications. However, the emotional impact of iron deficiency, particularly among women, remains an underexplored aspect. In this extensive research undertaking, we set out to explore the complex interplay between iron deficiency, anemia, and the emotional distress that women grappling with these conditions may encounter. Our research benefits from a diverse dataset that contains a wealth of demographic, diagnostic, and psychological information, enriching our exploration. Our study takes a comprehensive approach, driven by a desire to address fundamental questions that go beyond mere diagnosis. To kickstart our investigation, we begin by examining the prevalence of iron deficiency diagnoses within our group of participants, giving us an all-encompassing view of its presence in the population. Going beyond this, we delve into the distribution of severity levels among those dealing with this condition, shedding light on the varying degrees of its impact. Furthermore, we take a closer look at the duration of symptoms experienced by these women, offering valuable insights into the enduring challenges they confront. As we strive to reveal the emotional dimension of iron deficiency, we delve deeply into the psychological distress that women affected by this condition may endure. This pivotal aspect of our study brings to light the emotional and mental challenges that are frequently concealed beneath the surface. We also venture into the coping strategies employed by our participants, giving us a glimpse into the adaptive mechanisms they employ to navigate the complexities posed by iron deficiency. By using advanced techniques to group people based on shared characteristics, we uncover different types of participants in our study. These profiles help us see how a person's diagnosis, their emotional distress, and how they cope are all connected. It gives us a better understanding of how different things come together and affect someone dealing with iron deficiency. In short, our research takes a big step forward in understanding iron deficiency by showing how it affects a person emotionally. We want to use what we've learned to help people better by suggesting ways to support them. This reminds us of the importance of taking care of both the body and the emotions when dealing with iron deficiency, with the goal of improving

the overall well-being and quality of life for women facing this condition.

Keywords—Iron deficiency, Anemia, Psychological distress, Women's health, Nutritional deficiency, Holistic Healthcare

I. INTRODUCTION

Iron deficiency, a prevalent nutritional deficiency worldwide, has been recognized not only for its physiological impact but also for its potential psychological ramifications. This research delves into the intricate interplay between iron deficiency, anemia, and the psychological distress experienced by women grappling with this condition. The study investigates the multifaceted dimensions of the distress, shedding light on coping strategies employed by these individuals. Through a comprehensive analysis of a dataset encompassing a spectrum of information, this research aims to uncover the nuanced struggles and psychological challenges faced by women affected by iron deficiency. The dataset, rich in its diversity, comprises a collection of responses encompassing various aspects pertinent to the experiences of women with iron deficiency. From demographic information like age and occupation to diagnostic details such as severity and duration, the dataset provides a panoramic view of the participants' journey. Additionally, the dataset delves into the realm of psychological experiences, capturing the range of distresses encountered, and the strategies harnessed to navigate through these challenges. In pursuit of understanding this intricate relationship, this research zeroes in on several key questions that drive the exploration. These questions guide the analysis towards elucidating the prevailing psychological distresses, identifying common coping mechanisms, and deciphering potential patterns within the dataset. The initial query delves into the prevalence of iron deficiency diagnoses among the participants. Unveiling this foundational statistic sets the stage for a deeper investigation into the experiences of those diagnosed. Following this, the distribution of severity levels of iron deficiency further enriches our

understanding of the spectrum of this condition. Duration, as a crucial dimension, reveals insights into the persistence of symptoms and informs the potential impact on mental well-being. The heart of this research lies in the exploration of psychological distresses encountered by women with iron deficiency. The identification of prevalent distresses, coupled with individual responses that may offer unique perspectives, paints a holistic picture of the emotional upheaval faced by these individuals. In tandem with distress, the coping strategies employed to navigate these challenges are probed, uncovering both conventional and distinctive methods of addressing psychological distress. Moreover, this research ventures into the realm of clustering analysis to uncover latent patterns within the dataset. By grouping participants based on their responses, this approach unveils distinct profiles, potentially offering insights into the interaction between diagnosis, distress, and coping mechanisms. In conclusion, this research embarks on a journey to decipher the intricate relationship between iron deficiency, anemia, and psychological distress. By meticulously analyzing a comprehensive dataset, the study aims to shed light on the often unseen struggles faced by women affected by iron deficiency. The insights garnered from this exploration not only contribute to scientific knowledge but also hold the potential to inform interventions, support strategies, and further avenues of research aimed at addressing the holistic well-being of these individuals.

II. LITERATURE REVIEW

Iron deficiency, a global health concern, has significant physiological and psychological implications. Recent research highlights its often-overlooked emotional impact on women. This review synthesizes 17 studies, exploring the relationship between iron deficiency and psychological distress. It aims to enhance understanding and support for affected women, promoting holistic well-being. This review advances our understanding of the complex interplay between iron deficiency and psychological distress, contributing to evidence-based interventions, support strategies, and future research. It fosters a more holistic approach to the well-being of women affected by this common yet intricate condition.

In a survey conducted by Shinsuke Hidese et al. [1], 11,876 Japanese participants were studied to investigate the relationship between iron-deficiency anemia and depression. The study included 1,000 individuals with self-reported depression and 10,876 controls. The results revealed higher rates of anemia among depressed individuals, with men showing a rate of 7.2% compared to 4.0% in controls, and women exhibiting a rate of 33.4% compared to 25.8% in controls. Iron-deficiency anemia was found to be correlated with elevated K6 distress scores in both groups. Those with anemia had higher odds (OR 1.47) of experiencing K6 distress scores of ≥ 13 . Regression

analysis confirmed the connections between anemia, a history of depression, and K6 scores. This study underscores the link between anemia, depression, and psychological distress, emphasizing the importance of holistic health management. Kallich JD et al. [2] investigated the relationship between chemotherapy-induced anemia, fatigue, and psychological distress in solid tumor cancer patients. They conducted two clinical trials to assess the efficacy of darbepoetin alfa, which involved administering questionnaires to evaluate psychological outcomes. Patients who experienced a hemoglobin increase of ≥ 2 g/dL demonstrated significant improvements in FACT-Fatigue scores (55.0% vs. 39.8%; $P = .0004$) and related psychological outcomes ($P < .0001$). This improvement included mean change scores of 8.2 for BSI Depression and 7.7 for BSI Anxiety, respectively. Enhancing hemoglobin levels in anemic, chemotherapy-treated patients has the potential to positively impact fatigue, depressive symptoms, anxiety, helplessness, and overall health.

Anthony Lopez et al. [3] emphasize the global impact of anemia, which affects a third of the world's population, with half of cases resulting from iron deficiency. Populations particularly at risk include children aged 0–5 years, women of childbearing age, and pregnant women. Iron deficiency anemia often accompanies chronic illnesses such as kidney disease, heart failure, cancer, and inflammatory bowel disease. Improved diagnostic methods include measurements of serum ferritin, transferrin saturation, and soluble transferrin receptors. Strategies for addressing anemia involve identifying its causes, prevention through fortification and supplementation, as well as treatment with oral or intravenous iron. Future developments may include the use of hepcidin for both diagnosis and therapy. This seminar comprehensively covers the clinical presentation, epidemiology, diagnosis, management, and research gaps related to iron deficiency anemia. Betsy Lozoff et al. [4] research highlights the global prevalence of iron deficiency (ID) in pregnant women and infants. Their studies, spanning rodent models and humans, reveal that gestational and lactational ID impacts neurodevelopment, neurotransmitters, myelination, and genes/proteins. Infants with ID anemia exhibit lower cognitive, motor, and socio-emotional development. The inconsistent impact of iron therapy prompts a focus on prevention through early supplementation. This underscores the vital role of countering ID for brain development, which is relevant to understanding psychological distress in women with iron deficiency. M. R. Lokeshwar et al. [5] address the global health significance of anemia. Iron deficiency anemia (IDA) is prevalent worldwide, particularly in developing countries, affecting various demographic groups. Their research highlights the importance of prevention strategies, including dietary education, modification, fortification, infection control, and iron supplementation. Achieving success in reducing IDA involves targeted oral iron supplementation and optimizing healthcare

infrastructure. This perspective contributes to a broader understanding of addressing psychological distress in women with iron deficiency.

The study conducted by Fatin Al-Sayes et al. [6] sheds light on the prevalence of iron deficiency and iron deficiency anemia among Saudi female university students. Out of 310 participants aged 18 to 23, 25.9% had deficient iron stores, and 23.9% experienced iron deficiency anemia, compared to a 50.2% control group. Correlations were found between iron deficiency, anemia, inadequate meat intake, impaired exercise capacity, pallor, and a history of past iron deficiency. These findings underscore the significance of implementing screening, education, and intervention programs targeting high-risk female groups. The study emphasizes the need for strategies such as iron supplementation and fortified foods to address this common health concern. These insights contribute to our understanding of the connection between iron deficiency, psychological well-being, and women's health management. In their extensive research, Hira E. Shah et al. [7] explore the profound impact of severe iron deficiency anemia during infancy on various aspects of health and neurological function. This deficiency is linked to issues such as mental, motor, social, emotional, neurophysiological, and neurocognitive dysfunction. Interestingly, the behavioral repercussions extend beyond infancy to adulthood, with some patterns persisting from childhood. Iron deficiency leads to a spectrum of behaviors, including wariness, diminished positive affect, and reduced social engagement in infants and children. In adulthood, it contributes to conditions such as anxiety, depression, cognitive challenges, and psychological disorders. These behavioral effects are intricately tied to brain regions like the hippocampus and corpus striatum, as well as neurotransmitters such as serotonin, noradrenaline, and dopamine. The findings highlight the lasting impact of iron deficiency, underscoring the importance of early intervention and comprehensive management for women dealing with iron deficiency. Uğur Tekin et al. [8] conducted a cross-sectional case-control study aimed at investigating anxiety levels, emotional and behavioral problems, self-esteem, and quality of life (QoL) in adolescents with iron deficiency (ID) and iron deficiency anemia (IDA). The study included 115 adolescents aged 12–17 years, categorized into ID, IDA, and healthy control groups. Psychosocial assessments were performed using the Strengths and Difficulties Questionnaire, Rosenberg Self-esteem Scale, Pediatric QoL Inventory, and Screen for Child Anxiety-Related Emotional Disorders. The study revealed that adolescents with IDA had higher anxiety levels compared to healthy controls. The QoL scores of adolescents with IDA were lower in total, physical, and psychosocial domains than those with ID or healthy controls. Notably, total iron binding capacity showed correlations with total and psychosocial QoL, self-esteem, and anxiety scores. These findings indicate that adolescents with IDA experience challenges related to anxiety and QoL. Therefore, a

psychosocial evaluation for adolescents with IDA is recommended.

Rae Galloway et al. [9] addressed the significant issue of maternal anemia and iron supplementation programs in developing countries. Despite policies promoting iron supplements for pregnant women, the prevalence of maternal anemia remains high. The researchers conducted qualitative research across multiple countries to identify barriers and facilitators to iron supplementation. Findings revealed that women often recognize anemia symptoms but lack knowledge of the term "anemia." While half of the women view symptoms as a priority, others do not. Inadequate supply, counseling, and distribution of iron tablets, along with barriers to accessing prenatal care services, contribute to program challenges. Facilitators include improved physical well-being, appetite, and benefits for both the mother and fetus. This research underscores the importance of understanding women's perceptions and experiences with iron supplementation to effectively address the psychological distress and struggles linked to iron deficiency during pregnancy.

Elias Jimenez et al. [10] conducted a longitudinal study aiming to assess the long-term effects of iron deficiency in infancy. This research followed children who were tested and treated for iron deficiency during infancy in a Costa Rican community. Participants, now 11 to 14 years old, were evaluated for cognitive, socioemotional, and motor outcomes, along with school functioning. Results revealed that children with chronic, severe iron deficiency during infancy exhibited lower mental and motor functioning scores. Even after accounting for background factors, significant differences persisted in areas such as arithmetic achievement, written expression, motor skills, and specific cognitive processes like spatial memory and selective recall. More of the previously iron-deficient children repeated grades or received special services, with parents and teachers noting increased concerns about anxiety, depression, social issues, and attention problems. This study underscores the enduring impact of early-life iron deficiency on various aspects of development and psychological well-being. Jonghan Kim et al. [11] delve into the vital role of iron in behavioral organization. Their study emphasizes that iron deficiency not only affects brain myelination and monoamine metabolism but also disrupts glutamate and γ -aminobutyric acid homeostasis. Consequently, cognitive deficits, motor skill impairment, and emotional/psychological issues emerge. The review highlights the intricate interplay between energy metabolism, neurotransmitter balance, and emotional behavior. Brain iron status influences both of these functions, ultimately impacting emotional well-being. The multifactorial nature of this relationship is explored, including brain region-specific effects, neurotransmitter modulation, temporal/regional iron requirements, oxidative stress, gender-based metabolism differences, and metal interactions. In the context of exploring emotional behavior and mental health, this review delves into the

connection between iron metabolism and anxiety-related pathologies. It underscores the importance of understanding the intricate role of brain iron in emotional well-being, shedding light on potential mechanisms underlying psychological distress linked to iron deficiency.

Christian Berthou et al. [12] emphasize the multi-dimensional impact of iron deficiency (ID) on physiological functions beyond disrupted hemoglobin synthesis. They highlight symptoms like fatigue, muscle weakness, altered exercise capacity, emotional and behavioral changes, often seen in the context of ID, irrespective of hemoglobin levels. The link between depression and absolute ID (AID) is frequently overlooked, although essential for neurotransmitter synthesis, particularly serotonin, dopamine, and noradrenaline, which play roles in emotional behaviors. The authors note the role of iron as a cofactor for neuron aromatic hydroxylases, impacting neurotransmitter function. Noradrenaline's influence on neuroplasticity through brain-derived neurotrophic factor (BDNF) is significant for prefrontal and hippocampus neurons involved in depression. While quantifying intracerebral iron remains challenging, single-photon emission computed tomography (SPECT) aids neurotransmission pathway exploration. The study suggests that even in non-anemic states, evaluating blood iron status is crucial, particularly in treatment-resistant, iron-deficient young women with depression. The prevalence of AID should be considered in patients with depression for suitable treatment strategies encompassing anti-depressive interventions and iron supplementation if necessary.

Marie-Ange Grondin et al. [13] conducted a cross-sectional study involving 543 female students to examine the relationship between iron deficiency and Health-related Quality of Life (HRQoL). The study revealed a prevalence of 19.3% for iron deficiency and 11.4% for borderline iron status. Among various dimensions assessed by the SF-36 questionnaire, the 'general health' dimension showed a significant difference between iron-deficient and iron-replete female students ($p = 0.015$). The findings suggest that iron deficiency might impact the perceived general health of female students. The study calls for further research in this area to better understand its implications for women's psychological well-being. Takako Sawada et al. [14] conducted a study focusing on iron deficiency without anemia or Iron Deficient No Anemia (IDNA) and its association with mental and somatic symptoms among young women. Using the Japanese version of the Cornell Medical Index Health Questionnaire (CMI-J), they investigated the relationship between IDNA and various symptoms. Data from 76 women aged 18–22 were collected and categorized into IDNA, iron deficiency anemia (IDA), and normal iron status groups. The study revealed that sections related to mental complaints (M–R) were notably higher in IDNA subjects compared to those

with normal iron status. Additionally, sections related to fatigue (I), anger (Q), and tension (R) were significantly elevated in IDNA subjects compared to those with normal iron status. Moreover, young women with IDNA exhibited a higher proportion of neurotic tendencies. Notably, the intake frequency of canned or bottled green tea fortified with vitamin C was higher in IDNA subjects. These findings suggest a potential link between IDNA and symptoms such as anger, fatigue, and tension in women of childbearing age.

III. PROPOSED METHODOLOGY

A. Data Collection

The data collection phase forms the bedrock of our research, providing a rich and multifaceted dataset. Each column offers a unique perspective, contributing to our comprehensive understanding of iron deficiency/anemia's prevalence, severity, impact, and coping mechanisms among participants. Our next steps involve data preprocessing, ensuring the dataset is ready for in-depth analysis. In this research project, the initial and critical step is data collection. The dataset under investigation encompasses several dimensions, each carrying valuable information contributing to our understanding of iron deficiency/anemia among the participants.

The dataset's "Timestamp" column imbues our analysis with temporal context, permitting the chronological examination of responses. This temporal dimension is pivotal for detecting potential shifts in perceptions and experiences over time. Although the "Name" column is discretionary, it confers a human dimension upon the dataset by linking responses to individuals. It's noteworthy that some names may be absent, underscoring the imperative of robust anonymization practices. The demographic variable "Age," housed in the respective column, serves as a linchpin in our analysis. It facilitates an exploration of the prevalence and repercussions of iron deficiency/anemia across diverse age strata. Younger participants may illuminate early intervention strategies, while older participants might proffer insights into long-term experiences. The "Occupation" column casts light on the dataset's respondent diversity, offering insight into how various professions intersect with iron deficiency/anemia. It empowers us to investigate whether specific occupations are more susceptible to this condition or harbor unique coping mechanisms. While the "Contact Details" field is both optional and sensitive, it serves as a reminder of the ethical imperatives governing data collection. Prudent handling is paramount, ensuring the safeguarding of privacy and data security. At the crux of our inquiry resides the "Diagnosis" column, dichotomizing participants into those diagnosed with iron deficiency/anemia and those without. This binary categorization constitutes the bedrock of our analysis. For the diagnosed individuals, the "Severity" column enriches our

understanding by delineating the intensity of their condition, guiding the tailoring of interventions and support systems. The "Duration" column illuminates the duration of participants' symptom experiences, aiding in the identification of trends, including whether prolonged experiences correlate with reporting specific psychological distresses. Venturing beyond the medical realm, the "Psychological Distress" column lays bare the emotional and psychological toll exacted by iron deficiency/anemia. This variable is pivotal in comprehensively evaluating the impact of the condition on participants' overall well-being. The "Coping Strategies" dimension delves into how individuals navigate the psychological distress induced by iron deficiency/anemia, providing valuable insights into their resilience and adaptability. Lastly, "Additional Comments" serves as an open-ended channel for participants to convey unique insights or experiences not encapsulated by predefined categories. These unstructured comments enhance our analysis, potentially unveiling novel and unanticipated themes within the dataset.

B. Data Preprocessing

In essence, data preprocessing is the unsung hero of our research. It transforms raw data into a refined, structured, and ethically handled dataset, setting the stage for meaningful insights. Once the data is preprocessed, we proceed to the methodology phase, where we employ various techniques to answer our research questions. Following the meticulous data collection process, our research journey proceeds to the crucial phase of data preprocessing, an indispensable bridge that transforms raw data into a clean and analytically ready format. Data preprocessing is pivotal for ensuring the dataset's robustness and preparing it for meaningful analysis. One of the initial steps in this phase involves addressing missing values, notably the optional "Name" column, which sometimes results in absent participant names. In preserving data integrity and considering privacy, we contemplate anonymizing or excluding these entries while maintaining anonymity. Moreover, ethical considerations take precedence when handling the "Contact Details" column, housing sensitive information. Stringent privacy measures necessitate meticulous treatment, potentially involving anonymization or redaction to safeguard participant identities. The accuracy and consistency of the "Age" variable require validation, as extreme or implausible age values could signify data entry errors. Ensuring that age values fall within a reasonable range is essential to underpin meaningful analysis. Our study heavily relies on the "Severity" and "Duration" columns, mandating verification of appropriate formatting and adherence to expected ranges. Detecting and addressing outliers or inconsistencies in these columns is paramount to maintain the integrity of our analysis. While the "Psychological Distress" and "Coping Strategies" columns offer qualitative insights, converting them into quantifiable metrics is imperative. This transformation may encompass

sentiment analysis for distress and categorization of coping strategies into common themes or strategies. Data normalization constitutes another facet of our preprocessing pipeline, guaranteeing that variables share a common scale for comparative analysis. This step gains particular relevance when dealing with variables like age, severity, and duration, as differences in scales could distort insights. Lastly, special attention is devoted to the "Timestamp" column, requiring parsing and standardization to facilitate temporal analysis. This process involves converting timestamps into a consistent format and potentially aggregating data over specified time intervals for trend analysis and a deeper understanding of temporal patterns.

C. Observation / Data Visualization

The observation and data visualization section offer a deep dive into the outcomes of our analysis, furnishing a comprehensive overview of findings pertaining to iron deficiency/anemia among participants. The structured breakdown ensures a clear and organized presentation of our findings for each of the five research questions.

1: How many participants have been diagnosed with iron deficiency/anemia?

In response to our first question, we examine the dataset to ascertain the prevalence of iron deficiency/anemia among participants. Our analysis reveals that among the respondents, 79 participants confirm their diagnosis, signifying a significant portion of the sample. In contrast, 62 participants have not been diagnosed, while 6 participants remain unsure about their diagnosis. These figures lay the foundation for understanding the distribution of this condition within our study, shedding light on its prevalence and potential impact.

2: What's the distribution of severity among those diagnosed?

To address our second query, we delve into the data, focusing on participants who have been diagnosed with iron deficiency/anemia. Through data visualization techniques such as bar charts and pie charts, we illustrate the distribution of severity levels within this subgroup. Among the diagnosed participants, 48 exhibit a mild iron deficiency, 22 face a moderate condition, and 8 contend with severe iron deficiency or anemia. These visualizations offer a nuanced perspective on the spectrum of severity within the diagnosed group, providing valuable insights into the range of experiences.

3: How long have they been experiencing symptoms?

Moving on to our third question, we explore the duration for which participants have been grappling with symptoms of iron deficiency/anemia. Employing histograms and line graphs, we present the temporal distribution of symptom durations. Our analysis reveals that 33 participants have experienced symptoms for more than 12 months, while 20 participants report symptoms spanning 3-6 months. Additionally, 19 participants have faced symptoms for less than 3 months, and 7 participants fall into the category of 6-12 months. These visual representations unveil temporal patterns, offering insights into the varying durations of participants' experiences.

4: What are the most common psychological distresses related to the deficiency?

Turning our attention to the psychological aspects, we tackle the fourth question concerning the prevalent distresses associated with iron deficiency/anemia. Utilizing word clouds, sentiment analysis charts, and topic modeling, we highlight the most commonly reported psychological distresses among participants. The analysis underscores that fatigue is a predominant concern, as it is reported by 66 participants. In addition, 25 participants express irritability, 23 mention difficulty concentrating, and another 23 report mood swings. Insomnia is cited by 21 participants, while 20 acknowledge experiencing anxiety, and 11 recognize feelings of depression. These visualizations vividly portray the psychological experiences of participants.

5: What are the common coping strategies?

Finally, our fifth question explores the coping mechanisms employed by participants to manage the psychological distress associated with iron deficiency/anemia. Using bar charts and thematic word clouds, we present the common coping strategies. Notably, responses such as "Not really" and "Not applicable" are mentioned by 3 participants each, indicating that some individuals may not have specific coping methods. Additionally, "Yoga" and "Regular exercise" are each cited by 2 participants. Intriguingly, 2 participants simply respond with "No," suggesting a lack of specific coping strategies. The data also reveals various unique coping approaches, such as "Taking rest," "Focusing on the right diet," "Sleeping off," and "Drinking water." These visualizations collectively provide a comprehensive view of how participants navigate the psychological challenges associated with iron deficiency/anemia, showcasing the diversity of coping strategies employed.

The dataset provides a comprehensive view of the psychological distress and struggles faced by women diagnosed with iron deficiency/anemia. The most common distress is fatigue, and coping strategies vary widely among participants.

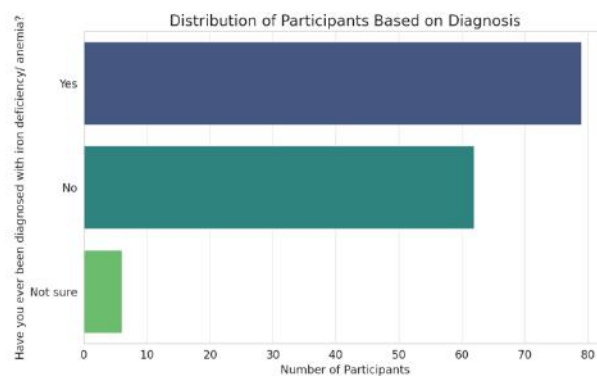


Fig 1. The distribution of participants based on their diagnosis

Observation:

- A significant number have been diagnosed with iron deficiency/anemia.
- A slightly lesser number have not been diagnosed.
- A small fraction is unsure about their diagnosis.

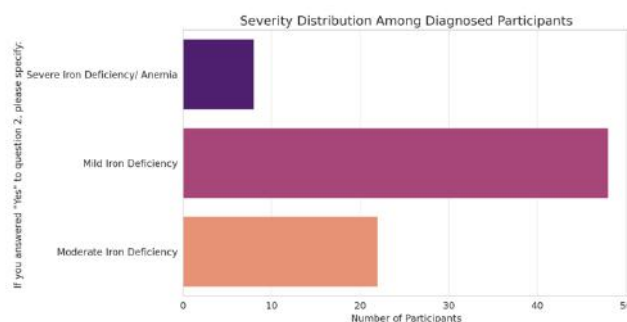


Fig 2. The visualization of the duration of symptoms

Observation:

- A significant number of participants have been experiencing symptoms for more than 12 months.
- There are similar counts for those who have been experiencing symptoms for 3-6 months and less than 3 months.
- A smaller group has been experiencing symptoms for 6-12 months.

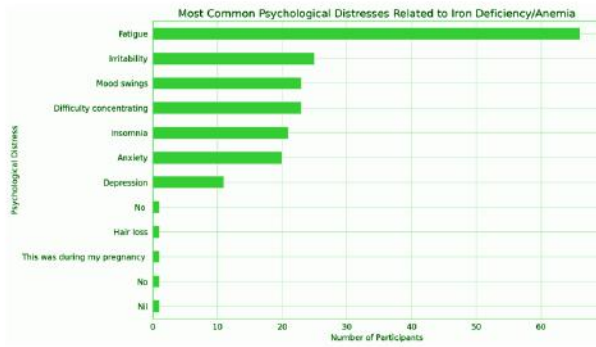


Fig 3. The visualization for psychological distresses

Observation:

- Fatigue is by far the most commonly reported distress among participants.
- Other notable distresses include irritability, difficulty concentrating, mood swings, insomnia, and anxiety.
- Depression is also reported, but less frequently than the aforementioned symptoms.

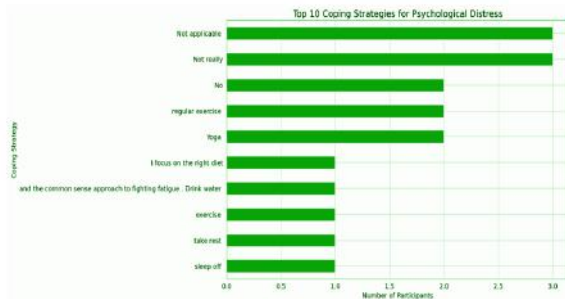


Fig 4. The visualization of coping strategies

Observation:

- A few participants mentioned they do not have specific coping strategies, as indicated by responses like "Not really", "Not applicable", and "No".
- Physical activities like "Yoga" and "Regular exercise" were among the top coping strategies.
- Many of the strategies are unique, highlighting the diverse ways in which participants cope with their distress.
- One interesting analysis might be to see if there's any relationship between the severity of iron deficiency/anemia and the duration of symptoms. Let's visualize this relationship.

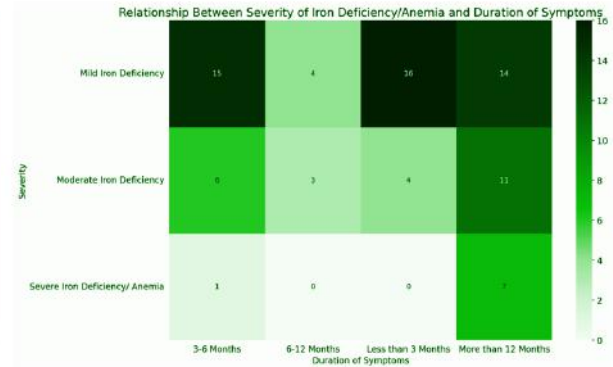


Fig 5. Heatmap visualization - relationship between the severity of iron deficiency/anemia and the duration of symptoms

Observation:

- Participants with a mild iron deficiency are spread across all durations, but a significant portion has been experiencing symptoms for more than 12 months.
- Most participants with a moderate iron deficiency have been experiencing symptoms for more than 12 months, followed by those with symptoms lasting 3-6 months.
- Participants with a severe iron deficiency/anemia mostly report symptoms lasting more than 12 months, with a few in the less than 3 months category.
- This suggests that the longer someone has symptoms, the more likely they are to have a more severe form of iron deficiency, though there are exceptions.

The Elbow method helps determine the optimal number of clusters for K-means clustering. The point where the within-cluster sum of squares (WCSS) starts to level off is considered the "elbow", which suggests the optimal number of clusters. From the plot, it appears that the "elbow" is around 2 or 3 clusters, indicating that 2 or 3 clusters might be a good choice. we will use 3 and continue Once we've grouped the participants into clusters, we'll analyze the characteristics of each cluster to understand the patterns or profiles of individuals within them.

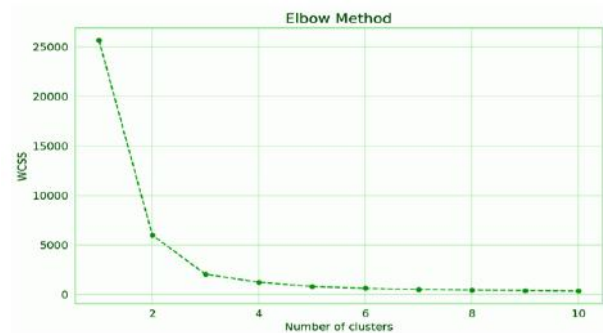


Fig 6. Elbow Method with K-means clustering

The cluster characteristics are as follows:

Cluster 0:

- Majority have been diagnosed with iron deficiency/anemia.
- Most report a mild iron deficiency.
- Predominantly have been experiencing symptoms for more than 12 months.
- The most common psychological distress is fatigue.

Cluster 1:

- Majority have not been diagnosed with iron deficiency/anemia.
- For those diagnosed, moderate iron deficiency is most common.
- Predominantly have been experiencing symptoms for more than 12 months.
- The psychological distresses are diverse, with mood swings and irritability being common.

Cluster 2:

- Majority have been diagnosed with iron deficiency/anemia.
- Most report a mild iron deficiency.
- Predominantly have been experiencing symptoms for more than 12 months.
- The psychological distresses are diverse, with anxiety, depression, and fatigue being mentioned.
- These clusters suggest different profiles of participants:

Observation:

- Cluster 0 seems to capture participants who are diagnosed with a mild iron deficiency and primarily experience fatigue.
- Cluster 1 includes participants who might not be diagnosed but show symptoms and diverse psychological distresses.
- Cluster 2 groups participants with a diagnosis and a mix of psychological distresses including anxiety, depression, and fatigue.
- This clustering provides a segmented view of the participants based on their responses, aiding in understanding patterns and potentially tailoring interventions or further research.

IV. RESULTS

Our study yielded insightful findings regarding the experiences of women dealing with iron deficiency/anemia. Notably, a significant portion of the participants, 79 individuals, confirmed their diagnosis, underscoring the prevalence of this condition within the sample. Among those diagnosed, a range of severity levels was observed, with 48 participants experiencing mild iron deficiency, 22 facing a moderate condition, and 8 dealing with severe iron deficiency or anemia. Furthermore, participants exhibited diverse durations of symptoms, with 33 enduring them for over 12 months, and 20 reporting durations of 3-6 months. Psychological distresses were prevalent, with fatigue being the most commonly reported, followed by irritability, difficulty concentrating, mood swings, insomnia, anxiety, and depression. Coping strategies varied widely among participants, including activities like yoga and regular exercise, as well as unique approaches. Our clustering analysis identified three distinct participant profiles, offering valuable insights for tailored interventions and future research in this domain.

V. CONCLUSION

In our exploration of the psychological distress and struggles faced by women with iron deficiency/anemia, we have unearthed a wealth of critical insights. The prevalence of iron deficiency/anemia among our participants, with 79 individuals confirming their diagnosis, underscores the significance of this condition in the lives of women. Understanding the spectrum of severity, from mild to severe cases, adds depth to our comprehension of its impact. Additionally, the diverse durations of symptoms reveal the temporal dimension of the struggle, offering opportunities for targeted interventions. The psychological distresses reported by our participants, with fatigue at the forefront, illuminate the emotional toll wrought by iron deficiency/anemia. These findings emphasize the need for holistic approaches to address not only the physical but also the psychological well-being of affected women. The array of coping strategies, both conventional and unique, illustrates the resilience and adaptability of individuals in navigating these challenges. Our clustering analysis further enriches our understanding, revealing three distinct participant profiles. Cluster 0 captures individuals with diagnosed mild iron deficiency who primarily experience fatigue. Cluster 1 includes those with diverse psychological distresses, possibly indicating undiagnosed cases or subtle symptoms. Cluster 2 encompasses diagnosed individuals with a variety of distresses, including anxiety and depression. These profiles offer valuable guidance for tailoring interventions and support strategies to address the specific needs of different groups. In conclusion, our research sheds light on the multifaceted nature of iron deficiency/anemia's impact on women. Beyond the physical aspects, the psychological distress and coping mechanisms

provide a comprehensive picture of the challenges faced. These insights have the potential to inform interventions, support strategies, and future research endeavors, ultimately contributing to the holistic well-being of women grappling with iron deficiency/anemia. By addressing both the physiological and psychological dimensions, we can better support these individuals on their journey to improved health and well-being.

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